34th EARSeL Symposium

European remote sensing - new opportunities for science and practice

Abstract and Programme Book

Edited by:
Bogdan Zagajewski, Anita Sabat, Martyna Golenia, Anna Robak,
Aleksandra Kusiak, Adriana Marcinkowska

University of Warsaw, Faculty of Geography and Regional Studies
Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

PUBLISHED FOR:

EARSeL - European Association of Remote Sensing Laboratories
University of Warsaw, Faculty of Geography and Regional Studies

Warsaw, June 2014

Cover design: Aleksandra Kusiak (University of Warsaw)

Cover photograph: Orthopotograph of central part of Warsaw.
Image was acquired and deliverd by MGGP Aero, Tarnów, Poland (http://mggpaero.com/).
Copyright © MGGP Aero

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Welcome and Acknowledgements

It is our honour and pleasure to invite remote sensing society to Warsaw. The main topic of 34th EARSeL Symposium held in Warsaw from 16 to 20 June 2014 is *European remote sensing - new opportunities for science and practice*, It is good time to share new ideas, activities across European borders.

The Symposium is organized by University of Warsaw Faculty of Geography and Regional Studies in cooperation with Department of Remote Sensing and Geoinformatics of Polish Geographical Society, Institute of Geodesy and Cartography and Space Research Centre of Polish Academy of Sciences.

The 34th EARSeL Symposium attracted many participants coming from many countries. Almost 310 presentations in all EARSeL events and 5 keynote speeches will discuss wide spectrum of remote sensing.

The EARSeL Symposium will be accompanying by other events:

- 2nd Workshop of Special Interest Group on Forestry Remote Sensing for forestry applications: new challenges, approaches and achievements will take time in 17-18 June 2014;
- Joint Workshop of EARSeL Special Interest Groups 3D Remote Sensing & Urban Remote Sensing will be on 19-20 June 2014;
- 5th International Workshop of the EARSeL Special Interest Group "Geological Applications" Remote Sensing and Geology "Surveying the GEOsphere" will be on 19-20 June 2014;
- EARSeL & ISPRS Young Scientist Days 2014 accompanied by 2nd Polish Student Conference on Geoinformatics and Remote Sensing will be organised from 16 to 21 June 2014. On this conference will be presented 70 poster and oral presentations and couple of courses;
- Symposium Exhibition.

The 34th EARSeL Symposium, EARSeL SIGs Workshops and Young Scientist Days would not have taken place without substantial help and advice from many people, organizations and companies. Credit for the quality of the EARSeL events goes first and foremost to the authors.
We also want to express our thanks to the chairpersons and members of Scientific Committee for reading and evaluating all the submissions and for their effort put into preparation of outstanding and interesting programmes. We are grateful to EARSeL Secretariat and Organising Committee.
The meeting could not exist without a substantial support from our sponsors, partners and cooperation of University and Faculty authorities.

We hope that the EARSeL events will contribute to the development and future successes in the field of remote sensing, serving as a useful resource for researches interested in this topic. We are also looking forward to the 35th EARSeL Symposium to be held in Stockholm in 2015

Organisers

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

ORGANISER:

CO-ORGANISERS:

PARTNERS & SPONSORS

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Scientific Committee

Dr. Katja Alanko-Huotari - Specim, Finnland
Prof. Dr. Yifang Ban - Royal Institute of Technology, Stockholm, Sweden
Prof. Dr. Marek Banaszkiewicz - Space Research Centre, Polish Aacademy of Sciences, Poland
Assoc. Prof. Dr. Marek Baranowski - Institute of Geodesy and Cartography, Poland
Prof. Dr. Matthias Braun - University Nürnberg-Erlangen, Germany
Prof. Dr. Jan Clevers - University of Wageningen, the Netherlands
Dr. Mattia Crespi - University of Rome "La Sapienza", Italy
Prof. Dr. Katarzyna Dabrowska-Zielinska - Institute of Geodesy and Cartography, Poland
Prof. Dr. Fabio Dell'Acqua - University of Pavia, Italy
Prof. Dr. Paolo Gamba - University of Pavia, Italy
Ass. Prof. Dr. Ioannis Gitas - Aristotle University of Thessaloniki, Greece
Prof. Dr. Rudi Goossens - University of Gent, Belgium
Dr. Lena Halounova - Czech Technical University, Prague, Czech Republic
Dr. Mario Hernandez - UNESCO, Paris
Prof. Dr. Karsten Jacobsen - University of Hannover, Germany
Dr. Anna Jarocinska - University of Warsaw, Poland
Prof. Dr. Carsten Jürgens - Ruhr University Bochum, Germany
Dr. Claudia Kuenzer - DRL Oberpfaffenhofen, Germany
Dr. Lucie Kupkova - Charles University, Prague, Czech Republic
Dr. Rosa Lasaponara - IMAA-CNR, Tito Scalo, Italy
Assoc. Prof. Dr. Eng. Stanislaw Lewinski - Space Research Centre, Polish Aacademy of Sciences, Poland
Prof. Dr. Artur Magnuszewski - University of Warsaw, Poland
Prof. Dr. Derya Maktav - Istanbul Technical University, Turkey
Dr. Ioannis Manakos Centre of Research & Technology - Hellas, Thessaloniki, Greece
Dr. Andreas Müller - DLR Oberpfaffenhofen, Germany
Dr. Konstantinos Nikolakopoulos - Institute of Geology and Mineral Exploration, Greece
Prof. Dr. Jan R. Oledzki - Nicolaus Copernicus University, Poland
Dr. Antonio Palucci - ENEA, Frascati, Italy
Prof. Dr. Eberhard Parlow - University of Basel, Switzerland
Prof. Dr. Konstantinos Perakis - University of Thessaly, Volos, Greece
Prof. Dr. Antonio Plaza - University of Extremadura, Spain
Dr. Rainer Reuter - University of Oldenburg, Germany
Prof. Dr. Alexander Siegmund - University of Education, Heidelberg, Germany
Ass. Prof. Dr. Demetrios Stathakis - University of Thessaly,Volos, Greece
Dr. Premysl Stych - Charles University, Prague, Czech Republic
Asc. Prof. Dr. Piotr Wezyk - Agricultural University of Cracow, Poland
Dr. Stefan Wunderle - University of Bern, Switzerland
Asc. Prof. Dr. Bogdan Zagajewski - University of Warsaw, Poland

Organising Committee

Mrs. Helga Braun - EARSeL Secretariat
Katarzyna Dabrowska-Zielinska - Institute of Geodesy and Cartography, Poland
Alicja Folbrier - University of Warsaw, Poland
Anna Jarocinska - University of Warsaw, Poland
Monika Kacprzyk - University of Warsaw, Poland
Malgorzata Krowczynska - University of Warsaw, Poland
Marlena Kycko - University of Warsaw, Poland
Stanislaw Lewinski - Space Research Centre, Polish Academy of Sciences, Poland
Adriana Marcinkowska - University of Warsaw, Poland
Adrian Ochtyra - University of Warsaw, Poland
Jan R. Oledzki - Department of Remote Sensing and Geoinformatics of Polish Geographical Society
Karolina Orłowska - University of Warsaw, Poland
Piotr Pabjanek - University of Warsaw, Poland
Reiner Reuter - University of Oldenburg, Germany
Martyna Wietecha - University of Warsaw, Poland
Ewa Wilk - University of Warsaw, Poland
Bogdan Zagajewski-(head) - University of Warsaw, Poland

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium 2014
European remote sensing - new opportunities for science and practice
University of Warsaw, Main Campus, Krakowskie Przedmiescie 26/28, Warsaw,
Warsaw, 16-19 June 2014

accompanied by:

Workshop of EARSeL Special Interest Group Forestry
(chairmen: Piotr Wężyk, Bogdan Zagajewski)
Warsaw, 17-18 June 2014

Joint Workshop of
EARSeL Special Interest Groups 3D Remote Sensing and Urban Remote Sensing
(chairmen: Mattia Crespi Carsten Jürgens, Derya Maktav, Karsten Jacobsen)
Warsaw, 19-20 June 2014

Workshop of EARSeL Special Interest Group Geological Applications
(chairman: Konstantinos G. Nikolakopoulos)
Warsaw, 19-20 June 2014

EARSeL & ISPRS Young Scientist Days
(chairpersons: Anna Jarocińska, Bogdan Zagajewski, Krzysztof Stereńczak)
Warsaw, 16-20 June 2014

34TH EARSEL SYMPOSIUM: thematic sessions and chairpersons:

Climate - Rainer Reuter, Hans Tommervik
Fluvial Remote Sensing - Luca Demarchi, Simone Bizzi, Melanie Bertrand
Water&Wetland - Lena Halounova, Artur Magnuszewski, Zbigniew Bochenek
Oceans & coastal zones - Samantha Lavender, Marullo Salvatore
Cultural & Natural Heritage - Rosa Lasaponara, Mario Hernandez, Piotr Pabjanek
Forest Fires - Ioannis Z. Gitas, Agata Hosciło, Edyta Woźniak
UAV - Koen Meuleman, Anna Zmarz
Instruments - Miroslaw Rataj, Konstantinos Perakis
Methods - Eyal Ben Dor, Małgorzata Krówczynska, Konstantinos Nikolakopoulos
Image Processing - Stanisław Lewiński Anna Jarocińska
Multitemporal Remote Sensing - Eberhard Parlow, Yifang Ban
Hyperspectral Remote Sensing - Koen Meuleman, Eyal Ben Dor, Adriana Marcinkowska
Developing Countries - Joost Vandenabeele, Jean-Christophe Schyns
Vegetation - Katarzyna Dąbrowska-Zielińska, Lucie Kupkova, Anna Jarocińska
Forestry - Piotr Wężyk, Bogdan Zagajewski
Land Cover - Ioannis Manakos, Premysl Stych
Agriculture - Jerzy Cierniewski, Ioannis Manakos
3D & Urban RS - Carsten Jürgens, Derya Maktav, Mattia Crespi, Karsten Jacobsen

KEYNOTE SPEAKERS:

Prof. M. Banaszkiewicz *Chances and challenges of Polish EO sector after joining ESA*,
Dr. Paolo Pasquali *Operational applications of satellite Synthetic Aperture Radar data*,
Prof. Z. Goraj *Design aspects of UAV platforms used in remote sensing*,
Prof. E. Parlow *Atmospheric corrections*,
Dr. F. Sarti *ESA Earth Observation programme: recent results and tools for Education & Training.*

34th EARSeL Symposium, 16-20.06.2014, University of Warsaw, Stary BUW (Old Library), ul. Krakowskie Przedmieście 26/28, 00-927 Warszawa

Time	Monday, 16.06.2014	Tuesday, 17.06.2014	Wednesday, 18.06.2014	Thursday, 19.06.2014
08.45-09.05	**Opening Session** *Audytorium*	Keynote: Design aspects of UAV platforms used in remote sensing, *Prof. Z. Goraj* *Audytorium*	Keynote: Atmospheric corrections, *Prof. E. Parlow* *Audytorium*	**Land Cover** *Ioannis Manakos, Premysl Stych* *Audytorium*
09.05-09.25	Keynote: Chances and challenges of Polish EO sector after joining ESA, *Prof. M. Banaszkiewicz* *Audytorium*			
09.25-09.30	Keynote: Operational applications of satellite Synthetic Aperture Radar data, *Dr. Paolo Pasquali* *Audytorium*	Technical break	Technical break	
09.30-10.45	**Climate** *Rainer Reuter, Hans Tommervik* *Audytorium*	**UAV** *Koen Meuleman, Anna Zmarz* *Audytorium*	**Multitemporal Remote Sensing** *Eberhard Parlow, Yifang Ban* *Audytorium* — **Vegetation** *Katarzyna Dabrowska-Zielinska, Lucie Kupkova, Anna Jarocinska* *room 105*	
10.45-11.00	Coffee Break	Coffee Break	Coffee Break	Coffee Break
11.00-11.15				Poster Session
11.15-11.30				
11.30-13.00	**Fluvial Remote Sensing** *Luca Demarchi, Simone Bizzi, Melanie Bertrand* *Audytorium*	**Instruments** *Miroslaw Rataj, Konstantinos Perakis* *Audytorium* — **Cultural & Natural Heritage** *Rosa Lasaponara, Mario Hernandez, Piotr Pabjanek* *room 107*	**Hyperspectral Remote Sensing** *Koen Meuleman, Eyal Ben Dor, Adriana Marcinkowska* *Audytorium*	**Agriculture 1** *Jerzy Cierniewski, Ioannis Manakos* *Audytorium*
13.00-14.00	Lunch	Lunch	Lunch	Lunch
14.00-15.30	**Water&Wetland** *Lena Halounova, Artur Magnuszewski, Zbigniew Bochenek* *Audytorium*	**Methods** *Eyal Ben Dor, Malgorzata Krowczynska, Kostantinos Nikolakopoulos* *Audytorium* — **Cultural & Natural Heritage** *Mario Hernandez, Rosa Lasaponara, Piotr Pabjanek* *room 107*	**General Assembly** *Audytorium*	**Agriculture 2** *Jerzy Cierniewski, Ioannis Manakos* *Audytorium* — **3D & Urban RS** *Carsten Jürgens, Derya Maktav, Mattia Crespi, Karsten Jacobsen* *room 107*
15.30-16.00	Coffee Break	Coffee Break	Coffee Break	Coffee Break
16.00-16.15	**Oceans & coastal zones** *Samantha Lavender, Marullo Salvatore* *Audytorium*	Poster Session — **Forest Fires** *Ioannis Z. Gitas, Agata Hoscilo, Edyta Wozniak* *room 107*	**Closing Session**	
16.15-16.30			Keynote: The ESA Earth Observation programme: recent results and tools for Education and Training, *Dr. F. Sarti* *Audytorium*	
16.30-17.00		**Image Processing** *Stanisław Lewinski, Anna Jarocinska* *Audytorium* — *EARSeL Council meeting (only for EARSeL Council members) room 105*	**Developing Countries** *Joost Vandenabeele, Jean-Christophe Schyns* *Audytorium* — **Forestry** *Piotr Wezyk, Bogdan Zagajewski* *room 107*	
17.00-17.30				
17.30-18.00	**Ice-breaker** *Hall of the Old Library*			
18.00-18.30			**Gala Dinner,** *Bristol Hotel, 18.30-22.30, 65 EUR/person, for full-payment participants free of charge*	**Social Dinner** *Kompania Piwna, Podwale 25 (Old Town), 35 EUR/person*

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice

EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days

University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Time	Monday, 16.06.2014	Tuesday, 17.06.2014	Wednesday, 18.06.2014
09.00-09.10		**Opening Session** *room 107*	**3D Photogrammetry / TLS / Radar applications in forestry** *room 107*
09.10-10.45		LiDAR - ALS *room 107*	
10.45-11.00		*Coffee Break* *room 107*	*Coffee Break* *room 107*
11.00-11.15			
11.15-11.30		**Hyperspectral RS and vegetation indices** *room 107*	**Forest inventory / TLS / forest mmonitoring and GIS analyses** *room 107*
11.30-13.00			
13.00-14.00		*Lunch*	**Closing Session** *room 107*
14.00-14.30		Geographic Object Based Image Analysis (GEOBIA) *room 107*	**General Assembly** *Audytorium*
		Workshop - part 1	
		ALS applications in forestry — *Monika Moskal* *room 107* | GEOBIA of RS and ALS data with eCognition (TRIMBLE) — *Marcin Pierzchalski, Pawel Hawrylo* *room 308* | LAStools – rapidlasso — *Martin Isenburg* *room 105*	
15.30-16.00	**Coffee Break**	*Coffee Break*	*Coffee Break*
16.00-16.15	**Forest Fires** *Ioannis Z. Gitas, Agata Hoscilo, Edyta Wozniak* *room 107*	Poster Session	
16.15-16.30			Keynote: ESA, Dr. F. Sarti *Audytorium*
16.30-17.00		**Workshop - part 2**	
17.00-17.30		ALS applications in forestry — *Monika Moskal* *room 107* | GEOBIA of RS and ALS data with eCognition (TRIMBLE) — *Marcin Pierzchalski, Pawel Hawrylo* *(room 308)* | LAStools – rapidlasso — *Martin Isenburg* *room 105*	**Symposium session: Forestry** *Piotr Wezyk, Bogdan Zagajewski* *room 107*
17.30-18.00	**Ice-breaker** *Hall of the Old Library*		**Gala Dinner,** *Bristol Hotel, 18.30-22.30, 65 EUR/person, for full-payment participants free of charge*

2nd Workshop of EARSeL SIG Forestry, University of Warsaw, Stary BUW (Old Library), ul. Krakowskie Przedmieście 26/28, 00-927 Warszawa

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Joint Workshop of EARSeL SIGs: 3D & Urban Remote Sensing, 19-20.06.2014, Stary BUW (Old Library), ul. Krakowskie Przedmieście 26/28, Warszawa

	Wednesday, 18.06.2014	Thursday, 19.06.2014	Friday, 20.06.2014
09.00-09.10		**Opening Session** *room 107*	**3D Session 2** *Karsten Jacobsen* *room 107*
09.10-10.25		**3D Session 1** *Mattia Crespi* *room 107*	*room 107*
10.25-10.55		Coffee Break	Poster Session
10.55-11.30			
11.30-12.45		**Urban Remote Sensing Session 1** *Carsten Jürgens* *room 107*	**Urban Remote Sensing Session 2** *Derya Maktav* *room 107*
12.45-13.00			**Closing Session** *room 107*
13.00-14.00		Lunch	Lunch
14.00-15.30		**3D & Urban Remote Sensing Joint SIGs & Symposium Session** *Carsten Jürgens, Derya Maktav, Mattia Crespi, Karsten Jacobsen* *room 107*	
15.30-16.00		Coffee Break	
16.00-18.00			
18.30-21.30	**Gala Dinner,** *Bristol Hotel, 18.30-22.30, 65 EUR/person, for full-payment participants free of charge*	**Social Dinner** *(Kompania Piwna, Podwale 25, Warszawa, Old Town), 35 EUR/person*	
21.30-22.30			

Time	Wednesday, 18.06.2014	Thursday, 19.06.2014	Friday, 20.06.2014
09.00-09.10		**Opening Session** *room 105*	**Training** *room 105*
09.10-10.45		**Geohazards I** *room 105*	*room 105*
10.45-11.00		*Coffee Break*	
11.00-11.15			
11.15-11.30		Poster session	
11.30-12.45		**Hyperspectral** *room 105*	*room 105*
12.45-13.00			**Closing Session** *room 105*
13.00-14.00		Lunch	*room 105*
14.00-15.30		**Geohazards II** *room 105*	
15.30-16.00		Coffee Break	
16.00-18.00		**Geology- Geomorphology** *room 105*	
18.30-21.30	**Gala Dinner**, *Bristol Hotel, 18.30-22.30, 65 EUR/person, for full-payment participants free of charge*	**Social Dinner** *(Kompania Piwna, Podwale 25, Warszawa, Old Town), 35 EUR/person*	
21.30-22.30			

**5th International Workshop of the EARSeL SIG Geological Applications, 19-20.06.2014,
University of Warsaw, Stary BUW (Old Library), ul. Krakowskie Przedmieście 26/28, Warszawa**

EARSeL & ISPRS Young Scientist Days, 16-20.06.2014, University of Warsaw, Stary BUW (Old Library), ul. Krakowskie Przedmieście 26/28, Warszawa

Time	Monday, 16.06.2014	Tuesday, 17.06.2014	Wednesday, 18.06.2014	Thursday, 19.06.2014	Friday, 20.06.2014
08.45-09.05	**Opening Session** *Audytorium*	Keynote: Design aspects of UAV platforms used in remote sensing, *Prof. Z. Goraj* *Audytorium*	Keynote: Atmospheric corrections, *Prof. E. Parlow* *Audytorium*	Course: **The role of the oceans in climate change,** *Rainer Reuter* *room 207*	**Urban** *room 207* — Course: **Introduction to radar data processing with NEST,** *Chris Stewart* *room 106*
09.05-09.25	Keynote: Chances and challenges of Polish EO sector after joining ESA *Prof. M. Banaszkiewicz*	Technical break	Technical break		
09.25-09.30	Keynote: Operational applications of satellite Synthetic Aperture Radar data, *Dr. Paolo Pasquali*	Course: **Introduction to basic RS data processing with LEOWorks 4,** *Chris Stewart* *room 207* — Course: **Ground based remote sensing with a Spectral Evolution spectroradiometer** *Nate Bloomingdale* *room 106*	Course: **Hyperspectral remote sensing** *Hans-Jörg Fischer* *room 106* — Course: **Introduction to optical data processing with BEAM,** *Samantha Lavender (308)*		
09.30-10.45	**Climate** *Rainer Reuter, Hans Tommervik* *Audytorium*				
10.45-11.00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
11.00-11.15					
11.15-11.30	**Vegetation** *room 207*			**Agriculture** *room 207* — Course: **SEOS – EARSeL's e-learning tutorials for science education** *Rainer Reuter* *room 207*	**Agriculture** *room 207* — Course: **Introduction to radar data processing with NEST** *Chris Stewart* *room 106*
11.30-13.00	Course: **Analysis of time series of SAR amplitude and phase images in SARscape** *Paolo Pasquali* *room 106*	Course: **Introduction to basic RS data processing with LEOWorks 4** *Chris Stewart* *room 207* — Course: **Hyperspectral remote sensing** *Hans-Jörg Fischer* *room 106* — Course: **Field remote sensing,** *Geomor-Technik* *room 105*	**Land cover** *207* — Course: **Introduction to optical data processing with BEAM** *Samantha Lavender* *room 308* — Course: GNSS surveying for remote sensing (1) *Bartosz Smaczny* *room 106*		
13.00-14.00	**Vegetation** *room 207*	Course: **LAStools - rapidlasso (1)** *Martin Isenburg* *room 105* — Course: **ALS in forestry (1)** *Monika Moskal* *room 107*	Lunch		Course: **TLS in Forestry** *IBL* *room 207* — Course: **Integrated image processing and GIS using LEOWorks 4** *Chris Stewart* *room 207*
14.00-15.30	Course: **ArcGIS - How to automate your geoprocessing efficiently?** *Maksymilian Ufa* *room 106*		**General Assembly** *Audytorium* — Course: GNSS surveying for remote sensing (2) *Bartosz Smaczny* *room 106*	Course: **Ocean remote sensing using lasers** *Rainer Reuter* *room 207*	
15.30-16.00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
16.00-16.15	**Methods** *room 207*	Poster Session	Keynote: The ESA Earth Observation programme: recent results and tools for Education and Training, *Dr. F. Sarti* *Audytorium* — Course: GNSS surveying for remote sensing (3) *Bartosz Smaczny* *room 106*	**Methods 2** *room 207* — **Forest** *room 106*	**Closing Session** *room 207*
16.15-16.30	Course: **ENVI - How to analyze vegetation condition in ENVI?** *Klaudia Bielińska* *room 106*	Course: **Hyperspectral remote sensing** *Hans-Jörg Fischer* *room 207* — Course: **LAStools - rapidlasso (2)** *Martin Isenburg* *room 105* — Course: **ALS in forestry (2)** *Monika Moskal* *room 107*			
16.30-17.00			**Water** *room 207*		
17.00-18.00					

Course: **UAVs,** Military Technical Academy (WAT) Klub WAT Kaliskiego 25a Warsaw, only for 40 participants

Programme

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

34th EARSeL Symposium

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

27

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Climate

Rainer Reuter, Hans Tommervik

Monday, 16.06.2014, 10:30-11:00, *Audytorium,*

Potential of Geostationary Satellite Imagery for Land Surface Monitoring
Kyu-Sung Lee, Hwa-Seon Lee
10:30 - 10:45
40 years Landsat time series of snow patch dynamics in N-Sweden
Eberhard Parlow
10:45 - 11:00

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

28

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Potential of Geostationary Satellite Imagery for Land Surface Monitoring

Kyu-Sung Lee, Hwa-Seon Lee

ksung@inha.ac.kr, leehwaseon@inha.edu
Inha University, Republic of Korea
http://rslab.inha.ac.kr

Keywords: geostationary satellite, time series NDVI, GOCI, land monitoring

Abstract:
High temporal resolution is an important issue for detecting and monitoring rapid land cover changes and disasters, such as forest fires, flood, and heavy snow. Geostationary satellites can be an alternative to acquire high temporal resolution images over polar orbit satellites. The geostationary ocean color imager (GOCI) is a major imaging sensors onboard the Communication Ocean and Meteorological Satellite (COMS), which was successfully launched on 27 June 2010 to a geostationary orbit of 36,000km altitude. The GOCI is indeed unique and perhaps the first ocean color sensor to provide continuous images at regional scale, which covers an area of about 2,500x2,500 km2 in northeast Asia including all of the Korean peninsula and Japan and part of China, Mongolia, and Russia.. The GOCI image has a 500m spatial resolution and is providing eight hourly observations per day during daytime. Although the GOCI was mainly developed for ocean color monitoring, it has shown appropriate radiometric quality to be used for various land applications. In this study, we are trying to evaluate the potential of the GOCI data for land surface monitoring. As an initial approach, we evaluated the temporal resolution of cloud-free normalized difference vegetation index (NDVI) composites produced by GOCI data. After radiometric and atmospheric corrections on GOCI radiance data, daily NDVI composite was produced by maximum value compositing of eight hourly images captured during daytime. Further NDVI composites were produced with different composite periods ranging from two to five days. The cloud coverage of each NDVI composite was then compared with the Moderate Resolution Imaging Spectroradiometer (MODIS) Aqua cloud product and 16-day NDVI composite. The GOCI NDVI composites showed much higher temporal resolution with less cloud coverage than the MODIS product. The average cloud coverage of the five-day GOCI NDVI composites during the one-year period was only 2.5%, which is a significant improvement compared to the 8.9%~19.3% of the 16-day MODIS NDVI composites. We also compared GOCI NDVI with MODIS Aqua 16-day NDVI acquired at the same one year period. Several sample points of known cover type were selected and time-series NDVI values were extracted for the sample locations. The number of NDVI observation is 73 for the 5-day GOCI composites and 23 for the 16-day MODIS composites. Temporal profile and absolute magnitude of NDVI were almost the same between GOCI and MODIS for vegetative areas. On the other hand, GOCI NDVI was slightly higher than MODIS NDVI for the non-vegetative bare soil and desert areas. Although further refinements are needed to enhance fidelity of NDVI for the GOCI data, the close relationship with MODIS NDVI is encouraging indication that the GOCI can be used to monitor terrestrial environments with high temporal resolution.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

40 years Landsat time series of snow patch dynamics in N-Sweden

Eberhard Parlow

eberhard.parlow@unibas.ch
University Basel, Switzerland
http://www.mcr.unibas.ch

Keywords: time series analysis, climate change, snow dynamics

Abstract:
Since last year (2013) the series of Landsat satellites has been complemented by the new Landsat 8 satellite. The Landsat data set started in 1972 and in the meantime there are more than 40 years of Landsat satellite data enabling to study dynamic changes and trends in the landscape. This data was used to study the change of late summer snow patch distribution in the northern Swedish mountains close to the research station Abisko (at 68 ° n. lat.). In this study late summer means late July until early September. At this time the year most of the snow melt has ended and most of the remaining snow patches and snow fields survive the rest of the summer when sun height is more and more decreasing resulting in less melting energy. At mid-September the first new snow is again covering the highest mountain tops. The data series of Landsat over a time span of 40 years is used to study if and how the late summer snow patch distribution has changed. The analysis considers the strong regional climatological trend from west to east with a maximum of fall and winter precipitation in the Swedish-Norwegian border zone and a summer precipitation maximum towards Kiruna. Over this west-east transect there is a decrease of annual precipitation from 1100 mm to 290 mm per annum. The first Landsat scene from this area available is from 1973 and in August 2013 the last scene for this study was taken, covering 40 years of satellite data time series. The analysis is carried out by computing temporal trend analysis over a mowing window with further analysis of in influence of altitude and aspect. The results show that over the 40 years a significant decrease of snow patch size could be manifested which is closely related to the temperature increase measured at the nearby station Abisko.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Fluvial Remote Sensing

Luca Demarchi, Simone Bizzi, Melanie Bertrand

Monday, 16.06.2014, 11:30-13:00, *Audytorium,*

Channel morphology through airborne LiDAR data: recent advances from mountain streams to large rivers
Francesco Comiti, Walter Bertoldi, Marco Cavalli, Joshua Theule, Sebastiano Trevisani
11:30 - 11:45

Characterization of riparian zones in Wallonia (Belgium) from local to regional scale using aerial LiDAR data and photogrammetric DSM
Adrien Michez, Hervé Piégay, Philippe Lejeune, Hugues Claessens
11:45 - 12:00

IN-STREAM HABITATS CHARACTERIZATION COUPLING NEAR INFRARED VHR IMAGERY AND LIDAR DERIVED PRODUCTS WITHIN A GEOGRAPHIC OBJECT BASED APPROACH
Luca Demarchi, Simone Bizzi, Christof Weissteiner
12:00 - 12:15

Hillslope erosion mapping from multi-resolution and multi-sources remote sensing data: application in the Southern French Alps
Mélanie Bertrand, Frédéric Liébault, Hervé Piégay
12:15 - 12:30

Potential and challenges of ground imagery to study wood debris production and ice dynamics in fluvial systems.
Véronique Benacchio, Hervé Piégay, Thomas Buffin-Bélanger, Kristell Michel, Lise Vaudor
12:30 - 12:45

Application of hyperspectral image for hydrodynamic model verification - Bug and Narew Rivers confluence, Poland
Artur Stanisław Magnuszewski, Bogdan Zagajewski, Łukasz Sławik, Jarosław Chormański
12:45 - 13:00

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Channel morphology through airborne LIDAR data: recent advances from mountain streams to large rivers

Francesco Comiti[1], Walter Bertoldi[2], Marco Cavalli[3], Joshua Theule[1], Sebastiano Trevisani[4]

francesco.comiti@unibz.it, joshuaisaac.theule@unibz.it
[1] Free University of Bozen-Bolzano, Italy

walter.bertoldi@unitn.it
[2] University of Trento, Italy

marco.cavalli@irpi.cnr.it
[3] National Research Council of Italy, Italy

strevisani@iuav.it
[4] University IUAV of Venice, Italy

Keywords: ALS, bathymetric LiDAR, stepped channels, braided rivers, morphometric indices

Abstract:
Airborne Laser Scanner (ALS) surveys are widely used to obtain high-resolution DTMs to be used in natural hazards preventive analysis, e.g. flood and debris-flow modelling, as well as to reconstruct sediment budget through DoD (DEM of Difference) analysis, in particular in mountain basins after large events . In contrast, the use of ALS to capture the morphometric features of stream channels is less favorable as the infrared signal, characteristic of the most common LiDAR instruments, do not penetrate deep water bodies and thus do no permit to analyze the wet portion of channels. Yet, surveys carried out by these instruments can provide sufficient data to characterize and analyze morphometrically stream channels featuring either very shallow flows relative to bed roughness(e.g. steep mountain channels) or relatively limited wet areas (e.g. braided rivers). So far, very few investigations have deployed bathymetric LiDAR surveys, also known as green LiDAR, to map river systems. Bathymetric LiDAR has the potential to offer high-resolution DTMs for morphometric analysis in river systems complementary to those mentioned above (i.e. channels with perennial and substantial wet areas) and where bathymetric surveys using boats are not easily carried out due to fast and turbulent flows. These conditions are typical of mild-sloping, single-thread or wandering mountain rivers, widely distributed worldwide, in which detailed morphometric analysis are thus very challenging when carried out through traditional approaches. We will present a state of the art of morphometric analyses used to characterize channel morphology, including published and unpublished examples from step-pool channels as well as from sinuous-meandering and braided rivers, based on both infrared and green LiDAR data.

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Characterization of riparian zones in Wallonia (Belgium) from local to regional scale using aerial LiDAR data and photogrammetric DSM

Adrien Michez[1], Hervé Piégay[2], Philippe Lejeune[1], Hugues Claessens[1]

adrien.michez@ulg.ac.be, P.Lejeune@ulg.ac.be, hugues.claessens@ulg.ac.be
[1] University of Liege - Gembloux Agro-Bio Tech - Department of Forest Nature Landscape -Unit of Forest and Nature Management, Belgium
http://www.gembloux.ulg.ac.be/gestion-des-ressources-forestieres-et-des-milieux-naturels/

Herve.Piegay@ens-lyon.fr
[2] Directeur de Recherche CNRS -Ecole Nationale Supérieure de Lyon, France
http://umr5600.univ-lyon3.fr/chercheur/piegay/piegay.html

Keywords: riparian zone monitoring, aerial LiDAR, photogrammetric digital surface model

Abstract:
The present study proposes an innovative approach to automatically extract riparian zone characteristics in order to assess its quality, from pre-determined river management reaches (1-3 km long) to regional scale (ca. 13000 km for 1000 management sectors). The aim of this remotely sensed monitoring is to improve the river and riparian zone management and planning by providing some key information for river managers. The methodology was developed based on two watersheds covering approximately 500 km of river network (ca. 200 management sectors). The riparian zone quality is evaluated through various indicators of its ecological integrity (e.g. longitudinal continuity of riparian forest, mean vegetation height and relative standard deviation), hydromorphological quality and physical settings (e.g. flow channel extent, floodplain width, channel sinuosity). The physical characteristics of the riparian zone are mainly extracted from a high quality Digital Terrain Model (derived from ALS data) while the attributes of the riparian forest are derived from a « hybrid » Canopy Height Model (photogrammetric Digital Surface Model – LiDAR derived DTM). This first research is exclusively based on data which are available at the regional scale (170000 square km) to develop automated tools to implement the methodology to the whole Walloon river network (13000 km) before 2015 with an update frequency of 3 years (photogrammetric DSM survey frequency).

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

In-Stream habitats characterization coupling Near Infrared VHR imagery and LIDAR derived products within a Geographic Object Based Approach

Luca Demarchi, Simone Bizzi, Christof Weissteiner

luca.demarchi@jrc.ec.europa.eu, simone.bizzi@jrc.ec.europa.eu, christof.weissteiner@ext.jrc.ec.europa.eu

European Commission, Joint Research Centre, Institute for Environment and Sustainability, Water Resources Unit, Via E. Fermi 2749, I-21027 Ispra, VA, Italy

Keywords: in-stream geomorphic units, Geographic Object Based Image Analysis, LiDAR, VHR imagery.

Abstract:
Recent advances in Remote Sensing (RS) techniques are transforming the way we look and analyse river systems. In this paper we focus our attention on the potentiality of RS data on mapping morphological units within river channels. The distribution of in-stream habitats in gravel-bed rivers present sequences of riffles and pools in between of which is common to find runs and standing water areas. There are various existing fluvial theories which tried to explain the periodicity and dynamics of such distribution of morphological units. So far, these theories could hardly be validated since mapping in-stream habitats required resource demanding field work which in turn provides only partial and discontinuous sampling. Semi-automated procedures based on RS datasets, allowing a continuous analysis of river systems on wider spatial and temporal scales have a great potential to improve river monitoring activities both in terms of resource savings and in accuracy results, opening promising new opportunities to understand the dynamics determining morphological units patchiness. In this work we present a new semi-automated method for the characterization of in-stream habitats where we integrate very high resolution (VHR) near infrared imagery (0.4 m) and LiDAR-derived digital terrain model (DTM at 5 m) within a geographic object based image analysis (GEOBIA). The potentialities of GEOBIA on coupling VHR and LiDAR DTM are tested for the identification of in-stream morphological units on a 40 km section of the Orco River, a tributary of the Po River (Italy). The approach was following a hierarchical segmentation combined with classification. At the first step the active channel was delineated integrating the LiDAR derived product (slope at 5 m) with the multi-spectral information. At the second level, water objects were detected within the active channel using near infrared spectral information. Finally, a supervised classification was implemented for the water objects alone. Two advanced machine learning classifiers -Random Forest and Support Vector Machines (SVM) -were tested on detecting the main in-stream habitats: riffles, pools, runs and standing waters. Different input variables based on topography, geometry, spectral and texture features were compared, in order to assess their importance on identifying different morphological units. Results show the potentialities of GEOBIA approach coupled with machine learning classifiers on characterizing in-stream features. High accuracies are achieved for both classifiers, especially for riffles and runs, whereas some confusion is present between pools and standing waters. Compared to traditional methods, the proposed procedure provides a continuous characterization of in-stream habitats along the 40 km section of the selected river in a semi-automated manner, enhancing efficiency and objectivity about the criteria adopted for the classification.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Hillslope erosion mapping from multi-resolution and multi-sources remote sensing data: application in the Southern French Alps

Mélanie Bertrand[1], Frédéric Liébault[2], Hervé Piégay[3]

melanie.bertrand@ens-lyon.fr
[1] ENS de Lyon France

[2] IRSTEA France

[3] CNRS France

Keywords: hillslope erosion, mapping, multi-sources, multi-scales, infrared orthophotos

Abstract:
The demand for accurate land-cover maps, especially for erosion features, is very needed, notably for assessing debris-flow susceptibility, because of the predisposing role of sediment supply on the debris-flow triggering and run-out. In a context of mountainous area, debris-flows can play a significant role of geomorphological agent, by eroding, reworking and depositing very large volumes of sediment in the riverbed and on alluvial fans, and the effects of sediment cascade are recognized (ecological and risk issue), so that such erosion mapping is a critical issue. It requires the development of an adapted methodological framework as only one land-cover class has to be identified, notably when questions are posed at a regional scale. In this study, we proposed a new methodology to map areal erosion in the Southern French Alps, in order to prepare an input which will contribute assessing the debris-flow susceptibility. At this large scale, the only available and accurate data source which can be used for erosion mapping is the infrared orthophotos (0.5m). This source of data has already been proved as very powerful for riverscapes mapping on the Drôme river (France). Using the Landsat 7 ETM+ images and infrared orthophotos, we defined a complex model as a combination of a set of classification methods, in order to take advantages of the spatial resolution of the orthophotos and of the wide spectral resolution of Landsat 7 ETM+ images. Results showed that this combination of multi-source and multi-resolution data significantly improved the erosion patches detection, the overall accuracy of the classification of orthophotos of the validation dataset reaching 90%.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Potential and challenges of ground imagery to study wood debris production and ice dynamics in fluvial systems.

Véronique Benacchio[1], Hervé Piégay[2], Thomas Buffin-Bélanger[3], Kristell Michel[4], Lise Vaudor[4]

veronique.benacchio@ens-lyon.fr
[1] Université de Lyon, France

[2] CNRS UMR 5600, France

[3] UQAR, Canada

[4] ENS de Lyon, France

Abstract:
Automatic cameras allow acquisition of large amount of information at high resolution in both temporal and spatial dimensions. Recently, in situ cameras have been used to study the morphological evolution of fluvial environments (e.g. bank erosion) or to quantify components of fluvial dynamics (e.g. wood debris transport or river ice development). As the amount of information increases, automatisation of the data processing becomes essential, but many challenges arise for features detection, like luminosity contrasts or speed of occurrence of a phenomenon. To analyse and quantify different key processes of fluvial geomorphology, we installed two in situ cameras. The first camera was placed on the Genissiat dam (Rhône River, France) focusing on the upstream side of the dam where pieces of woods are trapped in the reservoir, creating a large wood raft. The objective is to characterise wood raft area as a surrogate of basin wood production of the catchment over time by using remote sensing technics, especially feature based classification. Texture indexes are mainly used to achieve a discrimination between wood and water. The second camera was fixed on the banks of the St Jean River (Gaspesia, Québec) focusing on a pool section of the river. The objective here is to characterise the evolution of the ice cover, in terms of growing rate and ice types. Many challenges are met in a snowy environment, like a particular brightness of environment or homogeneity between ice classes. This study illustrates the high potential and the numerous challenges of in situ cameras to observe and quantify rapid, stochastic or complex events in fluvial systems.

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Application of hyperspectral image for hydrodynamic model verification -Bug and Narew Rivers confluence, Poland

Artur Stanisław Magnuszewski[1], Bogdan Zagajewski[2], Łukasz Sławik[3], Jarosław Chormański[4]

asmagnus@uw.edu.pl
[1] University of Warsaw, Faculty of Geography and Regional Studies, Department of Hydrology, Warsaw, Poland

bogdan@uw.edu.pl
[2] University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Warsaw, Poland

lslawik@mggpaero.com
[3] MGGP Aero, Tarnów, Poland

j.chormanski@levis.sggw.pl
[4] Warsaw University of Life Sciences, Faculty of Civil and Environmental Engineering, Department of Hydraulic Engineering, Warsaw, Poland

Keywords: AISA airborne scanner, hyperspectral image classsification, MNF, SVM, Secchi disk, flyvial geomorphology, CFD hydrodynamic model

Abstract:
Dębe dam has been build in 1963 creating Zegrze Reservoir at the confluence of two major lowland rivers Bug and Narew. Bug discharging to the reservoir deposit large volumes of sediments transported as a bedload and in water column. Water flow at the confluence of the rivers is controlled by the discharge and suspended sediments concentration. Structure of the velocity field has been obtained from two-dimensional hydrodynamic model CCHE2D. Geometry of the channel has been measured by echo-sounding, and boundary conditions are known from hydrological observations. The results of model are displayed in the form of velocity vector map and suspended sediment scalar values. It is relatively easy to verify the results of model calculations for the velocity field, but sediment concentration pattern is difficult to evaluate. The AISA hyperspectral image was acquired by MGGP Aero aircraft on 5/08/2013 and then geometrically and radiometrically corrected. The atmospheric correction was conducted with at-surface reflectance measurements using ASD FieldSpec 3 spectroradiometer. MNF allowed to analyse water mixing of Bug and Narew rivers.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Water & Wetland

Lena Halounova, Artur Magnuszewski, Zbigniew Bochenek

Monday, 16.06.2014, 14:00-15:30, *Audytorium,*

Applying Spectral Unmixing to Determine Surface Water Parameters in Mining Environment
> *Veronika - Kopackova, Lenka Hladikova*
> 14:00 - 14:15

Wetland leaf area index modelling with field and satellite hyperspectral data
> *Tomasz Berezowski, Jarosław Chormański*
> 14:15 - 14:30

Application of various classification approaches and types of satellite data for mapping wetland habitats
> *Zbigniew Bochenek, Shailesh Shrestha, Iwona Malek*
> 14:30 - 14:45

Disassembling "evapotranspiration" in-situ with a complex measurement tool including field spectrometer
> *Jaroslaw Chormanski, Tomasz Berezowski, Tomasz Okruszko, Malgorzata*
> *Kleniewska, Sylwia Szporak-Wasilewska, Jan Szatyłowicz, Okke Batelaan*
> 14:45 - 15:00

Modelling of carbon uptake for wetlands in relation to soil – vegetation parameters – examined by satellites data
> *Katarzyna Dabrowska-Zielinska, Monika Tomaszewska, Maria Budzynska, Alicja*
> *Malinska, Iwona Malek*
> 15:00 - 15:15

Monitoring of water surface changes of groundwater influenced lakes in NE Germany using RapidEye archive data
> *Iris Kleine*
> 15:15 - 15:30

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Applying spectral unmixing to determine surface water parameters in mining environment

Veronika Kopackova[1], Lenka Hladikova[2]

veronika.kopackova@seznam.cz
[1] Czech Geological Survey

[2] Charles University in Prague, Faculty of Science, Czech Republic

Keywords: image spectroscopy, water pollution, linear spectral unmixing, dissolved Fe, suspension

Abstract:

Water has been traditionally monitored by in situ measurement taking point samples at regular intervals. From an optical perspective, in addition to pure water itself, the optical properties of surface water bodies are mainly influenced by three constituents: phytoplankton, suspended sediment, and colored dissolved organic matter (CDOM). Although image spectroscopy can serve as a modern method to monitor polluted surface waters, only limited studies have been published on this topic. In our study we tested a feasibility to map properties of surface waters affected by long-term mining activities using airborne multi-flight-line HyMap hyperspectral (HS) datasets. An approach using fundamental water image end-members to map relative abundances of selected parameters of surface waters (dissolved Fe, dissolved organic carbon – DOC, non-dissolved particles) was tested and the ground truth (8 monitored ponds) was then used to validate results of spectral mapping. Although the detected end-members didn't have to be implicitly absolutely pure, they represented the most extreme water types within the studied area. Correlations between the studied water parameters and three fractional images were detected (R^2 for Fe dissolved: $R^2=0.74$, Undissolved particles: $R^2=0.57$, DOC: $R^2=0.42$), these images were further used to create the semi-quantitative maps.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Wetland Leaf Area Index modelling with field and satellite hyperspectral data

Tomasz Berezowski, Jarosław Chormański

t.berezowski@levis.sggw.pl, j.chormanski@levis.sggw.pl

Department of Hydraulic Structures, Warsaw University of Life Sciences, Nowoursynowska 166, 02-787 Warsaw, Poland

Keywords: LAI, hyperspectral data, field spectroscopy

Abstract:
Leaf Area Index (LAI) is an important variable in environmental processes modelling. Already several approaches were proposed to model wetlands LAI with remote sensing data. However, none of these methods was based on upscaling the field spectral reflectance measurements, what is a matter of this paper. In this study we use combined measurements of spectral reflectance (350-2500 nm) and LAI to establish a regression model of LAI. The spectral reflectance is beforehand resampled to the spectral resolution of a satellite hyperspectral sensor (CHRIS-PROBA) and next is used to calculate NDVI-based spectral indices. From the set of spectral indices the one with the strongest correlated with LAI is chosen for the regression. The established regression with LAI has the r2=0.69 and the error as low as 15% of data range. Finally the regression is applied on the CHRIS satellite imaged and the results are analysed in scope of different wetlands communities of the study area.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Application of various classification approaches and types of satellite data for mapping wetland habitats

Zbigniew Bochenek, Shailesh Shrestha, Iwona Małek

zbigniew.bochenek@igik.edu.pl, shailesh.shrestha@igik.edu.pl, iwona.malek@igik.edu.pl
Institute of Geodesy and Cartography, Warsaw, Poland
http://www.igik.edu.pl

Keywords: object-oriented classification, very high resolution images, wetland vegetation

Abstract:
The paper presents results of the research work aimed at developing efficient methods for classifying wetland habitats, based on different types of satellite data and on various classification approaches. At first stage of the work very high resolution World View 2 satellite images were used as basic input data. Several classification approaches were studied in order to find optimum solution for analyzing wetland environment. Finally, an object-oriented approach was applied in order to achieve high accuracy of classification of wetland vegetation classes. Several classification algorithms were tested in the course of research works – Support Vector Machines (SVM), k-Nearest Neigbour (KNN) and Bayes classifier (ML), but finally rule-based approach was found to be the best for achieving acceptable accuracy of classification. As a result of the research a semi-automatic classification method has been prepared within the eCognition environment, which enables high accuracy of the resultant map (ca. 90 %) to be reached. The map comprises eight wetland vegetation categories: two types of forest, shrub communities, sedge, moss-sedge communities, wet grassland, reeds and rushes. At the final stage of the research, applicability of microwave Terra SAR-X images for vegetation classification was also studied. Multi-temporal radar imagery collected through vegetation period 2012 has been used for wetland vegetation mapping and for monitoring environmental changes within the growing season. This study revealed that high-resolution microwave imagery can deliver complementary information for classification purposes to that obtained from optical imagery, especially useful for monitoring soil moisture regimes, which affect directly development of plant communities.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Disassembling "evapotranspiration" in-situ with a complex measurement tool including field spectrometer

Jarosław Chormański[1], Tomasz Berezowski[1], Tomasz Okruszko[1], Małgorzata Kleniewska[1], Sylwia Szporak-Wasilewska[2], Jan Szatyłowicz[3], Okke Batelaan[4]

j.chormanski@levis.sggw.pl

[1] Dept. Hydraulic Engineering, Faculty of Civil and Environmental Engineering, Warsaw University of Life Sciences, Nowoursynowska 159, 02-776 Warsaw, Poland

[2] Water Centre Laboratory, Faculty of Civil and Environmental Engineering, Warsaw University of Life Sciences, Ciszewskiego 6, 02-776 Warsaw, Poland

[3] Dept. Environmental Improvement, Faculty of Civil and Environmental Engineering, Warsaw University of Life Sciences, Nowoursynowska 159, 02-776 Warsaw, Poland

[4] School of the Environment, Flinders University, GPO Box 2100, Adelaide SA 5001, Australia

Keywords: interception canopy storage, water fluxes, field spectroscopy, wetlands

Abstract:
In this work we present a complex tool for measuring water fluxes in wetland ecosystems. The tool was designed to quantify processes related to interceptions to rage on plants leafs. The measurements are conducted by combining readings from various instruments, including: eddy covariance tower (EC), field spectrometer, SapFlow system, rain gauges above andunder canopy, soil moisture probes and other. The idea of this set-up is to provide continuous measurement of overall water flux from the ecosystem (EC tower), intercepted water volume and timing (field spectrometers), through-fall (rain gauges above and under canopy), transpiration (SapFlow), evaporation and soil moisture (soil moisture probes). Disassembling the water flux to the above components allows giving more insight to the interception related processes and differentiates them from the total evapotranspiration. The measurements are conducted in the Upper Biebrza Basin (NE Poland). The study area is part of the valley and is covered by peat soils (mainly peat moss with the exception of areas near the river) and receives no inundations waters of the Biebrza. The plant community of Agrostietum-Carici caninae is a dominant here, creating an up to 0.6 km wide belt along the river. The main result of the measurement set-up will be the analyzed characteristics and dynamics of interception storage for sedge ecosystems and a developed methodology for interception monitoring by use spectral reflectance technique. This will give a new insight to processes of evapotranspiration in wetlands and its components transpiration, evaporation from interception and evaporation from soil. The results of this research will there for contribute to a better understanding of the hydrological balance of wetland ecosystems.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Modelling of carbon uptake for wetlands in relation to soil – vegetation parameters – examined by satellites data (Climate Change Studies)

Katarzyna Dąbrowska-Zielińska, Monika Tomaszewska, Maria Budzyńska, Alicja Malińska, Iwona Małek

katarzyna.dabrowska-zielinska@igik.edu.pl, Monika.Tomaszewska@igik.edu.pl, Maria.Budzynska@igik.edu.pl, Alicja.Malinska@igik.edu.pl, iwona.malek@igik.edu.pl

Institute of Geodesy and Cartography, Poland
http://www.igik.edu.pl

Keywords: Carbon; NOAA/AVHRR; Terra MODIS

Abstract:

The role of carbon (C) in the climate evolution causes that knowledge about C exchange between surface and atmosphere is in the centre of interest in last years. Wetland ecosystems keep large amounts of organic carbon and may have large influence on global climate change. Spatial estimations of potential carbon sequestration or release are difficult to conduct. Terrestrial Net Primary Production (NPP) is the carbon related variable which plays important role between the plants and atmosphere. The attempts of calculations the approach used in this study allowed performing the "scale up" from in-situ measurements to the whole area of wetlands. The amount of carbon exchange depends on such factors as soil, hydrology (water balance components) and vegetation. The perspective of prediction of carbon requires information about land – atmosphere interaction. Net ecosystem exchange (NEE), defined as difference between CO2 uptake in gross primary production and ecosystem respiration, has been directly measured by static closed chamber method which provided Remote Sensing Center in the Institute of Geodesy and Cartography. The distribution of carbon balance has been presented in reference to vegetation and moisture calculated from satellites data. The NEE has been related to biomass and characterising hydrological conditions soil moisture and evapotranspiration deduced from NOAA/ AVHRR. The statistical Principal Components Analysis were used to create the model. It was found that the seasonal variation occurred in carbon uptake. The total balance of carbon has been calculate for the whole Biebrza Wetlands in Poland for the seasons from 2011 – 2013 years.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Monitoring of water surface changes of groundwater influenced lakes in NE Germany using RapidEye archive data

Iris Kleine

ikleine@gfz-potsdam.de
GFZ Potsdam, Germany

Keywords: groundwater influenced lakes, NE Germany, water area changes, NDWI, RapidEye

Abstract:

Groundwater influenced lakes in northeastern Germany revealed massive fluctuations in their water levels during the last decades. However, precise water level measurements were only recorded for a small numbers of lakes. In this study we evaluate the use of multi-spectral satellite data (RapidEye) to determine former water surface areas. The main test area for the evaluation is the lake "Großer Fürstenseer See" near Neustrelitz. "Großer Fürstenseer See"is characterized by asignificant increase of its water level since 2010. Between 2009 and 2013 over 50 RapidEye images were acquired. After the pre-processing of the RapidEye images, we extracted the water surface areas using a normalized difference water index (NDWI).As the shore linetopography of the lake is heterogeneous, weselected subareas of the lake for the analysis. The evaluation of the data used and the methodology are based on in situ water level records. RapidEye images enable the seasonal and annual variations of water surface changes of "Großer Fürstenseer See". The increase of the water surface area is especially visible at shallow shorelines, whereas vegetation at the shorelines hinders accurate extraction of water surface areas.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Oceans & coastal zones

Samantha Lavender, Marullo Salvatore

Monday, 16.06.2014, 16:00-17:15, *Audytorium,*

Use of video monitoring system based on high-resolution security cameras for coastal sciences
 Paweł Andrzejewski
 16:00 - 16:15
Multi-Sensor Ocean Colour Atmospheric Correction for Time-Series Data
 Samantha Jane Lavender
 16:15 - 16:30
Quantifying coastal sediments using MERIS and MODIS data in the Taranaki Bight, New Zealand.
 Mike Tuohy, Paula Nieto, Di Zhou
 16:30 - 16:45
Validation of ocean color satellite derived water-leaving radiance by latitude in Pacific and Southern Ocean
 Jung-il SHIN, Sang-il Kim, Hyun-cheol Kim
 16:45 - 17:00
Wavelet based ship detection on optical and SAR imagery
 Guillaume Jubelin, Ali Khenchaf
 17:00 - 17:15

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Use of video monitoring system based on high-resolution security cameras for coastal sciences

Paweł Andrzejewski

pawel.andrzejewski@univ.szczecin.pl
University of Szczecin, Poland

Keywords: video monitoring, remote sensing, SatBałtyk

Abstract:
The aim of this paper is to show how to implement high-resolution IP cameras into scientific, world oriented remote sensing system. Whole system can be used such as the most known video system for coastal analysis called Argus. The main concept of coastal video system is to determine parameters of camera lens distortion which are necessary to reduce image pixel errors which can affect distance inaccuracy while making on screen measurements. The other problem is to find solution how to determine internal and external parameters of the camera which are essential for rectification process. The paper describes the best known methods how to easily define all needed parameters and information for world orienting camera sets. The idea of the system needs a computer for real-time calculations, image transformations and product storing purposes. The paper shows how to develop cost-free solutions which are based on Linux/UNIX systems with use of cron jobs, bash scripting and combining them with proper software. The analysis described in this paper includes shoreline detection, waves run-up and even sand bars detection with determining their position. Everything written above is possible with use of GIS software and image processing techniques. All used methods are well known for remote sensing researchers and are mainly based on difference of pixels values and contrast balancing. Complete system described in this paper, have been developed as a part of Micore and SatBałtyk projects and was already set on two field sites in western part of Polish coast.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Multi-Sensor Ocean Colour Atmospheric Correction for Time-Series Data (Using all the information available)

Samantha Jane Lavender

slavender@pixalytics.com
Pixalytics Ltd. United Kingdom
http://www.pixalytics.com

Keywords: ocean colour; atmospheric correction

Abstract:
Traditionally ocean colour atmospheric correction (AC) has used the information available at the processing time (near real time data) or updated calibration / meteorological data for offline processing. However, the resources required for data reprocessing are reducing as datasets are kept online and multi-core processing has become common place. Therefore, reprocessing can be carried more frequently and potentially in an iterative way. Code also typically runs on a pixel-by-pixel basis and so lacks both spatial and temporal awareness of variability. However, the creation of climate quality data-sets can potentially be optimised by using all the information / knowledge gained from the image itself alongside the time-series. The premise is that the more the AC code is run for a geographical/temporal location the more it understands by remembering previous solutions. Therefore, a location database has been setup that contains the centre latitude / longitude and the validity extent for which the atmospheric knowledge, currently defined via the Angstrom exponent, can be applied both spatially and temporally. Currently the implementation is being tested on collection of satellite imagery (includes MERIS, MODIS-Aqua, MODIS-Terra, SeaWiFS and Landsat) geographically located over the southern North Sea during March 2003. This approach represents a significant departure from current research where the target has been to achieve the 'best result' on a pixel-basis as judged by the comparison to in-situ point match-ups. Therefore, the definition of a suitable result for this research is producing results that are consistent with what's expected (separation of the atmospheric from the oceanic and terrestrial signals) and allows the usage of imagery from different sensors to be combined; the AC code is run over the land as well as water as this allows for estimates of coastal vegetation and correction of estuarine and inland waters.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Quantifying coastal sediments using MERIS and MODIS data in the Taranaki Bight, New Zealand. (Sediments from satellites sans in situ sampling)

Mike Tuohy[1], Paula Nieto[2], Di Zhou[3]

m.tuohy@massey.ac.nz
[1] Senior Lecturer New Zealand

[2] Spain

[3] New Zealand

Keywords: coastal sediments, MERIS, MODIS, New Zealand

Abstract:
Five major river catchments, covering most of the southwestern North Island of New Zealand, contribute sediments into the Taranaki Bight. Both MERIS and MODIS data have been processed to provide insights into the quantities of sediments carried out to sea. Ten MERIS images, acquired between 2003 and 2013, that were cloud-free and showed high total suspended sediment concentrations, were selected. The full resolution and reduced resolution products were compared over a range of sediment concentrations. With MERIS imagery no longer available, MODIS data were evaluated. A quasi-analytical method was developed for quantifying the suspended sediment concentration from the backscattering coefficient at 645nm. Good agreement between the MERIS and MODIS estimates of the total sediments, within a zone from the coast to 50km off-shore, were achieved.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Validation of ocean color satellite derived water-leaving radiance by latitude in Pacific and Southern Ocean

Jung-il SHIN, Sang-il Kim, Hyun-cheol Kim

jishin@kopri.re.kr, sangill31@kopri.re.kr, kimhc@kopri.re.kr
Korea Polar Research Institute, Republic of Korea

Keywords: water-leaving radiance, validation, latitude, Pacific, Southern Ocean

Abstract:
Ocean color (chlorophyll-a concentration) is an important parameter to study ocean environment, fishery and climate change. The ocean color satellites data issued to estimate various environmental parameters especially including chlorophyll-a concentration. It can be estimated using ocean color algorithms based on water-leaving radiance. Almost of ocean color satellites are using a type of global ocean color algorithm although it has big difference with in-situ data in regional area. The reasons of difference could be from limitation of global ocean color algorithms or radiometric correction. Especially, high-latitude area has optical problem from low sun elevation. First of all, accurate water-leaving radiance should be derived for accurate chlorophyll-a concentration in high-latitude area. This preliminary study aims to validate water-leaving radiance of ocean color satellites by latitude in the Pacific and the Southern Ocean. In-situ water-leaving radiance was measured from October 2011 to April 2012 using Hyper-SAS spectrometer (Satlantic Inc., USA) which is installed on the ice-breaker ARAON. Study area is around of ARAON route from Incheon, South Korea (37°N, 126.5°E) to Amundsen Sea (70°S, 110°W) of Southern Ocean. In-situ measured Hyper-SAS data (upwelling radiance, sky radiance and solar irradiance) were filtered and calculated to exact water-leaving radiance by proposed protocol by NASA. Satellite derived normalized water-leaving radiance (level-2) also converted to exact water-leaving radiance by NASA protocol. Then exact water-leaving radiance data is compared for matched satellite and Hyper-SAS pairs. The result shows big difference of water-leaving radiance in high-latitude than mid-and low-latitude area. The reasons might be low solar elevation angle and different inherent optical properties of Southern Ocean water.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Wavelet based ship detection on optical and SAR imagery

Guillaume Jubelin, Ali Khenchaf

guillaume.jubelin@ensta-bretagne.fr, ali.khenchaf@ensta-bretagne.fr
ENSTA Bretagne, France

Keywords: ship detection, optical, SAR, wavelet, multiscale

Abstract:
Still important security issues of the maritime domain and observation capabilities of satellites, in particular in open-ocean, allow the emergence of operational ship detection systems based on spaceborne imagery. Initially based on SAR images, these systems use increasingly optical images because of their complementarity. In this combined use of SAR and optical images context, we present in this paper an algorithm developed to detect vessels in both types of images. The algorithm must be able to detect vessels of any size in any resolution images. The detection strategy is based on the fact that ships have a scale-dependent common signature. It is possible to reduce any vessel signature to a small vessel one: a bright localized pattern contrasting with the surrounding sea clutter. Reviewing the literature lead us to believe that the wavelet transform has the best potential to detect at different scales this common signature. Among tested decomposition and wavelets, stationary wavelet transform with the discrete Meyer wavelet provides the strongest response to the desired pattern. Without preferential orientation of vessels and with a view to reinforce signal-tonoise ratio, detail coefficients are multiplied at each scale. A conventional adaptive threshold based on local mean and standard deviation is applied at each scale. The method is set separately for optical and SAR data. A part of a data set consisting of panchromatic images from six different optical sensors and SAR images from two different is used for this purpose. The other part of the data set is used to evaluate the performance of the method. The obtained results are reported and analyzed. They validate the ability to use the same algorithm with different parameters for detecting the vessels in both the optical images and SAR images.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Remote Sensing for Cultural & Natural Heritage 1

Rosa Lasaponara, Mario Hernandez, Piotr Pabjanek

Monday, 16.06.2014, 11:30-13:00, *room 107*

From space to place: using photogrammetry and its derived products for Egyptian archaeology and geomorphology in the area of Dayr al-Barshã, middle Egypt
> *Marijn Hendrickx, Véronique De Laet, Gertrud Van Loon, Bart Vanthuyne, Harco Willems, Gert Verstraeten, Rudi Goossens*
> 11:30 - 11:45

Using surface models to analyze and detect urban pressure around the Pyramids of Giza, Egypt
> *Marijn Hendrickx, Cornelis Stal, Véronique De Laet, Gert Verstraeten, Rudi Goossens*
> 11:45 - 12:00

Remote Sensing for Monitoring urban expansion in Greater Cairo: A multi-temporal multi-sensor supervised land use classification method.
> *Jose Manuel Delgado Blasco, Gert Verstraeten, Ramon Hanssen*
> 12:00 - 12:15

Analysis of the aeolian-fluvial-human interactions in the Nile valley (central Egypt) by combining field-based geomorphology with remote sensing
> *Gert Verstraeten, Ihab Mohamed, Harco Willems, Véronique De Laet, Jose Manuel Delgado Blasco*
> 12:15 - 12:30

Integrated Remote Sensing Investigations of Ancient Quarries and Road Systems in the Greater Dayr al-Barshã Region, Middle Egypt: a Study of Logistics
> *Véronique De Laet, Gertrud Van Loon, Athena Van der Perre, Harco Willems, Gert Verstraeten*
> 12:30 - 12:45

Quantifying migration rates of barchan dunes using radar and optical remote sensing imagery
> *Ihab Mohamed, Jose Manuel Delgado Blasco, Ramon F Hanssen, Gert Verstraeten*
> 12:45 - 13:00

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

From space to place: using photogrammetry and its derived products for Egyptian archaeology and geomorphology in the area of Dayr al-Barshã, middle Egypt

Marijn Hendrickx, Véronique De Laet, Gertrud Van Loon, Bart Vanthuyne, Harco Willems, Gert Verstraeten, Rudi Goossens

Marijn.Hendrickx@Ugent.be
Belgium

Keywords: digital surface models, dynamics, photo modelling, geo-archaeology

Abstract:
Documenting and mapping cultural heritage is an important aspect nowadays in geo-archaeological research. The rapidly changing surroundings of Dayr al-Barshã where not only physical but also anthropogenic dynamics strongly influence the environment aren't an exception. Although archaeologist and geomorphologist work nowadays with remote sensing data, it is mainly done in two dimensions. The third dimension can complement this data because it introduces the height component which is quiet important in mapping and analyzing archeological and physical environments. This height component can be introduced using photogrammetry and using its derived products like digital surface models (DSMs) and orthoimages The elevation data is generated out of stereoscopic images from not only satellites like Corona, Worldview and GeoEye but also terrestrial photography and ground control points taken in the field. First of all DSMs and orthoimages have been computed using satellite images from 1970, 2009 and 2012. The most recent ones are further used as a base map to plot archaeological sites. Contour lines acquired from the generated DSMs are a perfect tool to better understand the (natural) environment of these features. To analyze anthropogenic and physical landscape dynamics, a pixel-wise subtraction is used on the DSMs from the different periods. This results in quantifying village changes, river bed movement and estimated dune volumes. Photo modeling out of terrestrial images is a second approach in this work. To accurately document and reconstruct different archaeological objects, they were photographed, measured and processed, using photo modelling software. A main example in this case was a weaver loom dug out in a quarry. Using this photo modelling approach and literature we were able to reconstruct the loom. The elaborated work illustrates that photogrammetric techniques hold great potential for geo-archaeological research from different image sources and at different (time) scales. This abstract fit within the APLADYN project: a Belgian Science Policy project on anthropogenic and landscape dynamics in large fluvial systems.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Using surface models to analyze and detect urban pressure around the Pyramids of Giza, Egypt

Marijn Hendrickx, Cornelis Stal, Véronique De Laet, Gert Verstraeten, Rudi Goossens

Marijn.Hendrickx@Ugent.be
Belgium

Keywords: Urban sprawl, change detection, digital surface models, Cairo

Abstract:
One of the largest threats to cultural heritage is their rapidly changing surroundings. The Giza pyramid plateau (Egypt) is a prime example of this phenomenon, asitis threatened by the enormous urban expansion of Cairo over the last decades. Geographic data derived from satellite images is very important for documenting and detecting suchan expansion especially urbanareas without accurate cadaster and population statistics like Cairo. Remote sensing techniques have proven to be very useful to visualize and analyze urban sprawl and land use changes in two dimensions. However, the impact assessment of urban sprawl needs to be complemented with accurate elevation data, because this urban sprawl is not only limited to planimetric growth. To create this accurate elevation data, digital surface models (DSMs) from Corona (1970), Ikonos (2005) and GeoEye (2009 and 2011) images have been computed using photogrammetric software and ground control points. This work focuses first of all on a procedure to improve 2.5D change detection from satellite imagery in mainly informal areas. A pixel-wise subtraction is performed on the 2009 and 2011 DSMs resulting in an automated change detection workflow. The proposed workflow is validated in the Hada'iq al-Ahram or Pyramid Gardens stretching west of the Giza Pyramid plateau. Based on statistical analyses of these change maps, it can be concluded that the proposed 2.5D change detection workflow using raster DSMs is the closest to reality. The resulting change maps for western Cairo do not only clarify the horizontal urban sprawl, but also the increase in building levels increase, i.e. the vertical urban expansion. Since horizon pollution is a major factor in heritage protection, a second focus is on the evolution of the view towards and from the famous pyramids during the last four decades. A viewshed analysis is performed on all DSMs resulting in change maps indicating the evolution throughout the past 40 years. With this work we proved that surface models are very useful for analyzing urban pressure on cultural heritage sites and we hope that this work will be used in the protection and conservation of our world heritage. This abstract fit within the APLADYN project: a Belgian Science Policy project on anthropogenic and landscape dynamics in large fluvial systems

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Remote sensing for monitoring urban expansion in Greater Cairo: A multi-temporal multi-sensor supervised land use classification method

Jose Manuel Delgado Blasco[1], Gert Verstraeten[2], Ramon Hanssen[1]

J.M.DelgadoBlasco@tudelft.nl, R.F.Hanssen@tudelft.nl
[1] Department of Geoscience and Remote Sensing, Delft University of Technology, Delft
The Netherlands

Gert.Verstraeten@ees.kuleuven.be
[2] KU Leuven, Department of Earth & Environmental Sciences, Leuven, Belgium

Keywords: remote sensing, urban expansion, supervised classification, Greater Cairo, Giza Pyramids

Abstract:
Greater Cairo is increasing in population and in built-up extension in the last decades. Monitoring of new construction works is crucial in this area, since some of the new buildings are threatening the Heritage Cultural Site of the Giza Pyramids. In addition, the fertile land of the Nile floodplain is also being urbanized, despite the government's prohibition since the 1990s. By using optical and radar satellite remote sensing data it is possible to monitor the urban expansion. However, both single sensor approaches have problems in properly detecting urban features in the rapidly changing environment of Greater Cairo. The solution pointed us towards the integration of active and passive remote sensing datasets. Here we present a new method to detect not only more urban features than other medium resolution sensor approaches, but also construction areas in early stages. This is done by using multi-temporal multi-sensor supervised land use classification and including a new land use class for detecting undefined anthropogenic disturbances (UAD). Our results also show the relationship between the detected UAD and the future built-up areas. The total urban extent had increased 81% since 1998 to 2010, and these new built-up areas where detected in both desert and floodplain. This information can be used for predicting the future extension of Greater Cairo. This abstract fits within the APLADYN project: a Belgian Science Policy project on anthropogenic and landscape dynamics in large fluvial systems.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Analysis of the aeolian-fluvial-human interactions in the Nile valley (central Egypt) by combining field-based geomorphology with remote sensing

Gert Verstraeten[1], Ihab Mohamed[2], Harco Willems[3], Véronique De Laet[1], Jose Manuel Delgado Blasco[4]

gert.verstraeten@ees.kuleuven.be
[1] KU Leuven, Department of Earth & Environmental Sciences, Leuven, Belgium

ihab.mohamed@narss.sci.eg
[2] National Authority for Remote Sensing & Space Sciences (NARSS), Environmental Studies & Land Use Division, Cairo & KU Leuven, Department of Earth & Environmental Sciences, Leuven, Egypt

[3] KU Leuven, Near Eastern Studies, Leuven, Belgium

[4] Department of Geoscience and Remote Sensing, Delft University of Technology, Netherlands

Keywords: corona, Landsat, dune dynamics, cultural heritage, natural heritage, river, Nile, Egypt

Abstract:
Interactions between aeolian processes and fluvial processes are important in shaping and transforming the landscape of large river systems in arid environments. This is in particular the case for the River Nile in Egypt where dune fields are entering the floodplain thereby not only destroying fertile agricultural land but also impacting the preservation of cultural heritage from former time periods. An integrated study combining traditional geomorphic field-based approaches, terrestrial geophysics as well as multi-temporal analysis of remote sensing imagery provides more information on the temporal evolution of the interaction area between the South-Rayan Dune Field (SRDF) and the Nile valley in central Egypt for the last 5000 years. Results show that the interaction area has been very dynamic whereby the invasion of dunes has impacted agricultural activities from the Old Kingdom period. Several cultivation layers, the oldest dating from the onset of the Old Kingdom, could be detected illustrating the presence of humans in a fluvial landscape that becomes influenced by aeolian processes from the mid-Holocene onwards, which is related to the general drying trend in Northern Africa. The ongoing migration of dunes preserved this Pharaonic agricultural landscape and possibly also important settlements from this time period. Through time the Nile floods were more and more blocked by invading dunes, although the sand flux into the Nile valley was insufficient to block the Nile itself. It is, however, suggested that invading sand dunes shifted the Bahr-Youssef channel further east. Sand flux estimates were provided by measuring contemporary dune migration rates through multi-temporal analysis of optical and radar imagery. At present, the major process shaping the interaction area is of anthropogenic origin. Field observations and satellite images from 1963, 1984 and 2003 showed that dunes are being removed at high rates by quarrying activities, leveling, irrigation and the establishment of agriculture. As such, these sediment archives providing valuable information on the Holocene fluvial-aeolian-human interactions, and thus can be considered are being a specific form of both cultural and natural heritage, are being obliterated at a very high rate. This abstracts fits within the APLADYN project: a Belgian Science Policy project on anthropogenic and landscape dynamics in large fluvial systems.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Integrated Remote Sensing Investigations of Ancient Quarries and Road Systems in the Greater Dayr Al-Barshã Region, Middle Egypt: a Study of Logistics

Véronique De Laet[1], Gertrud Van Loon[2], Athena Van der Perre[2], Harco Willems[2], Gert Verstraeten[1]

gert.verstraeten@ees.kuleuven.be,
[1] KU Leuven, Department of Earth and Environmental Sciences, Leuven, Belgium

harco.willems@arts.kuleuven.be
[2] KU Leuven, Near Eastern Studies, Leuven, Belgium

Keywords: archaeology, Egypt, stone quarries, roads, desert

Abstract:
Although the study of stone quarries is gaining increasing importance in Egyptian archaeology, quarry logistics, particularly as concerns transport facilities, has hitherto hardly been investigated. In the case of the quarry roads in the greater Dayr al-Barshã region (Middle Egypt), distinguishing between roads related to quarry exploitation from those resulting from other periods of use (in this case mainly related to funerary cult and Late Antique-Early Islamic monastic communities) poses another methodological problem. In this paper the use of very high spatial resolution satellite (VHSRS) technology is combined with archaeological methods to investigate the interplay between limestone quarries and roads in the study region. Remote sensing affords significant advantages over traditional survey techniques by visualizing the spatial context, whereas the spectral information content of the imagery adds information on road characteristics. Results indicate that spectral content is of less importance for road detection in desert-like conditions than the spatial resolution of the imagery. Filtering techniques have an additional value, but in general enhancement techniques such as histogram equalization are most important for mapping road networks in the greater Dayr al-Barshã region. Based on spectral and morphological characteristics, six road types could be identified, a seventh being located using traditional techniques. Ground verification in conjunction with archaeological evidence clarified the spatial context and functions of the routes in the pharaonic and later periods, serving cemetery, quarry and settlement logistics. Apart from one Middle Kingdom processional road, most roads have their origin in New Kingdom quarry activities. The road pattern we discovered provides important indications on how the stone transport was organised in a practical way. Many quarries in Dayr Abū Hinnis were not connected to harbours along the Nile, but to a long desert road that facilitated talatat transport to an area in northern Amarna. When the abandoned quarry complexes were turned into settlements in the Late Antique-Early Islamic Period, the resident communities selected parts of the existing road system for inter-site transport and transport from and to and the Nile Valley. New paths were only rarely developed. These observations demonstrate that remote sensing techniques hold great potential for surveying road patterns over large distance in desert-like conditions. This abstract fits within the APLADYN project: a Belgian Science Policy project on anthropogenic and landscape dynamics in large fluvial systems.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Quantifying migration rates of barchan dunes using radar and optical remote sensing imagery

Ihab Mohamed[1], Jose Manuel Delgado Blasco[2], Ramon F Hanssen[3], Gert Verstraeten[4]

ihab.mohamed@narss.sci.eg
[1] National Authority for Remote Sensing & Space Sciences (NARSS), Environmental Studies & Land Use Division, Cairo & KU Leuven, Department of Earth & Environmental Sciences, Leuven, Egypt

[2] Department of Geoscience and Remote Sensing, Delft University of Technology & KU Leuven, Department of Earth & Environmental Sciences, Leuven, Netherlands

[3] Department of Geoscience and Remote Sensing, Delft University of Technology, Netherlands

gert.verstraeten@ees.kuleuven.be
[4] KU Leuven, Department of Earth & Environmental Sciences, Leuven, Belgium

Keywords: Egypt, dune migration, Landsat-TM5, Envisat ASAR

Abstract:
Quantifying sand dune migration is an important aspect in analyzing desert dunes and in particular barchans dunes. Moreover, identifying the active barchans and estimating their migration rate are crucial steps for proper understanding and assessment of sand encroachment hazard. The increasing availability of remote sensing data for larger regions have made it possible to study (less)inaccessible regions such as large desert dune fields. Contrary to the detailed study on individual dunes, this has also made it possible to study the dynamics of entire dune fields. Multi-temporal analysis of remote sensing data offers to the potential to quantify dune migrations rates and sand fluxes. However, the reflectance properties of dune surfaces challenges the automatic detection and delineation of sand dunes, and thus also the automatic calculation of migration rates. In this study, barchan dunes in the South-Rayan dunefield (SRFD) in central Egypt were therefore examined through a combination of optical RS data(i.e. multi-temporal Landsat imagery) as well as with active RS data (i.e. Envisat ASAR SLC images). The method used for extracting dunes' shape from radar imagery is easier, faster and requires minimum human interaction than their extraction from optical data, however, the latter are more readily available and require less preprocessing. The dune migration rate in m a-1 of 43 dunes was estimated based on the calculation of the movement of centroids (i.e. centroid displacement) corresponding to each dune. Fieldwork (i.e. GPS-surveyed dune boundaries) and a recent GeoEye image were integrated to assess the results. Results obtained with optical and radar imagery are similar and point towards an average migration rate of 4.4 m a-1, with values for individual dunes ranging from 1 m a-1 to 18 m a-1. Moreover, the dune migration was found to be mainly controlled by dune size and the interdune slope-aspect. The centroid displacement technique is a successful approach that enabled a fully automatic calculation of barchans dune migration. This abstracts fits within the APLADYN project: a Belgian Science Policy projection anthropogenic and landscape dynamics in large fluvial systems.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Remote Sensing for Cultural & Natural Heritage 2

Mario Hernandez, Rosa Lasaponara, Piotr Pabjanek

Monday, 16.06.2014, 14:00-15:45, *room 107*

Potential of airborne lidar scanning data - "IT System of the Country's Protection against extreme hazards" (ISOK) in detection and inventory of cultural heritage
Rafał Zapłata
14:00 - 14:15

Remote Sensing technologies for natural and cultural heritage monitoring and management in Italy and Argentina
Rosa Lasaponara, Nicola Masini
14:15 - 14:30

Remote sensing of preventive archaeology: new insight in the context of the "Silk Road project"
Rosa Lasaponara, Nicola Masini
14:30 - 14:45

A View from Space over the Lower Khabur
Tobias Etessami
14:45 - 15:00

Assessment of SAR Configurations for Archaeological Survey in Desert Regions
Christopher Stewart, Rosa Lasaponara, Giovanni Schiavon
15:00 - 15:15

An overview of optical satellite data and methods for detection of archaeological distinguishing marks
Dominik Ruciński, Jan Niedzielko
15:15 - 15:30

A geometric analysis of Neolithic hunting traps in the Arabian harra
Ramon F. Hanssen, Vera Liem, Lorenzo Iannini, J. Manuel Delgado
15:30 - 15:45

34ʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Potential of airborne lidar scanning data –"IT System of the Country's Protection against extreme hazards" (ISOK) in detection and inventory of cultural heritage

Rafał Zapłata

rafalzaplata@poczta.onet.pl
Cardinal Stefan Wyszyński University in Warsaw, Poland
http://teledetekcja.nprh.uksw.edu.pl/

Keywords: airborne laser scanning, cultural heritage, monuments, Poland, ISOK

Abstract:
The aim of this paper is to discuss the potential of and chosen issues connected with airborne laser scanning, with special focus on geodata collected within the ISOK (IT System of the Country's Protection against Extreme Hazards) project, in cultural heritage research and protection. The "IT System of the Country's Protection against Extreme Hazards" is a project implemented as a part of priority axis 7 "Information society -establishment of electronic administration" of the Operational Programme Innovative Economy (POIG) 2007 -2013, on the basis of the grant agreement POIG No. 07.01.00-00-025/09-00 of 30.07.2010. The ISOK project involves the conduction of airborne laser scanning, which has already covered an area of over 65 % of Poland's territory (191 000 km^2). The ISOK-generated database provides new, unprecedented on this scale, analytical and research possibilities for archaeologists, conservators and historians of architecture in Poland. ISOK data is a resource that is already contributing to work for the benefit and protection of cultural heritage. This presentation refers to research carried out within a scientific project entitled "Use of Laser Scanning and Remote Sensing in the Protection, Analysis and Inventory of the Cultural Heritage. Development of Non-invasive, Digital Methods of Documentation and Recognition of Architectural and Archaeological Heritage Resources" conducted by the Cardinal Stefan Wyszyński University in Warsaw as part of the "National Program for the Advancement of Humanities" established by the Ministry of Science and Higher Education.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Remote sensing technologies for natural and cultural heritage monitoring and management in Italy and Argentina

Rosa Lasaponara[1], Nicola Masini[2]

rosa.lasaponara@imaa.cnr.it
[1] CNR-IMAA, Italy

n.masini@ibam.cnr.it
[2] IBAM-CNR, C/da S. Loya Tito Scalo 85050 (PZ), Italy

Abstract:
The current availability of very high resolution satellite data provides an excellent tool to detect and monitor archaeological marks, namely spectral and spatial anomalies linked to the presence of buried archaeological remains from a landscape view down to local scale (single site) investigations. Since the end of the nineteenth century, aerial photography has been the remote sensing tool most widely used in archaeology for surveying both surface and sub-surface archaeological remains. Aerial photography was a real "revolution" in archaeology being an excellent tool for investigations addressed at detecting underground archaeological structures through the reconnaissance of the so-called "archaeological marks" generally grouped and named as "soil","crop marks" "snow marks", and also recently "weed marks" (Lasaponara and Masini). Such marks are generally visible only from an aerial view (see detail in Lasaponara and Masini 2009, Ciminale et al. 2009, Masini and Lasaponara 2006 Lasaponara et al 2011) . In particular, soil marks are changes in soil colour or texture due to the presence of surface and shallow remains. Crop marks are changes in crop texture linked to as differences in height or colour of crops which are under stress due to lack of water or deficiencies in other nutrients caused by the presence of masonry structures in the subsoil. Crop marks can also be formed above damp and nutritious soil of buried pits and ditches. Such marks are generally visible only from an aerial view, especially during the spring season. In the context of the Project "Remote sensing technologies applied to the management of natural and cultural heritage in sites located in Italy and Argentina: from risk monitoring to mitigation strategies (P@an_sat)", funded by the Italian Ministry of Foreign Affair, we tested the capability of multitemporal data, from active and passive satellite sensors, in the detection of "archaeological marks". The areas of interested were selected from within Basilicata and Puglia Region, southern Patagonia and Payunia-Campo Volcanicos Liancanelo e PayunMatru respectively, in Italy and Argentina. We focused our attention on diverse surfaces and soil types in different periods of the year in order to assess the capabilities of both optical and radar data to detect archaeological marks in different ecosystems and seasons. We investigated not only crop culture during the "favourable vegetative period" to enhance the presence of subsurface remains but also the "spectral response" of spontaneous, sparse herbaceous covers during periods considered and expected to be less favourable (as for example summer and winter) for this type of investigation. The main interesting results were the capability of radar (cosmoskymed) and multispectral optical data satellite data (Pleiades, Quickbird, Geoeye) to highlight the presence of structures below the surface even (i) in during period of years generally considered not "suitable for crop mark investigations" and even (ii) in areas only covered by sparse, spontaneous herbaceous plants in several test sites investigate din both Argentine and Italian areas of interest. Preliminary results conducted in both Italian and Argentina sites pointed out that Earth Observation (EO) technology can be successfully used for the monitoring and management of natural heritage as well as for extracting useful information on traces the past human activities still fossilized in the modern landscape in different ecosystems and seasons. Moreover the multitemporal analyses of satellite data can fruitfully applied to: (i) improve knowledge, (ii) support monitoring of natural and

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

cultural site, (iii) assess natural and man-made risks including emerging threats to the heritage sites.

References:

Lasaponara R, N Masini 2009 Full-waveform Airborne Laser Scanning for the detection of medieval archaeological microtopographic relief Journal of Cultural Heritage 10, e78-e82

Ciminale M, D Gallo, R Lasaponara, N Masini 2009 A multiscale approach for reconstructing archaeological landscapes: applications in Northern Apulia (Italy) Archaeological Prospection 16 (3), 143-153

Masini N, R Lasaponara 2006 Satellite-based recognition of landscape archaeological features related to ancient human transformation Journal of Geophysics and Engineering 3 (3), 230

Lasaponara R, N Masini, E Rizzo, G Orefici 2011 New discoveries in the Piramide Naranjada in Cahuachi (Peru) usingsatellite, Ground Probing Radar and magnetic investigations Journal of Archaeological Science 38 (9), 2031-2039

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Remote sensing of preventive archaeology: new insight in the context of the "Silk Road project"

Rosa Lasaponara[1], Nicola Masini[2]

rosa.lasaponara@imaa.cnr.it
[1] CNR-IMAA, Italy

n.masini@ibam.cnr.it
[2] CNR-IBAM (Istituto per i Beni Archeologici e Monumentali), Potenza, Italy

Keywords: archaeology, Silk Road

Abstract:
In the framework of cooperation activities between CNES and CNR-IMAA and IBAM the potentialities of Pleiades satellite data have been evaluating since September 2013. Remarkable case studies have been selected from within Europe, Africa and Southern America in order to evaluate how Pleiades can support archaeological investigations in different environmental setting, ranging from desert to vegetated covers, climate conditions, from arid to temperate ecosystems, and different archaeological deposits (buried remains, filled ditches) and building materials (stone, bricks, adobe, etc..). In some cases multi temporal images have been analyzed in order to assess the visibility of 'archaeological marks' over the year. The large variety of archaeological features and contour conditions required the use of different data processing approaches to enhance and extract information of cultural interest. In detail, in Europe the phenomenon of crop marks, revealing buried remains, has been analyzed for a well known Neolithic settlement in Apulia (Southern Italy). In the desert of Nazca, Southern Peru, microrelief revealing a large pre Inca settlement built in stone have been investigated. Moreover, the capability of Pleiades images has been assessed in a comparative way with QuickBird and GeoEye data for the detection of microrelief and buried remains in adobe in the ceremonial center of Cahuachi dating back to Nazca age. Finally, Roman remains of Sabratha, in the desert of Libya, have been analyzed using both Pleiades imagery and Cosmo Skymed Spot light data. As a whole, the current evaluation, performed in a qualitative way, put in evidence the high potential of Pleiades imagery, including the stereo pair, to detect surface anomalies expected in the presence of archaeological buried remains.

References:

Lasaponara R., Masini N. (Eds) 2012, Satellite Remote Sensing: a new tool for Archaeology, Springer, Verlag Berlin Heidelberg, Series: Remote Sensing and Digital Image Processing, Vol. 16.

Lasaponara R., Masini N. 2011, Satellite Remote Sensing in Archaeology: past, present and future, Journal of Archaeological Science, 38(9), 1995–2002, doi:10.1016/j.jas.2011.02.002

Ciminale M, D Gallo, R Lasaponara, N Masini 2009 A multiscale approach for reconstructing archaeological landscapes: applications in Northern Apulia (Italy) Archaeological Prospection 16 (3), 143-153

Masini N, R Lasaponara 2006 Satellite-based recognition of landscape archaeological features related to ancient human transformation Journal of Geophysics and Engineering 3 (3), 230

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

A View from Space over the Lower Khabur
(Applying Landsat 7 Satellite Imagery for the Detection of Archaeological Features in the Syrian Jazira)

Tobias Etessami

tobias.etessami@gmail.com
Germany

Keywords: Archaeology, Remote Sensing, Landsat 7 ETM+, Spectral Search, Syria, Tell Spotting

Abstract:
This paper presents the results of a study that set out to identify archaeological features around the Lower Khabur Region, Syria, by applying a number of simple Remote Sensing methods. This approach was adopted in part due to the unfortunate turn of events on the ground, inhibiting the continuation of actual fieldwork to this day, as well as the extend of the area of interest, which is too extensive for systematic surveying even if the political situation would permit it. Particularly the work undertaken by the University of Tübingen and the Free University of Berlin has lead to the accumulation of much archaeological data, focusing in particular on settlement and associated canal systems around the Khabur proper as well as settlements further east located along the Wadi Agig. Considerable gaps in the record remain, however. In order to complement the existing archaeological find corpus imagery from the Landsast 7 ETM+ sensor were chosen and analyzed by first characterizing the natural environment as well as those archaeological features encountered during the fieldwork of the institutions mentioned above in order search and isolate pixels associated with archaeological settlements on a spectral basis. In addition colour composit images were generated in order to extend and complement the known canal structures on either side of the Khabur River on a visual basis. All findings of were mapped using GIS. Although limitations were encountered during the course of this study, particularly due to the spectral similarity between natural environment and anthrosols in the dryer steppe area east of the Khabur River, both canal structures as well as settlements were distinguishable, thus a useful contribution to existing findings could be made. Based on this, data image recommendations for future studies can be made which will consider the particular environmental conditions of the Study Area while aiming to be as low-cost as possible.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Assessment of SAR configurations for archaeological survey in desert regions

Christopher Stewart[1], Rosa Lasaponara[2], Giovanni Schiavon[1],

stewartchrisroma@gmail.com, schiavon@disp.uniroma2.it
[1] Tor Vergata University, Department of Civil Engineering and Computer Science, Rome, Italy
http://www.disp.uniroma2.it/jml/

lasaponara@imaa.cnr.it
[2] CNR IMAA, Potenza, Italy

Keywords: SAR, Archaeological Survey, Desert Regions

Abstract:
Different configurations of Synthetic Aperture Radar (SAR) are compared and assessed, in order to determine the most suitable deployment for archaeological survey in desert regions of Egypt. Data from various sensor modes of COSMO SkyMed, ALOS PALSAR and Envisat ASAR have been obtained for the analysis to enable a comparison to be made of incidence angle, microwave frequency, polarisation and spatial resolution. The optimal choice of each is assessed for the detection of buried structures and topographic features in the study areas. The focus of the analyses has been in the areas of North Sinai and Saqqara. Both areas are characterised by arid, predominantly sand covered land, with a very high density of buried archaeological structures. Processing of the SAR datasets has included multitemporal speckle filtering, sigma naught calibration, orthorectification, polarimetric and Interferometric SAR analysis. Comparison of SAR datasets has been made using RGB combinations, ratios of sigma naught backscatter in areas over and outside of buried archaeological structures, and profile plots. The analyses are still on-going, but provisional results show that high incidence angles yield better distinction of structures buried under sand and distinguished by lower SAR backscatter. Results also show that lower frequencies are more suitable for distinguishing partially buried roads characterised by higher backscatter. These contrast better with the lower backscatter of the surrounding sand, which seems to absorb the microwave signal to a greater extent in L-band than in C or X band.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

An overview of optical satellite data and methods for detection of archaeological distinguishing marks

Dominik Ruciński, Jan Niedzielko

dominik.rucinski@wasat.pl
Poland

Keywords: Remote sensing for archaeology, Vegetation index, Crop marks, Archaeological site detection

Abstract:
The presented overview is a result of the initial stage in ESA-funded ArchEO (Archaeological application of Earth Observation techniques) project which aims to assess and expand the use of Earth Observation techniques for discovery and analysis of archaeological heritage in specific Central European conditions. The region has highly anthropogenically transformed landscapes with a large percentage of agricultural lands. Three types of archaeological distinguishing marks caused by underground objects are the most important in such conditions – soil marks, vegetation marks and moisture marks. Archaeology is a scientific discipline, in which airborne remote sensing data have been successfully used for decades. In recent years the archaeological community looks favourably at the use of satellite imagery and relevant processing techniques. The most important added value offered by optical satellite remote sensing is its ability for acquisition of data in spectral ranges invisible to the human eye and the possibility to perform analysis of relationships between different bands. Nowadays there are a number of orbiting satellites providing high resolution multispectral data: GeoEye-1, Ikonos-2, Kompsat-2, QuickBird-2, WorldView-2 and Kompsat-3 (commercially operating since April 1, 2013). What is more, WorldView-3 due to be lunched in mid-2014, will provide high resolution data in one panchromatic, 8 multispectral and 8 SWIR bands (2-4 times more spectral bands than is offered by other satellites). The archival data are available from various satellite sensors, they were obtained under different vegetative, soil, seasonal and anthropogenic conditions. In conjunction with newly obtained imagery they enable comparative studies for detecting archaeological features. Three main categories of satellite-based indices for use in archaeology can be distinguished on the basis of previous researches on the topic: • Vegetation indices -based on the difference between near infrared reflectance and visible spectrum reflectance (e.g. NDVI, SR, MSR, EVI, Green NDVI, Red Edge NDVI, RVI, DVI); • Soil adjusted vegetation indices -corrected due to large percent of soil in overall reflective surface area (e.g. TSAVI, MSAVI, OSAVI); • Other specially adjusted indices – for example soil and/or atmospherically resistant indices (e.g. ARVI, SARVI, GEMI). In recent years, on the basis of in-situ hyperspectral analysis researchers have been trying to develop Normalized Archaeological Vegetation Index (NAVI) adjusted to satellite sensors. The results are promising, however further testing is required in various climatic conditions. Inaddition to satellite-based indices, spectral transformations of imagery bands can be used e.g. methods of Principal Component Analysis and Minimum Noise Fraction. Produced layers of data bands, transformed bands and indices can undergo further transformations. Spatial analysis techniques can be performed on prepared layers. Spatial filters and edge detection can improve feature detection capabilities. Furthermore, unsupervised and supervised approach to dataset classifications (both pixel-and object-based) can be performed to extract archaeological features. Despite the fact that the available satellite data sources and processing methods are various and obtained results are promising in distinguishing archaeological features, still the archaeological expert knowledge is required for their correct interpretation.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

A geometric analysis of Neolithic hunting traps in the Arabian harra

Ramon F. Hanssen, Vera Liem, Lorenzo Iannini, J. Manuel Delgado

r.f.hanssen@tudelft.nl, vl2097@gmail.com, l.iannini@tudelft.nl, J.M.DelgadoBlasco@tudelft.nl
Delft University of Technology, Netherlands

Keywords: archeology, remote sensing, geodesy

Abstract:
The black basaltic rock areas (harra's) in the northern Arabian peninsula are home to many Neolithic remains, such as rock art and inscriptions dating back to 7000 BC. One of the oldest remains of the Neolithic civilization appears to be the massive hunting traps: kilometers long shallow walls composed of basaltic rock fragments, shaped in a funnel to drive herds of wild gazelle or oryx to a focus place where they could be killed. Although they have been found over large parts of the Arabic peninsula, little is known about these 'kites', as they are commonly described. Here we report a quantitative geodetic analysis of these kites. We seek an answer to the question how the people in the Neolithic were able to design and construct such very large infrastructural works, and what guiding mechanisms they used. Our analysis focuses on a set of kites in the Jebel Qurma area in the east of Jordan. We performed GPS RTK mapping, derived a digital elevation model from Aster GDEM, and automatic mapping of the kite structures using optical (Ikonos) and synthetic aperture radar (SAR) data (TerraSAR-X). The latter was also used for precise geocoding of the spaceborne imagery. We analyze the relationship between the local topography and the kites, and comment on the correlation between local slopes of the various kite walls. It is suggested that a particular down-hill slope may have been optimal for the hunters running after the game. The fact that several kite walls follow almost perfect lines over undulating terrain implies that the people should have had primitive surveying skills, e.g. to set out intermediate points. On the other hand, slightly curving walls may have been carefully set out to follow local topographic gradients. Our results suggest a relatively advanced level of design and construct skills, where people were able to communicate and teach these skills to others.

34ʰᵗ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Forest Fires

Ioannis Z. Gitas, Agata Hościło, Edyta Woźniak

Monday, 16.06.2014, 16:00-17:15, *room 107*

Can remotely sensed data be used to support monitoring of fires in Poland?
Agata Hościło, Konrad Turlej, Milena Napiórkowska
16:00 - 16:15

Use of SAR images for assessing forest fires in the Brazilian Amazonia
Felipe C Costa, Mahdi Motagh, Olaf Hellwich
16:15 - 16:30

The satellite-based products for supporting Prevention and Recovery of Forest Fires in PREFER
Giovanni Laneve, Roberto De Bonis, Lorenzo Fusilli, Barbara Hirn, Fabrizio Ferrucci
16:30 - 16:45

Enhancement of MSG fire product by using regionalized thresholds
Ibrahim Sonmez, Erdem Erdi, Fatih Demir, Murat Arslan, Ahmet E Tekeli
16:45 - 17:00

DATA PROCESSING OF RUSSIAN FOREST FIRES REMOTE MONITORING SYSTEMS
Vitold Komorovski
17:00 - 17:15

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Can remotely sensed data be used to support monitoring of fires in Poland?

Agata Hościło, Konrad Turlej, Milena Napiórkowska

agata.hoscilo@igik.edu.pl
Institute of Geodesy and Cartography, Poland

Keywords: active fires, fire intensity, MODIS, World Fire Atlas

Abstract:
During the last decades, there is an increasing trend in number of fires observed in Poland. Fire monitoring system existing currently in Poland is based explicitly on the ground data collection. Ground data collection is usually time consuming and cost ineffective especially at large scale as national and sub-national levels. In this study we examine the potential of remotely sensed techniques in monitoring fire events in Poland. The spatio-temporal distribution of fires over Poland was ob-tainedfrom1)active fire products available globally from MODIS/Terra&AquaandATSR/Envisat (night time fires) sensors and 2) from analysis of a time series of AVHRR/NOAA images. The study covered the period 2000-2013. Detected hotspots were integrated into a satellite-based fire database and compared with the existing in situ data from the National Forest Fire Information System managed by the Forest Research Institute. Fire counts were then divided according to the land cover classification map obtained from the CORINE land cover 2006 inventory. Arable land was the most fire-affected land cove type, followed by grasslands and pastures, forest, heterogeneous agriculture area, discontinuous urban areas and wetlands. Apart for the detection of fires, we have studied the relationship between fire intensity and land cover types using the Fire Radiation Power product derived from MODIS.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Use of SAR images for assessing forest fires in the Brazilian Amazonia

Felipe C. Costa, Mahdi Motagh, Olaf Hellwich

felipe@gfz-potsdam.de, motagh@gfz-potsdam.de, olaf.hellwich@tu-berlin.de
Germany

Keywords: SAR, forest, fire, wildfire

Abstract:
This research within the framework of a master thesis (MSc.) aims to address the use of SAR (Synthetic Aperture Radar) images for monitoring forest fi res in the Brazilian Amazonia. For this purpose,time-series SAR C-Band images from Envisat and ERS (European Remote Sensing) satellites are analyzed regarding the amplitude value of the backscattered signal ("backscattering coefficient"). The backscattering coefficient will be correlated to a climatic index, the so called Daily Drought Index (DDI). This step will be done by applying the Pearson correlation which shall subsequently render a Map of Proneness to Fire. The set of SAR imagery is provided by ESA. It plays an important role as a complement of ongoing monitoring systems based on optical sensors (ESA, 2013). Maps of burnt areas generated by BSI algorithm (Burn Scar Index) applied on Landsat TM imagery will be used as a validation data. The information contained in SAR images combined with the aspects of pre-fi re conditions, surface temperature maps, physical properties and weather conditions can lead, for instance, to more accurate 'Fire Vulnerability Maps', resulting in a more efficient Fire Alarm System.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The satellite-based products for supporting Prevention and recovery of forest fires in PREFER

Giovanni Laneve[1], Roberto De Bonis[1], Lorenzo Fusilli[1], Barbara Hirn[2], Fabrizio Ferrucci[3]

laneve@psm.uniroma1.it, robertodebonis@yahoo.it, fusilli@psm.uniroma1.it
[1] Università di Roma 'La Sapienza', Italy

b.hirn@iesconsultiing.net
[2] IES Consulting Italy

f.ferrucci@gmail.com
[3] Università della Calabria, Italy

Keywords: satellite; fires; fuel map; risk; damage; burned area

Abstract:
The PREFER FP7 project aims at responding to major fire prevention needs in Southern Europe. The Mediterranean area is systematically affected by uncontrolled forest fires with large impact on ecosystems, soil erosion, slope instability, desertification trends, and local economies as a whole, with a negative mid-to-long term prospect because of expected climate change. PREFER mainly concentrate on the fire prevention and post fire recovery phases of the forest fires emergency. In fact, prevention is still the most cost-effective strategy when compared to fire-fighting and extinguishing that are costly, local, and triggered only in response to already ongoing crises. The PREFER project intends to contribute to the need of reducing the incidence of the fire phenomena in the Southern Europe's forests by: 1) providing timely multi-scale and multi-payload information products based on exploitation of all available spaceborne sensors; 2) offering a portfolio of EO products focused both on Pre-crisis and Post-crisis forest fire emergency cycle in the EU Mediterranean area; 3) preparing the exploitation of new spaceborne sensors available by 2020 (e.g.: Sentinels) and 4) contributing to the definition of user requirements for the new EO missions. The paper is devoted to illustrate the project products and, in particular, the first results of the 1st year R&D activity.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Enhancement of MSG fire product by using regionalized thresholds (MSG fire product enhancement)

Ibrahim Sonmez[1], Erdem Erdi[2], Fatih Demir[2], Murat Arslan[2], Ahmet E. Tekeli[3]

isonmez@omu.edu.tr
[1] Ondokuz Mayıs University, Turkey

eerdi@mgm.gov.tr, fdemir@mgm.gov.tr, muarslan@mgm.gov.tr
[2] Turkish State Meteorological Service, Turkey

ahmetemretekeli1975@yahoo.com
[3] King Saud University, Turkey

Keywords: MSG, fire product, Turkey

Abstract:
Wildfires are among the most harmful disasters that Mediterranean countries suffer. Each year not only remarkable amount of property and settlements are destroyed but also lives of the inhabitants are threatened. Possible effect of wildfires from regional to global scale such as, effecting air/water quality and climate change is another reason to pay specific attention. For these reasons, intense and comprehensive studies about monitoring active fires and fire prone areas are being conducted worldwide. Among these studies, satellite data is gradually used in fire detection and monitoring where various algorithms are proposed for polar orbiting and geostationary satellites data. Along with the other products, Meteorological Operations Division in EUMETSAT is providing the fire product (FIR) via EUMETCast in 15 minute cycle with the full disc coverage. The FIR algorithm considers the brightness temperatures (BT) of the IR 3.9 µm and IR 10.8 µm data obtained from Spinning Enhanced Visible and Infrared Imager (SEVIRI) instrument. The predefined 5 tests in the algorithm uses the BT of IR 3.9 µm; BT difference of IR 3.9 µm and IR 10.8 µm; standard deviations of IR 3.9 µm, standard deviations of IR 10.8 µm and difference of the standard deviations IR 3.9 µm and IR 10.8 µm. Depending on the preset thresholds, each pixel is classified as either 'possible', 'probable', or 'no fire'. Considering the 2007-2009 period dataset over Turkey, Sönmez et. al (2013) indicated less than 5 and 10% match between the FIR product and the ground fire records for the 'possible', 'probable' product types respectively. Static thresholds used in the product algorithm for the whole disc area is mentioned to be the main reason for such low detection rates and regionalized threshold use is recommended in the same study for obtaining higher detection rates for the FIR product. In this study, possible enhancement due to the regionalized thresholds use in FIR product over Turkey is investigated. As the first step of the study, the FIR product is validated using the ground truth data from the Ministry of Environmental and Forestry for the 2007-2009 period. Secondly, the best FIR product algorithm thresholds for the 5 tests that provide the highest match between the FIR product and the ground truth are determined considering the same period. The new FIR product with the regionalized threshold is generated for 2010 using the BT of the IR 3.9 µm and IR 10.8 µm for the corresponding tests. The validation of the FIR product and the FIR product with the regionalized threshold versus the ground truth data is performed separately. The contingency tables are obtained on a monthly basis and categorical statistics of probability of detection (POD) and false alarm rate (FAR) are derived for two products' validation purposes and enhancement due to the regionalized thresholds in FIR product is analyzed in detail.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Data processing of Russian forest fires remote monitoring systems

Vitold Komorovski

komorovski.w@mail.ru

Siberian Fire Rescue Academy of Russia EMERCOM, Krasnoyarsk Russian Federation

Keywords: data processing, forest fires, Russia, remote monitoring systems

Abstract:
Sustainable forestry and forest fires management are not possible in Russia without using remote monitoring data. There are three main remote monitoring systems in Russia. The purpose of the study is to consider these systems data and to offer some processing methods. Different SQL and geospatial queries have been used for the systems to be compared. Results, we have obtained, demonstrate that there are considerable contradictions between these systems. Furthermore, every year some statistical manipulations with a scope of forest fire arise. To overcome these problems we have to use an advanced processing remote monitoring datasets. Some kinds of such advanced processing methods have been suggested. To match fires from different systems we have used a fuzzy logic, we have also used agent-based approach to represent forest fires dynamics. The fuzzy logic model is considered in detail. The result of this data processing can be the basis to develop fires forecasting systems and decision support systems. The proposed methods of comparative analysis and additional processing the monitoring systems data provide some additional advantages in fire extinguishing.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

UAV

Koen Meuleman, Anna Zmarz

Tuesday, 17.06.2014, 09:30-11:00, *Audytorium*

Overview of the VITO activities in field of UAV and remote sensing
Koen D.J. Meuleman, VITO RPAS team
09:30 - 09:45

Some optimization criteria of the UAV photogrammetric flight-tracks planning
Jaroslaw Hajduk, Miroslaw Rodzewicz
09:45 - 10:00

USE OF UNMANNED AIRCRAFT SYSTEMS (UAS) IN A MULTI-SCALE VEGETATION
INDEX STUDY OF ARCTIC PLANT COMMUNITIES IN ADVENTDALEN ON SVALBARD
Hans Tømmervik, Stein-Rune Karlsen, Lennart Nilsen, Bernt Johansen, Rune Storvold,
Anna Zmarz, Pieter S.A. Beck, Kjell-Sture Johansen, Kjell-Arild Høgda, Scott Goetz,
Taejin Park, Bogdan Zagajewski, Ranga B Myneni, Jarle W Bjerke
10:00 - 10:15

Five examples of advanced UAVs for demanding applications
Wienczyslaw Plutecki
10:15 - 10:30

UAV FOR MONITORING OF INDICATOR SPECIES ON ANTARCTIC PROTECTED AREAS
Małgorzata M Korczak-Abshire, Anna Zmarz, Katarzyna J Chwedorzewska, Stein Rune
Karlsen, Mirosław Rodzewicz, Rune Storvold, Zdobysław Goraj
10:30 - 10:45

UAV APPLICATION FOR PHOTOGRAMETRIC PURPOSES
Anna Zmarz, Jarosław Hajduk
10:45 - 11:00

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Overview of the VITO activities in field of UAV and remote sensing

Koen D.J. Meuleman and VITO RPAS team

koen.meuleman@vito.be
VITO – Centre for Remote Sensing and Earth Observation Processes, Mol, Belgium

Keywords: UAV

Abstract:
VITO has been active in the field of UAV (UAS, RPAS) since 2000 when it proposed its Pegausus concept to the world: http://www.pegasus4europe.com/node/1 Since then, VITO has been developping innovative applications making use of UAV platforms For this, VITO disposes over serveral kinds of research plat forms ranging from multi-copters over small scale fixed wing platforms to larger platforms fully equipped to allow for operations in controlled airspace. VITO is further experimenting with all kinds of payloads suitable to mount into an UAV platform. These payloads are ranging from normal RGB camera's to light-weight hyperspectral systems and air quality sensors. Simultaneously lightweight GPS/IMU systems are being integrated and tested as well as a corresponding processing chain being set up. Further, as a founding member of the Belgian Unmanned Aircraft Assosciation (www.beuas.be), VITO has been very active in legaslative matters with respect to the operational use of unmanned systems for research and commercial applications. This talk will give an overview of the serveral UAV remote sensing activities and projects currently running at VITO ranging from precision agriculture to situational awareness activties.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Some optimization criteria of the UAV photogrammetric flight-tracks planning

Jarosław Hajduk[1], Mirosław Rodzewicz[2]

jaroslaw.hajduk@itwl.pl
[1] Air Force Institute of Technology, Poland

miro@meil.pw.edu.pl
[2] Warsaw University of Technology, Institute of Aeronautics and Applied Mechanics Poland

Keywords: Unmanned Aerial Vehicles (UAV), photogrammetry, flights planning

Abstract:
The UAS (Unmanned Aerial Systems), which utilize very light and small unmanned aircrafts in photogrammetric applications became a very useful supplement for the classic aerial photogrametry systems, and are preferred for flight-missions over small areas (up to 20 km^2). Light unmanned aircraft allows for the effective collection of photogrametry data with significantly reduced cost in comparison to general aviation aircraft usage, but they have also some crucial limitations, for example: limited operational range and susceptibility to windy weather conditions. In order to increase the effectiveness of photogrametrics missions, the optimization of the flight-tracks has the crucial importance. The following parameters should be taken into account for such optimization task: the shape of the area to be photographed, dynamic properties of the aircraft (i.e. cruise speed, radius of turns, time necessary for reversion of the bank angle when turning direction has to be changed, increase of power consumption necessary for passing from the straight flight to turning at a fixed altitude, etc.), control laws and navigation algorithms applied in the autopilot and the weather conditions. The authors defined the set of parameters necessary for photogrametry mission effectiveness evaluation, and then they performed analysis of some typical methods of planning the turn-points, i.e. the points to be added to the grid points of photographed area. On this basis, authors proposed their own algorithm of planning the net of turn-points in photogrametry mission, taking into account dynamic properties of the UAV mentioned above. Finally, they presented the results of the experimental verification (i.e. flight tests) and the conclusions, which may be helpful for planning the photogrametry missions in windy conditions (close to the operational limits of the UAV).

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Use of Unmanned Aircraft Systems (UAS) in a multi-scale vegetation index study of arctic plant communities in Adventdalen on Svalbard

Hans Tømmervik[1], Stein-Rune Karlsen[2], Lennart Nilsen[3], Bernt Johansen[2], Rune Storvold[2], Anna Zmarz[4], Pieter S.A. Beck[5], Kjell-Sture Johansen[2], Kjell-Arild Høgda[2], Scott Goetz[6], Taejin Park[7], Bogdan Zagajewski[4], Ranga B. Myneni, Jarle W. Bjerke[1]

hans.tommervik@nina.no, jarle.werner.bjerke@nina.no
[1] Senior Research Scientist, Norwegian Institute for Nature Research (NINA), Norway
http://www.nina.no

stein.rune.karlsen@norut.no, bernt.johansen@norut.no, rune.storvold@norut.no,
kjell.sture.johansen@norut.no, kjell-arild.hogda@norut.no
Northern Research Institute (Norut)
http://www.norut.no

lennart.nilsen@uit.no
[3] Assoc. Professor, Artctic Univeristy of Norway (UiT), Norway
http://www.uit.no

azmarz@uw.edu.pl, bogdan@uw.edu.pl
[4] University of Warsaw, Faculty of Geography and Regional Studies, Poland
http://wgsr.uw.edu.pl/en/home

psabeck@gmail.com
[5] Senior Research Scientist, Italy
http://www.councilforeuropeanstudies.org

sgoetz@whrc.com
[6] Senior Research Scientist, United States
http://www.whrc.org

parktj@bu.edu
[7] PhD student, United States
http://cliveg.bu.edu/people/tpark.html

ranga.myneni@gmail.com
[8] Professor, United States
http://cliveg.bu.edu/people/rmyneni.html

Keywords: Arctic, UAS, remote sensing, NDVI

Abstract:
Use of Unmanned Aircraft Systems (UAS) gives the opportunity to carry out research with a reduced environmental footprint. Unmanned aircraft, including both fixed wing and multi rotor types (helicopters) allow us to collect very high resolution image data for vegetation mapping without the need for any personnel walking into the site and thereby potentially disturbing the sensitive Arctic ecosystems. The main aim of this project was to explore the feasibility and accuracy of UAS-based mapping for a range of different Arctic plant communities including dense marshes, moss tundra communities and different tundra heaths. The study area of Adventdalen valley on Svalbard, Arctic Norway, is located at 71.2°N 16°E and experiences a dry Arctic climate with a mean July temperature of about 6°C. The UAS was a

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

fixed wing aircraft instrumented with a Red, Green, Blue (RGB) compact camera and a Normalized Difference Vegetation Index (NDVI) camera taking pictures from 100 meters altitude with highest ground resolution of 2.5 cm capable of mapping 2-3 km^2 per flight. The study area's two main plant communities; the Arctic bell heath and a graminoid rich Polar Willow heath were easily detected both in the NDVI and RGB images. In addition, wet moss tundra and mires were separated from the heath communities. In the NDVI image the moss-dominated mires were in most cases difficult to separate from the graminoid dominated mires, but they were well separable in RGB color space Also in-situ NDVI measurements by a handheld passive proximal sensor were simultaneously done during the flight campaign. These measurements were analyzed in order to correlate the species level NDVI and community level NDVI measurements with the NDVI images acquired at a variety of spatial resolutions by the UAS. The analysis shows that NDVIs of four main plant species at in-situ leaf and community levels were significantly correlated ($R^2 = 0.60$, p<0.01). The correlation between the surface (in-situ) NDVI community level and the UAS NDVI community level acquired from 100 meters above the surface of four main plant communities was $R^2 = 0.75$, (p<0.01), and these two scales are considered to be best for extraction of NDVI observations in Arctic areas like Svalbard.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Five examples of advanced UAVs for demanding applications

Wieńczyslaw Plutecki

wienczyslaw.plutecki@uav.com.pl
MSP, Poland
http://www.uav.com.pl

Keywords: UAV, photogrammetry, teledetection, remote sensing, GIS, aerial images

Abstract:
MSP is a Polish company which since 2001 has dealt with design, manufacturing, integration and flight testing of unmanned aerial vehicles. MSP has prepared several dozen of UAV system types weighting from 0.5 up to 150 kg. We present five chosen examples of aircrafts which have or can have the application for the teledetection / photogrammetry branch: WATSAR (combustion-powered airplane, designed to carry SAR with stabilized platform, wingspan 3.5 m, MTOW 30 kg, flight duration 1.75 h); SKARABEUSZ (electric hexacopter, with gimbal for photo or video cameras, MTOW up to 8 kg, payload (including battery set) up to 4.5 kg, flight duration 30 minutes); OSA (unmanned, 1/2 scaled model of observation aircraft, combustion-powered, wingspan 4.5 m, MTOW 100 kg); NEO (multipurpose electric motoglider with exchangeable pho-to/video or gimbal container, wingspan 3.6 m, MTOW 7.5 kg, flight duration 1.5 h); AVI (photo-grammetric electric motoglider, wingspan 3.6 m, MTOW 7 kg, flight duration 1 h).

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

UAV for monitoring of indicator species on antarctic protected areas

Małgorzata M. Korczak-Abshire[1], Anna Zmarz[2], Katarzyna J. Chwedorzewska[1],
Stein Rune Karlsen[3], Mirosław Rodzewicz[4], Rune Storvold[3], Zdobysław Goraj[4],

mka@ibb.waw.pl
[1] Institute of Biochemistry and Biophysics Polish Academy of Sciences,
Department of Antarctic Biology, Warsaw, Poland

azmarz@uw.edu.pl
[2] University of Warsaw, Facuty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland

stein-rune.karlsen@norut.no
[3] Northern Research Institute Tromsø, Norway

miro@meil.pw.edu.pl
[4] Warsaw University of Technology, Faculty of Power and Aeronautical Engineering,
Department of Aircraft Design, Warsaw, Poland

Keywords: UAV, monitoring, Antarctica

Abstract:
In order to manage the commercial harvesting of Antarctic marine living resources, the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) have initiated the CCAMLR Ecosystem Monitoring Program. Its major function is to monitor the key life-history parameters of selected dependent species to detect changes in the abundance of harvested ones. An international program to monitor indicator species, including Antarctic birds and marine mammals is conducted on their breeding, molting and resting areas in Antarctic Specially Protected Areas No. 151 (ASPA 151) (approximately 2.5 km^2) and No. 128 (ASPA 128) (approx. 17.5 km^2) on King George Island (1150 km^2), South Shetlands. Additionally this area is exhibiting rapid regional warming, which might results in changes in the range and abundance of indicator species, as well as in distribution of plants in the terrestrial ecosystems. So far analysis of animal populations and distribution of flora occurring in the research areas were based on field observations and pictures taken from ground level. A need exists to extend the study area, increase the safety of the observers and reduce costs and human pressure on the protected areas. This projects solution is to utilize Unmanned Aerial Vehicles (UAV) to collect baseline geospatial environmental data. An integral part of the study will include developing the method for processing digital multispectral images from various types of sensors installed in the UAVs. Data processing will be based on digital algorithms used in remote sensing of the environment. Application purpose of the project will also include an analysis of the Antarctic ecosystems, including preparation of the maps demonstrating distribution and condition of biotic (e.g. plants, distribution of the penguin breeding areas and estimation of these species abundance) and abiotic (e.g. soil, rocks, water, snow and ice) environmental components.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

UAV application for photogrametric purposes

Anna Zmarz[1], Jarosław Hajduk[2]

azmarz@uw.edu.pl
[1] University of Warsaw, Faculty of Geography and Regional Studies
Department of Geoinformatics and Remote Sensing, Poland

jaroslaw.hajduk@itwl.pl
[2] Air Force Institute of Technology, Warsaw, Poland

Keywords: 'UAV' PHOTOGRAMMETRY'

Abstract:
The aim of this project was to develop an UAV system equipped with automatic control system for photogrammetric projects application within area range in size of 5 km2 -20 km2 . The first step of the project includes formulating assumptions concerning aerodynamic characteristics of UAV, system control and quality of acquired data (digital imagery and ortophotomaps). Afterwards field tests in actual conditions were conducted within selected areas size 60ha and 300ha, using following components: UAV (TwinStar and Mentor), automatic control system (Papparazzi and Micropilot MP2128), digital cameras (Sigma DP2 i Canon 550D). Analysis of data recorded during the test flights (RPY, angular velocity: PQR, data from GPS receiver and AGL) as well as analysis of collected photographic material were used to draw conclusions and design an optimal, autonomous UAV system for photogrammetry. The UAV made of composite materials was constructed and requirements for the control system were formulated. The laws of controlling in a form of PID (Proportional-Integral-Derivative) controller for all control channels and navigation algorithms were formulated and tested. Moreover, control and operation systems were prepared. Algorithms of flight course planning were developed according to atmospheric conditions. Successful test and task flights were carried out. Information about operation, durability and reliability of the system were collected.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Instruments

Mirosław Rataj, Konstantinos Perakis

Tuesday, 17.06.2014, 11:30-12:45, *Audytorium*

RGBI Images with UAV and off-the-shelf compact cameras
Ralf Gehrke, Ansgar Greiwe
11:30 - 11:45

Hyperspectral imaging spectrometer SPEKTROP - first measurements
Miroslaw Rataj, Piotr Wawer, Lukasz Platos, Stanislaw Lewinski, Michal Krupinski, Artur Nowakowski, Krzysztof Stopa
11:45 - 12:00

The DLR FireBIRD Mission
Doris Klein, Eckehard Lorenz, Thomas Terzibaschian
12:00 - 12:15

"Columbus Eye" - Earth Observation from the ISS
Andreas Rienow, Henryk Hodam, Gunter Menz
12:15 - 12:15

Preparations for application of Sentinel-2 images for Norwegian users
Arnt Kristian Gjertsen, Jon Arne Trollvik
12:15 - 12:30

The Flying Laboratory - multipurpose surveillance and observation platform
Henryk Szkudlarz, Dariusz Karczmarz, Przemysław Mądrzycki, Malgorzata Perz-Osowska
12:30 - 12:45

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

RGBI images with UAV and off-the-shelf compact cameras

Ralf Gehrke, Ansgar Greiwe

ralf.gehrke@fb1.fh-frankfurt.de, ansgar.greiwe@fb1.fh-frankfurt.de
Frankfurt University of Applied Sciences, Lab for Photogrammetry and Remote Sensing, Germany

Keywords: UAV, multispectral, off-the-shelf cameras, FOVEON, radiometric properties

Abstract:
UAVs are able to close the gap between ground based (totalstation, GNSS) and airborne data acquisition. For this purpose mostly cameras in the visible range of light are used. For the capturing of non-visible wavelengths, e.g. of the near infrared for vegetation analysis, only a few sensors are commercially available until now. However, almost all common camera sensors can be modified through small interventions for the near infrared to make a RGBI (red, green, blue, near infrared) sensor head. Vegetation parameters like NDVI can be calculated from this data. A number of issues have to be considered in this approach: The camera head should be not too heavy for use on UAV and must produce high quality images under the UAVs typical surrounding conditions (vibration, shaking, short exposure times). When using two cameras, the images must be registered to each other with high accuracy. Commercial cameras are made for "beautiful" pictures. Photographic corrections such as white balance and gamma correction destroy the linear response of the sensor. This results in a light intensity dependent variation of the NDVI. At the Fachhochschule Frankfurt am Main, a sensor head has been developed to collect RGBI data. The sensor head consists of two Sigma DP2 FOVEON-sensor cameras with one camera modified for the near infrared. This sensor head is mounted to an octocopter UAV with a maximum takeoff weight of 3.5 kg and has a flight duration of approx. 15 min. The cameras are triggered simultaneously. In the post-processing, the image channels are registered to each other by a self-developed software script and a radiometric adjustment based on reference targets in the field is carried out. The resulting multispectral images are processed to multispectral orthophoto mosaics in standard photogrammetric software. A spectrometer and various test panels are available for the investigation of linear characteristics of the cameras. This paper presents the construction of the sensor head as well as the usage from the UAV-flight in the field to the resulting orthophoto mosaic. In particular the radiometric properties of the sensor should be considered. The Sigma cameras have a bad color separation due to the installed FOVEON sensors. This is balanced by the algorithms implemented in the raw data software Sigma PhotoPro, supplied by the manufacturer. However, the linear sensor characteristic is destroyed by gamma correction and white balance. Freely available raw data converter can process the Sigma data without these photographic corrections and preserve the linear characteristic, but the image quality suffers from the poor spectral separation. The paper concludes with a comparison of two orthophoto mosaics created from Sigma PhotoPro and freely available raw data converter processed images.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Hyperspectral imaging spectrometer SPEKTROP - first measurements

Mirosław Rataj, Piotr Wawer, Lukasz Płatos, Stanisław Lewiński, Michał Krupiński, Artur Nowakowski, Krzysztof Stopa

rataj@cbk.waw.pl, wawer@cbk.waw.pl, lplatos@cbk.waw.pl, stlewinski@cbk.waw.pl, mkrupinski@cbk.waw.pl, anowakowski@cbk.waw.pl, kstopa@cbk.waw.pl
Space Research Centre of the Polish Academy of Sciences (CBK PAN), Poland

Keywords: hyperspectral imaging spectrometer

Abstract:
SPEKTROP is hyperspectral imaging spectrometer for remote sensing applications designed and built in Space Research Centre of the Polish Academy of Sciences (CBK PAN). The aim of the constructors was to minimize the size and the weight of spectrometer system and therefore SPEKTROP is dedicated to measurements from different platforms. It may be used on board of UAV (unmanned aerial vehicle), airplane and helicopter. The system consists of TMA (Three Mirror Anastigmat) telescopes cooperated with CCD detectors matrix, front-end electronic module, controlling unit with data collecting and processing unit. The system is equipped (optionally) with antivibration and stabilization modules. Images are registered in spectral range 400-1000nm divided into 200 spectral bands with spectral resolution 3nm. Field of view of the system is around 4deg (possible 15 deg by replacement of CCD array). The maximum speed of image frames collection is 100 frames per second. In 2012 system SPEKTROP was adapted to work on ultra-light plane platform-monoplane SONEX. The first flights were dedicated for system configuration. During these flights one of the first SPEKTROP acquisitions were performed over the area of Piotrków Trybunalski. Results of these measurements are presented.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The DLR FireBIRD Mission (New Data for IR Applications)

Doris Klein, Eckehard Lorenz, Thomas Terzibaschian

doris.klein@dlr.de
Remote Sensing Data Center (DFD) – DLR, German

Abstract:
FireBIRD is an infrared remote sensing mission of the German Aerospace Center (DLR) which started 2012. The aim of the mission is to detect hot temperature anomalies for fire detection and fire characterization as well as thermal patterns for the analysis of ecological processes. The mission consists of two satellites, TET-1 launched 2012 and BIROS scheduled for 2015, both based on the DLR Bispectral and Infrared Remote Detection (BIRD) satellite and respective infrared sensor (2001-2004). The spectral bands covered by FireBIRD are green (460-560 nm), red (565 –725 nm), near infrared (790-930 nm), midwave infarred (3400-4200 nm) and longwave infrared (8500 – 9300 nm) part of the electromagnetic spectra. The thermal bands have a spatial resolution of 165 m while the other bands have a resolution of 40 m at best, but can be resampled through 4x4 binning onboardto156m FireBIRD is ascientific mission and by using the data scientific research questions, new algorithm development, and applications shall be fostered. Users can acquire data through a proposal review process.
With its spatial resolution of 165 m for thermal data and a repetition rate of less than 5 days the system has a much higher spatial resolution than the standard thermal sensors from MODIS or Meteosat Seviri (1 km) or the upcoming Sentinel 3 SLTSR (1 km). Thus, the FireBIRD mission has the potential of covering unique observation possibilities.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

"Columbus Eye" – Earth Observation from the ISS

Andreas Rienow, Henryk Hodam, Gunter Menz

a.rienow@geographie.uni-bonn.de, h.hodam@geographie.uni-bonn.de, g.menz@uni-bonn.de
University of Bonn, Germany

Keywords: ISS, moderate spatial resolution, HDEV, education

Abstract:
In spring 2014, SpaceX will launch the NASA High Definition Earth Viewing (HDEV) payload to the International Space Station (ISS). HDEV consists of four commercially available high definition (HD) cameras. It will be mounted to the ESA Columbus module by the station's robotic arm. Once installed, the cameras will cover three different perspectives: aft, forward, and nadir view. The German project "Columbus Eye", which is executed by the University of Bonn and is funded by the German Aerospace Center (DLR), aims at the implementation of the ISS live imagery and videos in a web portal. While NASA arranges the data reception from ISS to earth, "Columbus Eye" is responsible for the transfer, preparation, and distribution of the HDEV footage from the US to Germany. The images and videos from the ISS exhibit a moderate spatial resolution of ~280 m in nadir and a temporal resolution of 90 min. Hence, the HDEV data could be well suited for observing sudden and rapid changes and processes of the land surface and the atmosphere like earth quakes or volcano eruptions along the ISS orbit track. A data archive will be developed, providing HDEV footage free of charge via an open source web Geographic Information System (GIS). Additionally, the portal will serve as a learning platform for pupils of secondary schools. Accordingly, it will contain learning material which should motivate the students to work consciously with the HDEV footage in order to learn about curriculum relevant topics in the field of Science, Technology, Engineering, and Mathematics (STEM). The web portal of "Columbus-Eye" will be launched correspondingly to the space travel of the German astronaut Alexander Gerst in May 2014. A nationwide road show in German schools will link his mission and the fascinating bird's-eye view of the HDEV payload. The talk presents the process chains for the big data transfer, conversion, storage, provision, and educational valorization of the ISS footage.

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Preparations for application of Sentinel-2 images for Norwegian users

Arnt Kristian Gjertsen[1], Jon Arne Trollvik[2]

akg@skogoglandskap.no
[1] Norwegian Forest and Landscape Institute, Norway
http://www.skogoglandskap.no

jon.arne.trollvik@kartverket.no
[2] Norwegian Mapping Authority, Norway
http://www.kartverket.no

Abstract:
ESA's new Earth observation mission, Sentinel-2, will consist of two identical satellites, and will have high spatial and temporal resolution. At Equator the revisit frequency is every five days and at high latitudes it will be even higher because of increasing overlap between neighbouring paths. With the short time interval between images, Sentinel-2 will be ideal for observing land cover dynamics. The Norwegian Geospatial Data Infrastructure (Norway Digital) is a national cooperation among institutions producing geospatial data. Norway Digital established a technical committee in 2009 with objective to study and review the challenges and user requirements related to Sentinel-2. With the large amount of free-of-charge data from Sentinel-2, it was expected that the use of images will greatly increase along with an increase in number of use cases. However, the huge amount of data that users will need to download, pre-process, and manage is a big challenge for the remote sensing community. Four categories of use cases were identified: 1) presenting images, 2) mapping, 3) change detection, and 4) associative analysis. The trend is increasing focus on monitoring land cover dynamics. Use cases not focused on change detection also require images from several dates to synthesize cloud-free time composites. Today's single scene oriented use will shift more and more to use of satellite image time series (SITS). SITS requires high standards in the pre-processing steps: geometric accuracy must be high so that images from different dates can be precisely aligned, radiance measurements must be corrected for the influence of a highly variable atmosphere to obtain comparable surface reflectance values, and pixels covered by cloud and cloud shadow have to be detected and masked. ESA plans to use a global DEM partly based on data from the Shuttle Radar Topography Mission (SRTM) to orthorectify images to level 1C. Low resolution and some large vertical errors in the SRTM DEM make it unacceptable as basis for geometric rectification of images over Norway's rugged terrain. ESA will not deliver surface reflectance products (level 2A), but will rather provide users with software to do atmospheric correction. A national satellite data service is proposed and core service elements required are: • Mirror archive of level 1B data to secure fast access to new and historical data • Orthorectification based on an accurate and detailed national DEM (level 1C) • Production of land/water and cloud/cloud-shadow masks • Atmospheric correction producing surface reflectance (level 2A) • Processing of time composites (level 3) • Data management system to archive and distribute data A pilot project is planned to test out different technical solutions and estimate the costs of establishing and running the service.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The Flying Laboratory – multipurpose surveillance and observation platform

Henryk Szkudlarz, Dariusz Karczmarz, Przemysław Mądrzycki, Malgorzata Perz-Osowska

malgorzata.perz@itwl.pl
Air Force Institute of Technology, Poland

Keywords: flying laboratory, flight tests, data transmission, surveillance

Abstract:
The Flying Laboratory is the name of the project created in Air Force Institute of Technology. The main aim of the Flying Laboratory was to create an autonomous research system for testing avionics or onboard equipment in real flying conditions. The system could be also used for surveillance or reconnaissance purposes. The system consists of : • specially converted and equipped light airplane (Sonex); • mobile ground platform cooperating with the airplane during flight tests; • special trailer for carrying the airplane. The airplane is designed in such a way that its wings can be dismantled and the airplane with its equipment can be mounted on the trailer. The airplane can be then easily transported to its destination airfield, without the necessity of performing long flights. The system has the ability of conducting tests of onboard devices in real flying conditions before they would be mounted on other airplanes. The airplane has two pylons mounted under its wings in order to provide ability of carrying external research equipment. Apart from that a special surveillance head can be mounted on the airplane, so the system can be used for monitoring selected areas during flights. The range of research equipment that can be carried on the airplane is broad, including but not limited to: interferometer, spectrometer, pollution measurement system, contamination measurement system, surveillance head. The main advantage of the Flying Laboratory is the fact that the data obtained during flights is not only recorded on a special recorder mounted onboard of the airplane but is also transmitted in real time to the ground platform. The crew in the ground platform can analyze data during the airplane's flight, without having to wait till the airplane landing. At the beginning of December 2011 the Sonex plane was registered in the Registry of Civil Aircrafts. Since then the Flying Laboratory has been used in several projects and more projects are planned to be carried out in 2014 and 2015. Further, more detailed information about the Flying Laboratory itself as well as projects in which it can be used will be presented in the paper.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Methods

Eyal Ben Dor, Małgorzata Krówczyńska, Kostantinos Nikolakopoulos

Tuesday, 17.06.2014, 14:00-15:30, *Audytorium*

Daily land surface monitoring system based on MODIS data
  Stanisław Lewiński, Edyta Wozniak, Adam Włodarkiewicz, Krzysztof Stopa
  14:00 - 14:15
Automatic extraction of built-up areas in satellite images using fractal analysis and morphological granulometry
  Przemysław Kupidura
  14:15 - 14:30
Semi-automatic open Source geoprocessing for change-detection in federal geodata
  Andreas Wicht, Ansgar Greiwe
  14:30 - 14:45
Digital cameras spectral calibration for improvement of DCVI (digital camera vegetation index) assessment
  Michal T. Chilinski, Marek Ostrowski
  14:45 - 15:00
A Doppler lidar for remote sensing of wind fields in offshore wind farms
  Paul G. Hofmeister, Christoph Bollig, Martin Kunze, Sarah Fayed, Mehmet Latif Bayrak, Rainer Reuter
  15:00 - 15:15
Interpolating accurate TerraSAR-X science orbit data
  Dimitra Vassilaki, Thanasis Stamos
  15:15 - 15:30

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Daily land surface monitoring system based on MODIS data

Stanisław Lewiński, Edyta Woźniak, Adam Włodarkiewicz, Krzysztof Stopa

stlewinski@cbk.waw.pl, edyta_wozniak@hotmail.com, awlo@cbk.waw.pl, kstopa@cbk.waw.pl
Space Research Centre of Polish Academy of Sciences, Poland

Keywords: Remote access to satellite data, MODIS, land surface monitoring, geo-server, geo-portal

Abstract:
Satellite images are key source of information about the environment nowadays. They are acquired by dozens of different systems installed on aboard satellites orbiting the Earth or located on geostationary orbits. Thanks to that the access to unique information about our environment is possible. On the basis of satellite images, it is possible to perform analysis on different levels of complexity. MODIS (Moderate-resolution Imaging Spectroradiometer) is a payload of Terra (1999) and Aqua (2002) satellites designed in frames of NASA Earth Observing System (EOS). The images of Earth surface are collected within 36 spectral bands with different spatial resolution; 250, 500 and 1000 m. They are available in daily intervals and are dedicated to provide regional-scale environmental information. The MODIS data access is free, images are available several hours after registration. Based on MODIS satellite images the Space Research Centre of Polish Academy of Sciences (CBK PAN) designed and launched a web service for daily land surface monitoring. The basic assumption of that project was to create a system running fully automatically without the need of user interaction. There was a software procedure prepared to check new data at NASA FTP server whether it is suitable for the system. The area of interest (the entire territory of Poland) is determined automatically and downloaded to CBK PAN where further processing is also automatic. Subsets of the data are stored and then they are used to create a number of products: vegetation indices (NDVI, NDII, EVI, VARI), brightness temperatures (BT), cloud mask, water vapor content and land surface temperature (LST). All calculated indicators are stored, and maps of their distribution are automatically published on geo-portal. There are plans for the nearest future to calculate more complex indicators using an auxiliary data like Forest Fire Hazard Index FFHI. The beta version of the monitoring system operates in CBK PAN since the beginning of 2013. The implemented functions are continually tested and systematically improved. New algorithms for MODIS data processing and new functionality of geo-portal including access to the geo-portal from mobile devices like smartphones has been introduced. The monitoring system performs two basic functions: on-line monitoring of the Earth surface parameters and collecting data for future statistical calculations.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Automatic extraction of built-up areas in satellite images using fractal analysis and morphological granulometry

Przemysław Kupidura

p.kupidura@gik.pw.edu.pl
Warsaw University of Technology, Laboratory of Remote Sensing and GIS, Poland

Keywords: remote sensing, mathematical morphology, fractal analysis, contextual, classification, granulometric maps

Abstract:
The paper presents a comparison of results of the automatic extraction of built-up areas, based on fractal analysis and granulometric maps, in the Quickbird-satellite images. Built-up areas as a land-use class can be clearly seen in an aerial or satellite image, due to its high granularity, but for the same reason they are very difficult to extract using a "traditional" non-contextual, pixel-based classification. Especially in high resolution images, where built-up areas consist of pixels presenting different types of land cover, such as: buildings, roads and pavements, but also: vegetation (grass, trees), bare soil, and shadows of high objects (especially buildings). Thus, a contextual approach is required to discern this type of land use effectively. Both approaches presented in the paper, fractal analysis and morphological granulometry, base generally on a pixel-based classification, but performed on images previously processed using these two types of processes. Fractal analysis consists in an empirical computing of fractal dimension of parts of an image, using a box-counting method. Such an approach generates an image where pixel values are equal to a fractal dimension values of their neighborhood. Since we can interpret a fractal dimension as a level of granularity, a simple reclassification of such an image can improve a performance of an automatic extraction of built-up area effectively. The second approach, based on a morphological granulometry creates a number of granulometric maps -images where pixel values mean an amount of objects of certain size (each map -different size of objects) in a set neighboring fragment of an image. This way a number of these images can be processed using a pixel-based classification, to perform an effective extraction of built-up areas in an image. The research has been performed in the Quickbird images (both, panchromatic and multispectral) of a rural areas in Poland. The results of the presented approaches have been compared to the reference mask obtained basing on a visual interpretation of the image. The image spatial resolution influence on an effectiveness of the process has been tested.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Semi-automatic open source geoprocessing for change-detection in federal geodata

Andreas Wicht, Ansgar Greiwe

andreas.wicht@fb1.fh-frankfurt.de, ansgar.greiwe@fb1.fh-frankfurt.de
Frankfurt University of Applied Sciences, Lab for Photogrammetry and Remote Sensing, Germany
http://www.fh-frankfurt.de/photo

Keywords: change detection, federal geodata, open source, OBIA

Abstract:

This project addresses the vast complexity of keeping federal geodata – according to the official regulations – up to date. Cooperating with the Hessian state agency for land management and geoinformation (Hessisches Landesamt für Bodenmanagement und Geoinformation – HLBG) concepts and solutions were developed in a one year project. It is supposed to enhance the efficiency of the geodata update processes within state agencies. With the help of the concept of change detection different thematic datasets are updated. The aim of the project is to provide a thematic layer of change indicators for the staff dealing with updating datasets. The changes are being detected using an object detection approach which results are being compared to the existing federal data. Several post-processing steps then lead to a thematic layer which is being used as a visual aid for the personnel working on the detection of changes between two epochs. During the first year of the project two datasets were taken as an example to assess the feasibility of the ideas. Lake boundaries as well as relevant elevation changes (the LiDAR- based DEM is supposed to be kept up to date without subsequentflights) were processed. According to the need soft estate agency processing-rulesets (e.g. accuracy tolerances or minimum area size) were developed. The rulesets were then implemented using the Python programming language to create geoprocessing scripts as post-processing algorithms for raster database queries, which can tackle the data amount for Hesse with its ~21.000 km^2.This paper presents the methods which are being used to detect objects and derive features which are being used in the process of change detection. The whole approach is based on several input data such as: four channel digital orthophotos (RGBI), photogrammetric point clouds, LiDARbased DEMs and rasterised topographic vector data such as land use. Due to the high topicality of the oriented aerial images their derivatives (photogrammetric point clouds, orthophotos) serve as the core element for the detection of change features in the more recent epoch. Extrapolation of the processing times for test-areas of the first thematic datasets resulted in reasonable processing times (< 6 h) for the whole federal state of Hesse. Therefore further studies are supposed to be conducted as the project is extended.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Digital cameras spectral calibration for improvement of DCVI (Digital Camera Vegetation Index) assessment

Michał T. Chiliński[1], Marek Ostrowski[2]

mich@igf.fuw.edu.pl
[1] University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Poland

samper@samper.pl
[2] Laboratory of Image-based Information and Modelling, Faculty of Biology,
University of Warsaw, Poland

Keywords: digital camera, DCVI, vegetation, UAS, CCD/CMOS matrix calibration

Abstract:
The last few years have been a period of rapid increase in the application of the lightweight unmanned aerial system (UAS) in science, farming and emergency management. Today, UAS are cheap, very mobile, and easy to pilot, enabling very quick preparation of measurements and offering low operational costs. In this respect, UAS are the best method for measurements with a lightweight sensor for low altitudes. The total mass of a payload is one of the most important limitations of UAS, what forces their users to develop and install light and miniaturized sensors. The cost of development and production of remote sensing devices is a significant factor, and due to that there is common practice of using simpler sensors, i.e. the home-made ones, constructed from mass production units. The most popular sensor made from a standard consumer product is a digital camera, without the IR filter (hot mirror) and equipped with a color filter, with the possibility to register the near infrared spectrum range. Consequently, it can be used for the calculation of the vegetation condition index (DCVI). Producers of digital cameras treat spectral response curves of CCD/CMOS matrix as confidential data and researchers usually base on simple division of blue and red pixel data, whose spectra are limited by a color filter mounted in front of matrix or lens. For the purpose of simple assessment of vegetation state from low-altitudes it is essentially enough, however for wider differentiation and quantity analysis, enhanced sensors are required. In my presentation, I will describe the method of obtaining digital camera spectral sensitivity curves with the use of monochromator and I will explain how retrieved spectral curve can improve algorithms for calculation of DCVI. The calibration process of one camera is fast, nevertheless it requires specialized and expensive equipment, which is out of reach for usual users of digital cameras. During the first test of the cameras from the same model, very good coherence of measured spectral characteristics was shown, what allows to replicate and reuse one calibration curve for all devices of the same model/series. The improvement of DCVI retrieval with spectral sensitivity curve will be illustrated by a series of low-altitude pictures taken with digital camera with and without the calibration. As a point of reference, a fully calibrated hyperspectral imaging sensor was used.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

A Doppler LIDAR for remote sensing of wind fields in offshore wind farms

Paul G. Hofmeister, Christoph Bollig, Martin Kunze, Sarah Fayed, Mehmet Latif Bayrak, Rainer Reuter

paul.gerke.hofmeister@uni-oldenburg.de, chris@bollig.info, martin.kunze@uni-oldenburg.de, sarah.fayed@uni-oldenburg.de, mehmet.latif.bayrak@uni-oldenburg.de, rainer.reuter@uni-oldenburg.de
University of Oldenburg, German
http://www.meeresphysik.uni-oldenburg.de

Keywords: wind lidar, Doppler effect, wind turbines, offshore wind farms

Abstract:

For future multi-megawatt wind energy converters (WEC) in large-scale offshore wind farms new and advanced control strategies are required. Dynamic wind loads have to be reduced efficiently and with minimal controller operation, in order to deliver electricity to the grid in an optimized way. Up to now the implementation of these visions suffers from fundamental obstacles, despite the progress in many fields of wind energy technology. Large uncertainties due to the complex inflow within the rotor area influence the control and operation of wind energy converters. This problem becomes even more serious with growing rotor diameters beyond 120 m. Current control concepts can only react to wind field fluctuations which have already caused changes in rotational speed or loads. When evaluating the averaged or instantaneous power production, it is unclear from which exact wind conditions they have been obtained. Thus, a precise performance analysis is impossible. These limitations can be overcome with Whirlwind 1, a new lidar instrument developed at the the ForWind Centre for Wind Energy Research, University of Oldenburg. Integrated into the spinner of a wind turbine the lidar allows to measure the incoming wind field remotely over distances of 500 m, typically. The data can be used to identify already small deviations from normal operation and to adapted control strategies for wind energy converter operation. The design and operational characteristics of the instrument and the instrument is presented, and live measurements of the wind are taken.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Interpolating accurate TerraSAR-X science orbit data

Dimitra Vassilaki, Thanasis Stamos

dimitra.vassilaki@gmail.com, stamthan@central.ntua.gr
NTUA, Greece

Keywords: SAR, direct georeferencing, orbit, interpolation

Abstract:
TerraSAR-X is a modern satellite SAR sensor offering various new possibilities for Earth Observation. The accurate direct georeferencing is among the key characteristics of the sensor: the TerraSAR-X data is accompanied by accurate science orbit data and other metadata which allow the computation of the 3D-2D projection transformation between the 3D object space and the 2D SAR image space without the need to employ ground control information. In order to project an arbitrary 3D point on the 2D SAR image, the position and velocity of the sensor at the time of the point acquisition must be computed. The orbit is provided as the position and the velocity vectors of the sensor for 12 time stamps. In order to compute the position and the velocity at arbitrary time (at point acquisitions) an interpolation must be used. The whole SAR image is acquired between 2 of the time stamps. Thus, the interpolation may be computed using 2 or more of the 12 time stamps. In this paper we study the performance of various interpolation methods: Linear interpolation, cubic interpolation, Lagrange polynomial interpolation, Newton polynomial interpolation, Trigonometric interpolation and Chebyshev interpolation. The interpolation schemes are tested with various TerraSAR-X data all over the world.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Poster session 1

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

High Resolution Ocean Color products estimation in fjord of Svalbard, Arctic Sea

Sang-il Kim, Hyun-cheol Kim, Jung-il Shin, Se-young Park

sangill31@kopri.re.kr, kimhc@kopri.re.kr, jishin@kopri.re.kr, pouvoin@kopri.re.kr
Republic of Korea

Keywords: Landsat-8 OLI, Ocean Color, Arctic, Fjord, Svalbard

Abstract:

Ocean Color (Chlorophyll-a, Suspended Sediments) data are used to understand marine ecosystem. However, the spatial resolution of data that are operated through polar orbit is about 1km such as MODIS (Moderate Resolution Imaging Spectroradiometer) and SeaWiFS (Sea-Viewing Wide Fieldof-View Sensor). In high latitude region, ice melting optically influences the ocean color product. In this study, we assessed an optical property in fjord around Svalbard (74°N -81°N, 10°E -35°E), and estimated distribution of chlorophyll-a and suspended sediment by using high resolution of satellite data, Landsat-8 OLI (Operational Land Imager). Landsat-8 OLI sensor (30m resolution) included a new coastal/aerosol band (band1). To estimate chlorophyll-a and suspended sediment concentrations, various linear models and logarithmic regression models were used with different band ratio. Regression models were not shown high correlation because of the temporal difference between satellite data and in-situ data. However, model-derived distribution of ocean color product by OLI showed possibility that a fjord and a coastal area around Arctic Sea can be monitored with high resolution satellite data. To understand climate change pattern around Arctic Sea, we need to understand what ice meting influences on marine ecosystem change. Result of this study will be used to high resolution monitoring on ice melting and its influences on the marine ecosystem change at high latitude. KOPRI (Korea Polar Research Institute) has been operated the Dasan station on Svalbard since 2002. This study has been doing based on this Korea Arctic station.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Quality assessment of geospatial data

Bouhadjar Meguenni

bmeguenni@cts.asal.dz
Algeria

Keywords: data quality, spatial consistency, topological errors

Abstract:
Geographic information in digital form is provided generally in insufficient quantity and in various structures, which leads to difficulties in exploiting such data. Addressing this deficiency requires the collecting of all available data and spending many efforts to integrate and standardize them. The main purpose for providing topological information in geographic information systems (GIS) is to improve spatial analysis capabilities. Several main components of spatial data quality were identified by international standardization bodies such as ISO/TC 211, OGC and FGDC, which consists of seven usual quality elements: lineage, positional accuracy, attribute accuracy, semantic accuracy, temporal accuracy, logical consistency and completeness. Our work focuses on the data consistency issue of the spatial data quality components, which involves the logical consistency. Due to complex geographic data characteristics, various data capture workflows and different data sources, the final large datasets often result in inconsistency, incompleteness and inaccuracy. To reduce spatial data inconsistency and provide users the data of adequate quality, the specification of spatial data consistency requirements should be explicitly described. On this background, the contribution of our work falls in the field of spatial data quality improvement. It involves applying a multi-stage methodology for detecting and correction errors. The methodology has allowed the development of tools for the detection and correction of the three types of errors: geometric, topological and semantic. Tests have been applied to various sets of data (from conversion of CAD files, vector data issued from vectorization of remote sensing images of very high spatial resolution etc.).

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

UAV Based Very-High-Resolution Imaging on Barton Peninsula, Antarctica

Hong Lyun Park, Se-Young Park, Chang-Uk Hyun, Hyun-Cheol Kim

parkhonglyun@kopri.re.kr, pouvoin@kopri.re.kr, cuhyun@kopri.re.kr, kimhc@kopri.re.kr

Korea Polar Research Institute, Republic of Korea

Keywords: UAV, Very-High-Resolution, Image mosaicking, KOMPSAT-2, Environment map

Abstract:
UAV (unmanned aerial vehicle) capable of shooting in low-altitude with an advantage of taking a high-resolution is economical and accessible way of obtaining images compared to satellite and conventional aerial photography. In Polar Regions, it is limited to obtain proper spatial-temporal images by satellite and aerial photography because of their geographic and climatic environment. To perform various studies about the Polar Regions, however, it is necessary to take high-resolution images without regard to space and time. In this study, UAV imaging was performed to obtain very-high-resolution images in restrictive environment of Antarctic in Jan 2014. The target area was nearby the Korean Antarctic station, the King Sejong station, located in Barton Peninsula, Antarctica. The UAV was equipped with GPS/INS and IMU, and Canon EOS 5D Mark III camera. Flight considering unexpected weather condition of Antarctica was planned with combination of 22 courses, flight altitude of about 300m from sea level, forward overlap of 70% and lateral overlap of 30%. As the flight result, about 1,500 images of spatial resolution about 2cm was obtained with location and attitude information. In preprocessing steps, brightness adjustment and geometric correction was performed to produce orthoimages. Mosaicked orthoimages was produced with an extent of about 3.1km2 around the King Sejong station. Quality of the mosaicked image was evaluated by overlapping 1/5,000 digital topographic map and KOMPSAT-2 satellite images of 1m spatial resolutions. Coastline, building outlines, and topographic ridges were compared between datasets. The UAV based imaging that could take very-high-resolution images economically in restricted areas as Polar Regions compared to satellite and aerial photography will be used to various fields of study, such as studying distribution of plants and animals or producing environmental map.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Applications of mobile GIS in forestry Tamilnadu Forest Department

Manoharan-Rajamanickam, Victor G. Rajamanickam

ramanimano@yahoo.com, simprravictor@gmail.com
Center for Disaster Management, PRIST University, India
http://www.Prist.in

Abstract:
Spatial data is one of the major key apparatus for Geographical Information System.It is accepted as a major element of GIS by specialists. Both data collecting and updating are most important and difficult for GIS. Global Positioning System (GPS) is one of the most efficient data collection methods for GIS. It is possible to obtain high-accuracy location data through GPS. As a result of development in location determination areas and wireless communication systems, GIS users can access the map or information via internet and also simultaneously share the collected data in the field. Mobile GIS is a mobile system which is integrated with GIS and GPS on a portable computer. Trimble GeoXT was used as a mobile GIS device for this study. It contains mobile sub-meter GPS receiver and a handheld computer. The main purpose this research is to develop an integrated mobile GIS application and capability that allows staff to collect real-time spatial information, verify existing data, and remotely access and post data from the field.Two (2) prototype mobile GIS real time applications have been developed already using the Environmental Systems Research Institute (ESRI) ARCGIS technology as the main spatial component. These prototype systems are the Forest Health Surveillance System andtheMobileGISforForestEco-Systemmonitoringsystem.TheForestHealthSurveillanceSystem
prototype is used for aerial forest health surveillance. It was developed using a tablet PC integrated with ArcMap GIS. A customized toolbar was developed using ArcObjectsR in the Visual Studio 2008. Resulting dynamic linked library provides a suite of custom tools developed based on the following steps Building of Mobile Geodatabase Designing of Mobile Application Integrate with existing solution Secure server and client data Services to mobile device Deploying of mobile solution Operate and manage your solution The Mobile GIS for forest ecosystem System prototype was developed for verifying existing wetland areas within ForestrySA's plantation estate, to collect new wetland ecosystem and ,and wetland conditions. Mapping of actual wetlands within ForestrySA's plantation estate is very critical because of the need to set up security buffers around these features during the implementation of plantation operations. The System development has been focused on a mobile phone platform (HTC HD2R) with WindowsR Mobile 6, ESRI's ArcGISR Mobile software development kit (SDK) employing ArcObjectsR written on .Net CF and .Net 2.0 and ArcGIS Server technology. The system has undergone testing by Forestry SA staff and the refinements had been incorporated in the latest version of the system. The next stages in the development of mobile GIS technologies at ForestrySA are to enhance the systems' capabilities as one of the organization main data capture systems. These include incorporating other applications, e.g. roads/tracks mapping, mapping of significant sites, etc., and migration of the system to Windows Phone7.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Evaluation of spectral indices for differentiating melt pond from sea ice

Chang-Uk Hyun, Hong Lyun Park, Hyun-Cheol Kim

cuhyun@kopri.re.kr, parkhonglyun@kopri.re.kr, kimhc@kopri.re.kr
Korea Polar Research Institute, Incheon, Republic of South Korea

Keywords: melt pond, sea ice, spectral index, reflectance, remote sensing

Abstract:
Melt pond covering sea ice over Arctic sea has shown quick development and transition during spring and summer season, and has also been known to significantly affect climate system as it changes sea ice albedo. Multiple high-spatial-resolution images, e.g., aerial or UAV images, are desirable dataset to differentiate the fast-changing melt pond from sea ice. In this study, spectral indices using two reflectance bands were evaluated to implement fast differencing theme lt pond from sea ice with large volume of images. The spectral indices comprise simple band-ratio calculations and these ratio based methods can compensate light variations within individual images, possibly exaggerated in high Arctic region. The spectral indices developed for emphasizing ice, snow and water were evaluated with fine snow, melting snow having a shallow puddle of water on top and water reflectance spectra selected from existing USGS Digital Spectral Library and NASA ASTER Spectral Library. Pairs of two bands of green and SWIR (shortwave infrared), red and SWIR, green and NIR (near infrared), and green and red wavelength regions were used as input bands for the spectral indices. The differences of the spectral indices between fine snow and water and between melting snow and water for every pairs were calculated to compare performance of the spectral indices. The larger difference indicates more sensitive spectral pairs to differentiate melt ponds from sea ice. The indices using green and SWIR band pairs and red and SWIR band pairs showed larger differences between fine snow and water and between melting snow and water than the indices using green and NIR band pairs and green and red band pairs. The highest separability inferred from averaged index differences between fine snow and water and between melting snow and water was obtained from the pairs of red and SWIR bands. The results can be applied to planning of a spectral imager specialized for polar region or to choose reasonable bands from existing remote sensing sensors. The preparation of the manuscript was supported by KOPRI-KISTI joint program (PN14010).

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Relief evolution monitoring using airphotos time series and GIS. A case study from western Greece

Katerina Kavoura, Konstantinos Nikolakopoulos, Nikolaos Sabatakakis

kavoura@upatras.gr, knikolakop@upatras.gr, sabatak@upatras.gr
Greece

Keywords: landslide, airphoto, remote sensing, GIS

Abstract:
Western Greece is suffering by landslides. The term landslide includes a wide range of ground movement, such as slides, falls, flows etc. mainly based on gravity with the aid of many conditioning and triggering factors. Landslides provoke enormous changes to the natural and artificial relief. The annual cost of repairing the damage amounts to millions of euros. The "Landslide Vulnerability Model – LAVMO" project, aims to create a persistently updated electronic platform assessing risks related with landslides. In this paper a combined use of airphotos time series, high resolution remote sensing data and GIS for the relief evolution monitoring is presented. Analog and digital air-photos used covered a period of almost 70 years from 1945 until 2012. Classical analog airphotos covered the period from 1945 to 2000, while digital airphotos and satellite images covered the 2008-2012 period. The air photos have been orthorectified using the Leica Photogrammetry Suite. Ground control points and a high accuracy DSM were used for the orthorectification of the air photos. The 2008 digital air photo mosaic from the Greek Cadastral with a spatial resolution of 25 cm and the respective DSM was used as the base map for all the others data sets. The rms error was less than 0.5 pixel. Changes to the relief and to the artificial constructions were digitized and then implemented in an ARCGIS database. The results are presented in this paper.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Objects of ancient system of navigation on coast of the White Sea (Possibilities of data of remote sensing for astronomical interpretation of heritage of the Stone Age)

Alina Nikolaevna Paranina, Roman Viktorovich Paranin

galina_paranina@mail.ru, romanparanin@yandex.ru
Russian Federation

Keywords: orientation in space-time, semiotics of geographical space, astronomical tools of the Stone Age, a sacral landscape, informational models

Abstract:
On coast of the White Sea since 2009 we participate in complex researches of objects of a natural and cultural heritage. The area of researches – archipelagoes of the Body and Solovki. For development of astro-arkheologichesikh aspects of heritage it is necessary not only to describe objects, but also to establish space connection (precisely to measure an azimuth and distance between them). Opportunity and effectiveness of application of materials of remote sensing of Earth depends on detail of the image. In the Body archipelago geological processes arranged islands according to astronomical azimuths of the main astronomical culminations. "the geodetic network" created by the nature gives the chance to use archipelago islands as prigorizontalny astronomical observatory. For example, the island Setna is well visible from the high stone throne established at top of the island of Chernetsky. In days of a winter solstice from a throne it is possible to observe how because of the island Setna the Sun rises. The shadow of a throne falls on stone steps, forming a classical sundial. The Solovetsky islands of the White Sea are known thanks to the biggest in Northern Europe to a congestion of stone labyrinths. Our researches showed that driving of a shadow of a gnomon deciphers labyrinth drawing as a solar calendar: radiuses of arches of labyrinths correspond to length of a midday shadow of a gnomon in days of solstices (extreme) and equinoxes (the second arch from the center). Record of a trajectory of driving of a shadow in a year in a form represents Labrys – a bilateral two-horned axe – attribute of the Supreme gods: founders of the world, masters of light and darkness. The most ancient labyrinths occupy the top terraces of the Big Zayatsky Island and are dated age to 5-7 thousand years. The majority of labyrinths is on the coast that allows to receive very precise azimuths of the astronomical objects crossing the line of the water surface. In a complex of Belomorsky petroglyphs (will render 6000 years) archeologists found the mostancient rock drawing ofthe ankh known in Ancient Egypt as "a key of the house of the Sunand a kingdom dead". Studying of drawing of a two-spiral labyrinth shows that the ankh well reflects structure of his central part. Dating of petroglyphs will be coordinated as with paleogeografichesky reconstruction: 7000 years ago – during an era of a climatic optimum of the Holocene, here was warmer, efficiency of a landscape was higher than the modern. That the person of this time well owned skills of sea navigation, images of larger boats with a capacity up to 20 people confirm, trade of large whales. Planet places which give the chance to receive precise information on a space-time order, always had the vital value. Therefore from an extreme antiquity of the island of the White Sea and the objects located on them, received the status of the especially esteemed – sacral. Today they attract an increasing flow of tourists, need research and protection as monuments of a natural and cultural heritage.

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Identification of floodplains, local depressions and hydrogenic habitats using satellite images and Digital Surface Models

Sylwia Szporak-Wasilewska, Dorota Mirosław-Świątek, Magda Szymańska

s-szporak@levis.sggw.pl, d.swiatek@levis.sggw.pl
Warsaw University of Life Sciences, Poland

Keywords: SRTM, ASTER-GDEM, Landsat, wetland inventory, remote sensing

Abstract:
Wetlands play an important role meeting the environmental, economic and social objectives described by authors in numerous publications. These areas characterized by long term presence of water on the soil surface or in the root zone, specific soil types, occurrence of specific vegetation adapted to those conditions and the lack of plants intolerant to flooding are nowadays one of the most threatened ecosystems. The main goal of this work was to create tools and methodology for processing remote sensing data enabling identification of floodplains, local depressions and hydrogenic habitats for the inventory of wetland areas in order to monitor their state. During analyses an attempt was made to define reference ranges of values that can later define parameters indicating areas with potential wetland habitats. In addition, new possibilities to increase identification accuracy through modern remote sensing techniques were indicated as a further step of planned research. These preliminary analyses utilized ASTER-GDEM, SRTM and Landsat data representing catchment of the Narew River. The result of the proposed method are maps of potential wetland areas in five-degree scale dependent on the number of met criteria compared to existing wetland inventory projects.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Alternative methods for updating reliable geospatial data

Hussein Abdulmuttalib

hussein.m.abdulmuttalib@gmail.com

Abstract:
Keeping up to date records of spatial data in a reliable manner is a challenge for government organizations. As many organizations prefer to use the usual practice of Surveying and Photogrammetry, as these methods represent a suitable and accurate methods of updating spatial data, but the drawback is the large gap period between the execution dates of these, that is once an air photography is completed al new items that are built on the reality will be out of date. And for that we introduce the experience of updating GIS data as transactions occur by permission seeking vendors, such as building permissions or road project permissions, etc. Previously GIS organizations of succeeded in the past to connect its database to several databases of other divisions and organizations of same Governments or large private institutes for the purpose of establishing a network that feeds the central databases within the Spatial Data Infrastructure (SDI) Central Department with GIS data of different kinds. This gathered data is maintained, perhaps processed in some cases and finally published by the department, for all the users through different means such as in-house built web applications or via database connectivity. Despite the achievements of the system work flow, the databases may lack temporal consistency and completeness with the created data from the different departments, the matter which may have a drawback on, designing, planning and decision making besides other unforeseen effects. Thus more efforts are needed for formalizing, and smoothing the workflow of data, its attributes, and meta data related to it with maximum efforts for minimizing operation expenses by automation and enforcing private sectors or in other words as plan and as built drawing providers that are generation data to conduct the majority of works according to the specified solid standards, supported by quality assurance and quality control acts that are performed by the data generators, data custodians, and by data publishing authority which is GIS SDI Department in the this case. The main objectives are to make all planning and existing Base Map effective Geospatial data instantly updated and available to users as transactions of the same take place by custodians and data generators seeking permissions, to reduce expenses by minimizing conducting Base Map projects, towards making all the data up to date instantly as it's generated by transactions, to fill in the gaps of missing data especially that is of geometrical type and not yet set to be generated through transactional activities, to make GIS data more reliable and efficient by providing it to users immediately when needed, reaching the end user in time after the stages of automated and manual quality control and assurance activities, not mentioning establish relationships between data generators, data custodians, end users with SDI Central Departments and better serve their needs, further introduce reduction of expenses by reducing the manual amount of work conducted by government authorities, and perhaps introducing some fees incase clients need assistance for processing their data to comply with GIS set standards for the purpose in hand. Finally the practical Implementation steps which took place for the activity began by investigating the existing data work flow systems, setting data priorities, building relations with concerned partners, conducting technical works and setting specifications, training users, testing the system, and publishing the data for end-users. The major steps performed for the success story where starting with getting the major geometry and some attributes of all new units of a project that the (consultants/contractors/owners) apply for permission for, prepare standards with which (consultants/contractors) will have to comply with and fulfil when submitting the data, establish the work flows to upgrade submitted cad data to GIS formats, prepare Spatial Databases and data models for updating the submitted unit's geometry data and attributes, conduct QC and QA and finally Automate

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

QC procedures, uploading procedures, to gain a reliable and up to date spatial database that can be used to support designers and decision makers.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

105

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Development and evaluation of a near real time system for assessing hydrologic response in Chenab river catchment (HEC-HMS modeling for Chenab river catchment.)

Muhammad Adnan Shahid

m_adnanshahid@yahoo.com

Inter-University Department of Regional and Urban Studies and Planning, Politecnico di Torino, Italy

Keywords: Climate change, Near real time hydrologic analysis, Flood management, HEC-HMS, TRMM satellite data

Abstract:
Investigating the hydrological response of an area to adverse climate changes is crucial for managing land and water resources and mitigating the natural hazards like floods and droughts. Pakistan is one of the developing countries facing severe challenges of climate change with high spatial and temporal variability in annual and seasonal rainfalls. It has been reported by Pakistan Meteorological Department that there is significant shift in the Monsoon rainfall patterns from east towards west and the areas in upper Punjab province of Pakistan critically require more attention for flood management. Limited availability of the in situ data, especially in case of Trans Boundary Rivers, further highlights the need to develop and evaluate decision support systems which may predict the flows in near real time using open source satellite rainfall data. This paper will present the study being conducted in the Chenab river catchment to develop and evaluate a hydrologic model using HEC-HMS for predicting rainfall-runoff patterns in the area. The catchment was analyzed regarding hydro-morphological properties using HEC-GeoHMS tools. Tropical Rainfall Measuring Mission (TRMM) Multispectral Precipitation Analysis data product (3B42) is being used in the model for estimating flows and calibrating it using local flow data for 2006. The developed model after proper calibration will help in predicting flows in near real time using satellite rainfall data and mitigating the natural disasters like floods in a better way.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Utilization of SEBAL algorithm and Landsat-8 data for estimation of evapotranspiration – a case study: Tatra Mountains region

Ayad Ali Faris[1], Ahmed Hashem al-Sulttani[1], Adrian Ochtyra[2,3] Anna M. Jarocińska[2], Adriana Marcinkowska[2]

ayadfaris@hotmail.com, asulttani@gmail.com
[1] University of al-Mustansiriyah, College of Education, Department of Geography, Iraq

adriana.marcinkowska@uw.edu.pl, ajarocinska@uw.edu.pl, adrian.ochtyra@uw.edu.pl
[2] University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Poland

[3] University of Warsaw, College of Inter-Faculty Individual Studies in Mathematics
and Natural Sciences, Poland

Keywords: evapotranspiration, Landsat-8 OLI/TIRS, Tatra Mountains, SEBAL

Abstract:
The evapotranspiration (ET) is one of the climate elements, which plays an important role in water balance and affects the ecosystem of any region. Accordingly, there are many mathematical equations and algorithms designed to calculate and estimate the values of ET, either based on data from weather stations or other sources in areas devoid of weather stations. Remote sensing data are one of the important sources and techniques to estimate the values of evapotranspiration. Landsat-8, which was launched in February 2013, as a new source of remote sensing data, still some reluctance from researchers to use Landsat-8 data, due to uncompleted reflectance and albedo calculation parameters of that sensor. In fact, this research represents attempttouseLandsat-8data in estimation of ET. The surface reflectance values are calculated according to COST method for atmospheric correction, while a new equation is implemented to calculate the surface albedo, both parameters represent the first step to achieve the requirements of solar radiation and estimation of ET models. The study area is located in Tatra Mountains, which are natural border between Poland and Slovakia. The Tatra Mountains are one of the most valuable areas in Poland and Slovakia. Furthermore, these areas are protected (Polish and Slovakian National Parks). Geologically the area was subjected to tectonic uplift caused mixing igneous rocks, metamorphic rocks and sedimentary rocks. The analysed region is characterised by vertical zones of climate, soils and vegetation. In Tatras it is possible to distinguish five climatic-vegetation belts: lower montane (with fir-beech forests), upper montane (forest dominated by spruce), dwarf pine, alpine (grasses or dwarf shrubs) and subnival (bryophytes, lichens and bare rocks). The main objectives of this study are to utilize the remote sensing represented by Landsat-8 data to calculate the values of evapotranspiration based on SEBAL algorithm. The data of Landsat-8 OLI/TIRS acquired on 08-SEP-2013 and the one arc-second resolution ASTER digital elevation model with some reference weather parameters are used as in puts for the models. The analyses are carried out using 16 ERDAS models, designed to calculate the various parameters related to solar radiation i.e. surface radiance, surface reflectance, surface albedo, NDVI, LAI, surface emissivity, surface temperature, net radiation, soil heat flux, sensible heat flux, latent heat flux, which are used later to calculate the hourly and daily evapotranspiration in the study area. The results of calculations shows, the values of surface temperature are varied from 6.2 ^{0}C at area covered by snow to 34.6 ^{0}C at bare rocks area, while the spatial variability of ET for different land covers shows, the hourly ET ranged from 0 to 0.72 mm/hr, the daily ET varied between 0.0 to 17.0 mm/day. Generally, the results proved the efficiency of Landsat-8 data in calculation of all the required solar radiations for estimating the ET values in a when compared to results from other satellite data.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Deconvolution Algorithm as a tool of spectral signal processing

Natalia Ewa Zalewska

natalia.zalewska@ilot.edu.pl
Institute of Aviation, Space Research Center, Poland
http://ilot.edu.pl/

Keywords: Deconvolution Algorithm, remote sensing, surface, atmosphere

Abstract:
Deconvolution Algorithm is a widely used tool in digital signal processing. Mainly, it is used in processing spectral response of the earth surface and surfaces of other planets. It is also used in determining the mineral composition of the Mars surface. Modeling of the measured spectrum by this algorithm is performed by employing a linear combination of the surface spectra and the atmosphere spectra. It is assumed that the surface spectrum can be described using a linear combination of the individual spectra of minerals, and the spectral contribution of the atmosphere can also be reconstructed by linear combination of the spectra of its components. All constituents of the atmosphere and surface are considered in matching the spectral shapes with the measured spectrum. Linear combination of surface components in the emission spectrum is the sum of products of surface concentration of each component and its emission factor. Besides the emission factor of the surface components we also have to consider the atmosphere transmission, which also contributes to the shape of the measured spectrum. Hence the expression that describes the shape and intensity of the spectrum can be approximated by the product of two sums: the concentration of each component of the surface multiplied by the emission factor and a factor of transmission of each component of the atmosphere multiplied by its concentration. Infrared spectrum of Martian surface is modeled by applying a linear combination of the spectra of each of the mineral, which are normalized against investigated surface area. Such an algorithm that is used to determine the mineral composition of the Martian surface can also be employed for determining the mineral composition of selected areas of the Earth (based on aerial and satellite images) and for determining vegetation diversity by employing libraries of minerals and libraries of individual spectra of selected plant species.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Shape-texture features for the VHRS satellite images classification using the MLP neural net

Mahi Habib, Kaouadji Mounia

mahihabib@yahoo.fr, kaouadjimounia@yahoo.fr
Algeria

Keywords: Texture features, Quaternion Zernike moments, MLP, classification, VHSR satellite images.

Abstract:
With the emergence of commercial satellites with on-board sensors characterized by Very High Spatial Resolution (VHSR), identification and localization of topographic features become conceivable. The VHSR sensors provide images with significant amount of geometrical details that yield new kinds of information, such as shape information. Indeed, if advantage is to be taken of the spatial resolution of VHSR sensors, it is therefore necessary to expand the object feature base to include geometrical characteristics in addition to spectral and spatial ones. In other hand, the classification of this heterogeneous set of information requires also the establishment of new techniques different than used for low and medium spatial resolution data classification. For this end, the Multi-Layer Perceptron (MLP) neural network has been investigated to classify this heterogeneous set of information using a combination of different features extracted from objects: Quaternion Zernike moments as shape descriptor and Haralick's features as textural descriptor. The MLP is a supervised classification algorithm that widely used in the remote sensing field, and that has proven its effectiveness. The proposed approach was conducted using a sub-scene of Quickbird image datasets of Algiers (northern Algeria). This one was acquired on August 23 2003 and consists of four multispectral images with a spatial resolution of 0.61 m. The results indicate a mean accuracy value of 79.991875% using only the shape features information, 74.88875% by applying the textural features information and 86.2325% by combination of shape descriptor and texture descriptor. The results of the proposed method with MLP classifier are also compared with results obtained by K-NN and SVM classifiers witch confirm the effectiveness of the proposed approach.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

TIMELINE - Processing of AVHRR time series over Europe and North Africa

Corinne M. Frey, Andreas Dietz, Martin Bachmann, Eva-Maria Bernhard, Thomas Ruppert, Katrin Molch, Meinhard Wolfmueller, Claudia Kuenzer, Andreas Mueller, Stefan Dech

corinne.frey@dlr.de, andreas.dietz@dlr.de, martin.bachmann@dlr.de, eva-maria.bernhard@dlr.de, thomas.ruppert@dlr.de, katrin.molch@dlr.de, meinhard.wolfmueller@dlr.de, claudia.kuenzer@dlr.de, andreas.mueller@dlr.de, stefan.dech@dlr.de
DLR, Germany
http://www.dlr.de/eoc

Keywords: AVHRR, re-processing, calibration, navigation, orthorectification, L1b, L2, L3

Abstract:
TIMELINE stands for "TIMe Series Processing of Medium Resolution Earth Observation Data assessing Long -Term Dynamics In our Natural Environment" and is a new project of the German Remote Sensing Data Center (DFD) of the German Aerospace Center (DLR). One of its primary goals is to re-process the full time series of available AVHRR data over Europe. For this, the existing in-house archive of AVHRR HRPT data (resolution at nadir: 1km) is consolidated with third-party data sources in order to complete an entire archive of all AVHRR observations recorded since the early 1980s. Pre-processing of the raw data includes precise navigation, orthorectification, and calibration, relying on up-to-date routines and coefficients. An additional homogenizing effort is undertaken to account for the different sensor characteristics in the AVHRR series. The processing chain leads to Level2 and, finally, to gridded Level3 products, whose specifications shall conform to the current requirements of the scientific community. The final products palette will contain the basic L1b products as well as a set of eighteen additional products (Albedo, LST, SST, Snow cover, Sea Ice, NDVI, LAI, FAPAR, FVC, Burnt Area, Hot spots, Water masks, Cloud fraction, Cloud phase, Cloud top temperature, Cloud optical thickness, Cloud effective radius, and Cloud liquid/ice water path). The TIMELINE data policy is free and open, time series download will be available through DLR servers.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Analysis of forest vegetation-climate feedback regimes through satellite remote sensing imagery

Maria A. Zoran[1], Adrian I. Dida[2]

maria@dnt.ro
[1] National Institute of R&D for Optoelectronics, Romania

didaadrian@yahoo.com
[2] University Transilvania of Brasov Romania

Keywords: forest vegetation, climate feedback regimes, satellite remote sensing data, Bucharest, Romania

Abstract:
Vegetation and climate interact through a series of complex feedbacks, which are not very well understood. The patterns of forest vegetation are largely determined by temperature, precipitation, solar irradiance, soil conditions and CO2 concentration. Vegetation impacts climate directly through moisture, energy, and momentum exchanges with the atmosphere and indirectly through biogeochemical processes that alter atmospheric CO2 concentration. Changes in forest vegetation land cover alter the surface albedo and radiation fluxes, leading to a local temperature change and eventually a vegetation response. This albedo (energy) feedback is particularly important when forests mask snow cover. Forest vegetation-climate feedback regimes are designated based on the temporal correlations between the vegetation and and the surface temperature and precipitation. The different feedback regimes are linked to the relative importance of vegetation and soil moisture in determining land sutface–atmosphere interactions. The spatio-temporal dynamics are assessed in terms of the NDVI-surface temperature correlations. Observed vegetation feedbacks on temperature and precipitation are assessed based on Landsat TM/ETM, MODIS Terra/Aqua, NOAA AVHRR and IKONOS satellite data across the forested areas in North/Eastern part of Bucharest town, Romania for a period of 1984 -2014 period. The computed feedback parameters can be used to evaluate vegetation–climate interactions simulated by models with dynamic vegetation. Specific aim of this paper is to assess the forest vegetation climate feedbacks on forest ecosystem and its biodiversity as well as on adjacent environment areas and to provide early warning strategies on the remote sensing spectral information basis.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Research of the White/Barents Seas harp seal population pup production distribution and numbers with use of multispectral air surveys technologies

Sergey Anatolievich Egorov

egorov@pinro.ru
PINRO, Russian Federation

Abstract:

The main purpose of this study is data collection of the White/Barents Seas harp seal population (harp seal) pup production distribution and numbers. Then these data for total calculation pup production numbers and assessment of total harp seal population size (harp seal stock) are used. For this purpose special multispectral air surveys technologies is used. This method began to use from 1998. Here remote sensing equipment which work in optical and infrared (IR) ranges of electromagnetic wavelengths are used, and it installed onboard aircraft. During last years multispectral aerial surveys carry out onboard two engines aircraft Antonov-26 (An-26) or L-410. Onboard this aircraft installed and operated following remote sensing equipment: -standard digital photo – and video cameras («Nikon D1X» and "Panasonic", accordingly), - IR-scanner "Malakhit" which was worked, created and adopted for considered aerial research specially. Air surveys carry out on base of harp seal biology knowledge. Under that they carry out during Marchfirsttwoten-dayperiodbutnolaterthanMarch22. The main area of air surveys is the White Sea and adjacent water of the Barents Sea. All research flights carry out along basic transects which are oriented along longitudes with distance between its no more than 10 km from flight altitude no less than 200 m, standard is 250-300 m. Each research flight transect begins and finishes on ice edge or coastal line. Received results allow to make conclusion that at present the White/Barents Seas harp seal population pup production numbers has stable low level values, in 2005 it was 122 700, in 2008 -123 100, in 2009 -156 600, in 2010, in 2011 -163032. Later to this year their numbers was the same. In 2005 was recorded the lowest modern level of pup production abundance. Under carried out additional and special research the main reason that was climatic changes in the Russian Arctic west part.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Automatic conversion of colour distribution in overlapped aerial photographs

Thanasis Stamos, Dimitra Vassilaki

stamthan@central.ntua.gr, dimitra.vassilaki@gmail.com
NTUA, Greece

Keywords: photographs, orthophotomosaic, colour adjustment

Abstract:
Aerial photographs used in photogrammetry come in overlapping pairs. Frequently the photographs differ in colour distribution, although they show largely the same land site and they are taken by the same air-camera. Almost always, this difference does not affect the accuracy of photogrammetric measures. However, if the photographs are used to make an orthophotomosaic, the difference in colour produces artificial boundaries in the resulting maps, and certainly it does not look good in the eye. This paper proposes an automatic conversion of the colours of one aerial photographs to the colours of the other. The method is based on the overlapping of the aerial photographs, typically 65%. It is assumed that, in the overlapped region, the difference is an artifact of the camera, the scanner or other reasons, which systematically affects all the colours. This it is possible to transform the histogram of each band of one aerial photograph to the corresponding histogram of the other aerial photograph. This is done by fitting a parabola to each histogram and then matching the parabolas, converting the colours on the second aerial photograph. The method has been tested with numerous aerial photographs and it gives satisfactory results.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Assessing erosion risks induced by land-use change in favor of commercial forestry in Chile

Andreas Ch. Braun, Callum C. Banfield, Joachim Vogt, Barbara Koch

andreas.braun@felis.uni-freiburg.de, calum.banfield@kit.edu, joachim.vogth@kit.edu
barbara.koch@felis.uni-freiburg.de
Germany

Keywords: Land-Use, Erosion, Commercial Forestry, Chile, Remote Sensing

Abstract:
The erosion of natural soils is perceived as a serious threat to human society. Erosion can threaten agricultural production and leads to the conversion of formerly intact landscapes into badlands which can hardly be used for sustaining agriculture or livestock ranching. Erosion is a multifaceted phenomen on linked with various aspects of the geoecosystem (e.g. the hydroregime, properties of the geological subsurface material and vegetation). Most of these factors are at least partly altered by human land-use. In Chile, large areas had been affected by erosion after agricultural abandonment in the 19th century. In order to halt erosion, commercial forestry plantations had been planted on eroded badlands. However, due to vigorous subsidies by the government, forestry is continuously expanding. In the course of this process, today, it is no longer eroded badlands that are planted with forestry plantations, but areas formerly covered by native forests. Since the plantations are harvested by clearcutting, soils in plantations are exposed to the winter rain regime every 10 to 15 years. In contrast, native forests are always densely vegetated. Thus, it has to be questioned whether commercial forestry, initially introduced to protect soils, has turned into a practice which promotes erosion today. This contribution discussed these issues. It performs i. a land-use change analysis based on multitemporal landsat Images which analyses the process of replacement of native forests by commercial plantations ii. an analysis of the differences in vegetation structure based on intensive Braun-Blanquet field sampling which is one of the factors that protects soils from erosion iii. a comparison of ongoing recent erosion in forests and plantations, based on pedological fieldwork, sediment traps and 137Cs measurements. It is shown that there are strong indicators for an increase in recent erosion under the commercial forestry plantations. Thus, commercial forestry companies -which continuously claim to be protecting Chilean landscapes from Erosion -may in fact be promoting soil degradation.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Calibration and evaluation of TRMM precipitation estimates for different climatic zones in Pakistan

Muhammad Adnan Shahid[1], Piero Boccardo[2], Walther Cámaro García[2], Adriana Albanese[2], Elena Cristofori[2], Muhammad Usman[3]

m_adnanshahid@yahoo.com

[1] Politecnico di Torino, Inter-University Department of Regional and Urban Studies and Planning, ITHACA Research Center, Torino Italy, Water Management Research Center, University of Agriculture, Faisalabad, Pakistan,

[2] Politecnico di Torino, Inter-University Department of Regional and Urban Studies and Planning, ITHACA Research Center, Torino Italy

[3] IGW, Faculty of Forest, Geo and Hydro sciences, TU Dresden

Keywords: calibration, TRMM, precipitation, climatic zones, Pakistan

Abstract:
Like other remote sensing applications, satellite based rainfall datasets are quite important for continuous and near real time monitoring of adverse climate impacts and related disasters like floods and droughts. However, it is important to have a comparison of such datasets with ground data to evaluate their accuracy and scope of use for a region. This paper presents the evaluation of TRMM monthly rainfall product (3B43) using 15 years' data from 1998 to 2012incomparison to the ground rainfall measurements for the same period for Pakistan. The calibration of TRMM rainfall estimates was performed for three climatic zones using regression analysis and developing relations on seasonal level. The devised climatic zones included northern mountainous areas along with KP and upper Punjab provinces, central and southern Punjab and Sind provinces, and Balochistan plateau. Regression weights obtained for different regions were used to develop the calibrated monthly and seasonal rainfall maps. The calibrated datasets were validated by calculating Nash-Sutcliffe Efficiency of TRMM estimates before and after calibration. TRMM 3B43 datasets were found quite reliable for their direct use with NSE values ranging from 0.6 to 0.98 for different zones, while the calibration further improved the NSE by about 20% on average for winter season. However, the NSE values were not found improved, but even decreased a little after calibration for summer season, especially in Zone-1, indicating that high accuracy and dense network of gauges is required to perform calibration in hilly areas to avoid effects of local gradients and heavy orographic rainfalls.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Image Processing

Stanisław Lewiński, Anna M. Jarocińska

Tuesday, 17.06.2014, 16:30-18:30, *Audytorium*

A STUDY ON THE TEMPORAL AND SPATIAL ENHANCEMENT OF THERMAL IMAGE SEQUENCES
   Paolo Addesso, Maurizio Longo, Rocco Restaino, Gemine Vivone
   16:30 - 16:45

New Continuum Removal Technique for Automated Absorption Feature Detection and Characterization from Reflectance Spectroscopy Data.
   Christian Mielke, Nina K Boesche, Christian Rogass, Hermann Kaufmann
   16:45 - 17:00

Influence of Satellite Image Filtration on Fractal and Multifractal Features in the Context of Land Cover Classification
   Anna Wawrzaszek, Michal Krupinski, Wojciech Drzewiecki, Sebastian Aleksandrowicz
   17:00 - 17:15

An automated processing chain for the retrieval of georeferenced reflectance data from hyperspectral EO-1 Hyperion acquisitions
   Christian Rogass, Luis Guanter, Christian Mielke, Daniel Scheffler, Nina K. Boesche,
   Christin Lubitz, Maximilian Brell, Daniel Spengler, Karl Segl
   17:15 - 17:30

Object-based Change Detection Using Multitemporal High-Resolution TerraSAR-X Data
   Osama A. Yousif, Yifang Ban
   17:30 - 17:45

The importance of absolute spatial congruency in pansharpening
   Aristidis D. Vaiopoulos, Kostas Karatzalos, Dimitrios Argialas
   17:45 - 18:00

A hierarchical classification of the German tidal flats using a multi-sensor and multi-temporal remote sensing approach
   Richard Jung, Winny Adolph, Alena Schmidt, Manfred Ehlers
   18:00 - 18:15

EXTREME LEARNING MACHINE FOR CLASSIFICATION OF HIGH RESOLUTION REMOTE SENSING IMAGES AND ITS COMPARISON WITH TRADITIONAL ARTIFICIAL NEURAL NETWORKS (ANN)
   Shailesh Shrestha, Zbigniew Bochenek, Claire Smith
   18:15 - 18:30

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

A study on the temporal and spatial enhancement of thermal image sequences

Paolo Addesso, Maurizio Longo, Rocco Restaino, Gemine Vivone

paddesso@unisa.it, longo@unisa.it, restaino@unisa.it, gvivone@unisa.it
DIEM -University of Salerno, Italy

Keywords: Remote Sensing, TIR Images, Sharpening, Data Fusion, Interpolation

Abstract:
Brightness Temperature (BT) images are at the core of many Earth Observation applications from satellite platforms, aiding several human activities, as agriculture, forestry and urbanization management[1]. Typically, the usefulness of remotely sensed images increases with the spatial resolution and with their acquisition rate. However, due to hardware limitations of their acquisition devices and to orbital constraints of the satellites, the information is typically poor in either space or time. This problem can be tackled through data fusion techniques that allow to obtain improved synthetic images by profiting from multisensor data [2]. In this work we address the specific issue of image sequence resolution enhancement, which exploits the correlation among successively acquired images to improve the performances of estimation techniques [3]. An effective method to obtain an high temporal resolution /High Spatial Resolution (htr/HSR) sequence, consists in: -spatially interpolating the high temporal resolution/Low Spatial Resolution (htr/LSR) sequence; -temporally interpolating the low temporal resolution/High Spatial Resolution (ltr/HSR) sequence; -finally, fusing the sequences. In this paper we thoroughly study the capabilities of this methodology by investigating the combination of different techniques for both temporal and spatial interpolation and various methods for the fusion of the two sequences. The schemes are assessed on TIR images acquired by the SEVIRI and MODIS sensors, acting as the htr/LSR and the ltr/HSR sequence, respectively.

Zhan W, Y Chen, J Zhou, J Li & W Liu, 2011. Sharpening thermal imageries: A generalized theoretical framework from an assimilation perspective. IEEE Trans. Geosci. Remote Sens., 49(2): 773–789.

Gao F, J Masek, M Schwaller & F Hall, 2006 "On the blending of the landsat and MODIS surface reflectance: predicting daily Landsat surface reflectance. IEEE Trans. Geosci. Remote Sens., 44(8): 2207–2218.

Addesso P, M Longo, R Restaino & G Vivone, 2013. Enhancing TIR Image Resolution Via Interacting Sequential Bayesian Estimation. Proc. of IEEE Geoscience and Remote Sensing Symposium (IGARSS), 21-26 July 2013, Melbourne, Australia.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

New continuum removal technique for automated absorption feature detection and characterization from reflectance spectroscopy data.

Christian Mielke, Nina K. Boesche, Christian Rogass, Hermann Kaufmann

chmielke@gfz-potsdam.de
GFZ German Research Centre for Geosciences, Germany
http://www.gfz-potsdam.

Keywords: Continuum Removal, Absorption Feature Extraction, Mineral Mixtures

Abstract:
Continuum removal is a widely used preprocessing technique for feature extraction. It is used to remove albedo effects from data in order to facilitate further data analysis steps such as material identification from reflectance spectra using well characterized spectral library data and spectral matching algorithms. This albedo removal is the first and most important step in expert systems such as the USGS Tetracorder/MICA or EnGeoMAP. With this technique absorption features are isolated for the extraction of e.g. feature position, feature depth and feature shape. These properties may serve as input parameters for algorithms that are calculating similarity measures between an unknown spectrum and well described reference spectra in a spectral library such as the USGS digital spectral library. There are numerous techniques to isolate the absorption features in a reflectance spectrum: knowledge based via a feature database, convex hull enclosed features extracted via delaunay triangulation or via concave hulls. Our experiments have shown that out of these techniques only the knowledge based approach, as implemented in the USGS Tetracorder/MICA, is able to efficiently isolate the characteristic absorption features of standard library material such as minerals. Spectroscopy data from field spectrometers or from airborne imaging spectrometers, however, represent a mixture of different surface material components that may not be found in this form in the reference library. Here exact feature isolation is a mandatory step in obtaining the best match between reference spectra and an unknown spectrum in cases of spectral mixing. Our new technique is addressing this problem by an automatic extraction of indicative absorption features through an iterative and parameter free process. Additionally this new technique is able to integrate acquisition related characteristics, such as signal to noise ratio and analysis confidence. First results show a close resemblance between the knowledge based absorption feature definition and the results of our technique.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Influence of satellite image filtration on fractal and multifractal features in the context of land cover classification

Anna Wawrzaszek[1], Michał Krupinski[1], Wojciech Drzewiecki[2], Sebastian Aleksandrowicz[1]

awawrzaszek@cbk.waw.pl, mkrupinski@cbk.waw.pl, saleksandrowicz@cbk.waw.pl
[1] Space Research Centre of the Polish Academy of Sciences (CBK PAN), Poland

drzewiec@agh.edu.pl
[2] AGH University of Science and Technology, Poland

Keywords: fractal dimension, multifractal formalism, texture, very high spatial resolution images, classification, filtration

Abstract:
In our research we consider fractal and multifractal parameters as features describing the content of Very High Spatial Resolution satellite images. In particular, we analyse three WorldView 2 scenes from different parts of Poland: the highly urbanised city of Warsaw, the region of Goczalkowice reservoir, dominated by water and agriculture lands, and the mountainous area in the vicinity of Nowy Targ covered mostly by different types of forests. Conducted research show that the degree of multifractality treated as a classification feature gives better results compared to the fractal dimension as well as to the mean value of pixels of original or filtered images. We also demonstrate that the efficiency of classification, which was based on fractal dimension or degree of multifractality, can be increased by the application of the filtration process. The most useful filters for the separation of the considered land cover classes are Sigma and median. More precisely, when we try to distinguish class urban the best approach is to use the Sigma filter and afterwards to evaluate the multifractality level. When we try to distinguish class water from the other classes, especially forest, low-pass filtration should be used as it decreases the multifractality level of water. The performed analyses prove that the degree of multifractality is a very useful feature for the description of the satellite image content. It may find applications e.g. in image information mining or change detection.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

An automated processing chain for the retrieval of georeferenced reflectance data from hyperspectral EO-1 Hyperion acquisitions

Christian Rogass, Luis Guanter, Christian Mielke, Daniel Scheffler, Nina K. Boesche,
Christin Lubitz, Maximilian Brell, Daniel Spengler, Karl Segl

christian.rogass@gfz-potsdam.de, luis.guanter@wew.fu-berlin.de, christian.mielke@gfz-potsdam.de,
daniel.scheffler@gfz-potsdam.de, nina.boesche@gfz-potsdam.de, christin.lubitz@gfz-potsdam.de,
maximilian.brell@gfz-potsdam.de, daniel.spengler@gfz-potsdam.de, karl.segl@gfz-potsdam.de
Germany
http://www.gfz-potsdam.de

Keywords: process chain, hyperspectral, Hyperion, reflectance, georeference

Abstract:
Spaceborne hyperspectral imaging becomes more and more important for remote sensing applications. Data acquisitions from current sensors having VNIR and SWIR detectors, like Hyperion on the EO-1 platform, and future sensors, such as EnMAP, HISUI, Prisma or HyspIRI, require precise data pre-processing to enable the variety of applications they are designed for. Most applications require continuous spectra over the VNIR and SWIR wavelength range (e.g. geological applications) and georeferenced reflectance as data process level to be independent of illumination and sensor geometry, to reduce the influence of the atmosphere during the acquisition and to enable the integration of application related outputs information into spatially larger georeferenced information systems. In this work, an automated pre-processing chain for EO-1 Hyperion data acquisitions is presented that aims on providing georeferenced reflectance data. As input serves only L1 radiance data, L1T radiance terrain corrected data, a DEM and some metadata which are freely distributed through the USGS Earth Explorer web portal. Data processing comprises rescaling of the data, removal of the spectral overlap, bad band detection, reductions for dead pixel and erroneous detector columns, intra-band spatial shifts, keystone, erroneous co-registration, radiometric miscalibration as well as the radiative transfer modelling assisted atmospheric correction that also accounts for smile. Georeferencing is performed after reflectance retrieval to exclude resampling effects from the atmospheric correction First results will be presented that demonstrate the potential of the new pre-processing chain. Improved and new data products will promote a higher interest and broader usage of the freely distributed EO-1 Hyperion data takes.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Object-based change detection using multitemporal high-resolution TerraSAR-X data

Osama A. Yousif, Yifang Ban

osama.yousif@abe.kth.se, yifang@kth.se
Geoinformatics, KTH Royal Institute of Technology, Sweden
http://www.kth.se/

Keywords: Object-based Change Detection, TerraSAR-X, Multitemporal, Urban

Abstract:
SAR-based change detection using high spatial resolution imagery has received a great deal of attention with launch of many SAR systems capable of producing such type of data (e.g., RADARSAT-2, COSMO-SkyMed, TerraSAR...etc.). With this data, the quantification of temporal changes can be achieved in unprecedented level of detail. This is especially true in the detection of urban changes with their inherent structural complexities. However, this new data also challenges the analysts in many different ways. For example, many existing data models and algorithms rendered obsolete and updating them to fit the new data is inescapable. Furthermore, high spatial resolution implies increase in the size of the involved imagery and consequently increases in there quired computational power. In this paper we will investigate the supervised identification of temporal urban changes using multitemporal high-resolution TerraSAR-X data. To take into consideration the contextual information, object-based change detection analysis are being evaluated. Other than maintaining scene structural detail, object-based analysis turns out to be a computationally efficient approach. After image segmentation, the conventional ratio operator is used to compare the multitemporal SAR images in the object level (as opposed to pixel level). To classify the change image derived from the multitemporal SAR images, a multi-classifier system is adopted. As has been shown in many studies (mostly in images classification field) a combination of different supervised classifiers normally results a significant improve in the achievable accuracies. In this particular work, we will restrain the analysis to a three well-known supervised classifiers, namely Support Vector Machine (SVM), Multinomial Logistic Regression (MLR), and Artificial Neural Network (ANN). For comparison, we also compare the object-based result with that from the well-know pixel-based Kittler-Illingworth change detection algorithm.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The importance of absolute spatial congruency in pansharpening

Aristidis D. Vaiopoulos, Kostas Karatzalos, Dimitrios Argialas

arisvaiopoulos@outlook.com
Greece

Keywords: Pansharpening, Fusion, Spatial Congruency, HCS, Worldview-2, Quality index, Q, UIQI

Abstract:
Pansharpening is a very common pre-processing method among researchers using satellite imagery, and it is still an active research area. It is widely known that most modern satellites acquire simultaneously two different images of the same scene. The first image, called panchromatic, has high spatial resolution and represents a single, broad spectral band (typically the VNIR range). The second image, called multispectral, has lower spatial resolution in relation to the panchromatic (usually 2 to 4 times lower), but has additional and relatively narrow spectral bands. For example, the multispectral image of the WorldView2 satellite has 8 spectral bands. By applying a pansharpening technique, a third image can be obtained (panshaprened image or fused image), which combines both the advantage of the high resolution from the panchromatic image and the advantage of the many spectral bands included in the multispectral image. However, it is important to assure absolute spatial congruency between the panchromatic and the multispectral image, in order to achieve the best possible result. The term "absolute spatial congruency" simply means that the two images need to refer to the exact same area (not even a pixel more). One may intuitively think that by cropping both images with the same AOI (Areal Of Interest) polygon, this is automatically achieved. Unfortunately, this is not the case, not even with the most sophisticated and up-to-date RS/GIS software (at present). Even in the literature, the absolute spatial congruency problem seems to elude an adequate discussion and solution. The present study focuses on the importance of the absolute spatial congruency before the application of pansharpening methods. This importance is highlighted by experimenting with WorldView-2 imagery, with the HCS (Hyperspherical Color Space) pansharpening technique. The need for absolute spatial congruency is validated both by qualitative (visual) and quantitative (analysis of the quality index Q) results.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

A hierarchical classification of the German tidal flats using a multi-sensor and multi-temporal remote sensing approach

Richard Jung, Winny Adolph, Alena Schmidt, Manfred Ehlers

rjung@igf.uos.de, Winny.Adolph@nlpv-wattenmeer.niedersachsen.de,
alena.schmidt@ipi.uni-hannover.de, manfred.ehlers@uos.de
Germany
http://www.igf.uos.de/en/institute/staff/jung-richard

Keywords: hierarchal classification, tidal flats, multi-sensor, multi-temporal, RapidEye, Terra SAR-X

Abstract:
The German tidal flats are a part of the trilateral Wadden Sea located in the southeastern part of the North Sea. The Wadden Sea is characterized by a large intertidal transition zone between land and sea with barrier islands, channels, gullies, salt marshes and tidal flats. The multitude of transitions between land and sea, salt-and freshwater are the basis for a highly adapted, partly endemic flora and fauna and relative species richness. It is a vulnerable ecosystem which is highly influenced by climate changes and the anthropogenic usage of the North Sea. Changes in temperature and variety of species, dangerous plankton blooms, reduction of fish population as well as changes of the morphology in the Wadden Sea are examples for the effects of global climate change and anthropogenic pressure. The changes in the environment caused by these factors cannot be monitored by the standard measurement methods alone. Large-area surveys of the intertidal flats are often difficult due to tides, tidal channels and unstable underground. For this reason, remote sensing offers effective monitoring tools. In this study a multi-sensor and multi-temporal concept for an automated and semi-automated classification of the German tidal flats is presented. Basis for this hierarchical method is a combined analysis of RapidEye and Terra SAR-X satellite data coupled with ancillary vector data about the distribution of vegetation, mussel beds and sediments. A decision tree based and hierarchically structured algorithm to combine the multi-sensor data sets was developed integrating object and texture-based analysis methods. The results showed that we are able to automatically classify the classes of interest mussel beds and salt marshes with high accuracy. Although some progress in the classification of vegetation and sediments in the tidal flats is achieved, it still remains as a challenge.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Extreme learning machine for classification of high resolution remote sensing images and its comparison with traditional artificial neural networks (ANN)

Shailesh Shrestha[1], Zbigniew Bochenek[1], Claire Smith[2]

shailesh.shrestha@igik.edu.pl, zbigniew.bochenek@igik.edu.pl, cls53@leicester.ac.uk

[1] Institute of Geodesy and Cartography, Warsaw, Poland
[2] University of Leicester, Leicester, United Kingdom

Keywords: Classification, High Resolution Remote Sensing, Extreme Learning Machine, Artificial Neural Networks, ANN

Abstract:
Use of ANN is steadily increasing for land cover classification of high resolution images. However, there are many inherit limitations of ANN based on Multi-Layer Perception (MLP) with back propagation such as necessity of fine tuning number of inputs parameters and slow convergence time. Therefore, it is attempted to introduce and explore the potential of Extreme Learning Machine (ELM) which deviates from iterative weight adjustment of neurons during the learning process and extremely fast for the classification of high resolution image. Detailed comparison of ELM is made with back propagation ANN with better learning algorithms (Scaled Conjugate Gradient (SCG) and Levenberg-Marquardt (LM)) in terms of accuracy, time required for fine tuning of different parameters and generalization capability. High Resolution (HR) satellite QuickBird satellite image collected over an area of Warsaw, Poland was used for the analysis. Experimental results showed that ELM produced comparable classification accuracy to that achieved with state-of-the-art newer ANNs. The stark benefit of employing ELM over conventional ANNs is need of determining only one user parameter namely number of neurons in the network as well as significantly lower computational cost. Simplicity of requiring determination of only one parameter and extremely fast speed of ELM can be extremely helpful for different applications when quick but accurate classification is desired.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Multitemporal Remote Sensing

Eberhard Parlow, Yifang Ban

Wednesday, 18.06.2014, 09:30-10:45, *Audytorium*

In-season bi-temporal land cover classification and change detection analysis of Bochum, Germany by multi-temporal Landsat TM data
László Henits, Carsten Jürgens, László Mucsi
09:30 - 09:45

Real-Time Geo-Information Fusion as one key aspect of Digital Earth
Florian Hillen, Manfred Ehlers, Bernhard Höfle, Peter Reinartz
09:45 - 10:00

Multitemporal TerraSAR-X Data for Urban Land Cover Mapping: Preliminary Results
Alexander Jacob, Yifang Ban
10:00 - 10:15

Multitemporal ENVISAT ASAR Data for Global Urban Mapping: Preliminary Results
Yifang Ban, Alexander Jacob, Paolo Gamba
10:15 - 10:30

Investigating satellite SPOT VEGETATION multitemporal NDVI maps for land degradation monitoring in the Basilicata Region using DFA and PCA
A. Lanorte, A. Aromando, F. De Santis, Rosa Lasaponara
10:30 - 10:45

34^{*th*} *EARSeL Symposium: European remote sensing - new opportunities for science and practice*
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

In-season bi-temporal land cover classification and change detection analysis of Bochum, Germany by multi-temporal Landsat TM data

László Henits[1,2], Carsten Jürgens[2], László Mucsi[1]

henits@geo.u-szeged.hu, mucsi@geo.u-szeged.hu
[1] University of Szeged, Hungary

carsten.juergens@rub.de
[2] Ruhr-University Bochum, Germany

Keywords: Landsat TM, multi-temporal data, bi-temporal maximum likelihood classification, urban land cover, change detection

Abstract:

The more than 40-year long Landsat time series that is available to users for free access makes it possible to continuously map and examine land cover changes. High accuracy maps cannot be produced from urban areas by traditional per-pixel methods due to the medium spatial resolution of Landsat images and the very high spectral and spatial complexity of urban areas. Therefore, methods or additional data are needed, which can solve this problem. By using bi-temporal imagery per classification year we can improve the classification accuracy per year and reduce the misclassification problem between bare lands or impervious surface and vegetation cover types which is inherent in almost all mono-temporal approaches. Two pairs of bi-temporal cloud-free Landsat TM images were selected from the area of the city of Bochum, Germany. One dataset was acquired from mid to late spring and early summer date in 1986 (1st May 1986, 9th June 1986) and another set from 2010 and 2011 (20th April 2011 and the 4th June 2010). The bi-temporal image sets were classified separately by using the maximum likelihood classification algorithm. Five different land cover classes, namely forest, agriculture land, bare land, urban areas and water were identified. Additionally, the four single satellite images were classified individually to compare the classification accuracy results of each single date and each bi-temporal classification. The overall accuracy of the 1st May 1986 image was 77.1% and the 9th June image 75.4%, while the overall accuracy of the 1986 bi-temporal classification raised to 82.1%. The overall accuracy of the 20th April 2011 image was 77.9% and for the 4th June 2010 image was 81.4%, while the overall accuracy of the 2010/2011 bi-temporal classification was 88.2%. The post-classification comparison change detection was used to determine change in land cover types. It is arguably the most obvious quantitative change detection method because it is provides "from-to" change information. However, the errors for each classification will propagate and reduce the overall accuracy of the change analysis. The change detection map showed that between 1986 and 2011 the amount of urban areas increased from 55.3% to 61.1% for the total area, while agriculture land decreased from 24.8% to 21.8% and bare land form 3.6% to 0.2%. Forest and water bodies remained almost unchanged from 1986 to 2011. The individual "from-to" changes results were verified and explained using large scale aerial photos.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Real-time Geo-Information Fusion as one key aspect of Digital Earth

Florian Hillen, Manfred Ehlers, Bernhard Höfle, Peter Reinartz

fhillen@igf.uos.de, mehlers@igf.uos.de, bernhard.hoefle@geog.uni-heidelberg.de, Peter.Reinartz@dlr.de

Germany

Keywords: Information-Fusion, Digital Earth

Abstract:
The Digital Earth vision by Al Gore recently has evolved to a powerful real-time toolbox for various use cases. Nowadays, almost every geo-sensor data can easily be integrated in a Digital Earth application in real-time and near real-time. This can be in-situ sensor data, smartphone sensor data or also high-resolution remote sensing imagery. However, the benefit of combining multiple data sources is only rarely exploited. Remote sensing data, for example, generally cover large areas but do not deliver information for hidden areas (e.g. under bridges, in house) or under cloud cover. In contrast to that, in-situ sensors deliver punctual information only but may provide information for areas that are invisible to remote sensors. Thus, the first idea that comes to mind is to use the advantages of the respective sensor types to eliminate the disadvantages of the other. The real-time aspect is a crucial point in this process, especially for time-critical applications like early warning systems, decision support systems for security issues or precision fertilisation for agricultural areas. Todate, there is alack of usage regarding real-time integration of fused geo-information even though the benefit is obvious. This work will present the information fusion service (IFS) as a standardised way to fuse and integrate real-time geo-sensor data in Digital Earth applications. An example is presented that utilises the concept of the IFS for a recording campaign combining remote sensing and smartphone in-situ data during a football game. In doing so, the benefit of real-time data integration as well as geo-information fusion in general is emphasised.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Multitemporal TerraSAR-X data for urban land cover mapping: preliminary results

Alexander Jacob, Yifang Ban

aljacob@kth.se, yifang@kth.se
Geoinformatics, KTH Royal Institute of Technology, Sweden
http://www.kth.se/

Abstract:
The accelerating urbanization around the globe has a significant impact on the environment and the wellbeing of urban inhabitants. Timely and accurate information on urban land cover is required to support sustainable planning. With the recent launches of several advanced spaceborne SAR sensors, such as TerraSAR-X and RADARSAT-2, multitemporal high-resolution SAR data became routinely available. Since SAR is less influenced by solar illumination or weather conditions, SAR data has been increasingly used for urban land cover mapping. The objective of this research is to evaluate the capabilities of multitemporal TerraSAR-X data in for urban land cover mapping. Five dates of TerraSAR X data acquired over Shanghai during June to September, 2010 were selected for this research. The major urban land cover types include: high-density buildup areas, low-density build up areas, roads, airport runways, grass/pasture, forest, agricultural crop, bare fields and water. The SAR data are being analyzed using KTH-SEG, our recently developed object-based image analysis tool based on an edge-aware region growing and merging algorithm. The post-segmentation classification will performed using a support vector machine classifier. It is anticipated that multitemporal TerraSAR-X data are able to classify the major urban land cover classes with reasonable accuracy. It is also anticipated that the combination of different incidence angles and look directions should lead to a better classification result.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Multitemporal ENVISAT ASAR data for global urban mapping: preliminary results

Yifang Ban[1], Alexander Jacob[1], Paolo Gamba[2]

yifang@kth.se, aljacob@kth.se
[1] Geoinformatics, KTH Royal Institute of Technology, Sweden
http://www.infra.kth.se/

paolo.gamba@unipv.it
[2] University of Pavia, Italy

Keywords: ENVISAT ASAR, Urban Mapping, Urban Extractor, Spatial indices, GLCM Textures

Abstract:
With more than half of the world population now living in cities and 1.5 billion more people expected to move into cities in 2030, urban areas pose significant challenges on local, regional and global environment. Timely and accurate information on spatial distributions and temporal changes of urban areas are therefore needed to support sustainable development and environmental change research. The objective of this research is to evaluate spaceborne SAR data for improved global urban mapping using a robust Urban Extractor. ENVISAT ASAR C-VV data at 30m resolution were selected over 10 global cities. The proposed methodology includes SAR data preprocessing, enhancement, urban extraction based on spatial indices and GLCM textures, and post-processing. The results show that the proposed Urban Extractor is effective in extracting urban areas from ENVISAT ASAR data and urban areas can be mapped at 30m resolution with very good accuracy using only one or two SAR images. These findings indicate that operational global urban mapping is possible with spaceborne SAR data, especially with the launch of Sentinel-1 that provides SAR data with global coverage, operational reliability and quick data delivery.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Investigating satellite SPOT VEGETATION multitemporal NDVI maps for land degradation monitoring in the Basilicata region using DFA and PCA

A. Lanorte, A. Aromando, F. De Santis, Rosa Lasaponara

rosa.lasaponara@imaa.cnr.it
CNR-IMAA, C.da S. Loja 85050 Tito Scalo (PZ), Italy

Keywords: SPOT VEGETATION, multitemporal, NDVI, land degradation, Basilicata Region, DFA, PCA

Abstract: Nowadays, remotely sensed data has become increasingly available thus offering, at low cost and even also free of charge, a unique tool with great potential for a improving knowledge of both natural (Lasaponara 2005, Lasaponara and Telesca 2006) and cultural heritage (see, for example Lasaponara and Masini 2009, Ciminale et al. 2009 Masini and Lasaponara 2006, Lasaponara et al 2011) In this paper, we focus on the investigations we conducted in the context of the MITRA project focused on the use of low cost technologies (data and software) for pre-operational monitoring of land degradation in the Basilicata Region. The characterization of land surface conditions and land surface variations can be efficiently approached by using satellite remotely sensed data mainly because they provide a wide spatial coverage and internal consistency of data sets. In particular, Normalized Difference Vegetation Index (NDVI) is regarded as a reliable indicator for land cover conditions and variations and over the years it has been widely used for vegetation monitoring. For the aim of our project, we used satellite SPOT-VEGETATION multitemporal NDVI maps which are free available and useful for extracting information on land degradation. The analysis was performed using two different approaches (i) the Detrended Fluctuation Analysis (DFA) and (ii) Principal Component Analysis (PCA) applied to a temporal series (1999–2011) of the yearly Maximum Value Composite of SPOT/VEGETATION NDVI using open source software codes. Both naturally vegetated areas (forest, shrub-land, herbaceous cover) and agricultural lands have been investigated in order to extract the most prominent natural and/or man induced alterations affecting vegetation behaviour. The comparison of maps obtained applying both DFA and PCA to the whole Basilicata Region pointed out the application of PCA provides more reliable results which are easier to a be analyzed and interpreted

References:

Lasaponara R, A Santulli, L Telesca, 2005 Time-clustering analysis of forest-fire sequences in southern Italy Chaos, Solitons & Fractals 24 (1), 139-149

Tuia D, F Ratle, R Lasaponara, L Telesca, M Kanevski 2008 Scan statistics analysis of forest fire clusters Communications in Nonlinear Science and Numerical Simulation 13 (8), 1689-1694

Lasaponara R 2005 Inter-comparison of AVHRR based fire susceptibility indicators for the Mediterranean ecosystems of southern Italy International Journal of Remote Sensing 26 (5), 853-870

Telesca L, R Lasaponara 2006 Pre and post fire behavioral trends revealed in satellite NDVI time series Geophysical Research Letters 33, (14)

Lasaponara R 2006 Estimating spectral separability of satellite derived parameters for burned areas mapping in the Calabria region by using SPOT-Vegetation data Ecological modelling 196 (1), 265-270.

Ciminale M, D Gallo, R Lasaponara, N Masini 2009 A multiscale approach for reconstructing archaeological landscapes: applications in Northern Apulia (Italy) Archaeological Prospection 16 (3), 143-153

Masini N, R Lasaponara 2006 Satellite-based recognition of landscape archaeological features related to ancient human transformation Journal of Geophysics and Engineering 3 (3), 230 Journal of Archaeological Science 38 (9), 2031-2039

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Hyperspectral Remote Sensing

Koen Meuleman, Eyal Ben Dor, Adriana Marcinkowska

Wednesday, 18.06.2014, 11:05-13:05, *Audytorium*

The Airborne Prism Experiment: operations and latest status of the Processing and Archiving Facility
> *Koen D.J. Meuleman, Kristin Vreys, Sindy Sterckx, Bart Bomans, Jan Biesemans, APEX team*
> 11:05 - 11:20

Practical Example of the Supervised Vicarious Calibration (SVC) method - ValCalHyp Airborne Hyperspectral Campaign under EUFAR
> *Anna Brook, Eyal Ben-Dor*
> 11:20 - 11:35

Recent advances in reducing radiometric miscalibration – Application for hyperspectral push-broom sensors
> *Christian Rogass, Christian Mielke, Daniel Scheffler, Nina K. Boesche, Christin Lubitz, Maximilian Brell, Daniel Spengler, Karl Segl*
> 11:35 - 11:50

MINERAL MAPPING BASED ON AN AUTOMATIC DETECTION OF MULTIPLE ABSORPTION FEATURES
> *Veronika Kopackova, Lucie Koucka*
> 11:50 - 12:05

Laboratory and image spectroscopy for mapping of selected rocks in peak areas of the Krkonoše Mountains
> *Lucie Kupkova, Jana Kubečková, Bogdan Zagajewski, Adriana Marcinkowska, Adrian Ochytra*
> 12:05 - 12:20

Hyperspectral Digital Image Analysis and Geochemical Analysis of a Rare Earth Elements Mineralized Intrusive Complex (Fen Carbonatite Complex in Telemark Region, Norway)
> *Nina Boesche, Christian Mielke, Christian Rogass, Hermann Kaufmann*
> 12:20 - 12:35

Classification of vegetation communities based on APEX hyperspectral data and Support Vector Machines
> *Adriana Marcinkowska, Bogdan Zagajewski, Adrian Ochtyra, Anna Jarocińska, Edwin Raczko, Koen Meuleman, Bronisław Wojtuń, Lidia Przewoźnik*
> 12:35 - 12:50

Relationships between narrow-band vegetation indices and fluorescence
> *Marlena Kycko, Bogdan Zagajewski, Elżbieta Romanowska, Adrian Ochtyra, Anna Jarocińska, Aneta Modzelewska*
> 12:50 - 13:05

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The Airborne Prism EXperiment: operations and latest status of the processing and archiving facility

Koen D.J. Meuleman, Kristin Vreys, Sindy Sterckx, Bart Bomans, Jan Biesemans, APEX team

koen.meuleman@vito.be, kristin.vreys@vito.be, sindy.sterckx@vito.be, bart.bomans@vito.be
VITO – Centre for Remote Sensing and Earth Observation Processes, Mol, Belgium,

Keywords: APEX, hyperspectral airborne scanner, PAF

Abstract:
Since its first operational flights in 2011, more than 2 TB of hyperspectral airborne data have been acquired with the Airborne Imaging Spectrometer APEX (Airborne Prism Experiment) for users all over Europe. To ensure the highest image quality, intensive on-ground calibration campaigns are carried out at least once a year at the Calibration Home Base (CHB) situated at DLR. The infrastructure at the CHB allows to perform a full geometric, radiometric and spectral characterization/calibration of APEX. However this characterization is performed at laboratory conditions (i.e. room temperature, ground atmospheric pressure). This paper will provide an overview of the major project areas acquired with APEX over the last few years and for which the data sets are freely available to the scientific community. Further the latest status and developments of the operational APEX Processing and Archiving Facility (PAF) will be highlighted ensuring the delivery of highest quality level2 data towards the user community.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Practical example of the Supervised Vicarious Calibration (SVC) method – ValCalHyp airborne hyperspectral campaign under EUFAR

Anna Brook[1], Eyal Ben-Dor[2]

abrook@geo.haifa.ac.il
[1] University of Haifa, Department of Geography and Environmental Studies, Israel

bendor@post.tau.ac.il
[2] Tel-Aviv University, Department of Geography, Remote Sensing and GIS Laboratory, Israel

Keywords: Supervised Vicarious Calibration, Radiometric Cross-Calibration, ValCalHyp, EUFAR, AISA-Dual, AHS, CASI

Abstract:
A novel reflectance-based approach for radiometric calibration and atmospheric correction of airborne hyperspectral (HRS) data, supervised vicarious calibration (SVC), was proposed by Brook and Ben-Dor in 2011. The present study aimed to validate the SVC method using simultaneously operated several different airborne HRS sensors that acquired data above several selected sites. The general goal is thus to apply a cross-calibration approach to examine the capability and stability of the SVC method. In the current study three sensors were involved in an airborne campaign mission supported by EUFAR under a project entitled ValCalHyp. The AISA-Dual (operated by NERC), AHS and CASI (operated by INTA) were acquired data over several selected sites in the south of France (Salon de Province, Marseille, Avignon and Montpellier) on October 28th 2010 between 13:00 and 16:00 UTC.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Recent advances in reducing radiometric miscalibration – application for hyperspectral push-broom sensors

Christian Rogass, Christian Mielke, Daniel Scheffler, Nina K. Boesche, Christin Lubitz, Maximilian Brell, Daniel Spengler, Karl Segl

christian.rogass@gfz-potsdam.de, christian.mielke@gfz-potsdam.de, daniel.scheffler@gfz-potsdam.de, nina.boesche@gfz-potsdam.de, christin.lubitz@gfz-potsdam.de, maximilian.brell@gfz-potsdam.de, daniel.spengler@gfz-potsdam.de, karl.segl@gfz-potsdam.de
Germany
http://www.gfz-potsdam.de

Keywords: ROME, radiometric, calibration, stripes, destriping, push-broom

Abstract:
Data takes of hyperspectral imagers are of increasing demand in Earth Observation related applications. As for other remote sensing techniques this requires precise pre-processing comprising of radiometric, spectral and geometric distortion reductions. One of these steps is radiometric scaling to transform recorded digital number to radiance. For this, laboratory assessed mathematical relations between required radiance and recorded digital number (gain) and short-term measurements of dark current variations (offset) during operation are incorporated. Due to changes in the sensor system, which include thermal imbalance and mechanical stress gain and offset may vary over time. The result of this is visually perceptible as along-track striping noise after radiometric calibration. In this work, a new approach is presented that enables fast, highly precise and parameter-free destriping of uncorrelated striping noise that enhances the radiometric accuracy of hyperspectral push-broom data takes and, hence, improves the outputs of succeeding applications. It is part of the existing ROME (Reduction of Miscalibration Effects) framework and is based on a noise-perpendicular gradient minimization technique. The performance was tested and compared to four state-of-the-art algorithms using artificially degraded hyperspectral whisk-broom scenes from a HyMAP campaign over Germany, two AISA scenes over Germany and two EO-1 Hyperion scenes over Namibia. Proposed approach clearly outperforms all other tested approaches even in low SNR scenarios like close to atmospheric absorption bands. On average a destriping accuracy of 99.75 % can be achieved having 3σ of only 1 % and, thus, it has been integrated into the state-of-the-art ROME framework that becomes a standard inside hyperspectral pre-processing chains.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Mineral mapping based on an automatic detection of multiple absorption features

Veronika Kopackova, Lucie Koucka

veronika.kopackova@seznam.cz, lucie.koucka@gmail.com
Czech Geological Survey, Czech Republic

Abstract:
In contrary to multispectral image data, hyperspectral (HS) imagery with higher spectral resolution provides sufficient spectral resolution to describe diagnostic absorption signatures. Specific chemical bonds in materials, whether solid, liquid or gas, determine the surface reflectance and emittance, as variations in material composition often cause shifts in the position and shape of absorption bands in the spectrum. In addition, detecting the exact absorption wavelength position is a key factor not only for mineral identification but also for tracking diverse environmental processes and pathways. A couple of techniques to identify absorption parameters have been suggested, however they are capable of a quantitative characterization of just one major absorption feature and, due to the techniques they use, limited to the SWIR region. In this paper a new technique is proposed allowing automatic detection of multiple absorption feature parameters (absorption maximum wavelengths and depths). The newly proposed method is based on a trend analysis of the spectra, while bad bands (e. g., noise, error bands) are detected at first and excluded from the further analysis. The new tools – e.g. called QUANTools – have been created using IDL programing language and can be used under ENVI/IDL (version 5.0 and higher). As multiple absorption features are detected within the VNIR/SWIR region, respectively their wavelength positions, the newly suggested method has a potential to become a new mapping technique suitable for environments characterized with high heterogeneity and dynamics.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Laboratory and image spectroscopy for mapping of selected rocks in peak areas of the Krkonoše Mountains

Lucie Kupková[1], Jana Kubečková[1], Bogdan Zagajewski[2], Adriana Marcinkowska[2], Adrian Ochtyra[2]

lucie.kupkova@gmail.com
[1] Charles University in Prague, Faculty of Science,
Department of Applied Geoinformatics and Cartography, Czech Republic

bogdan@uw.edu.pl, adriana.marcinkowska@uw.edu.pl, adrian.ochtyra@uw.edu.pl
[2] University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Poland

Keywords: geological mapping using hyperspectral data, classification, rocks, lichens, The Krkonoše Mountains, spectral mixture, spectral library

Abstract:
The study deals with geological mapping of selected rocks in peak areas of the Krkonoše Mountains on the Czech – Polish border (area of Vysoké kolo, Harrachovy kameny, Sněžka Mts. and Kozí hřbety) using hyperspectral data (APEX sensor). The main goal was to classify rocks in areas of interest using four classification methods: SAM (Spectral Angle Mapper), SID (Spectral Information Divergence), MESMA (Multiple Endmember Spectral Mixture Analysis) and LSU (Linear Spectral Unmixing) and to compare the used methods (evaluation of classification results based on expertise of geologist).
The second goal was to evaluate influence of lichens covering the rocks in different density on the classification result. The main data were acquired by the hyperspectral sensor APEX in September 2012. Field spectral measurements of selected rocks, block fields and outcrops and the laboratory spectral measurements of geological samples and lichens were executed (using ASD FieldSpec 4 WR spectroradiometer) and the spectra were stored in spectral library. This spectral library contains spectra of pure rocks and lichens and mixtured spectra of rocks and lichens (25%, 50% and 75% share of green, yellow and black lichens). Classifications were performed based on endmembers taken from spectral library and also from the image. Better classification results were achieved based on spectra from image and on mixed spectra of rocks and lichens. As for classification methods based on expertise of geologist the best results were achieved using MESMA classifier that produced the best spatial accuracy and also the best classification accuracy of particular rocks types.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Hyperspectral digital image analysis and geochemical analysis of a rare earth elements mineralized intrusive complex
(fen carbonatite complex in Telemark region, Norway)

Nina Boesche[1], Christian Mielke[1], Christian Rogass[1], Hermann Kaufmann[2]

nina@gfz-potsdam.de, chmielke@gfz-potsdam.de, rogass@gfz-potsdam.de
[1] Research Geological Scientist, Germany

charly@gfz-potsdam.de
[2] Head of the Remote Sensing Section, Germany

Keywords: Hyperspectral, EnMAP, Rare Earth Element, Geology, Exploration

Abstract:
Today rare earth elements are of great interest for both political relations and the global economy. They are of particular importance in modern technology, such as batteries, LCD displays and catalytic converters. Hyperspectral imagers, like the Earth Observing-1 Hyperion and the future environmental mapping and analysis program (EnMAP) bear a potential to identify rare earth element enriched zones in hardly accessible terrains on Earth. Moreover, it is a brilliant technology for monitoring exploration with regard to environmental pollution and protection of local communities. Hence, a fast and accurate geological prospection algorithm using highly spectrally resolved satellite and airborne images is in development. Since a lot of competing absorptions (e.g. vegetation, iron oxides and atmospheric water) take place in the VNIR spectral range and the shape of REE absorption bands are usually similar to the shape of noise, a clear detection of Rare Earth Elements is hampered. In situ field spectrometer data were gathered to analyze the connection between characteristic spectra of rare earth element bearing rocks and its geochemistry. A total of three different rock types (Sövites, Rauhaugites, REE-bearing iron ores) were sampled and thin slices were produced for a microscopic study of the geochemical composition (Micro XRF) and spectroscopic behavior (Hyspex Imager). This dataset built up the base for the identification of indicative features in the spectra, whose absorption depth significantly varies with the amount of rare earth elements. Therefore, a spectral library with its REE related parameters was set up and used for a Richardson Lucy Convolution. It was applied to extract a certain frequency range of the spectrum and was used to deconvolve the composite image spectra into the REO related part of the spectrum and the residual part of the spectrum. The results show new implications for the use of hyperspectral spectroscopy in exploration research by detecting REE bearing minerals and mineralized areas. This also enables the aggregation of the developed approach to be applied in 2D image scenes acquired from the near in the laboratory up to airborne and spaceborne acquisitions such as HySPEX and EnMAP. The outcome of this project is a final verification of spectroscopic mineral detection algorithms that can be used to analyze airborne and spaceborne image scenes.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Classification of vegetation communities based on APEX hyperspectral data and Support Vector Machines

Adriana Marcinkowska[1], Bogdan Zagajewski[1], Adrian Ochtyra[1], Anna M. Jarocińska[1], Edwin Raczko[1], Koen Meuleman[2], Bronisław Wojtuń[3], Lidia Przewoźnik[4]

adriana.marcinkowska@uw.edu.pl, bogdan@uw.edu.pl, adrian.ochtyra@uw.edu.pl, ajarocinska@uw.edu.pl, edwin.raczko@student.uw.edu.pl
[1] University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Poland

koen.meuleman@vito.be
[2] VITO – Centre for Remote Sensing and Earth Observation Processes, Belgium

bronislaw.wojtun@uni.wroc.pl
[3] University of Wroclaw, Faculty of Biological Sciences, Department of Ecology, Biogeochemistry and Environmental Protection, Poland

lidia.przewoznik@kpnmab.pl
[4] Karkonosze National Park Poland

Keywords: APEX, hyperspectral, classification, SVM, vegetation communities, EUFAR

Abstract:
Hyperspectral data allows for obtaining very accurate information about vegetation. Many narrow ranges of the electromagnetic spectrum allow to distinguish between different plant communities (Zagajewski, 2010). The aim of the study was to identify communities located in the Karkonosze Mountains area (UNESCO M&B Reserve), based on hyperspectral data from the APEX scanner with the spatial resolution ranging from 1,75 m till4 m, while the spectral resolution is 288 bands in the range of 0.4-2.5μm (Itten et al., 2008). The aerial imagery was acquired in the framework of the international HyMountEcos project (Hyperspectral Remote Sensing for Mountain Ecosystems) and covered the whole of the Polish and Czech part of the Karkonosze and Krkonoše National Parks. During the flight campaign I fieldwork was performed to collect, among others, spectral characteristics and polygons of dominant vegetation communities. The reference material to perform the classification was a non-forest vegetation vector map (Wojtuń et al., 2004). It contains 48 plant communities and the main units include following types: forests (2 classes), meadows and pastures (1), grasslands (5), idle lands (1), bog-springs, fens and bogs (5), ruderal vegetation (8), rock and scree vegetation (5), springs (2), subalpine tall-forbs (2), deciduous shrubs vegetation (1) , subalpine dwarf pine scrubs (3) and heathlands (2). The analyzed area is a fragment located in the surroundings of Śnieżka Mountain, on Polish territory. In order to perform a classification a supervised Support Vector Machines method was used, which is the type of machine learning for pattern recognition, implemented in the ENVI 5.0 software. Based on the vector map, the terrain information and using the Pixel Purity Index (PPI) method, to find the most spectrally pure pixels, which could represent classes, appropriately homogeneous (about 400 pixels) polygons were chosen for training the machines. To perform an accuracy assessment of classification, the verification polygons were used, based on the terrain information. Firstly, classification was lead using all of APEX bands.
Different kernel types – linear, polynomial, radial basis function and sigmoid – were tested in the SVM procedure. Finally, the confusion matrix was applied, which analyses overall accuracy, kappa coeffcient, user and producer accuracy (Marcinkowska et al., 2014). The best results were acquired for all of APEX bands, it was the 86.99% of overall accuracy, what confirm the hypothesis that the SVM

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

classifier with APEX hyperspectral data is a very useful tool for the vegetation classification.

Literature:

Itten K. I. , Dell'Endice F., Hueni A., Kneubühler M., Schläpfer D., Odermatt D., Seidel D., Huber S., Schopfer J., Kellenberger T., Bühler Y., D'Odorico P., Nieke J., Alberti E. & Meuleman K., 2008, 'APEX – the Hyperspectral ESA Airborne Prism Experiment', Sensors, vol. 8, pp. 6235-6259

Marcinkowska A., Zagajewski B., Ochtyra A., Jarocińska A., Raczko E., Kupková L., Stych P. & Mueleman K., 2014, 'Mapping vegetation communities of the Karkonosze National Park using APEX hyperspectral data and Support Vector Machines', Miscellanea Geographica – Regional Studies on Development, vol. 18, no. 2

Wojtuń B., Żołnierz L. & Raj A., 2004, 'Nowy operat ochrony ekosystemów nieleśnych Karkonoskiego Parku Narodowego, Geoekologické problémy Krkonoš', Opera Corcontica, vol. 41, pp. 560-567

Zagajewski B., 2010, 'Ocena przydatności sieci neuronowych i danych hiperspektralnych do klasyfikacji roślinności Tatr Wysokich' (Assessment of neural networks and Imaging Spectroscopy for vegetation classiffcation of the High Tatras), Teledetekcja Środowiska, vol. 43, pp. 113

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Relationships between narrow-band vegetation indices and fluorescence

Marlena Kycko[1], Bogdan Zagajewski[1], Elżbieta Romanowska[2], Adrian Ochtyra[1,3],
Anna M. Jarocińska[1], Aneta Modzelewska[1]

marlenakycko@student.uw.edu.pl
[1] University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland

[2] University of Warsaw, Faculty of Biology, Department of Molecular Plant Physiology, Warsaw, Poland

[3] University of Warsaw, College of Inter-Faculty Individual Studies in Mathematics and Natural Sciences, Warsaw, Poland

Keywords: narrow-band vegetation indices, florescence, trampled vegetation

Abstract:
The main driving force of photosynthesis is light absorbed by photosynthetic pigments. It can be registered by hyperspectral detectors and an analysis of chlorophyll a fluorescence. Chlorophyll fluorescence can provide information about the amount of light energy used in photochemistry and heat dissipation Thus, chlorophyll a fluorescence is used as a signature of photosynthesis. Such analyses can allow for observations of physiological changes in plant vegetation. It can be registered by remote sensing detectors, e.g. field, airborne and satellite detectors. The aim of this study was to compare the field hyperspectral remote sensing methods with biometrical fluorescence measurements. The experiment consists of 2parts: a) field studies of dominant plant species of high mountain ecosystems of the Tatra National Park; b) laboratory measurements of control and heavy metal stress pea plants . In both experiments Biomonitor Plant Stress Meter fluorometer and ASD FieldSpec 3 spectrometer (spectral range is 350-2500 nm) were used. Spectrometric measurements allowed to calculate remote sensing indices, which were compared with minimal (F0) and maximal (Fm) level of fluorescence and half rise time (T1/2) from F0 to Fm. Spectral characteristics as well as vegetation indices were analyzed by statistical test ANOVA, which showed a significant relationship between photosynthetic parameters measured by spectrometer and fluorometer. The highest correlation was observed between the indicators and the value of fluorescence ratios obtained for SIPI and the PRI group Light Use Efficiency which is characterized by the light energy used in photosynthesis. The decline in Fv/Fm ratios of leaves adapted to the darkness indicate the reduction of photochemical efficiency of the photosynthetic apparatus as a result of photo inhibition, induced by environmental stress factors.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Remote Sensing for Developing Countries

Joost Vandenabeele, Jean-Christophe Schyns

Wednesday, 18.06.2014, 17:00-18:15, *Audytorium*

Remote Sensing for Developpment in Africa
>   *Klaus U. Komp*
>   17:00 - 17:15

Preliminary geomorphological mapping of the Ngounié watershed in the south-west Gabon
>   *Dieudonne MTD Mouketou-Tarazewicz, Dieudonne MTD Mouketou-Tarazewicz*
>   17:15 - 17:30

Improving soil and landuse mapping and analyzing the degradation risks in a typical Lesser Himalayan watershed
>   *Pawanjeet S Datta, Andreas Ch Braun, Helmer Schack-Kirchner, Barbara Koch*
>   17:30 - 17:45

Mekrou transbounday river basin
>   *Iban Ameztoy, Ezio Crestaz, César Carmona-Moreno, Luca Demarchi*
>   17:45 - 18:00

Investigating Quality Measures of Spatial Analysis Conducted for Assessing Energy Conservation Towards Sustainability
>   *Hussein Abdulmuttalib*
>   18:00 - 18:15

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Remote sensing for developpment in Africa (technological and political perspectives based on three decades of experience)

Klaus U. Komp

klaus.komp@eftas.com
EFTAS Fernerkundung Technologietransfer GmbH, Germany
http://www.eftas.com

Keywords: Developing Countries, Mapping, Monitoring, Change Analysis, Development Policy

Abstract:
Remote Sensing – often qualified as the third discovery of the Earth – has improved the direct access of science and knowledge to remote places of our planet. Africa has benefitted throughout the decades from 1940 to 1960 from photogrammetric mapping at scales of 1:500.000 to 1:200.000, mostly realized by French and British survey organizations. The launch of the first revisiting EO satellites since 1972 opened the possibilities of filling the white gaps of maps and gave even the basis to study land cover changes since the topographic mapping period. In the frame of cooperation with developing countries in Africa remote sensing has been applied in many technological programs to improve institutions, infrastructure, education and living conditions. However the results of these efforts have rarely lead to sustainable changes of the environment and living conditions of the target populations. The contribution will review different project and success stories to raise the question of the right forms of cooperation in the sphere of science and technology of remote sensing in Africa. There are many results of regional inventories and monitoring of forestry, agriculture, settlement and environment, but not enough sustainability in education, training and institution building. Based on recent works the contribution will show options for changes in the European development policy and the need to apply remote sensing methods to reduce in long terms the economic emigration from Africa to Europe.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Preliminary geomorphological mapping of the Ngounié watershed in the south-west Gabon

Dieudonne MTD Mouketou-Tarazewicz

dieudonne@expetrop.com
Gabon
University of Warsaw, Poland

Keywords: Ngounié Watershed, south west Gabon, geomorphological mapping, Digital Terrain Modeling

Abstract:
This paper aimed to develop a preliminary geomorphological mapping and characterization of the Ngounié watershed, in the south-western part of Gabon by the use of geomorphological mapping methodologies developed in the sub-commission on geomorphology mapping of the IAG (Klimaszewski, 1963), supported by Geo-tools (remote sensing data and geographical information system software). As the main material used to map the Ngounié watershed were obtained by the Program SRTM/NASA (Digital Elevation Model – DEM with 90 m. resolution. The DEM were geoprocessed using Erdas Imagine and ArcGIS 10.1 to generate maps of slope, hipsometric and Shaded Relief (auxiliary products for characterization and mapping). This was followed by the methodological assumptions of AFRICOVER PROJECT. This disclosed the possibility of applicability of Geo-tools allied methodologies devoted to geomorphological and physico-geographical elements mapping.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Improving soil and landuse mapping and analyzing the degradation risks in a typical Lesser Himalayan watershed

Pawanjeet S. Datta, Andreas Ch. Braun, Helmer Schack-Kirchner, Barbara Koch

pawan.datta@felis.uni-freiburg.de, andreas.braun@felis.uni-freiburg.de,
helmer.schack-kirchner@bodenkunde.uni-freiburg.de, barbara.koch@felis.uni-freiburg.de

Keywords: degradation risks, Himalaya, erosion, forests, remote sensing

Abstract:
In the fragile Lesser Himalayan region, soil degradation is a serious threat to land-use sustainability. One important indicator of susceptibility of soil to degradation is soil erodibility. The objective of this study is: a) to improve the parametrization of erosion relevant soil properties using mixed-effects modeling based pedotransfer functions with the aim of producing a high resolution soil erodibility map for the study watershed, b) to analyze the relationship between soil factors and land-use in order to understand the degradation risks associated with land-use change patterns in the region. This study involves innovative procedures to map both soil properties and landuse. Producing soil maps is time consuming and cost intensive exercise and alternatively many studies have focused on producing soil maps by incorporating topographical and land use information as predictors. The mixed-effects modeling approach for soil property mapping (Datta et al. 2014) uses a large number of topographical (derived from SRTM DEM)and landuse based parameters (derived from Landsat ETM+ data) in order to obtain the best predictors for erosion relevant soil properties (soil texture, bulk density,and carbon content). These are then used to develop the watershed scale soil erodibility map. For land-use mapping, there are two factors which render land-use mapping a difficult task for the study site. Firstly, a complex, small-scaled pattern of different land-use classes distinguished only by subtle differences is found. Secondly, like in many developing areas, data availability is poor and traditional low-quality optical data have to be used. Exactly for this purpose, in previous work, a specialized land-use mapping scheme has been developed (Braun et al. 2014). The scheme makes use of state-of-the art classification techniques like Support Vector Machines and Contitional Random Fields which exploit textural context information (Extended Morphological Profiles) to distinguish spectrally similar classes by their integration into landscape context. This framework is employed for the first time in a multi-seasonal scenario herein and is supposed to raise land-use mapping accuracy considerably. The resultant maps -land-use, soil properties, and soil erodibility are subsequently used to analyze the relationship between landuse and soil erodibility, in order to understand the dynamics of forest and soil degradation in the high risk Lesser Himalayan region.

Datta P.S., Schack-Kirchner H. and Hildebrand E. (2014) Parametrization of Soil Erodibility in a Lesser Himalayan watershed using Pedotransfer Functions and Mixed Effects Modeling. In: Arrouays D., McKenzie N. and Hempel (eds.) Global soil map: basis of the global spatial soil information system. 2014 Taylor & Francis Group, London. 245 -251

Braun, A.C., Weidner, U., Echerverria, C., Aguayo, M., Rojas, C., Niemeyer, J., Kosov, S., Rottensteiner, F., Bähr, H.P. and Hinz, S. (2014): "Design of a Spectral-Spatial Pattern Recognition Framework for Risk Assessments using Landsat Data -A case study in Chile. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, in print.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Mekrou transbounday river basin
(a general framework of an Integrated Information system)

Iban Ameztoy, Ezio Crestaz, César Carmona-Moreno, Luca Demarchi

iban.ameztoy@jrc.ec.europa.eu, ezio.crestaz@jrc.ec.europa.eu,
cesar.carmona-moreno@jrc.ec.europa.eu, luca.demarchi@jrc.ec.europa.eu
IRC, Italy

Keywords: Water Resources, land use, integrated information system, developing countries

Abstract:
Water Resources Unit within the Joint Research Centre (JRC-EC) jointly with Global Water Partnership (GWP), and inclose collaboration with key partners and relevan twater authorities of Benin, Burkina Faso and Niger, is carrying out a pilot project in the Mekrou transboundary River basin, a right wing tributary of Niger river, aiming the Economic Green Growth and Poverty Reduction of the area. The project focuses on the nexus agriculture-water-energy, by pursuing an integrated assessment of land use change, agriculture practices for estimation of crop yields and water demand, and water availability, face to the challenges of high hydroclimatic variability and relevance of both surface and ground water in the region. The design, implementation and delivery of an open source framework will support an integrated approach to surface and groundwater hydrology, and agro-hydrology analysis, towards the development of sustainable policy and increasing institutional capacity building. In such a framework, provided that agriculture is mostly developed in Benin while lower part of the Mekrou basin extends over the W National Park, adoption of remote sensing technologies is expected to support quantification of land cover/use change. This characterization will help to better understand the historical development of agriculture and other users, as human settlements, that make use of water resources, and therefore to assess past patterns in water demand changes, as well as address analysis of future scenarios. This paper briefly introduces the general framework of the Integrated Information system (e-Water) that will be developed, the different modelling and management components, discussing the role and relevance of remote sensing in contributing information for enhanced assessment.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Investigating quality measures of spatial analysis conducted for assessing energy conservation towards sustainability

Hussein Abdulmuttalib

hussein.m.abdulmuttalib@gmail.com
Hungary

Keywords: Spatial Analysis, Quality Measures, Cartographic Rendering, Sustainability, Environmental Assessment

Abstract:
The proper knowledge of Quality Measures guides towards a proper management of activities, its required level of investment, the necessary resource allocation, and the expected results. That is, there is always a probability of failure when a reduction of precautions is involved, unless the failure becomes negligible at a certain level, and any investments of resources, efforts and time above that level would be a total waste and not wise. Thus, we need to defined these levels at the beginning so that we can plan all the other aspects of the activities related to it, and of course Spatial Analysis of environmental variations also requires such tuning to set the quality measures depending on the sought levels of conservations and therefore regulate the related sub activities of analysis, the quality of the feature classes involved, and the cartographic aspects of the published results or information. This paper is intended to show the results of the investigation conducted previously in the course of the research activities, for setting the quality measures of spatial analysis, that was performed to analyse the effects of conserving energy in buildings as much as increasing greenery areas in the surrounding neighbourhood and measuring the effects of major dense transportation roads, all that in relation to a targeted reduction of greenhouse gases emitted as an act of enforcing sustainability planning. Each feature class of data that was used in the course of the spatial analysis together with its attributes is investigated in the sense of quality measures such as spatial and temporal accuracy, cartographic aspects of quality, and the limits are set where this feature acts positively and negatively on the analysis results with some statistical measures shown as a result of combining the different used feature classes. Above that the effects of analysis procedures and functions used are also investigated and categorized in a rank of effecting levels on the final result. The results of the quality investigations are then tabulated in a manner that is to be used for guidelines of such activities in the future

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Remote Sensing of Vegetation

Katarzyna Dąbrowska-Zielińska, Lucie Kupková, Anna M. Jarocińska

Wednesday, 18.06.2014, 09:30-10:30, *room 107*

PROSAIL model in simulating the reflectance of mountains non-forest communities
Anna M. Jarocinska, Bogdan Zagajewski, Adrian Ochtyra, Adriana Marcinkowska, Lucie Kupkova
09:30 - 09:45

Application of MODIS and Landsat NDVI to detect vegetation-groundwater interactions
Urszula Somorowska, Anna M. Jarocinska
09:45 - 10:00

Classification of vegetation damage using Landsat data and Artificial Neural Network
Adrian Ochtyra, Bogdan Zagajewski, Anna Kozłowska, Marlena Kycko, Anna Jarocińska, Adriana Marcinkowska
10:00 - 10:15

The assessment of the temporal ecosystem services changes in suburban area of Warsaw
Piotr Pabjanek, Iwona Szumacher, Jacek Leszko
10:15 - 10:30

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

PROSAIL model in simulating the reflectance of mountains non-forest communities

Anna M. Jarocińska[1], Bogdan Zagajewski[1], Adrian Ochtyra[1,2], Adriana Marcinkowska[1],
Lucie Kupková[3]

ajarocinska@uw.edu.pl, bogdan@uw.edu.pl, adrian.ochtyra@uw.edu.pl,
adriana.marcinkowska@uw.edu.pl
[1] University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland

[2] University of Warsaw, College of Inter-Faculty Individual Studies in Mathematics and Natural Sciences
Warsaw, Poland

lucie.kupkova@gmail.com
[3] Charles University in Prague, Faculty of Science,
Department of Applied Geoinformatics and Cartography, Prague, Czech Republic

Keywords: PROSAIL, non-forest communities, Karkonoše, RTM

Abstract:

Monitoring vegetation cover, especially in mountain and protected areas is an important issue. The analyses were conducted in Karkonosze Mountains in the Krkonoše National Park in Czech Republic. Non-forest mountain heterogeneous communities were analysed in the researches. The aim of the study was to check the possibility to use Radiative Transfer Model to simulate the reflectance of very diverse mountains non-forest communities. During field measurements were collected biophysical parameters as an input parameters to the model PROSAIL and reference spectrum. Then, PROSAIL model was used to simulate the spectrum for each polygon. The accuracy was tested using reference spectrum based on RMSE and nRMSE values. The average RMSE value for whole analysed range was equal 0.129. The biggest errors were noticed in near infrared (0.241), whereas the smallest in 400-600 nm range – 0.016. Generally all noticed RMSE and nRMSE values are very diverse and quite big. These results cannot be used to the inversion and acquired biophysical parameters, because of high RMSE values. Although after necessary adjustments model can be used for further analysis, like inversion. Acquired results showed that PROSAIL can be used to simulate the reflectance, but it has to be adjusted, especially in near infrared range.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Application of MODIS and Landsat NDVI to detect vegetation-groundwater interactions

Urszula Somorowska[1], Anna M. Jarocińska[2]

usomorow@uw.edu.pl
[1] University of Warsaw, Faculty of Geography and Regional Studies,
Department of Hydrology, Warsaw, Poland

ajarocinska@uw.edu.pl
[2] University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland

Keywords: MODIS, Landsat, vegetation, groundwater, NDVI, MOD13Q1, MOD13A1, Kampinos National Park

Abstract:
Water requirements of terrestrial vegetation are satisfied dominantly by precipitation recharging groundwater resources. To sustain transpiration and growth through a dry season, the diffuse discharge of shallow groundwater plays additionally an important role. The role which groundwater plays in controlling ecosystems requires detailed understanding and is useful for land managers and decision makers for environmentally oriented water management. Especially in the area of Biosphere Reserves such a research and investigation are required. The main objective of this study was to investigate the spatial and temporal patterns of Normalized Difference Vegetation Index (NDVI) in the Kampinos Biosphere Reserve in central Poland and its links with groundwater depth. Vegetation dependencies on groundwater were analyzed from the relationship between the values of Normalized Difference Vegetation Index (NDVI) and groundwater depth at the transect and pixel scales covering different research sites with natural, semi-natural or transformed vegetation, including grasslands and forests. Data used in this study include (1) 10-year (2001-2010) MODIS NDVI products 'MOD13Q1' and 'MOD13A1'; (2) selected Landsat TMand ETM+images (calibrated and atmospherically corrected) ; and (3) groundwater levels acquired from the Groundwater Monitoring of the Kampinos National Park. The MODIS NDVI time series data were temporally smoothed to reduce noise and possible residual cloud effects. The results were compared to the NDVI calculated using Landsat data aggregated to the MODIS resolution. Regression model was fitted to quantify relation between NDVI and groundwater. Results show that vegetation depends highly on groundwater; the NDVI decreases with the increase of the groundwater depth.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Classification of vegetation damage using Landsat data and artificial neural network

Adrian Ochtyra[1,2], Bogdan Zagajewski[1], Anna Kozłowska[3], Marlena Kycko[1], Anna M. Jarocińska[1], Adriana Marcinkowska[1]

adrian.ochtyra@uw.edu.pl, bogdan@uw.edu.pl, marlenakycko@student.uw.edu.pl, ajarocinska@uw.edu.pl, adriana.marcinkowska@uw.edu.pl
[1] University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland

[2] University of Warsaw, College of Inter-Faculty Individual Studies in Mathematics and Natural Sciences
Poland

a.kozl@twarda.pan.pl
[3] Institute of Geography and Spatial Organization PAS, Department of Geoecology and Climatology
Poland

Keywords: Landsat OLI, ANN, classification, Tatra Mountains

Abstract:
The aim of this study was to develop an algorithm to classify vegetation condition of high mountain ecosystems using Landsat OLI data and an Artificial Neural Networks simulator. The study area is located in the Tatra Mountains (the Tatras) in south Poland. Tatras are protected by Polish and Slovak Tatra National Parks and also by UNESCO as the M&B Biosphere Reserve. This region is very valuable because this is the highest range in Central Europe and it has a unique climate. In the Tatras, there are vertical zones with different microclimate and vegetation communities. There have been dramatic changes over several years in the subnival belt, which is dominated by spruce stands. These changes have been caused by strong winds and bark beetle which is destroying quite large patches of forest. Monitoring of this region is therefore very important. Satellite images like Landsat OLI can support traditional techniques of environmental protection. The proposed approach can be especially useful in monitoring hard-to-reach places like mountain ecosystems. To classify vegetation condition, vegetation indices were developed that distinguish five classes of vegetation condition. Using such data and an original image from 08.09.2013 the areas of interest were selected and supervised ANN classification was performed. The results were validated with ground truth data collected during field measurements at the end of August 2013. Measurements were conducted in all main types of vegetation communities in the study area. We used several instruments including spectrometer ASD FieldSpec 3, pyrometer IRTecMiniRay, LAI2000 Plant Canopy Analyzer, ceptometer AccuPAR, digital camera with fish eye lens and GPS receiver -Trimble GeoXT. The results suggest that Artificial Neural Networks can be used with satellite data to supplement and replace intensive field studies.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The assessment of the temporal ecosystem services changes in suburban area of Warsaw

Piotr Pabjanek, Iwona Szumacher, Jacek Leszko

p.pabjanek@uw.edu.pl, szumi@uw.edu.pl
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, Poland

Keywords: land use changes, aerial photos, urban sprawl, ecosystem services, Warsaw

Abstract:
Urban sprawl causes degradation of ecosystems, ecosystem functions and services. Next to Warsaw there are several natural ecosystems such as Kampinos National Park, which are very attractive neighborhood for dwellers. We can observe very rapid land use change on the transect Warsaw – rural area. The assessment of the temporal ecosystem services changes on this areas is necessary to find way how should be optimize planning to keep high quality of life of dwellers. In first step using aerial photos land-use changes were identified between 1972, 1987, 2007 and 2012. In second step, focusing on the main ecosystem services regarded as important to quality of life of dwellers, assessment of changes of these services have been done by implementation of methods from other urban areas in Europe and USA. Direction of changes is similar. There has been a large decline in arable land and increase in building area. The value of the ecosystem services are found lower in urban area, but in suburban area not necessarily.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Forestry

Piotr Wężyk, Bogdan Zagajewski

Wednesday, 18.06.2014, 17:00-18:00, *room 107*

Remote sensing of periurban forest vegetation biophysical variables using time-series MODIS satellite data
Maria A Zoran, Roxana S Savastru, Dan M Savastru, Marina N Tautan, Laurentiu V Baschir
17:00 - 17:15

TEMPORAL CHANGES IN NORWAY SPRUCE PHYSIOLOGICAL STATUS USING HYPERSPECTRAL DATA: A CASE STUDY OF MOUNTAINEOUS FORESTS HEAVILY AFFECTED BY A PAST LONG-TERM ACIDIC DEPOSITIONS
Lucie Čevená, Zuzana Lhotáková, Veronika Kopačková, Lucie Kupková, Jan Mišurec, Markéta Potůčková, Pavel Cudlín, Petya Entcheva-Campbell, Jana Albrechtová
17:15 - 17:30

Environment Modification Follow-up and Diagnosis of Degradation Risk of Forest Ecosystems by Remote Sensing and Spatialized Indicators
Marjolaine Okanga-Guay, Nadine Ndonghan Iyangui, Ghislain Moussavou, Rodrigue Mintsa, Médard Obiang Ebanega, Bruno Nkoumakali
17:30 - 17:45

Influence of stand height and standing volume on selected Vegetation Indices acquired from RapidEye images
Aneta Modzelewska, Krzysztof Stereńczak, Radomir Bałazy
17:45 - 18:00

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Remote sensing of periurban forest vegetation biophysical variables using time-series MODIS satellite data

Maria A. Zoran, Roxana S. Savastru, Dan M. Savastru, Marina N. Tautan, Laurentiu V. Baschir

maria@dnt.ro, rsavas@inoe.ro, dsavas@inoe.ro, marina@inoe.ro, baschirlaurentiu@inoe.ro
National Institute of R&D for Optoelectronics Romania

Keywords: forest vegetation, biophysical parameters, MODIS Terra/Aqua satellite data, climate changes.

Abstract:
Forest protection represents one of the most important aim involving practical aspects of pest prevention and control, as well as aspects of fundamental and applicative scientific research to find the best solutions for maintaining the appropriate fitosanitary condition of the national public forest area in Romania. Changes in the atmospheric abundance of greenhouse gases and aerosols, in solar radiation and in land surface properties alter the energy balance of the climate system. These changes are expressed in terms of radiative forcing, which is used to compare how a range of human and natural factors drive warming or cooling influences on regional and global climate. Given the ability to define vegetation and land cover at the site level based on attributes such as physiognomy, horizontal and vertical structure, vegetation phenology and leaf morphology, direct parameterisation and mapping using remotely sensed data can enhance the ability to characterize and monitor these important biogeophysical parameters. Terrestrial processes modelling and other applications need quantification of biophysical parameters. The forest vegetation indices have been calculated from Earth Observation satellite data taking into account jointly the features of vegetation responsible for reflection in various bands and combining this information from several spectral bands. A study testing the role of satellite remote sensing multispectral data for monitoring biophysical parameters was conducted over a periurban forested area Cernica-Branesti, placed North -Eastern part of Bucharest town, Romania. Based on MODIS Terra/Aqua and IKONOS images over 2002-2012 period, have been derived forest vegetation biophysical parameters. The various soil-vegetation indices have been calculated using different spectral bands for obtaining LAI values. Land surface temperature, land surface albedo and land cover have been also investigated. The analysis of time series daily MODIS Terra/Aqua satellite data shows strong seasonal dynamics of surface reflectance of green, near infrared and shortwave infrared bands, and clearly delineate leaf phenology and length of plant growing season for a temperate deciduous broadleaf forest.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Temporal changes in Norway spruce physiological status using hyperspectral data: a case study of mountaineous forests heavily affected by a past long-term acidic depositions

Lucie Červená[1], Zuzana Lhotáková[2], Veronika Kopačková[3], Lucie Kupková[1], Jan Mišurec[3], Markéta Potůčková[1], Pavel Cudlín[4], Petya Entcheva-Campbell[5], Jana Albrechtová[2]

lucie.cervena@natur.cuni.cz, lucie.kupkova@gmail.com, marketa.potuckova@natur.cuni.cz
[1] Charles University in Prague, Faculty of Science,
Department of Applied Geoinformatics and Cartography, Prague, Czech Republic

zuzana.lhotakova@natur.cuni.cz, jana.albrechtova@natur.cuni.cz
[2] Charles University in Prague, Faculty of Science,
Department of Experimental Plant, Prague, Czech Republic

veronika.kopackova@seznam.cz, jan.misurec@geology.cz
[3] Czech Geological Survey, Prague, Czech Republic

cudlin.p@czechglobe.cz
[4] CzechGlobe, Academy of Sciences of the Czech Republic, České Budějovice, Czech Republic

petya.k.campbell@nasa.gov
[5] Joint Center for Earth Systems Technology, NASA Goddard Space Flight Center, Biospheric Sciences Branch, Greenbelt, Maryland, United States

Keywords: laboratory spectroscopy, Norway Spruce, physiological status, acid deposition

Abstract:
The physiological status of trees within forest ecosystems determines their proper functioning. The forest decline in the Krušné Hory Mts., the western part of the Czech Republic, has been described since the early 1950´s and was attributed to the combination of severe atmospheric pollution and climatic conditions. Due to the mining activities and coal burning power plants that were built in the close vicinity of the Krušné Hory Mts. a strong gradient of acidic deposition leading from heavy (the eastern part) to light (the western part) developed during the 1970´s and 1980´s. Although the load of SO_2 has significantly decreased since 1991, the full recovery of forests damaged by previous acid deposition is a long term process. The physiological status of Norway spruce was assessed using the ground truth data (biochemical and spectroscopic data) as well as the two hyperspectral data sets acquired in 1998 (ASAS sensor -NASA Goddard Space Flight Center) and in 2013 (APEX sensor - developed by a Swiss-Belgian consortium on behalf of ESA, currently operated by VITO). The very first results coming from the analysis of the foliar chemistry indicate that the stands exhibited different physiological status corresponding to the pollution gradient in 1998 and 2013. Slight improvement of the Norway spruce physiological status was recorded in the eastern part of the mountains (e.g. total carotenoids to chlorophyll ratio), while a status of the western-located stands slightly worsened. This finding may correspond to a tremendous decrease in the atmospheric pollution though remaining adverse soil conditions. Further linking of foliar chemistry and reflectance and soil chemistry is currently being under investigation.
The support of the Ministry of Education of the Czech Republic is acknowledged: LH12097.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Environment modification follow-up and diagnosis of degradation risk of forest ecosystems by remote sensing and spatialized indicators (forest ecosystem dynamics monitoring)

Marjolaine Okanga-Guay[1], Nadine Ndonghan Iyangui[1], Ghislain Moussavou[2], Rodrigue Mintsa[2], Médard Obiang Ebanega[1], Bruno Nkoumakali[1],

m_okanga_guay@yahoo.fr, n_iyangui@yahoo.fr, obiang_medard@yahoo.fr, nkoumakali_bruno@yahoo.fr
[1] LAGRAC, Gabon
http://lagrac.uob.ga

gmoussavou@gmail.com, rodriguemintsa@yahoo.fr
[2] IRET, Gabon

Keywords: land use mapping, remote sensing, forest ecosystem, Gabon

Abstract:
The purpose of the study is to characterize forest ecosystem changes derived from natural or an-thropological dynamics, to identify and to map the degradation risk factors and to develop relevant follow-up indicators of dynamics and risks. The study concerns the northeast zone of Libreville, the main city in Gabon. This poster presents partial results. The monitoring of the forest ecosystem dynamics will be made through a diachronic analysis (1990-2013), derived from land use mapping from satellite data. The registering of satellite data will be made with GPS points and image processing will allow the segmentation and classification of land use. A field study will help to confirm results of satellite data analysis. Partial results show that in Bambouchine, the more rural zone, breaks appear in forest, while in Bikele, the more urban zone, a large part of the forest has been cleared. The other part of the study site is located since 2002 in Akanda National Park, where mangrove swamp seems to have gained in height. These results will help to identify modifications in ecosystemic resources and services, environmental change factors and to understand their causes. The final results are the elaboration of a follow-up method of the forest ecosystem dynamics and of an evaluation method of degradation risks by means of the remote sensing. The project obtained in 2013 a 24 690 financing over 18 months of the Fond Français pour l'Environnement Mondial (FFEM) via the Geoforafri project of the Institut de Recherche pour le Développement (IRD).

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Influence of stand height and standing volume on selected vegetation indices acquired from RapidEye images
(Vegetation Indices acquired from RapidEye)

Aneta Modzelewska, Krzysztof Stereńczak, Radomir Bałazy

modzelewskaaneta@gmail.com, k.sterenczak@ibles.waw.pl, r.balazy@ibles.waw.pl
Department of Information Technology and Modelling, Forest Research Institute,
Braci Leśnej 3 Street, 05-090 Raszyn, Poland

Keywords: RapidEye, Vegetation Indices, stands parameters

Abstract:
As vegetation indices are broadly utilized in forests condition analysis, their sensitivity to spatial changes of stand characteristics, like height, standing volume or diameter are not fully understood. To detect accurately woodland damages, such knowledge is useful. As spruce is main conifer specie of polish mountain forests,it was chosen to analysis. The main goal of this research was to recognize, how the response of the indices will be changing, with alterations of stand height or volume. To acquire that, we have chosen four vegetation indices: Simple Ratio (Jordan, 1969), Normalized Difference Vegetation Index (Rouse et al., 1973), Normalized Difference Red Edge Index (Barnes et al, 2000) and Green Normalized Vegetation Index (Buschmann and Nagel, 1993). Simple Ratio is the first spectral vegetation index basing on change between near infrared and red reflectance. It shows general vegetation state. Normalized Difference Vegetation Index is also an index of vegetation state, mostly used in studies, because of its simplicity and normalization of values in opposite to SR. Next used index, Normalized Difference Red Edge Index is the NDVI modification, which uses red-edge band, sensitive to chlorophyll content changes and known as early detecting vegetation stress (Eitel et al, 2011). The fourth index, Green Normalized Vegetation Index, also a modification of the NDVI, is using the green band, instead of red, what makes it more corresponding with biophysical variables (Gitelson, Merzylak, 1996). To do the research, three areas of mountain forests were chosen and 1327 stands were analyzed, where the dominating specie was healthy spruce (more than 70%). Analyses were carried on 4 different level of samples size. Results proved similar trends whatever the level of analysis was. Additionally mean and standard deviation values were not far from each other, showing similar trends regarding to analyzed value.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Remote Sensing of Land Cover

Ioannis Manakos, Premysl Stych

Thursday, 19.06.2014, 09:00-10:30, *Audytorium*

Analysis of the content of Norwegian CORINE Land Cover classes.
 Hanne Gro Wallin, Linda Aune-Lundberg
 09:00 - 09:15
GIO Land Monitoring component in Poland
 Agata Hościło, Andrzej Ciołkosz, Dariusz Ziółkowski, Milena Napiórkowska, Anna Dębowska, Marta Gruziel
 09:15 - 09:30
THE ASSESSMENT OF THEMATIC RELIABILITY OF ARTIFICIAL AREAS FROM CLC2006 DATABASE
 Agnieszka Jenerowicz, Anna Wolszczak, Paweł Postek, Elżbieta Bielecka
 09:30 - 09:45
Land cover mapping of seminatural and extensively used areas basing on Landsat images and Artificial Neural Networks
 Bogdan Zagajewski, Jakub Olczyk, Urszula Pytlak, Monika Kacprzyk
 09:45 - 10:00
Improving SPOT-5 land cover classification using RADARSAT polarimetric decompositions
 Sebastian Aleksandrowicz, Edyta Woźniak, Stanisław Lewiński
 10:00 - 10:15
Evaluation of land cover changes based on the fusion of multispectral and lidar data
 Premysl Stych, Krystina Lihanova
 10:15 - 10:30

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Analysis of the content of Norwegian CORINE Land Cover classes.

Hanne Gro Wallin, Linda Aune-Lundberg

hgw@skogoglandskap.no, lla@skogoglandskap.no
Norwegian Forest and Landscape Institute, Norway
http://www.skogoglandskap.no

Keywords: CORINE Land Cover, quantitative description, qualitative assessment, generalization, accuracy,

Abstract:
This paper presents an assessment of the Norwegian approach to production of the CORINE Land Cover (CLC) dataset through a bottom-up approach utilizing national land cover datasets wherever available. The study explains the actual content of the different CORINE Land Cover classes (CLC) by combining the CLC map with the most detailed national land resource maps. The result is a quantitative description as well as a qualitative assessment of the accuracy of CLC-product for Norway. The purpose of the study is to present a more detailed description of the actual content of the CLC classes as they are used in Norway. The classification system for CLC is set up with three hierarchical levels. Level one has 5 classes, level two has 15 classes and level three has 44 classes. In Norway 31 level three classes are used. Norway is covered by large areas of forest and mountains. Settlements and agriculture are only found in small and scattered areas, compared to the rest of Europe. Because of this there is uncertainty about the content of the classes, both as a result of data generalized with strict requirements for minimum area, the extensive use of mixed agricultural classes, and because the classification originally was adapted to a southern European landscape. The approach is to provide a statistical description of selected CLC classes, obtained from an overlay between the CLC2006 dataset and the more detailed Norwegian land resource databases. The results demonstrate good overall correspondence between the legend and the actual content of the CLC classes. Still, the results clearly demonstrate that CLC is the product of a generalization process in which details are hidden and broader trends are emphasized. For Norway, CLC2006 offers a good general, cartographic overview of land cover distribution, but it is inadequate as a source of land cover statistics at the national and sub-national level.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

GIO Land Monitoring component in Poland

Agata Hościło, Andrzej Ciołkosz, Dariusz Ziółkowski, Milena Napiórkowska, Anna Dębowska, Marta Gruziel

agata.hoscilo@igik.edu.pl
Institute of Geodesy and Cartography, Warsaw, Poland

Keywords: land cover, CORINE, HRL

Abstract:
GMES Initial Operations (GIO) Pan-EULand Monitoring Component includes CORINE land cover 2012 and land cover change CLC 2006-2012 inventories and the verification and enhancement of the 5 High Resolution Layers (HRLs). The national project is carried out by the Institute of Geodesy and Cartography (IGiK) in Warsaw, which acts as National Reference Center (NRC) in Poland, nominated by the Chief Inspectorate of Environmental Protection in Poland. IGiK participated in elaboration all the previous CORINE Land Cover databases: CLC1990, CLC2000, CLC2006, CLC-Change 1990-2000, and CLC-Change 2000-2006.
The CORINE 2012 inventory includes revision of CLC2006, interpretation of land cover changes between 2006 and 2012 and generation CLC2012 database. The inventory is carried out base on SPOT and IRS images (from 2006) and IRS-P6 and RapidEye images acquired in 2011 and 2012. The production of CLC2012 is organized per working units corresponding to four 1: 100 000 map sheets. The methodology, processing chain and preliminary results of the CORINE 2012 and CLC-change 2006-2012 inventory will be presented.
The HRLs include characteristics of 5 main land cover types namely: imperviousness, tree cover and forest types, grasslands, wetlands and water bodies. The HRLs are generated using semi-automat image classification by service providers. IGiK is responsible for verification and enhancement of the 5 HRLs for Poland. The verification process comprises the following steps of accuracy assessment: qualitative 'general overview' and 'look-and-feel' and quantitative 'statistical' assessment. Next step is the enhancement of the HRLs, which aims to improve the accuracy of the final HRL product. We will present the preliminary results of the analysis of the selected HRLs for Poland.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The assessment of thematic reliability of artificial areas from CLC2006 database

Agnieszka Jenerowicz[1,2], Anna Wolszczak[2], Paweł Postek[2], Elżbieta Bielecka[2]

jenerowicz_a@yahoo.com
[1] Military University of Technology, Department of Remote Sensing and Photogrammetry, Poland

akowerdziej@wat.edu.pl, posti85@o2.pl, ebielecka@wat.edu.pl
[2] Military University of Technology, The Faculty of Civil Engineering and Geodesy,
The Institute of Geodesy, Warsaw, Poland

Keywords: CLC2006, thematic reliability, validation, thematic classes, artificial areas

Abstract:
The CLC2006 (Corine Land Cover 2006) is a database of land cover for whole area of Europe, which is an continuation of CLC2000 program initiated by European Union. All information about land cover in CLC2006 were derived from visual interpretation of SPOT and IRS satellite images acquired in the years 2005-2007. The technical specifications for this dataset assume that the reliability of thematic data is no less than 85%. However after data validation carried out by European Environmental Agency it turned out that its reliability varies between 95% for waters and less than 70% for sparse vegetation. Artificial areas (urban areas) are reliable at the 60%-95%. These are mean values for the whole Europe. However, due to character of terrain and time period of images capture (from April till October), the values can considerably vary between countries and regions. The aim of this study was to assess the reliability of the classification of artificial (urban) areas for Mazovia region, located in central Poland. The credibility was assessed directly, with full inspection, using external data. For data validation were used mostly Landsat 7 images from 2006 and 2007 and topographic vector database with detail of map 1:10 000. During the validation there were assessed the correctness of interpretation of classes: 111, 112, 121, 122, 123, 124, 131, 132, 133,141, 142 and 242 that in Poland includes areas of dispersed development. The overall assessment of the reliability of the thematic classification of artificial areas for investigated area is 76%. The most accurate were determined classes 111 (92%), 121 and 122 (90%), the less accurate classes 112 and 242 (75%). There was observed that classes 112 and 242 were not secreted consistently. Observed errors are mostly related to careless designation of polygon boundaries, erroneously assigned codes to classes (242 instead of 112) and distinction in a single polygon areas of a different nature (112 and 242 or 122 and 112).

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Land cover mapping of seminatural and extensively used areas basing on Landsat images and artificial neural networks

Bogdan Zagajewski, Jakub Olczyk, Urszula Pytlak, Monika Kacprzyk

bogdan@uw.edu.pl, j.olczyk@student.uw.edu.pl, urszula.pytlak@student.uw.edu.pl,
monika.kacprzyk@student.uw.edu.pl
University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland

Keywords: Landsat , CORINE, ANN, classification, Land cover

Abstract:
The goal of presented study was an elaboration of a semiautomatic classification method of Landsat images, SNNS and fuzzy ARTMAP simulator for mapping of natural and seminatural areas. The study area covers Podlasie and Mazury area (north-eastern Poland, corresponding to the Landsat TM scene: path 187, row 23). Studied area includes inter alia: natural forests (Bialowieza Virgin Forest – National Park and M&B Reserve), wetlands (surrounding Narew River National Park), numerous glacial lakes, semi natural fields and meadows. The reference material for the classification of land cover is database CLC2006. Therefore, it was decided to adopt an example to determine the land cover the third and an elaborated fourth level of the CORINE key units. As a result of preliminary analysis and classification decision was made to select the following land cover types: artificial and non-agricultural vegetated areas; arable land; orchards; meadows and pastures; broad leaved forest; coniferous forest; mixed forest; peatland; open spaces with little or no vegetation; peat bogs; wetlands; water courses and bodies. The selected scene was dated on 28/07/2006 (image was not covered by clouds and this year the CLC was updated). Basing on field validated patters ANN simulators was trained. The training data set should provide as complete are presentative description of each land category as possible. After developing a test polygon for learning neural network, the classification of land cover was made using SNNS and fuzzy ARTMAP simulators. Important at this stage is the selection of network parameters and optimization classification procedures (selection the weights connecting neurons signal). The final stage was post-classification analyses (classified area were compared to the database CLC2006 and field random selected polygons), which included error matrix; total, user and producer accuracies, according to the procedures of the ENVI software. Detailed results will be presented during the Symposium.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Improving SPOT-5 land cover classification using RADARSAT polarimetric decompositions

Sebastian Aleksandrowicz, Edyta Woźniak, Stanisław Lewiński

saleksandrowicz@cbk.waw.pl, ewozniak@cbk.waw.pl, stlewinski@cbk.waw.pl
Space Research Cetnre of the Polich Academy of Sciences, Poland

Keywords: land cover classification, SPOT, Radarsat, polarimetric decomposition

Abstract:
The information which optical and radar satellite images provide is complementary so the classification realized on both types of data is more accurate or more classes are distinguished, what was shown in many papers. However the polarimetric approach of SAR data analysis which defines the object by its scatter mechanism, was not researches in this context. The aim of the work was to improve the land cover classification realized on multispectral SPOT-5 image using information about scatter mechanism from objects obtained from fully polarimetric RADARSAT. Firstly the SPOT-5 image was classified using object oriented approach into following classes: urban areas, urban green, deforestations, bare soil, agriculture, coniferous, deciduous and mix forests, surface water with the overall accuracy of 79%. The main difficulty of the classification was found in a relation to class agriculture. On the one hand the urban areas were mixed with the arable lands without vegetation. On the other hand there was a need of the separation of more detailed classes: annual and permanent crops, meadows, wetlands. Extraction of those classes is impossible using just one optical image. To solve these problems polarimetric decompositions: three-component Freeman-Durden and Van Zyl models, four-component Yamaguchi model and H/A/Alpha theorem were applied to RADARSAT images. Variables obtained in such way were used in the classification process. In our research we checked how the use of different polarimetric parameters influenced the classification quality. Because multitemporal optical image acquisitions are not possible in periods of time that would guarantee classification of all desired classes we propose combination of optical and polarimetric data.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Evaluation of land cover changes based on the fusion of multispectral and lidar data

Premysl Stych, Krystina Lihanova

stych@natur.cuni.cz
Faculty of Science, Charles University in Prague, Czech Republic

Keywords: Land Cover, Lidar data, Multispectral data, Czech Republic, Data fusion

Abstract:

Land cover changes in Sumava National Parks in the Czech Republic were evaluated based on the fusion of multispectral and lidar data. For this purpose SPOT and Landsat data were used. Object-based classification (OBIA) was the main used method for classification. Developed methods of classification enable to distinguish several classes of forest decay stages for years 2005 and 2010. Results present forest and non-forest classification using the combination of multispectral and lidar data.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Poster Session 2

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Land evaluation using remote sensing and GIS technology for major crops grown in Amran Valley, Yemen

Abdulhameed Hussein Alashwal

ahgis2013@gmail.com
Department of Geography, Sana'a University, Yemen

Keywords: soil resource inventory, land evaluation, soil Morphological properties

Abstract:
In the present study, an attempt has been made to evaluate land for major crops using GIS and remote sensing technology in the Amran Valley, a part of Amran Governorate in Yemen. This carried out through soil resource inventory and classification of soil up to family level, examining water requirement and its availability to crops, inventory of land use/land cover, crop acreage estimation and assessment of land suitability for major cultivated crops in the study region. Soil mapping units in the Amran plain were delineated using satellite false color composite image, aerial photographs and topographic maps. Soil survey for 20 soil profiles from different soil mapping units with GPS coordinates was conducted. Soil samples were collected as horizon wise from each profile for analysis of physical and chemical properties in the laboratory. Morphological properties studied in the field are soil depth, soil color, structure and consistency and stickiness and plasticity, HCl reaction, horizon boundary etc. Physical analysis of soil profiles involves texture, bulk density, available water capacity, pH and electrical conductivity. Chemical analysis of soils include cation exchange capacity (CEC), exchangeable cations (Ca2+, Mg2+, Na+, and K+), free $CaCO_3$, OC%, N2, phosphorous and potassium. Based on morphological, physical, and chemical properties of soil profiles and soil taxonomy system 1975, soils in the study area were classified into four soil orders viz., Entisols, Aridisols, Mollisols and Vertisols. Based on textural classes, clay minerals type, calcareousness, soil moisture and temperature regime and alkalinity characteristics of soil profiles, soils were classified into 15 soil families. Entisols were found to be the dominant soils followed by Aridisols, Mollisols and Vertisols with area of 9800 ha (42.35%), 7470 ha (32.29%), 5224 ha (22.60%) and 646 ha (2.80%) respectively. Entisols were found to dominate the marginal areas of Amran plain. Mollisols and Vertisols dominate the central parts of the study area. Aridisols soils were found between Entisols and Molisolls orders. Land use/land cover and crop acreage estimation for major crops during spring and winter seasons were studied using two satellite images ETM+ (May) and TM (January) 2004. Training signatures were developed from ground truth and visual interpretation. Supervised classification (MXL algorithm) was used to generate land use/land cover map. Crop water requirement (ETcrop) was calculated following modified Penman equation by Doorenbos and Pruitt (1977) using ten-day data for temperature, relative humidity, wind and sunshine during the period of 1975-1980 for three stations viz; Raydah, Al-Janat, and AL-Manjedah. The cumulative water balance is calculated for entire growing season of major crops following procedures given in FAO, publication No. 73, 1986. Analyzing precipitation, ETo, crop coefficient (kc), water requirement and available water capacity; the water surplus, water deficit and water requirement satisfaction index (WRSI) were calculated during growing period for potato, sorghum and wheat crops for the period of 1975 to 1980. Reference Crop Evapotranspiration (ETo) during studied period (six years) is marked with upper limits of 1121 mm, 1119 mm and 1115 mm of ETo at Al-Manjidah, Aljanat and Raydah respectively.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

A new method for artefact-free estimation of surface slope from lidar data

Teemu Kumpumäki, Tarmo Lipping

teemu.kumpumaki@tut.fi, tarmo.lipping@tut.fi
Tampere University of Technology, Pori, Finland

Keywords: topographic lidar

Abstract:
Estimating the slope of a surface obtained by Lidar scanning often involves artefacts due to disagreement in the elevation values of the point data of neighbouring swathes in the regions of overlap. In this paper we propose an efficient way for artefact-free estimation of slope by filtering the original point data using a set of scan angle based thresholds, interpolating the scan angle filtered data sets into gridded surfaces and combining the surfaces by either averaging or applying a trimmed mean type operation. We show that the proposed method yields slope estimates that are essentially artefact-free. The method is useful in the analysis of large bathymetric Lidar data sets as well as in other situations where overlapping data from different sources are combined.

166

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Evaluating Digital Elevation Models in the atmospheric correction procedure for different satellite image data (Bartin case study, Turkey).

Ayhan Atesoglu[1], Metin Tunay[2]

aatesoglu@yahoo.com
[1] Asst. Prof. Dr., Turkey

mtunay74@ttmail.com
[2] Prof. Dr., Turkey

Abstract:
The most valuable information to be obtained from remote-sensing sensors is radiation in a certain band-width reflected from a certain object. However, different illuminations originated from rough terrains and especially from atmosphere change radiation values of objects. Different correction algorithms are applied to satellite image data in order to prevent the effects of these errors. Removing atmospheric and topographic effects from images taken by sensor is beneficial especially for vegetation-based studies. In this study, the atmospheric correction procedure had been applied to the images of Landsat ETM+, Aster (VNIR) and Spot (HR-VIR) by using the digital elevation model created through the contour lines which are present in every 10 m on the topographic map with a scale of 1:25000, and the visual and digital analyses had been made through the result images. In the application, the ATCOR-3 module on the PCI Geomatica 9.1 software which is used for the rugged terrains had been used. In terms of the atmospheric correction, the advantages and disadvantages of the digital elevation model which is used on the satellite image data on different resolutions had been indicated. For the Landsat ETM+ image used in the study, the atmospheric correction process made by using good contrast value (Vis: 25km) had been observed to resolve the negativities on different view enlightenments especially sourced from the topography. The shade effect sourced from the topographic differences on the study area creates the spectral differences that cause as it is in a different structure for the shaded and light-receiving parts of the stand. With the atmospheric correction procedure, these kinds of mistakes sourced from the topography are precluded and homogeneity is provided by removing the spectral differences in the stand. In the SPOT HR-VIR image data, 25 km. value that had a good contrast as the visibility data had been chosen and the visual evaluation had been made. The shade effects sourced from the topography had been observed to be resolved especially from the effects on the slopes according to the other visibility values. As well as the azimuth for the Aster (VNIR) image had been quite bad, the negativities based on the topography became prominent. For the visibility values based on the normal and high contrast on the atmospheric correction phase, differences has been observed on the reflection values on both sides of the slopes in the areas where the shade effect had seen. Practices towards examining the changes on reflections of earth specifications and the knowledge inference regarding the area in different periods or places have been prevailed frequently. In this kind of practices, the radiance measured on target pixel for any satellite image data changes depending on the light of the field of view, atmospheric conditions and glance geometry of the detector. The accuracy of slope and aspect analyses that is subject to atmospheric correction depends on the digital elevation model created on the basis of complete resolution. Due to the result of the atmospheric correction made, the negativities based on the topography had also been removed. In this context, positive results will be provided for the remote sensing studies investigated of the information content level that is effective especially on spatial resolution such as reaching higher accuracies.

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Evaluating ASTER GDEM accuracy for two areas in Greece.

Konstantinos G. Nikolakopoulos, Konstantina Mexia

knikolakop@upatras.gr, mexiak@yahoo.com
University of Patras, Greece

Keywords: ASTER GDEM, 2D RMSE, accuracy, percentile

Abstract:
ASTER Global Digital Elevation Model (GDEM) was released on June 29, 2009. The GDEM was created by stereo-correlating the 1.3 million scene ASTER VNIR archive, covering the Earth's land surface between 83N and 83S latitudes. The GDEM is produced with 30 meter postings, and is formatted in 1 x 1 degree tiles as GeoTIFF files. Each GDEM file is accompanied by a Quality Assessment file, either giving the number of ASTER scenes used to calculate a pixel's value, or indicating the source of external DEM data used to fill the ASTER voids. In this study the accuracy of ASTER GDEM was examined. For two areas with different geomorphologic characteristics DSM from ASTER stereo pairs were created with classical photogrammetric techniques. Those DSMs were compared with the ASTER GDEM.Points of certified elevation collected with DGPS have been used to estimate the accuracy of the DSM. The elevation difference between the two DSMs was calculated. 2D RMSE, correlation and the percentile value were also computed and the results are presented.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Polarimetric SAR image classification on urban area using a subset selection method

Maryam Soheili Majd, Elisabeth Simonetto, Laurent Polidori

maryam.soheili_majd@cnam.fr, elisabeth.simonetto@esgt.cnam.fr, laurent.polidori@esgt.cnam.fr
GeF/L2G, France
http://esgt-siti.cnam.fr

Keywords: polarimetry, SAR, high-resolution, classification, genetic algorithm, mutual information, feature selection

Abstract:
In this study, we consider the capacity of a single look high-resolution PoLSAR image for discriminating different surfaces in urban area. First, a basic framework is set up to extract different polarimetric descriptors from Sinclar matrix and coherency matrices, coherent and incoherent decomposition descriptors, and some discriminators. Then, we use a subset selection method (SSM) based on GA-MI (Genetic Algorithm – Mutual Information) and mRMR (minimum Redundancy Maximum Relevance) evaluation function to obtain an optimal subset of descriptors as input of the classification process. To show the efficiency of this approach, we perform a comparison between the results of SVM classification obtained from the optimal feature subset and from different target decompositions based on different scattering mechanism assumptions, including the Pauli, Huynen, Cloude, Holm and Barnes, H/A/Alpha, Freeman 2 components, Freeman 3 components, Van Zyl, Krogager, or Yamaguchi methods. Experimental results on the optimal subset of SSM based on GA-MI show that the proposed method provides a meaningful selection in regards the different scattering mechanisms and leads to better classification performance. Then, a building footprint map is extracted by morphological operations from the image of radar amplitude. This spatial information is introduced as a constraint term in the SVM classification process using the optimal subset. The results show that the classification is improved. In particular, it overcomes classification ambiguities between flat roof pixels and tree pixels. Our experiments are performed on a single look PoLSAR image acquired by the airborne RAMSES SAR sensor of ONERA over a suburban area.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Assessment of WorldView 2 images for condition analysis of trampled high-mountain meadows

Marlena Kycko[1], Bogdan Zagajewski[1], Adrian Ochtyra[1,2], Anna M. Jarocińska[1], Adriana Marcinkowska[1], Małgorzata Krówczyńska[1], Karolina Orłowska[1,2]

marlenakycko@student.uw.edu.pl

[1] University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Warsaw, Poland

[2] University of Warsaw, College of Inter-Faculty Individual Studies in Mathematics and Natural Sciences, Warsaw, Poland

Keywords: WorldView 2, trampled meadows, vegetation indices

Abstract:

The aim of the study was to check the possibility to use WorldView 2 satellite images to high-mountain meadows analysis. This presentation aims at an assessment of the WV2 images were used for monitoring of trampled vegetation of the Tatras (UNESCO M&B Reserve and National Park). Research polygons were located in two buffer zones (upto 15 meters) near trails in the highest parts of alpine and subalpine meadows, where tourists seasonally damage plants. As the reference patterns the same meadows, but located in second buffer zones (form 6 to 15 meters), were selected. WV2 images were geometrically and atmospherically corrected and used to calculate vegetation indices: NDVI, SAVI, OSAVI, ARVI, GNDVI, EVI, PSRI, TCARI, MCARI, TVI, WARI, NCPI, CRI1 (carotenoid content), ARI2 (anthocyanin content). As a validation data ASD FieldSpec, fluorescence, chlorophyll measurements were used. The maximum differences of NDVI between the buffers were equal 0.2, minimum 0.05. The differences between indices values in two buffers were statistically significant (statistical significance of 0.05) for NDVI, ARVI, GNDVI, EVI, PSRI, TCARI, MCARI values. The differences for indices ARI2, CRI1 are within the limits of 0.001 0.002 however, the difference is still statistically significant on the level of 0.05. Differentiated value of indicators of the trail follows a worse state of vegetation. Trampling alpine grasslands causes solifluction and following erosion processes. The lower value of the index near the trail can be also related to the diverse response from one pixel (signal comes from the trail and from the vegetation). High-resolution imaging can be used to monitor and analyze the state of vegetation as well as surfaces and areas where the vegetation is disappearing as a result of trampling.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Characterization of high-mountain plant habitat preferences with a use of remote sensing vegetation indices and Digital Elevation Model data

Karolina Orłowska[1,2], Adrian Ochtyra[1,2], Anna Kozłowska[3], Bogdan Zagajewski[1]

karolina.orlowska@student.uw.edu.pl
[1] Department of Geoinformatics and Remote Sensing, Faculty of Geography and Regional Studies, University of Warsaw, Poland

[2] University of Warsaw and College of Inter-Faculty Individual Studies in Mathematics and Natural Sciences, University of Warsaw, Poland

[3] Department of Geoecology and Climatology, Institute of Geography and Spatial Organization, Polish Academy of Sciences, Warsaw, Poland

Abstract:
The study presents an attempt of determining basic habitat preferences of selected high-mountain plant communities with a use of different remote sensing vegetation indices as well as Digital Elevation Model. A part of Carpathian range, Polish Tatra Mountains (the Tatras), was chosen as the area of research. It encompasses subalpine, alpine and subnival vegetation belts, thus presenting a great differentiation of vegetation and available habitats. Selection of plant communities has been made based on scanned and georeferenced archival maps of actual vegetation complemented by a digital vegetation map from hyperspectral airborne DAIS 7915 and ROSIS sensors data. The vegetation indices were calculated using World View 2 from August 2013 and Landsat 8 OLI from 8th of September 2013 satellite imagery. The following indices were calculated using World View 2 image data: Carotenoid Reflectance Index 1 providing information about pigment content in leaf foliage, stress and vegetation condition indices such as Normalized Difference Vegetation Index and Soil-adjusted Vegetation Index. Landsat 8 OLI was used to acquire Moisture Stress Index, which depicts vegetation's water conditions. Additionally, the analysis was complemented by Digital Elevation Model with a 1m spatial resolution. DEM provided the following data: aspects, slopes and height above sea level maps. A statistical analysis was conducted to show a correlation between occurrence of specific plant communities, vegetation indices values and terrain features.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The relationship between the amount of precipitation and values of vegetation indices based on Landsat images

Adrian Ochtyra, Marlena Kycko, Anna M. Jarocińska, Bogdan Zagajewski, Piotr Pabjanek,Małgorzata Krówczyńska, Anna Chlebicka

adrian.ochtyra@uw.edu.pl
University of Warsaw, Faculty of Geography and Regional Studies, Poland

Keywords: vegetation indices, precipitation, Landsat, relationship

Abstract:

The spectral properties of vegetation are influenced by various factors. One of the very important external factors is the water in the environment, including precipitation. A large number of vegetation indices can be used for monitoring, mapping and analysing the vegetation structure of terrestrial canopies, they have practical application to crop monitoring and forecasting. Vegetation indices are very commonly used for plant monitoring. The values of vegetation indices are related to the amount of precipitation noticed on analysed areas. The aim of the study was to analyse the relationship between the amounts of precipitation and commonly used vegetation indices calculated from Landsat images. All analysis were conducted on natural areas – forests and meadows. The study area was located in Poland in two areas: Tatras National Park which is located in high mountains and Bialowieza Forest – one of the last and largest remaining parts of the immense primeval forest in Europe (both are the M&B Reserves). The images of Landsat were chosen: 34 from Bialowieza Forest (from 1986 to 2013) and 16 from Tatra Mountains (from 1987 to 2013). Images were atmospherically corrected using ATCOR software and for each image were calculated vegetation indices. To the analysis were chosen 7 meteorological stations: three in Tatra Mountains and four in Bialowieza Forest. To the analyses was chosen precipitation amount in each year in vegetation season from 1986 to 2013. The amount of precipitation were analysed before the day of acquisition of images (10, 20 and 30 days before). Secondly, the deviation from the long-term average was analysed. The average was calculated form 10, 20 and 30 days before the day of data acquisition from the all analysed years. The values of vegetation indices calculated from the chosen pixels near meteorological stations were correlated with the values of precipitation. Than were analysed the relationship between the variables and chosen the indices, that are influenced by the precipitation values the most and the least.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Evaluation of time periods role in modelling the relationship between leishmaniasis diseases distribution and environmental variables using GIS and remote sensing techniques
(time periods role in spatial modelling leishmaniasis diseases using GIS and remote densing techniques)

Abbas Alimohammadi[1], Mohammad Sharifikia[2], Zohre Mozaffari[3]

alimoh_abb@yahoo.com
[1] professor, Islamic Republic of Iran

sharifikia@modares.ac.ir
[2] Assistant professor, Islamic Republic of Iran

z.mozafari.64@gmail.com
[3] student, Islamic Republic of Iran

Abstract:
Prevalence and development of diseases, are largely dependent on the conditions of the environment. Knowledge of the environment can be used to protect humans and to control risks of diseases. Leishmaniasis is a parasitic disease that is transferred to humans by the female sandflies and includes two types of visceral and cutaneous leishmaniasis. The prevalence areas of this disease in Iran is mainly concentrated in Isfahan, Fars, Khorasan, Khuzestan, Kerman and Yazd provinces. Accordingly, identification of the main geographic distribution areas and influencing factors is an important task. In this research, by using a combination of GIS,RS and spatial statistical analysis locations with high densities and risks of diseases identified in four time periods including the month, season, 6 months and year in Yazd province. Environmental data including rainfall, temperature, population, relative humidity, longitude, latitude, time of year and MODIS products including the land surface temperature, enhanced vegetation index and gross primary product (GPP) have been used to model the spatial distribution and density of Leishmaniasis. Results showed that the coefficients of determination for time periods of 6 months and year was higher than that of the others and provide better model. Latitude, time, enhanced vegetation index, year, rainfall, relative humidity variables, respectively, had more effective role in disease modelling.

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Global DEMs' accuracy improvement with respect to local DEM data

Dimitra Vassilaki, Thanasis Stamos

dimitra.vassilaki@gmail.com, stamthan@central.ntua.gr
NTUA, Greece

Keywords: global, DEM/DTM, misalignment, accuracy

Abstract:
Today there is a great variety of Digital Elevation Models (DEMs). DEMs can be classified to two broad categories: global and local. Global DEMs cover the whole, or nearly the whole, surface of the Earth. Local DEMs cover a specific area of interest. Global DEMs are collected by spaceborne sensors (optical and SAR) while local DEMs are collected by air-borne sensors (optical, SAR, LIDAR) and/or with in-situ surveys (GNSS, UAS, TLS). Furthermore, the DEMs have been collected and computed with a great variety of methods (photogrammetry, interferometry, LIDAR, GNSS, etc), at different times and with a great range of accuracy standards that range from few tens of meters to few centimeters.

Global DEMs are useful for applications which demand extensive coverage of the Earths' surface, but do not require, at least initially, high accuracy: identification of sites for cellular phone towers or reservoirs' construction, massive and automatic orthorectification of satellite imagery, monitoring of remote areas of the world, crisis management etc. The usefulness of global DEMs is naturally limited by their low accuracy. The accuracy of global DEMs has been optimised for the whole surface of the Earth, trading local accuracy for global accuracy. As a result, a systematic planar error between global and local DEMs usually exists.

In this paper, we research the improvement of the accuracy of global DEMs locally by fitting them to more accurate local DEMs. The systematic planar error is computed indirectly through the computation of the RMSE of the global DEM elevations with respect to more accurate elevations taken from local DEM data. A combination of the exhaustive search and divide-and-conquer algorithms is used to compute the planar displacements of the global DEMs which minimise the RMSE of the elevations. The method is computationally intensive but doable with modern computers. The method is tested on the wider areas of Athens with encouraging results.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Crop identification using Random Forest classifier in multi-temporal images, two case studies in Iran
(evaluation of Random Forest classifier in crop mapping)

Hamid Salehi[1], AliAkbar Matkan[2], Davod Ashourloo[3]

hamidsalehi2007@gmail.com
[1] Employee, Islamic Republic of Iran

A-matkan@sbu.ac.ir
[2] Professor, Islamic Republic of Iran

Ashourloo@gmail.com
[3] Ph.D student, Islamic Republic of Iran

Keywords: Crop, Random Forest, Multi – Temporal, Iran

Abstract:
The classification of crops from remote sensing has become an important part of agricultural management. In recent years, there is an increasingly trend toward use of more robust and more accurate image classification techniques. Among them, however, using machine learning classifiers like random forest has been proven to be more effcient and reliable in terms of accuracy, time needed, training sample size, etc. A random forest is a collection of classification trees or treelike classifiers. The classifier uses a large number of individual decision trees, all of which are trained (grown) to tackle the same problem. Random forests have recently been investigated for classification of remote sensing data. It's a distribution – free and fast classifier. In this study, we assess the performance of random forest classifier, one of machine learning classifiers for crop identification in multi – temporal images in two case studies in Iran. For comparison, we have also used maximum likelihood for classification in these regions. First case study is in northwest of Iran, Mianeh county. In this region we have used a two – date (early -spring and mid -summer) SPOT5 image for mapping 7 crops. Our second case study is Ghorveh county in west of Iran, that we have used a three – date (early – summer, mid – summer and early -autumn) ASTER image for mapping 6 crops. The results showed that in all situations except early – summer image in Ghorveh region, RF have performed better than ML. In some situations like early – autumn image in Ghorveh study region, there is 10% increase in accuracy with RF classifier. Classification accuracy in both regions, increased in multi – temporal images. In Ghorveh, in three – date image, the classification accuracy increased 14% with RF classifier and in Mianeh county, in two – date image, accuracy of RF classification increased 10% in comparison to ML. In all multi – temporal images, the accuracy of RF is higher than ML classifier and in one of two – date (mid – summer and early -autumn) images in Ghorveh county, accuracy of RF is 10% higher than ML. In Ghorveh region, the most accurate two – date image with ML classifier is early – summer and early – autumn combination, but with RF, mid – summer and early – autumn combination is the most accurate. The best image for Mianeh region is mid – summer and for Ghorveh region, early – summer.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

An urban heat island model for the city of Sofia

Ivan G. Yanev, Lachezar H. Filchev

ivan.yanev@space.bas.bg, lachezarhf@space.bas.bg
Space Research and Technology Institute, Bulgarian Academy of Sciences (SRTI-BAS), Bulgaria
http://space.bas.bg/Eng/Eng.html

Keywords: Google Earth, Landsat, SUHI, UHI, Emissivity, Thermal infrared

Abstract:
The objective of this study is to build an operational model for monitoring of the urban heat island of city of Sofia, Bulgaria which can be easily modified and transferred to other urbanized areas. For this purpose the study is using freely available data sources, such as, Landsat moderate resolution satellite data and Google Earth high resolution data. The developed model uses Landsat + and Landsat Data Continuity Mission (LDCM) data as a source of extracting surface temperatures. The Google Earth RGB colour composites have been captured and georegistered using a set of ground control points (GCP), via object based image analysis. An object based image classification in ENVI, is used to derive an up-to-date land use/land cover necessary for the model. The model is coupled with meteorological data for the city of Sofia to test the validity of the derived surface temperatures. The so-developed model combines, by overlaying the intermediate resulting layers into a distinctive representation, the main emissivity sources. In order to test the model applicability of the proposed model, a case study for part of the city of Sofia, representing different cityscape and land covers, was carried out. In conclusion, it is suggested that the modelled results of the Sofia's UHI are to be expanded towards the entire city of Sofia on an operational basis.

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Urban expansion patterns for Bucharest, Romania (using remotely sensed open data analysis)

Mihaela Aldea, Florian Petrescu

imihaela@utcb.ro, florianp@utcb.ro
UTCB, Romania
http://iudr.utcb.ro

Keywords: urban expansion, urban remote sensing, supervised classification, unsupervised classification

Abstract:
Is there any spatial pattern for Bucharest urban expansion that occurred during the last 25 years, after the end of cold-war? This is the main question the paper attempts to answer. The applied methodology is based on the analysis of satellite data and follows the one published in 2005 within the study entitled The Dynamics of Global Urban Expansion that was conducted for the Department of Transport and Urban Development of the World Bank. The global sample from the above mentioned study included 120 cities all over the world, but neither Bucharest nor any other city from Romania are contained in the global sample. Also, the paper examines the possibility to use the methodology that was applied for producing the Urban Atlas that was developed within the framework of Copernicus (former GMES) Programme.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Land use/land cover and shoreline changes between Kalaignanapuram and Vembar coast – a study using remote sensing and GIS (land use and land cover, degradation and desertification)

Manoharan –Rajamanickam[1], Victor G Rajamanickam[2]

ramanimano@yahoo.com
[1] Assistant Professor, Center for Disaster Management, PRIST University, India
http://www.Prist.in

simpraavictor@gmail.com
[2] Director and Head, India
http://www.Prist.in

Keywords: coastal Land, anthropogenic activities, multi-date satellite images

Abstract:
Coastal Land is always in a constant flux of continual change due to transformation resulting from either natural processes or human activities. Large scale of land transformation is presently witnessed in and around coastal areas of Indian coastline. Some of these are very dynamic and rapid particularly in the coastal settlements. The main factors affecting coastal land use and land cover change due to growth population, commercial and institutional activities. In additionally caused by migration of population towards coastal area for employment and other developmental opportunity. The present study is aimed to bring out the temporal change of coastal land use and shoreline change its impact on ecology and environment of Kalaignanapuram and Vembar coast by using remote sensing technique as well as conventional method. During the course of study a series of thematic maps covering ecological parameters and anthropogenic activities have been prepared to depict the coastal changes and its impact on environment vis-à-vis land use. The coastal land has experienced its expansion at the cost of peripheral agricultural land, quite often very fertile and productive. This process has resulted in the conversion of water bodies and coastal wetlands into salt pans. Apart from the diversion of lands for non-agricultural uses, the extensive damage to ecology and environment due to industrial waste, pollution, and misuse of land can also be seen in the coastal areas and its periphery. One other important impact is noticed on the natural hydrological system of the coastal environment. Similarly the shoreline change study carried out from 1968-2002, based on multi-date satellite images and other datas the shoreline change maps was prepared as well as showed that 712.83 m^2 and 478.61 m^2 of the mainland coast have been eroded and accreted, respectively in the Kalaignanapuram and Vembar coast.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Global-scale evaluation of two satellite-based passive microwave soil moisture data sets (SMOS and AMSR-E) with respect to modelled estimates

Amen Alyaari, Jean-Pierre Wigneron, Agnes Ducharne, Yann Kerr, Patricia De Rosnay, Clement Albergel, Ahmad Al bitar, Richard De Jeu

amen.alyaari@bordeaux.inra.fr
France

Keywords: passive remote sensing, soil moisture, LAI, SMOS, AMSR

Abstract:
Global Level-3 surface soil moisture (SSM) maps from the passive microwave Soil Moisture and Ocean Salinity satellite (SMOSL3) have been released. To further improve the Level-3 retrieval algorithm, evaluation of the accuracy of the spatio-temporal variability of the SMOS Level 3 products (referred to here as SMOSL3) is necessary. In this study, a comparative analysis of SMOSL3 with a SSM product derived from the observations of the Advanced Microwave Scanning Radiometer (AMSR-E) computed by implementing the Land Parameter Retrieval Model (LPRM) algorithm, referred to here as AMSRM, is presented. The comparison of both products (SMSL3 and AMSRM) were made against SSM products produced by a numerical weather prediction system (SM-DAS2) at ECMWF (European Centre for Medium-Range Weather Forecasts) for the 03/2010-09/2011 period at global scale. The latter product was considered here a "reference" product for the inter-comparison of the SMOSL3 and AMSRM products. Three statistical criteria were used for the evaluation, the correlation coefficient (R), the root-mean-squared difference (RMSD), and the bias. Global maps of these criteria were computed, taking into account vegetation information in terms of biome types and Leaf Area Index (LAI). We found that both the SMOSL3 and AMSRM products captured well the spatio-temporal variability of the SM-DAS-2 SSM products in most of the biomes. In general, the AMSRM products overestimated (i.e., wet bias) while the SMOSL3 products underestimated (i.e., dry bias) SSM in comparison to the SM-DAS-2 SSM products. In term of correlation values, the SMOSL3 products were found to better capture the SSM temporal dynamics in highly vegetated biomes ("Tropical humid", "Temperate Humid", etc.) while best results for AMSRM were obtained over arid and semi-arid biomes ("Desert temperate", "Desert tropical", etc.). When removing the seasonal cycles in the SSM time variations to compute anomaly values, better correlation with the SM-DAS-2 SSM anomalies were obtained with SMOSL3 than with AMSRM, in most of the biomes with the exception of desert regions. Eventually, we showed that the accuracy of the remotely sensed SSM products is strongly related to LAI. Both the SMOSL3 and AMSRM (slightly better) SSM products correlate well with the SM-DAS2 products over regions with sparse vegetation for values of LAI < 1 (these regions represent almost 50% of the pixels considered in this global study). In regions where LAI>1, SMOSL3 outperformed AMSRM with respect to SM-DAS2: SMOSL3 had almost consistent performances up to LAI = 6, whereas AMSRM performance deteriorated rapidly with increasing values of LAI.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Spatial and temporal patterns of land surface temperature in the Mekong Basin

Corinne M. Frey, Claudia Kuenzer

corinne.frey@dlr.de, claudia.kuenzer@dlr.de
DLR, Germany
http://www.dlr.de/eoc

Keywords: LST, land surface temperature, Mekong, basin

Abstract:
Land surface temperature (LST) is an essential part of the surface energy budget and can be used as a measure for climate variability and change, given that regular measurements on a broad spatial scale are available. The MODIS (Moderate Resolution Imaging Spectroradiometer) sensor offers a 13 years' time series, which enables the analysis of spatial patterns along with the temporal evolution of the variable. Area of interest is the Mekong Basin (MB). It was analysed using MODIS LST data with a temporal granularity of 8-days. LST prove to be strongly dependent on the topography. 42% of daytime LST could be explained by topographic height in summer. In winter and generally in the night time scenes topography could explain 89-97% of the LST distribution. For further analysis the area of interest was divided into six physiographic homogenous regions. The mean temperature and the annual maximum and minimum values of LST are different for the various regions. Low temperatures coupled with large magnitudes are predominantly found in the high-lysing Tibetan Plateau, whereas the southern regions show high mean temperatures along with low magnitudes. There is a weak year-to-year variability of LST (regional 8-day daytime/night time deviations lower than 4°C/6°C) in all regions. However, over the Tibetan Plateau regional 8-day daytime/night time deviations reach 6°C and 18°C. Apart from the topography, LST is influenced by land use. As such, land use changes influence the LST pattern as is shown in this research on the example of deforestation in parts of Cambodia.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Monitoring phenological changes of different crop types in doroud region, west of Iran, using dual polarimetric tandem-x images

Sara Mirzaei[1], Mahdi Motagh[2], Hossein Arefi[3]

saramirzaee@ut.ac.ir
[1] MSc student of remote sensing, Islamic Republic of Iran

motagh@gfz-potsdam.de
[2] GFZ German Research Center for Geosciences, Potsdam, Germany

hossein.arefi@ut.ac.ir
[3] Assistant Professor of Tehran University, Islamic Republic of Iran

Abstract:
Due to its special imaging characteristics, Synthetic Aperture Radar (SAR) has become an important source of information for a variety of remote sensing applications dealing with environmental changes. SAR images contain information about both phase and intensity in different modes such as single, dual, and full polarimetric, which are important to extract reliable information about targets on the earth. Since this technology is sensitive to the geometrical structure and also physical properties of the targets such as dielectric and plant water content, it could be an efficient method for applications such as crop type mapping, seasonal change monitoring and classification. In this study, an algorithm is presented to monitor the changes occurring to different crop types due to their phonological stages using TanDEM-X (TDX) data. The dataset includes 20 TanDEM-X SAR images in dual polarimetric mode that were acquired from December 2011 through August 2013 over Doroud region in Lorestan, Iran. Some meaningful polarimetric features such as entropy, anisotropy, coherence, and band ratios are extracted from the SAR images to investigate their temporal behaviors and assess their ability to determine particular phonological stages, such as the time of emergence and the flowering moment. Additionally an investigation has been done to measure the temporal behavior of the NDVI, extracted from Landsat images, in order to compare with TDX results. The preliminary results show the promising ability of high-resolution TanDEM-X SAR images to extract critical phonological stages. Finally a classification is performed on crop types using SVM classifier and results are compared to an existing landcover map.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Remote Sensing for Agriculture 1

Jerzy Cierniewski, Ioannis Manakos

Thursday, 19.06.2014, 11:30-13:00, *Audytorium*

A tool for predicting diurnal soil albedo variation in Poland and Israel
Jerzy Cierniewski, Arnon Karnieli, Cezary Kazmierowski, Jakub Ceglarek
11:30 - 11:45
Estimating soil losses and relative erosion rates using high resolution SAR interferometry.
Magdalena Fitrzyk
11:45 - 12:00
Field scale management zones delineation: multisensor method development and validation
Jan Niedzielko, Anna M. Jarocinska
12:00 - 12:15
Improving the correlation between SMOS soil moisture product and field measurements
Matthew Ofwono, Katarzyna Katarzyna Dabrowska-Zielinska, Joerg Kaduk, Virginia Nicolas Perea
12:15 - 12:30
Cosmo-SkyMed® Imagery for Crop Characterization
Federica Segalini, Rocchina Guarini, Giovanni Mastronardi, Claudia Notarnicola, Francesco Vuolo, Luigi Dini, Giovanni Milillo
12:30 - 12:45
Improving Remote Sensing Derived Dry Matter Productivity By Reformulating The Efficiency Factors: Case Studies For Wheat And Maize
Yetkin Ozum Durgun, Sven Gilliams, Gregory Duveiller, Bakary Djaby, Bernard Tychon
12:45 - 13:00

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

A tool for predicting diurnal soil albedo variation in Poland and Israel

Jerzy Cierniewski[1], Arnon Karnieli[2], Cezary Kazmierowski[1], Jakub Ceglarek[3]

ciernje@amu.edu.pl
[1] Adam Mickiewicz University in Poznań, Department of Soil Science and Remote Sensing of Soils, Poznań, Poland
http://ztg.amu.edu.pl

karnieli@bgu.ac.il
[2] Ben-Gurion University of the Negev, The Remote Sensing Laboratory, Israel

[3] Adam Mickiewicz University in Poznań, Poland

Abstract:
ABSTRACT Studies on the effects of soil surface roughness on the diurnal broadband blue-sky albedo variation of cultivated and uncultivated soils were conducted in Poland and Israel. Results indicate that despite of genetically different soils of the two countries, the spectral reflectance is similar enough to use the same procedure for predicting the albedo's variation for all the soils together. This paper discusses this variation using data generated by equations describing the overall albedo level of these soils (taking into account only their roughness and the organic carbon and carbonates content) and the slope of their diurnal albedo increase as a function of the solar zenith angle (dependent only on the soil surface roughness), disregarding other properties of the soils.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Estimating soil losses and relative erosion rates using high resolution SAR interferometry.

Magdalena Fitrzyk

magdalena.fitrzyk@igig.up.wroc.pl

Wroclaw University of Environmental and Life Sciences, Institute of Geodesy and Geoinformatics
Wrocław, Poland

Keywords: synthetic aperture radar, InSAR, water soil erosion

Abstract:
Water soil erosion is a process of deterioration of the topmost soil horizon as a result of denudation and displacement of soil particles by the rainwater. Erosion processes bring about a gradual degradation of soil which in turn leads to significant economic losses. On this account, there is a necessity of monitoring this phenonomenon in order to develop and carry out effective counter-erosion measures. The requirement of identifying the areas threatened with water soil erosion and delineating their extent has also been included in numerous law regulations, both at the national and the European level. This study focuses on applying satellite radar interferometry to the research on water soil erosion. The results of the research attest to the possibility of taking advantage of interferometric processing of high resolution SAR (Synthetic Aperture Radar) images for the purpose of monitoring water soil erosion, estimating soil losses and relative erosion rates. Despite its potential arising from broad range and superficial character, this method also have relevant limitations which will be pointed in the presentation as well.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Field scale management zones delineation: multisensor method development and validation

Jan Niedzielko[1], Anna M. Jarocińska[2]

jan.niedzielko@wasat.pl
[1] Wasat Sp. z o.o., Warsaw, Poland

ajarocinska@uw.edu.pl
[2] University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland

Keywords: precision agriculture, vegetation indices, multisensor, data fusion

Abstract:
A division of whole fields into sub-regions called management zones (MZ) is a condition for an effective application of other tools of precision agriculture (PA). MZ are characterized by relatively homogeneous combination of yield-limiting factors and they are delineated by different methods that are divided, in general, into direct and indirect ones. Indirect methodology the yield-affecting factors are estimated through ground measurements and laboratory analysis. There are a number of available optical sensors that can be mounted on farming machinery to measure vegetation reflectance. The alternative for such ground-based data acquisition are indirect methods mainly based on remote sensing techniques. The aim of the study was to develop the algorithm to delineate management zones basing on the spatial distribution of vegetation condition on the field and its temporal stability. All the analysis were performed in Poland. Four different images were used with different temporal and spectral resolution Landsat 5 TM (03.07.2006), Terra ASTER (06.05.2008), RapidEye (29.06.2010) and Landsat 8 OLI (20.06.2013). The atmospheric correction was performed. Ten vegetation indices were calculated on each image. To select most appropriate vegetation indices amongst the previously selected ten statistical analysis were performed. Finally, four indices were selected: NDVI, GNDVI, EVI and NDII. The values of each index were normalized and the images were resampled to the same spatial resolution. The vegetation indices images were divided into the classes, filtered and based on that unsupervised classification was performed. On the basis of vegetation indices distribution in space and its stability in time the management zones was delineated. In the end the validation was done based on the in-situ measurements.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Improving the correlation between smos soil moisture product and field measurements

Matthew Ofwono[1], Katarzyna Dąbrowska-Zielińska[1], Joerg Kaduk[2], Virginia Nicolas Perea[2]

m-ofwono@igik.edu.pl
[1] IGIK Poland

[2] University of Leicester United Kingdom

Keywords: SMOS, GLDAS, Recalibration, soil moisture

Abstract:
L-band radiometry has proven to be the most promising remote sensing techniques to monitor soil moisture (SM) over land surfaces and at the global scale due to the fact that low frequency microwave radiations are not significantly affected by atmospheric scattering and vegetation attenuation. Moreover, an improvement in the estimation of the time variations in SM can provide significant improvements in meteorological and hydrological forecasts. Because of the significance of soil moisture in the hydrological cycle and in land-atmosphere interactions, the Soil Moisture and Ocean Salinity (SMOS) mission was launched in November 2009 specifically to measure global soil moisture and Ocean salinity. However, the soil moisture retrieved from SMOS brightness temperatures significantly underestimates the field measured soil moisture globally. It is observed that there is no significant differences between SMOS retrieved soil moisture over humid Scandinavian countries and the semi-arid sahel region in Africa, with the average global maximum value of 0.3 m3m-3. In this study, the SMOS retrieved soil moisture was recalibrated by first aggregating the brightness temperatures from both the descending and ascending passes to minimize the large data gaps attributed to high radio frequency interference. The original SMOS SM was then used to initialize an iterative process in which satellite measured brightness temperature is compared to brightness temperature calculated using a robust algorithm that uses Topp model rather than Dobson model to estimate dielectric constant as opposed to L-MEB model, and minimizing the difference between the two brightness temperature estimates. Hence, achieving soil moisture values which are comparable to ground measurements. There is a strong positive correlation between the improved SMOS SM measurements and GLDAS Noah modelled soil moisture (R2>0.7) and a high positive correlation with ground measurements R2=0.75.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Cosmo-SkyMed® imagery for crop characterization

Federica Segalini[1], Rocchina Guarini[1], Giovanni Mastronardi[2], Claudia Notarnicola[3],
Francesco Vuolo[4], Luigi Dini[1], Giovanni Milillo[1]

federica.segalini@est.asi.it, rocchina.guarini@est.asi.it, luigi.dini@asi.it, giovanni.milillo@asi.it
[1] Italian Space Agency, Italy

gm03@hotmail.it
[2] Politecnico di Bari, Italy

claudia.notarnicola@eurac.edu
[3] EURAC

francesco.vuolo@boku.ac.at
[4] Universität für Bodenkultur Wien, Austria

Keywords: Cosmo-SkyMed, SAR, X-Band, Vegetation, Agriculture, NDVI, Remote Sensing LAI, crop

Abstract:
This paper presents the microwave characterization of agricultural areas carried out with multi-temporal, multi-polarization and multi-angular SAR imagery, namely COSMO-SkyMed (CSK) acquisitions. Images have been collected within the "AGRI-CIDOT" project coordinated by ASI-CIDOT (Italian Space Agency -Center for the Interpretation of the Earth Observation Data) and in collaboration with EURAC and BOKU University of Wien. AGRICIDOT is a two year project aiming at assessing the COSMO SkyMed (CSK) potentialities for crop monitoring. CSK is an X-Band and dual pol SAR constellation with an high revisit time (up to 6 h) and different pixel space resolutions (up to 1m resolution). A dense multi-temporal CSK dataset has been collected from June to November 2013 over the Marchfeld region near the city of Wien. This region has been selected as an interesting test site since its heterogeneous varieties of crop species (up to 32 different varieties have been classified) and for the availability of cal/val and ancillary data collected by BOKU. The SAR dataset consists of 72 images acquired at different incidence angles (n. 33 at 20°, n. 29 at 30° and n. 10 at 50°), polarizations (n.13 at VV, n.4 at VH, n.14 at HH, n.3 at HV and n.38 at dual polarimetric VV+VH) and pixel spacing resolutions (n.34 at 3m to 1m res. Stripmap Himage and n.38 at 15m to 10m res. Stripmap Ping Pong dual polarimetric). The validation data consists of 9 LAI maps and 8 NDVI maps derived by 7 DEIMOS-1 images and 2 LANDSAT-8 images. The ancillary data consists of meteorological data series collected by a meteorological station close to the area of interest, one crop classification map derived by the LAI map and some general additional information provided by farmers organized into a WEB-GIS. In our work, we will present the results of the analysis of the backscattering temporal behavior of different crops at both regional and field scales for different looking acquisition angles (30°, 50°), different polarizations (HH, VV, VH) and pixel spacing resolutions (3m to 1m res. Stripmap Himage and 15m to 10m res. Stripmap Ping Pong). Moreover an analysis of the correlation between the X-Band CSK backscattering coefficients vs. NDVI and LAI for the different polarizations and acquisition angles will be presented and compared to those obtained by other groups either by using ground, airborne or spaceborne X-band SAR/radar sensors. Our analysis confirms the results obtained by other research groups: different species (i.e. different plant geometrical structures) interacts differently to SAR signal with different polarizations and acquisition angles. Results of the first three different crops analyzed, namely potatoes, carots and alfa-alfa, will be presented and preliminary results interpretation will be discussed.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Improving remote sensing derived dry matter productivity by reformulating the efficiency factors: case studies for wheat and maize

Yetkin Ozum Durgun[1], Sven Gilliams[1], Gregory Duveiller[2], Bakary Djaby[3], Bernard Tychon[4]

ozuem.durgun@vito.be, sven.gilliams@vito.be
[1] VITO, Belgium

gduveiller@gmail.com
[2] EC JRC, Italy

b.djaby@cgiar.org
[3] CGIAR, Niger

Bernard.Tychon@ulg.ac.be
[4] University of Liege, Belgium

Keywords: Monteith, Dry Matter Productivity, Agriculture, Water Stress

Abstract:
Crop condition monitoring throughout the growing season and crop yield forecasting are both important to estimate the seasonal production. Different methods have been developed to estimate crop yields using satellite data, one commonly applied is the development of empirical relationships between crop yield and remote sensing indicators. In this study, we looked at the relation between the actual crop yield and as a remote sensing indicator dry matter productivity (DMP). When growing, crop converts solar energy into chemical energy through the photosynthesis process during which water CO_2 and O_2 are exchanged into the atmosphere. DMP is the net result of this photosynthetic activity. As a definition, DMP is an increase in crop dry matter biomass. Thus, it is an important biophysical indicator. Monteith formulated the first Radiation Use Efficiency Model to estimate Net Primary Production (NPP), a variation of DMP. According to the model, the biomass accumulation of the plant is correlated with the amount of absorbed radiation (APAR), the actual efficiency of converting atmospheric CO_2 into plant tissue (εACT) and the autotrophic respiration (εAR) as DMP =APAR* εACT * εAR. The Remote Sensing research unit of VITO has started to produce DMP estimates on a regular basis since 2000 by using SPOT-Vegetation and meteorological data. VITO calculates a Monteith based variant of DMP. In the current version of DMP, APAR is formed by the incident solar radiation, fraction of absorbed photosynthetic radiation and fraction of photosynthetically active radiation. εACT is calculated by vegetation type specific maximum radiation use efficiency and includes reduction factors linked to temperature and CO_2 fertilisation effect. εAR is calculated based on the temperature. In this study, for wheat (C3 plant) and maize (C4 plant), all efficiencies (ε) were revised and adapted accordingly. Furthermore, water stress factor was added which was omitted in the original version. The objective of this study is to evaluate the capacity of the investigated and reformulated DMP to estimate regional crop yields for wheat and maize over Belgium and France for the period of 1999-2012. The original DMP was modelled for C3 plants. However, reduction factors used in εACT are plant type specific. Since the interest of this study was on both C3 and C4 plants in which the photosynthetic pathway is different, the reduction factors were reformulated. Moreover εAR was improved by combining autotrophic respiration from two models C-Fix and GLO-PEM2. Furthermore, in many places in the world, the most important factor for crop production is water availability. Thus water stress factor was also included in εACT as another reduction factor. Evapotranspiration (ET) is an important component of the water cycle and it is directly connected to the surface energy budget. The ratio of ETactual and ETcrop coefficient was used as a water stress factor. Finally, DMP estimates for C3 and C4 plants at pixel level were aggregated at agro-ecological/ administrative unit level and regression analysis

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

between this cumulated values over an optimal temporal window and actual yield statistics was calculated. The study areas are the main agro-ecological regions of Belgium and administrative regions of France. Selected countries have different climatic zones where predominant limitation to agriculture varies from non-rainfall dependent to rainfall dependent. This variation contributes to assess the impact of the water-limited version of DMP on wheat and maize. For calculation of DMP, SPOT-Vegetation derived fAPAR and operational forecasts of ECMWF for meteorological input were used.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Remote Sensing for Agriculture 2

Jerzy Cierniewski, Ioannis Manakos

Thursday, 19.06.2014, 14:00-15:00, *Audytorium*

Evaluation of Apple Scab prediction model using MODIS satellite data
> *Sylwia Nasilowska*
> 14:00 - 14:15

The high-resolution hyperspectral imaging for detection of fruit trees' diseases in the early period of vegetation season
> *Marek Ostrowski, Michal T. Chilinski, Sebastian Przybyłko*
> 14:15 - 14:30

FluoWAT leaf clip measurements for maize bio-physiological parameters measurements
> *Sylwia Nasilowska, Ittai Herrmann, Chiara Cilia, Luis Alonso, Loris Vescovo*
> 14:30 - 14:30

Rice Area Interannual Variation through a Remote Sensning Based Mapping Algorithm
> *Ashraf M Elshorbagy, Emad H Imam, Mohamed H Nour*
> 14:30 - 14:45

Development of automated satellite remote sensing and ground spectroscopy techniques for monitoring olive oil mill waste disposal areas in Crete-Greece
> *DIMITRIOS D ALEXAKIS, APOSTOLOS SARRIS, CHARITON KALAITZIDIS, NIKOS PAPADOPOULOS, PANTELIS SOUPIOS*
> 14:45 - 15:00

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Evaluation of apple scab prediction model using MODIS satellite data

Sylwia Nasiłowska

sylanas@wp.pl
University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Poland

Keywords: MODIS, apple scab, prediction model

Abstract:

Apple Scab, the most common orchard diseases, develop in certain weather conditions. Air temperature and relative humidity are one of the main factors taking into account in contagion prediction models. The research is an attempt to extract such information directly from the space. It focused on finding the method based on MODIS data to show spatial distribution of contagion risk. Mmeteorological data were obtained for the period of May and June 2010. Ground station collect data in a continuous manner with an accuracy of 30 minutes or 1 hour. A set of MODIS images was collected for the same period. Fitting data was possible with 15 or 30 min accuracy. Land Surface Tempreature and Water Wapour using Sobrino and Kharraz (2003) method were calculated. Computed parameters from MODIS were correlated with ground stations measurements. Statistics show strong relationship between satellite and ground level, only for pixels with NDVI higher than 0,4 and with homogenous type of land use. New algorithms for temperature and humidity from MODIS were tested and implemented. Calculated parameters directly from satellite level, were used in Apple Scab prediction model. The result maps can inform growers about the degree of risk of the factors threatening the cultivation. Developed model is ready to implement in real time.

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The high-resolution hyperspectral imaging for detection of fruit trees' diseases in the early period of vegetation season

Marek Ostrowski[1], Michał T. Chiliński[2], Sebastian Przybyłko[3]

samper@samper.pl
[1] Laboratory of Image-based Information and Modelling, Faculty of Biology,
University of Warsaw, Poland

mich@igf.fuw.edu.pl
[2] University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing Poland

[3] Katedra Sadownictwa; Wydział Ogrodnictwa, Biotechnologii i Architektury Krajobrazu SGGW, Poland

Abstract:
Remote sensing is one of the most important and precise tools in modern agriculture, as it allows for strict control of appropriate fertilization, prediction of yields and detection of diseases. In the environment-friendly cultivation, an emphasis is placed on the minimization of the usage of chemical substances for plant protection during agricultural production. That goal can be achieved by complex monitoring and early detection of potentially risky processes occurring in our orchards. In the last few years, unmanned aerial systems have started to be widely used as a platform for a variety of remote sensing sensors, as they are capable of delivering high-spatial resolution data, which could be used for precise identification of potential risk areas. We will present a case study of detection of fruit trees diseases, such as fire blight or apple scab. The study was conducted in the orchards of Grójec County, a region of the highest apple production in Europe. The detection was based on the analyses of the spectral curves acquired with a full-frame hyperspectral camera, in the range of 500 – 900 nm, and carried by a multi-rotor unmanned aerial system. We will focus on the high-resolution images taken from low altitudes, which could be used during the early stages of growing season, when leaves develop and trees bloom, before the formation of fruit buds. The presented case study illustrate same method which allows to consider implementing changes in chemical plant protection methods, from its preventive use on the entire acreage to its selective usage in the areas of potential risk. Such an approach for modern fruit producers could lead to substantial savings on chemical plant protection, and decrease the environmental footprint of plantations. Presently, only bigger fruits producers can equip themselves with highly specialized, dedicated remote sensing systems (sensors and platforms), due to the high initial costs of sensors and staff training, however those could be compensated by the savings on chemical tools of protection. With the further increase of popularity of UAS in agriculture, the prices of such devices should decrease, which would allow for widespread usage of the proposed methods – even by smaller fruit producers, or clusters of producers.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

FluoWAT leaf clip measurements for maize bio-physiological parameters measurements

Sylwia Nasiłowska[1], Ittai Herrmann[2], Chiara Cilia[3], Luis Alonso[4], Loris Vescovo[5]

sylanas@wp.pl
[1] Earth Observation Group, Space Research Centre, Polish Academy of Sciences, Warsaw, Poland

ittai9@gmail.com
[2] Ben-Gurion University of the Negev, Israel

chiara.cilia@gmail.com
[3] University of Milano Bicocca, Italy

luis.alonso@uv.es
[4] University of Valencia, Spain

loris.vescovo@fmach.it
[5] Fondazione Edmund Mach, S. Michele all'Adige, Italy

Keywords: water stress, maize, fluoWAT, field spectroscopy

Abstract:
The research was conducted during the 5th EUFAR FP7-EUROSPEC training course on "Regional Experiments For Land-atmosphere EXchanges" (REFLEX) in the "Las Tiesas" experimental farm, Barrax (Spain). The experiment was focused on a maize field where two set of field measurements aimed at vegetation spatial heterogeneity and water deficit investigation were performed on the 26th of July 2012. Measurements were taken along the main slope of the field, where changes in plants related to water stress were easily observable from a visual inspection. Leaf-level field spectroscopy measurements were performed with an ASD FieldSpec Pro coupled with the FluoWAT leaf clip which enables the extraction of the Fluorescence spectrum by selectively filtering the incoming light. Leaf samples were taken during the spectroscopy measurements and weighted just after cutting. Soil moisture measurements were carried out using a ThetaProbe (Delta-T Devices). A campaign measurements database was created, and a comparison of data taken on stressed and non-stressed maize plants was conducted. Computed vegetation indices from true reflectance were correlated with field measurements (water and nitrogen content). Results show strong dependence for few indices. For example MTCI/MSAVI gives R2=0,91 for fresh and R2=0,88 for dry weight. Water content was found to have the best correlation with Chlorophyll Index (R2=0,81) and nitrogen content with TCARI (R2=0,65).

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Rice area interannual variation through a remote sensning based mapping algorithm

Ashraf M. Elshorbagy[1], Emad H. Imam[1], Mohamed H. Nour[2]

elshorbagy@aucegypt.edu, eimam@aucegypt.edu
[1] AUC , Egypt

mnour@aucegypt.edu
[2] Cairo University, Egypt

Abstract:
Rice is the main water –consuming crop planted in Egypt Delta. Constrained with the limited water resources, mapping rice is essential for any better water resources management. Xiao (2005) developed an algorithm for rice mapping by studying the dynamics of three vegetation indices the normalized difference vegetation index(NDVI), the Enhanced vegetation index (EVI) and the Land surface water index (LSWI). Rice main differentiating feature is being planted in flooded land. Thus moisture sensitive index like LSWI will temporally exceed the EVI or the NDVI signaling rice transplanting. Xiao (2005) utilized MODIS free satellite imagery (500 m spatial resolution). However its coarse resolution combined with the Egyptian complex landscape raised the need for the algorithm modification. In this piece of work a low-cost rice mapping algorithm was developed. The multi resolution (MODIS 250m-red and near infrared bands) and (MODIS 500m-shortwave infrared and blue bands) were utilized. The arable land was mapped through the utilization of the NDVI and applying it on MODIS 250 m (fine spatial resolution) scenes. The MODIS fine temporal resolution (MOD09A1 product) was utilized to study the LSWI, NDVI and EVI dynamics throughout the rice planting season. The non-arable land from MODIS 250m was then used to refine the rice area calculated from the MODIS 500m imagery.The algorithm was applied on the Egypt delta region in years 2008, 2009 and 2010. The mapped rice area in 2008, 2009 and 2010 were enhanced from the MODIS 250 m arable mapping module and the results of the algorithm were validated against the annual areas reports. There was good agreement between the estimated areas from the algorithm and the reports. The inter annual variation in rice areas was successfully mapped. In addition, the rice area and probable transplanting dates conforms to local planting practices. The findings of this study indicate that the algorithm can be used for rice mapping on a timely and frequent manner.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Development of automated satellite remote sensing and ground spectroscopy techniques for monitoring olive oil mill waste disposal areas in Crete-Greece

Dimitrios D. Alexakis[1], Apostolos Sarris[1], Chariton Kalaitzidis[2], Nikos Papadopoulos[1], Pantelis Soupios[3]

alexakis@chania.teicrete.gr, asaris@ret.forthnet.gr, nikos@ims.forth.gr
[1] Laboratory of Geophysical-Satellite Remote Sensing & Archaeoenvironment, Institute for Mediterranean Studies, Foundation for Research and Technology-Hellas (FORTH), Greece

chariton@maich.gr
[2] Mediterranean Agronomic Institute of Chania, Greece

soupios@chania.teicrete.gr
[3] Technological Educational Institute of Crete, Dept. of Natural Resources and Environment, Laboratory of Geophysics and Seismology, Greece

Keywords: Satellite Remote Sensing, Ground Spectroscopy, Landsat 8, IKONOS, Spectral signatures, Wastes

Abstract:
Olive oil mill wastes (OOMW) constitute a major factor in pollution in olive-growing regions and an important problem to be solved for the agricultural industry in the island of Crete-Greece. The olive-oil mill wastes are normally deposited at tanks, or directly in the soil or even on adjacent torrents, rivers and lakes posing a high risk to the environmental pollution and the community health. This study aims to develop integrated satellite remote sensing methodologies for performing monitoring of land pollution from the disposal of OOMW in the island of Crete –Greece in South Eastern Mediterranean. Initially, extended integrated GPS survey took place throughout the island and approximately 1300 OOMW tanks were topographically mapped. Satellite images of both high (IKONOS) and medium (Landsat – 8 OLI) resolution were pre-processed, analysed and used. Geometric, radiometric and atmospheric corrections were applied to all images. An overall spectral signature library of OOMW tanks was developed for different time periods and satellite sensors. Simultaneously, ground spectroscopy campaigns were carried out and a second spectral signature library was developed. The narrow band reflectance of ground measurements was recalculated using the Relative Response Filters of the corresponding satellite sensors. Both libraries were compared for their accuracy through statistical approaches and the optimum spectral range for detecting OOMW areas was estimated. Following,some more methodologies such as image fusion, FCCs, PCA analysis and IHS were applied to satellite images for enhancing OOMW patterns and an innovative OOMW detection index for Landsat 8-OLI sensor was developed. In addition, several vegetation indices were applied and compared for their efficiency in detecting OOMW areas as well as sophisticated classification algorithms. The optimum results were derived from object-oriented analysis due to its special features incorporated in classification process (image segmentation, NDVI, texture). The study highlighted the potential of both satellite remote sensing and ground spectroscopy to the semi – automatic detection of OOMW areas in the context of Mediterranean landscape.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Joint Symposium and EARSeL SIGs 3D Remote Sensing & Urban Remote Sensing session

Carsten Jürgens, Derya Maktav, Mattia Crespi, Karsten Jacobsen

Thursday, 19.06.2014, 14:00-16:00, *room 107*

PERFORMANCE OF LARGE AREA COVERING HEIGHT MODELS
Karsten Jacobsen
14:00 - 14:20

EXTRACTION OF URBAN BUILDING HEIGHTS FROM LIDAR DATA: AN INTEGRATED REMOTE SENSING AND GIS APPROACH
Muhammad T Rahman
14:20 - 14:40

USE OF LIDAR HIGH RESOLUTION DEM FOR RISK STABILITY ANALYSIS
Nathalie Stephenne, Christophe Frippiat, Mathieu Veschkens, Marc Salmon, Daniel Pacyna
14:40 - 15:00

Determining Frankfurt's suitability potential for the „OnTop" concept
Marzena Markiewicz, Matthias Herrmann, Arthur Rikort, Sebastian Kreisel
15:00 - 15:20

Urban uplift in Staufen im Breisgau: What have we learned from five years of space-borne SAR observations?
Christin Lubitz, Mahdi Motagh, Hermann Kaufmann
15:20 - 15:40

DETERMINANTS INFLUENCING THE AMOUNT OF ASBESTOS-CEMENT ROOFING IN POLAND
Ewa Wilk, Małgorzata Krówczyńska, Piotr Pabjanek
15:40 - 16:00

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Performance of large area covering height models

Karsten Jacobsen

jacobsen@ipi.uni-hannover.de
Leibniz University Hannover, Germany
http://www.ipi.uni-hannover.de

Keywords: DHM, optical satellites, InSAR, accuracy, characteristics

Abstract:
Digital height models (DHM) are a basic requirement for several applications. The generation of DHM is time consuming and expensive, but several large area covering height models are available free of charge or commercially. For practical use it is important to have some information about accuracy, accuracy characteristics, areas with problems, height definition as digital surface model (DSM) or digital terrain model (DTM) with heights of the bare ground, resolution (point spacing), homogeneity, availability and influence of interpolation. The free of charge available height model from the SRTM mission is well known. It also has been improved to different versions as by gap filling and also by merging with other data as in case of the ACE2 corrected by radar altimeter data. The point spacing of 3 arcsec has been improved by merging with the also free available ASTER GDEM2 to the commercial NEXTMap World 30 with 1 arcsec point spacing. ASTER GDEM2 has some problems with homogeneity caused by quite different number of images used for the individual heights, nevertheless it is better as the GMTED2010 with 7.5 arcsec spacing, which replaced the GTOPO30. ETOPO1 is just limited to 1 arcmin point spacing. Commercial height models as Elevation 30 based on SPOT 5-HRS, NEXTMap based on airborne InSAR, Euro-MAPS 3D, based on Cartosat-1 and the coming TanDEM-X Global DEM have advantage in point spacing and accuracy. The characteristics and accuracy of the different height models are described to allow a selection corresponding to the individual requirements.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Extraction of urban building heights from lidar data: an integrated remote sensing and GIS approach

Muhammad T. Rahman

mtr@kfupm.edu.sa
King Fahd University of Petroleum and Minerals, Saudi Arabia

Keywords: Building Heights, LiDAR, High Resolution Imageries

Abstract:
Rapid improvements in passive remote sensing technology over the past several decades allow us to detect and map individual buildings and infrastructures in various urban settings. However, when it comes to extracting heights of individual buildings and infrastructures, the capability of passive remote sensing data is quite limited. By using a combination of data from passive and active sensors, it is now possible to generate maps of individual buildings along with their heights. In this paper, a combination of IKONOS and LiDAR data is used and processed through integrated remote sensing-GIS based method to extract individual building heights in the urban central part of Norman, Oklahoma. Results show that while the method extracts the location of buildings with moderately high (75%) degree of accuracy, the accuracy level in estimating the area and height was lower and depends mostly on the presence of trees surrounding the buildings. Future research should focus on using the method on IKONOS and LiDAR data collected during winter seasons when the leaves of trees are not present.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Use of lidar high resolution DEM for risk stability analysis

Nathalie Stephenne[1], Christophe Frippiat[1], Mathieu Veschkens[1], Marc Salmon[2], Daniel Pacyna[2]

n.stephenne@issep.be, ch.frippiat@issep.be, veschkens@issep.be
[1] ISSeP, Belgium

marc.salmon@spw.wallonie.be, daniel.pacyna@spw.wallonie.be
[2] SPW, Belgium

Keywords: Digital Elevation Model, Lidar, Risk, Geotechnical stability

Abstract:
Remote sensing data offer an accurate source of information to the administration. Walloon administration develops its capacities in using Earth Observation data to respond to the EU request of characterizing the risks related to closed and/or abandoned mining sites. This paper compares two Digital Elevation Model (DEM) derived either from aerial photos or from a LiDAR(Light Detection And Ranging) sensor in their capabilities of characterizing unstable land cover and risks of landslides for Walloon coal waste heaps. A first inventory of Walloon facilities at risk provided to EU authorities identified geotechnical failure as being one of the major risks linked to coal mine waste heaps. The risk of geotechnical failure was quantified using a geotechnical factor of safety computed on a pixel basis using the topography of the facility. The topography was extracted from a regional-scale DEM with a spatial resolution of 10 m (ERRUISSOL model, information on geoportail.wallonie.be). Since the first inventory, a new DEM dataset using LiDAR sensor has been acquired by the Walloon Region. This paper compares the two datasets in their ability to quantify the risk of slope instability on five specific heaps. The DEM from LiDAR data offers a resolution of 1m. It leads to significant differences in the spatial and statistical distributions of slopes, as compared to the regional 10 m-resolution DEM. To test this spatial effect, the resolution of the LiDAR DEM has been averaged by pixel aggregation to 2/4/8 and 10m-resolutions to allow direct comparison with the ERRUISSOL DEM. In all cases, the application of the geotechnical factor of safety criterion based on the high-resolution LiDAR DEM leads to larger portions of heap surfaces at risk of geotechnical failure. In the next months, this method will be proposed to the Walloon administration for application to all facilities considered at risk by the first inventory to improve the characterization of the risk of geotechnical failure, and confirm or not the risk.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Determining Frankfurt's suitability potential for the „OnTop" concept

Marzena Markiewicz[1], Matthias Herrmann[2], Arthur Rikort[2], Sebastian Kreisel[2]

mmarkiewicz@gik.pw.edu.pl
[1] Faculty of Geodesy and Cartography, Department of Photogrammetry, Remote Sensing and GIS,
Warsaw University of Technology, Poland

Mat_ffm@gmx.de, rikort@gmx.net, kreisel@stud.fh-frankfurt.de
[2] Department of Architecture, Civil Engineering and Geomatics,
Frankfurt University of Applied Sciences, Germany

Keywords: GIS, LiDAR, superstructures, urban sprawl, Solar Decathlon

Abstract:
The OnTop Project at Frankfurt University of Applied Sciences, competing in Solar Decathlon Europe 2014, aims to demonstrate an approach to the rising challenge of urban densification by the help of an extra construction on top of an already existing building. Whereas architects work on the most profitable structure of the building, equally crucial is to detect which buildings are actually suitable for this purpose. Through the spatial data (3d city model, solar-roof-and buildings-cadaster, ortophotos, thermal images and LiDAR data) an analysis was conducted, deriving acceptable buildings within Frankfurt meeting appointed criteria. Unfortunately, data protection issues and the desire to make the entire analysis automatic made only some criteria usable. Some proofed to be crucial: height, function and roof-surface, while others were used to weigh the results and appoint teach building to a suitability class. For instance, the concept assumed that a roof's remodeling is acceptable. To proceed it was stressed that no resettlement should occur. Therefore one of the most essential criteria was to assess from the available data whether the building's roof is habited. This question was mainly assessed through the usage of the derived average roof angle per building where small angles indicate less likely habitation. One of the biggest challenges of the project was managing huge amount of data, their accuracy and inadequacy as well as their different origins. The analysis returned estimations, overlaid on building polygons, which may be used for this concept and further evaluation resulted in a possible number of built OnTop structure. The close cooperation with the OnTop-Team, consisting of architects and civil engineers, resulted in a comprehensive approach to tackle the Frankfurt's future sustainability problems.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Urban uplift in Staufen im Breisgau: What have we learned from five years of space-borne SAR observations?

Christin Lubitz, Mahdi Motagh, Hermann Kaufmann

chlubitz@gfz-potsdam.de, motagh@gfz-potsdam.de, charly@gfz-potsdam.de
GFZ Potsdam, Germany

Abstract:
More than five years have passed since first cracks occurred at buildings within the historical city centre of Staufen im Breisgau (Germany) due to an unprecedented uplift phenomenon. Hydro-chemical driven anhydrite-gypsum transformation in the subsurface was identified as the cause leading to volume increase that is observable at the surface as uplift. This process is directly related to drillings for geothermal probes in 2007 that have crossed several groundwater reservoirs. More than 260 buildings are now affected by wall cracks and other damages. Spaceborne synthetic aperture radar interferometry (InSAR) has become an intensively used geodetic technique for surface displacement investigation and monitoring. In this work, we summarize and present the findings of InSAR image analysis of the uplift phenomenon in Staufen over the five year period from July 2008 through July 2013. By applying the Small Baseline Subset (SBAS) method, we find a localized elliptical-shaped deformation field in NE-SW orientation with area of maximum uplift 50 m NNE of the drilling zone. At this location, we observe a cumulative uplift of approx. 13.7 cm ± 0.34 cm (mean value within an area of 30 m by 30 m) from July 2008 to July 2009, which then was reduced to cumulative uplift of 3 cm ± 0.25 cm from July 2012 to July 2013. The deceleration can be related to applied countermeasures as borehole sealing and groundwater pumping. Moreover, comparison with terrestrial leveling measurements indicates significant contributions of horizontal motions in cm-range. Therefore, analyzing and combining ascending and descending SBAS results for the period from October 2012 through July 2013 allows decomposition into horizontal and vertical motion contributions. We find a symmetric horizontal motion pattern for eastward and westward motion along the NE-SW orientation axis of the deformation field. Additionally, to better understand the deformation source at depth, In SAR displacements were inverted to assess the source parameters.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Determinants influencing the amount of asbestos-cement roofing in Poland

Ewa Wilk, Małgorzata Krówczyńska, Piotr Pabjanek

ewa.wilk@student.uw.edu.pl, krowczynska@wgs84.pl, p.pabjanek@uw.edu.pl
University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Poland

Keywords: asbestos, asbestos-cement roofing, Poland, statistical correlation

Abstract:
The unique set of physical and chemical properties, has led to many industrial applications of asbestos. Due to its harmfulness to human health, asbestos has been banned in 55 countries, including EU. In Poland the usage and production of asbestos and asbestos containing products has been forbidden in 1997. However there is uncertainty about the amount of the asbestos-containing products to be abated from the territory of Poland. This survey aims to lay down measures which have a significant impact on the estimation of the asbestos-containing products used in Poland. Statistical correlation between the physical counting inventory results done in 155 gminas was examined. Also the proximity of the 29 asbestos manufacturing plants and appropriately selected statistical data were investigated. The degree of correlation (Spearman Rank Correlation Coefficient rs) was determined. As a result of the survey conducted it was stated that the amount of asbestos-cement roofing depends on the following features: the number of individual farms in the village, the distance from the asbestos manufacturing plants, the age of buildings and the economic situation of gmina. Results obtained may contribute to the prediction of the amount of asbestos-containing products used in other non-analysed gminas.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

2nd Workshop

of
EARSeL Special Interest Group
Forestry:

Remote Sensing for forestry: applications – the new challenges, approaches and achievements

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

203

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Opening session & ALS in forestry applications

Tuesday, 17.06.2014, 09:00-10:55, *room 107*

Opening session and LiDAR - ALS
> *Opening session & ALS in forestry applications*
> *Presentation of Chairmen*
> 09:00 - 09:10

Remote Sensing of Forests at ESA
> *Frank Martin Seifert*
> 09:10 - 09:25

A comprehensive lidar data analysis system for describing forest structure to improve forest ecoystem management
> *Benoit St-Onge, Bruce Persaud, Daniel Kneeshaw, Udaya Vepakomma*
> 09:25 - 09:40

Measuring and monitoring of forest ecosystem services with LiDAR
> *L. Monika Moskal*
> 09:40 - 09:55

Individual tree and crown identification in the Danube floodplain forests based on airborne laser scanning data
> *Ivan Sačkov, Tomáš Bucha, Géza Király, Gábor Brolly, Rastislav Raši*
> 09:55 - 10:10

Attenuation correction of full-waveform airborne laser scanner data for improving the quality of volumetric forest reconstructions based on a simplified waveform history analysis
> *Katja Richter, Nadine Stelling, Hans-Gerd Maas*
> 10:10 - 10:25

Comparison of methodologies for forest biomass estimation by LiDAR data: the "LESTO" GIS-based toolbox
> *Valentino Floreancig, Andrea Antonello, Silvia Franceschi, Alessandro Andriolo, Francesco Comiti, Giustino Tonon*
> 10:25 - 10:40

Land cover change detection analysis in a forestry environment on a basis of 3D ALS points
> *Karolina Korzeniowska, Markus Hollaus, Norbert Pfeifer*
> 10:40 - 10:55

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Remote Sensing of Forests at ESA

Frank Martin Seifert

frank.martin.seifert@esa.int
Earth Observation Programme – European Space Agency

Keywords: Forest, ESA

Abstract:

Forests applications in remote sensing have been a driver for development of new satellites and new techniques for decades. Based on service demonstrations the European Space Agency (ESA) developed within the COPERNICUS initiative with the European Commission the SENTINEL satellite family, where Sentinel-1 – a C-band Radar, and Sentinel-2 – a multispectral optical sensor, will contribute significantly to forest observations world-wide. Additionally last year ESA Member states decided on BIOMASS as its 7th Earth Explore rmission, to measure forest biomass from space. Application development at ESA varies from local to global scale and from science to demonstration of operational services. Emphasis will be put on the United Framework Convention on Climate Change (UNFCCC) established process to reduce greenhouse gas emissions from deforestation and degradation (REDD) in developing countries. This talk will addresses the research community with open scientific questions to improve methodologies to support REDD early actions and readiness mechanisms for building national REDD monitoring systems. Critical issues on monitoring forest degradation, accuracy assessments, biomass burning and the role of evolving technologies will be discussed. Funding opportunities within the ESA application programs will be presented.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

A comprehensive lidar data analysis system for describing forest structure to improve forest ecoystem management

Benoit St-Onge[1], Bruce Persaud[1], Daniel Kneeshaw[1], Udaya Vepakomma[2]

st-onge.benoit@uqam.ca, bruce.elliot.persaud@gmail.com, kneeshaw.daniel@uqam.ca
[1] Université du Québec à Montréal, Canada

Udayalakshmi.Vepakomma@fpinnovations.ca
[2] FP Innovations, Canada

Abstract:
Vast Canadian forests possess great structural complexity due to their history of natural and man made disturbances. This presents a difficult challenge for forest managers as well as for ecological characterization. Unfortunately standard inventory procedures do not provide all the information needed for decision-making. While airborne lidar can generate 3D data over potentially large areas, its full potentiall has rarely been utilized for providing a comprehensive description of forests tructure, including both tree height and canopy gap size frequency distributions. We here used a set of methods tha thave been operationally tested for producing data on individual treat tributes (height, crown diameter), species class, standwise characteristics (e.g. stem density), and gap size frequency. Trees are first delineated from a raster canopy height model (CHM) and their height and crown diameterare extracted. The shape of the crowns is analyzed to determine species class (hardwoodor softwood). Trees can be grouped by spatial units to describe stand characteristics such as number of stems per hectare or tree height distribution. Forest gaps are automatically delineated from the CHM and their size distribution is computed. We have performed this analysis to compare the structure of mature forests of two contrasted origins: natural forests that regenerated after forest fire, and forests that regenerated following harvesting. The overall forest characteristics thus extracted reveal structural differences between these two forest types. They provide indications for future silvicultural approaches that could ensure that harvested forests evolve towards a more natural structure having greater diversity of habitats.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Measuring and monitoring of forest ecosystem services with LiDAR

L. Monika Moskal

lmmoskal@uw.edu

University of Washington, United States

http://faculty.washington.edu/lmmoskal/

Keywords: lidar, ecosystem services

Abstract:

Ecosystem services can be categorized into: provision, regulating, supporting, preserving and cultural services. All of these amenities can be attributed to forested environments and are becoming a targetable issue for sustainable management of these resources. Because field studies represent only a snapshot in the spatiotemporal continuum of a landscape, remote sensing can assist with spatially explicit modeling at a site, watershed and landscape levels. Although, a wide array of remote sensing approaches for ecosystem assessment has been developed over decades, these are applicable to imaging satellite datasets, and come with limitations related to the resolution and lack of spatial (and three dimensional in the case of forests) detail. It is with the onset of lidar and our ability to capture the detailed and even leaf level structure of the forested landscape that remote sensing of ecosystem services has become feasible. This talk will focus on providing examples of provision services mapping, such as biomass and cellulosic biofuels estimation. Regulatory services will be explored through examples of detailed modeling of forests in the Pacific Northwest applied to a variety of purposes, including the close study of the riparian forest/water interface and function for the suitability and sustainability of salmon habitat. Preserving services related to biodiversity, habitat and accounting for uncertainty will also be addressed through examples of monitoring forested wetlands on Mt. Rainier, Washington. The study extends beyond the suitability of habitat toward the ecosystem services of the forest for quality drinking water. Finally, discussion on how supporting and cultural services, such as pest/disease control and recreational opportunities, can also be addressed with lidar remote sensing will be provided.

Individual tree and crown identification in the Danube floodplain forests based on airborne laser scanning data

Ivan Sačkov[1], Tomáš Bucha[1], Géza Király[2], Gábor Brolly[2], Rastislav Raši[1]

sackov@nlcsk.org, bucha@nlcsk.org, rastislav.rasi@jrc.ec.europa.eu
[1]National Forest Centre, Slovakia

kiraly.geza@emk.nyme.hu, gbrolly@emk.nyme.hu
[2]University of West Hungary, Hungary

Keywords: Forestry, Forest monitoring, Remote sensing, Geoinformatics

Abstract:
In the work, a fully automatic approach for individual tree and crown identification using laser scanning data is presented. The automatic identification was realized in the parts of Danube floodplain forests (47˚52´N, 17˚32´E). The poplar and willow plantations are dominant in the area, but also there are reservations with mixed forests of broadleaves. The basis of workflow was identification of a "true" top of tree from all local maxima that were found in the point cloud. For this purpose the module "Tree and Crown Identification" from the "reFLex" software was used. Outputs of automatic detection were compared with a ground data from reference plots (500 trees). Overall accuracy (RMSE) of tree and crown identification with the "reFLex" software in area of interest was ±41 %.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Attenuation correction of full-waveform airborne laser scanner data for improving the quality of volumetric forest reconstructions based on a simplified waveform history analysis

Katja Richter, Nadine Stelling, Hans-Gerd Maas

katja.richter1@tu-dresden.de, nadine.stelling@tu-dresden.de, hans-gerd.maas@tu-dresden.de
TU Dresden, Germany
http://www.tu-dresden.de/fghgipf/

Keywords: full-waveform airborne laser scanning, attenuation correction, waveform history analysis

Abstract:
Full-waveform airborne laser scanning data yield a great amount of information for the analysis of vegetation density in forestry applications. So far, the processing of full-waveform laser scanner data in forestry applications has mostly been limited to the extraction of discrete maxima via a Gaussian decomposition. This will usually lead to a densification of the 3D point cloud between terrain model and crown model by 3-5 extra 3D points per laser pulse. However, beyond this extraction of additional discrete 3D points, full waveform data may form a valuable basis for a fully volumetric representation of forest stands in a 3D voxel structure, wherein the voxel attributes are derived from the digitized waveform directly. For this purpose, the digitized pulse echoes have to be projected into a Cartesian voxel structure of a suitable resolution, wherein the voxel entries represent amplitudes of the pulse echo and can be interpreted as a local measure for the amount of pulse reflecting matter. However, the 'history' of each laser echo pulse is characterized by attenuation effects caused by reflections in higher regions of the crown. To achieve a radiometrically correct voxel space representation, the loss of signal strength caused by partial reflections on the path of a laser pulse through the canopy has to be compensated. Thereby, the correction term has to be derived from the digitized pulse echo itself. In this paper, we present an approach for a discrete correction, realized as a segment-based modification of the echo waveform amplitude. The basic idea of the procedure is to enhance the waveform intensity values in lower parts of the tree crown for portions of the pulse intensity, which have been reflected (and thus blocked) in higher parts of the crown. Furthermore, an extension of the approach to an integral correction method is introduced. The paper will discuss the developed models of attenuation correction and show results from a validation both with synthetic and real world data.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Comparison of methodologies for forest biomass estimation by LIDAR data the "LESTO" GIS-based toolbox

Valentino Floreancig, Andrea Antonello, Silvia Franceschi, Alessandro Andriolo,
Francesco Comiti Giustino Tonon

Valentino.Floreancig@natec.unibz.it
Free University of Bolzano-Bozen, Italy

Keywords: LiDAR, Geographic Information System, JGrasstools, uDig, tree extraction, data validation, tree volume

Abstract:
The exponential growth of the availability of LiDAR surveys and LiDAR-derived datasets in the last decade has pushed terrain sciences to find ways to properly exploit the detail of information contained. The fact that the quality of the results mostly depends on the quality of the raw data might seem an obvious statement. But how much does the resolution of the dataset really weigh on the shoulders of the result? Is the use of raw, high resolution data really necessary to gain a realistic tree top or crown extraction, or might the DSM supply a similar result without the overkill of necessary processing resources? In this presentation the authors will give one possible answer to these questions based on a set of new modules implemented within the GIS framework uDig and the JGrasstools spatial processing library, which are both open source and freely available. A comparison of methodologies on a selected test area will be presented. Some of the most frequently used algorithms in literature have been tweaked and applied on LiDAR-derived raster datasets (DTM, DSM), as well as point clouds of raw data. The methods range between the simple extraction of tops and crowns from local maxima, the region growing method, the watershed method, and individual tree segmentation on point clouds. The testing procedure consisted of matching the field-and LiDAR-derived measurements. The validation sites consist of a series of circular sampling plots randomly selected from a 50x50 m regular grid within a buffer zone of 150 m from the forest road. The plots are located in an area for which information about the forest structure was already known. Reference measurements of position, diameter, species and height were taken for each tree. Allometric relationships were obtained for each species, deriving the stem volume of single trees based on their height and diameter at breast height. The tools developed are meant to be released under open source license once mature and properly tested.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Land cover change detection analysis in a forestry environment on a basis of 3D ALS points

Karolina Korzeniowska, Markus Hollaus, Norbert Pfeifer

k.korzeniowska@uj.edu.pl, Markus.Hollaus@geo.tuwien.ac.at, Norbert.Pfeifer@geo.tuwien.ac.at
Vienna University of Technology, Austria

Keywords: LiDAR, classification, forestry, change detection

Abstract:
The aim of the study is to present the aspects and possibilities of land cover change (LCC) detection on a basis of airborne laser scanning (ALS) data. The research is focused on the analyses performed for 3D environment in the forested area. Three-dimensionality enable to measure and verify the changes in height and volume of the forest which is a significant advantage against to aerial and satellite images on which, due to the lack of the third dimension, it was not possible to do. As study area several forested regions located in the federal district Vorarlberg, Austria were selected. The ALS data were acquired during two laser scanning campaigns in 2003-6 and in 2011 in snow free and leaf off conditions. For the 3D classification several geometric attributes calculated for the 3D point cloud were used. There are: 1) echo ratio, 2) echo number, 3) number of returns, 4) normalized echo, 5) normalized Z, and 6) planarity. The echo ratio enables to measure the local transparency and roughness of the terrain. In this parameter we measure the number of neighbours which are in a 3D search distance and the number of neighbours which are in the same distance, but in 2D. By division of the two achieved values it is possible to determine the roughness of the terrain. The echo number and the number of returns attributes give the information about intermediate return which represent the vegetation and also can be used for normalized echo parameter evaluation. The normalized echo is a simply measure achieved by dividing the echo number by the total number of echoes – this measure is helpful for vegetation class extraction, especially for a data contained multiple returns. The normalized Z can be applied to measure the point height above the terrain. This information is applied for low, medium, and high vegetation separation. The planarity is a measure which enables to detect planar surfaces, what is necessary for division between the ground and low vegetation class. The assessment of the land cover changes have been verified on a basis of 2D analysis on which we analyses extend of the changes of the LCC as well as on 3D where we analysed the changes in the height and the volume of the objects. We also analysed the influence of geolocation errors for the results, and the acquisition parameters for the data collection. The results show the potential of airborne laser scanning data for land coved change detection and give the advantage over the analysis based on 2D aerial and satellite imagery. Third dimension of the data enable to determine the growth of vegetation in the time series what can be used for predicting of the forecast development in the future.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Hyperspectral Remote Sensing and vegetation indices

Tuesday, 17.06.2014, 11:30-13:00, *room 107*

Early Recognition of Changes in the Health Status of Norway Spruce with Hyperspectral Data
> *Lea Henning, Nicole Pinnel, Markus Immitzer, Uta Heiden*
> 11:30 - 11:45

Spectral properties and condition of dominant forest tree species
> *Bogdan Zagajewski, Martyna Wietecha, Adrian Ochtyra, Marlena Kycko, Karolina Orłowska, Zbigniew Bochenek, Dariusz Ziółkowski, Maciej Bartold, Hans Tømmervik, Jarle Werner Bjerke, Andrzej Kłos, Zbigniew Ziembik, Dagrun Vikhamar Schuler, Anna Maria Jarocińska, Elżbieta Romanowska, Adriana Marcinkowska, Anita Sabat, Anna Robak, Martyna Golenia*
> 11:45 - 12:00

Modelling forest habitat of zoological communities
> *Benjamin F Leutner, Martin Wegmann, Jörg Müller, Martin Bachmann, Stefan Dech*
> 12:00 - 12:15

Dominant forest species classification of Polish Karkonoski Natinal Park using hyperspectral APEX data and Stuttgart Neural Network Simulator
> *Edwin Raczko, Zagajewski Bogdan, Adrian Ochtyra, Anna Jarocińska, Marek Dobrowolski, Adriana Marcinkowska*
> 12:15 - 12:30

Forest ecosystem health assessment by exergy approach
> *Olga Brovkina, V. Gorny, I. Latypov, F. Zemek*
> 12:30 - 12:45

The course of ecological disaster in Karkonosze and Izerskie Mountains based on Landsat data
> *Anna M. Jarocinska, Adrian Ochtyra, Bogdan Zagajewski, Adriana Marcinkowska, Marlena Kycko*
> 12:45 - 13:00

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Early Recognition of Changes in the Health Status of Norway Spruce with Hyperspectral Data

Lea Henning[1], Nicole Pinnel[1], Markus Immitzer[2], Uta Heiden[1]

lea.henning@dlr.de, uta.heiden@dlr.de
[1] German Aerospace Centre, Germany

[2] University of Natural Resources and Life Sciences in Vienna, Austria

Keywords: Spectroscopy, Norway spruce, health status, pre-visual detection

Abstract:
Recent studies show that Norway spruce monocultures are fragile with regard to climate changes (LWF) and furthermore vulnerable to different threats like storm damages or insect infestations. Especially due to the last mentioned, early detection of changes in the health status could help minimizing economical loss. The fundamental idea which lead to Norway spruce needle reflectance spectra analysis is, that within a time period of five months after artificial weakening of trees, reflectance spectra of needles show differences, which might make it possible to distinguish between weakened and control trees. Artificial weakening through ring-barking leads to a wide time frame for change detection due to a slow die back of trees. The point of time where needles still appear green but changes in reflectance spectra indicate a decline in the health status of ring-barked trees is of special interest. During the whole period needles were sampled directly within tree crowns and reflectance spectra were measured in a spectral laboratory. Comparison of spectra between both groups was conducted with the principal component analysis, the Jeffries-Matusita Distance and different health related indices. The results show that it is not possible to distinguish between ring-barked and control trees with the applied methods after a period of five months. This thesis illustrates that trees are complex systems with regard to their water-and assimilate transportation system. Time span from 'damage' to 'symptom' is dependent on various different factors. This makes 'early' recognition of health problems with needle reflectance spectra difficult in forest stands.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Spectral properties and condition of dominant forest tree species

Bogdan Zagajewski[1], Martyna Wietecha[1], Adrian Ochtyra[2], Marlena Kycko[1], Karolina Orłowska[2], Zbigniew Bochenek[3], Dariusz Ziółkowski[3], Maciej Bartold[3], Hans Tømmervik[4], Jarle Werner Bjerke[4], Andrzej Kłos[5], Zbigniew Ziembik[5], Dagrun Vikhamar Schuler[6], Anna Maria Jarocińska[1], Elżbieta Romanowska[7], Adriana Marcinkowska[1], Anita Sabat[1], Anna Robak[1], Martyna Golenia[1]

bogdan@uw.edu.pl
[1] University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland

adrian.ochtyra@uw.edu.pl, karolina.orlowska@student.uw.edu.pl
[2] University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing,
College of Inter-Faculty Individual Studies in Mathematics and Natural Sciences, Warsaw, Poland

zbigniew.bochenek@igik.edu.pl, dariusz.ziolkowski@igik.edu.pl, maciej.bartold@igik.edu.pl
[3] Institute of Geodesy and Cartography, Warsaw, Poland

hans.tommervik@nina.no, jarle.werner.bjerke@nina.no
[4] Norwegian Institute for Nature Research (NINA), FRAM - High North Research Centre
for Climate and the Environment, Tromsø, Norway

aklos@uni.opole.pl, ziembik@uni.opole.pl
[5] Opole University, Chair of Biotechnology and Molecular Biology, Opole, Poland

dagrun@met.no
[6] Norwegian Meteorological Institute, Oslo, Norway

romanela@biol.uw.edu.pl
[7] University of Warsaw, Faculty of Biology, Department of Molecular Plant Physiology, Poland

Keywords: hyperspectral techniques, spectral properties, vegetation, forest ecosystems, fluorescence, Karkonosze Mts, Zywiec, Bialowieza Forest

Abstract:
Excess light, extreme temperatures, water deficit and ion inbalance are the major abiotic stress conditions that reduce plant growth and result in significant yield losses. Plants evolved a wide spectrum of programs for sensing, responding and adapting to changing environment. Those adaptations result from physiological, biochemical and biophysical properties of the green, vegetative matter. Laboratory and field analyses of spectral properties of plants have shown that identification of plants and state of vegetation communities is possible. Spectral signature of a plant is distinctive and variable with wavelength, its characteristic absorption features being a direct result of their physiological processes. Photosynthesis is based on absorption of blue and red parts of electromagnetic spectrum of solar energy and conversion to chemical energy (ATP). Chlorophyll a is the main factor in photosynthesis while chlorophyll b plays a secondary function, supporting chlorophyll a in light absorption. Major role of carotenoids is to harvest light energy and pass this energy on to chlorophyll, also thay have a role in photopotection to prevent formation of toxic oxygen species and in non-photochemical quenching, in which excess energy is released as heat. High content of carotenoids is noted for plants subjected to excess sun radiation (e.g. mountain species). Amount of carotenoids increases also during plant senescence. Other

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

pigments such as xanthophyslls and anthocyanins can also contribute to absorption of visible radiation. In addition to spectral characteristics of vegetation, there exists a wide range of supporting indices used in vegetation research, like: NDVI, SR, WDVI, SAVI, MSAVI, NLI and NLI2, AVI and PRI. The principal of a vegetation index is to define a simple relationship between the reflectance measured by a sensor in particular wavelengths and one or several parameter directly characterising plants health or performance (e.g. state of a photosynthetic apparatus, efficiency of transpiration process) or vegetation stand conditions (biomass or canopy structure). The PRI index is of particular interest since it is sensitive to changes in carotenoid pigments, an indicative of photosynthetic light use efficiency which can be used as a proxy for productivity and stress (ecosystem health). In this paper, methods of the monitoring vegetation, using field remote sensing techniques will be presented. This is the first stage of the assessment of the potential of hyperspectral data and plant physiology for analysis and monitoring of seminatural and natural environments with a special focus on vegetation conditions. In this study we advanced field measurements of spectral properties, photosynthetic pigments and fluorescence measurements (Fm, Fo, Fv, t1/2 and Fv/Fm). The studies are conducted in Karkonosze, Beskid Żywiecki (both areas located in SW Poland) and Białowieża, Knyszyńska and Borecka Forests (NE Poland), which are protected areas. The results of the field campaign can be outlined as follows: the qualitative and quantitative analysis of photosynthetic pigments showed significant differences between the species studied; field radiometric measurements confirmed in the laboratory of analyses of leaf pigment contents; the spectral signatures of the communities studied are characteristic for healthy plants. The next stages of our research will focus on satellite images and their applications for regional scale analyses of vegetation health and performance in space and time.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Modelling forest habitat of zoological communities
(Which sensors do we actually need?)

Benjamin F Leutner[1], Martin Wegmann[1], Jörg Müller[2], Martin Bachmann[3], Stefan Dech[3]

benjamin.leutner@uni-wuerzburg.de
[1] Dept. of Remote Sensing, University of Würzburg, Germany

[2] Bavarian Forest National Park, Germany

[3] German Remote Sensing Data Center, German Aerospace Center (DLR), Germany

Keywords: habitat, forest biodiversity, community, spectral resolution, spatial resolution

Abstract:

Modelling forest habitat types is of crucial importance for resource and conservation management on landscape scales. During the past decades substantial progress has been made in the development of remote sensing based forest type mapping, for which a multitude of different sensor systems have been employed. Yet, researchers frequently face the difficult decision which remote sensing data to acquire for a particular modelling task. Apart from specific sensor to sensor comparisons there is, however, no general understanding on how fundamental sensor characteristics such as spectral and spatial resolution interplay in determining mapping success.

Based on airborne hyperspectral data we developed a general modelling framework for the identification of both sufficient and optimal sensor characteristics for a given modelling task with respect to spectral and spatial resolution. To this end, we simulate a spectral information gradient by means of a novel spectral clustering algorithm and perform spatial upscaling using general point-spread functions.

The focus of our study lays on mapping habitat for different zoological communities in montane mixed forest stands in the Bavarian Forest national park, Germany. Habitats are defined for continuous community gradients obtained by means of non-metric multidimensional scaling of zoological ground survey data and are subsequently modelled using random forest regression with remote sensing data serving as predictors.

A major result of direct practical relevance is the observed complementarity between spatial and spectral resolution, e.g. cases in which higher spectral resolution can make up for a less suitable spatial resolution. Moreover, this approach allows us to estimate the expected increase in model accuracy if transitioning from less suitable data to more suitable data. Besides providing recommendations on suitable sensor choice and sensor set-ups the proposed framework is a valuable tool to support the definition of sensor requirements for future missions in an objective, data-driven way.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Dominant forest species classification of Polish Karkonoski Natinal Park using hyperspectral APEX data and Stuttgart Neural Network Simulator

Edwin Raczko[1], Zagajewski Bogdan[1], Adrian Ochtyra[1], Anna M. Jarocińska[1], Marek Dobrowolski[2], Adriana Marcinkowska[1]

edwin.raczko@student.uw.edu.pl, bogdan@uw.edu.pl, adrian.ochtyra@uw.edu.pl, ajarocinska@uw.edu.pl, adriana.marcinkowska@uw.edu.pl
[1] University of Warsaw, faculty of Geography and Regional Studies, Warsaw, Poland

marek.dobrowolski@kpnmab.pl
[2] Karkonoski National Park, Poland

Abstract:

288-band airborne APEX (Airborne Prism EXperiment) images and SNNS simulator were used to map five dominant forest species of Karkonoski National Park (M&B reserve of the UNESCO, SE Poland). Two areas were classified for comparison of methods. The first area is located in a core of the National Park, it is forested by homogenous polygons, second research area is located on the Chojnik Mt., (near the headquarter of the Karkonosze National Park). Mount Chojnik played a significant military role in the past, now it is a mix of different types of forests. APEX images, characterised by 1,75 meter spatial resolution, coupled with field research and allowed to recognise homogeneous areas (10x10 m) of spruce, larch, pine, birch and beech. Radiometric and geometric corrections were made by Belgian VITO (APEX operator). Large amounts of data caused processing problems (namely long classification times) it was decided to perform data quality analysis of all bands. Analysis consisted of repeated SVM classifications of particular area with random selection of learning pixels. In each classification iteration, one band was taken out from data set, it measured band impact and classification accuracy. In result 40 best bands were selected for artificial neural network based classification (band, spectral range, ordered by most important: 64 (0.7248 µm); 59 (0.7061 µm); 139 (1.2575 µm); 62 (0.7172 µm); 73 (0.7623 µm); 146 (1.3256 µm); 196 (1.7846 µm); 6 (0.4711 µm); 60 (0.7098 µm); 63 (0.7210 µm); 108 (0.9689 µm); 134 (1.2090 µm); 136 (1.2284 µm); 138 (1.2478 µm); 141 (1.2769 µm); 159 (1.4509 µm); 8 (0.49 µm); 10 (0.5092 µm); 11 (0.5181 µm); 13 (0.5336 µm); 14 (0.5473 µm); 23 (0.5866 µm); 27 (0.6041 µm); 30 (0.6183 µm); 35 (0.6323 µm); 40 (0.6458 µm); 43 (0.6544 µm); 45 (0.6602 µm); 65 (0.7288 µm); 68 (0.7408 µm); 70 (0.7492 µm); 77 (0.7807 µm); 122 (1.0945 µm); 132 (1.1897 µm); 140 (1.2672 µm); 158 (1.4413 µm); 177 (1.6184 µm); 195 (1.7761 µm); 224 (2.0083 µm); 225 (2.0159 µm)). As a classification method we used neural network with backpropagation learning algorithm. Every class had its own neural network to provide greater control on learning and classification process. Data obtained during field research and given from National Park administration were used to select learning and verification areas. We managed to successfully map five tree species. Early results show better classification accuracies for dominant species (beech and spruce) reaching around 80%, while sparsely growing tree species (birch, larch and pine) reached up to 70% overall accuracy. Results for pine reached about 60% which is worst accuracy of all five species. It was caused by small data sample used for learning (pines grow on steep slope of Chojnik Mountain that made field measurements impossible to do).

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Forest ecosystem health assessment by exergy approach

Olga Brovkina[1] V. Gorny[2] I. Latypov[2] F. Zemek[3]

olgabrovkina@mail.ru
[1]Faculty of Forestry and Wood Technology, Mendel University in Brno, Czech Republic

[2]Laboratory of Remote Environmental Monitoring Methods and Geoinformatic, Saint Petersburg Scientific Research Center for Ecological Safety, Russian Academy of Sciences, Russian Federation

[3]Department of Remote Sensing, Global Change Research Centre, Academy of Sciences of the Czech Republic, Czech Republic

Keywords: Exergy, forest ecosystem, satellite images

Abstract:

The forest ecosystem as an important natural resource provides valuable ecological functions. Therefore it is necessary to monitor the forest ecosystem health state. Exergy is demonstrated to be a useful measurable parameter reflecting the state of the ecosystem and allowing estimation of the severity of its anthropogenous damage. According to recent studies (Jørgensen, Svirizhev, 2004; Gorny, et al, 2010; Silow, 2010; Puzachenko et al, 2011) exergy is shown to have advantages such as good theoretical basis in thermodynamics, close relation to information theory, rather high correlation with others ecosystem goal functions and relative ease of computation with remote sensing data. The ecosystem exergy is a measure of its deviation from thermodynamic equilibrium with the environment, and represents the maximum capacity of energy to perform useful work as the system proceeds to equilibrium, with irreversibility increasing its entropy at the expense of exergy. Taken by itself, the total exergy of an ecosystem is a measure of the change in entropy content from the equilibrium and the actual state. Interaction of the solar radiation with vegetation is resulting as a new composition of the spectrum of outgoing radiation. The difference between incoming and outgoing radiation is not defined by the properties of these radiation fluxes only, but also by the state (properties) of the vegetation. The exergy of the solar radiation, reflected by the surface of forest ecosystem can be calculated by using digital data, recorded by the Landsat TM (ETM+), Terra(ASTER), Terra/Aqua(MODIS), etc. remote sensing satellites. This approach has been applied to the assessment of the forest ecosystem health. The study area is located in Beskids Mountain, the North-East part of the Czech Republic. Norway spruce and European Beech dominate the forest cover there. Landsat TM and Terra (Aster) satellite data have been acquired for this territory. Exergy maps have been compiled for several time periods of satellite images from 1987 up to 2011. The change detection analysis demonstrates significant exergy variations. These variations are interpreted as an exergy consumption for the transpiration and the carbon deposition, which determined the past and current health of the mountain forest ecosystem.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The course of ecological disaster in Karkonosze and Izerskie Mountains based on Landsat data

Anna M. Jarocińska[1], Adrian Ochtyra[2], Bogdan Zagajewski[1],
Adriana Marcinkowska[1], Marlena Kycko[1]

ajarocinska@uw.edu.pl, bogdan@uw.edu.pl, adriana.marcinkowska@uw.edu.pl,
marlenakycko@gmail.com
[1]University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland

adrian.ochtyra@uw.edu.pl
[2]University of Warsaw Faculty of Geography and Regional Studies Department of Geoinformatics
and Remote Sensing, University of Warsaw, College of Inter-Faculty Individual Studies
in Mathematics and Natural Sciences, Warsaw, Poland

Keywords: Karkonosze, Izerskie Mountains, Landsat, vegetation condition, ecological disaster

Abstract:

The Karkonosze and Izerskie Mountains are in south-western Poland. From the beginning of 60s in 20th century were noticed worst condition of forests. It was caused by many factors: air pollution, strong winds and pests. The biggest damages were noticed in upper mountane part, especially in spruces. From the end of 80s were started cleaning of the forests, especially in spruce stands and plantings to renovate the forests. The aim of the study was to analyse the changes in forest areas and in the plants condition from 1984 to 2013 based on Landsat data. Four Landsat TM images and one OLI/TIRS image were analysed form July 1984, 1992, 2002, 2010 and 2013. The images were calibrated and atmospherically corrected using ATCOR 2/3 software. On each image was performed classification to estimate the forest areas. Than were calculated vegetation indices: Normalied Difference Vegetation Index, Soil Adjuster Vegetation Index and Moister Stress Index to evaluate plant condition and water stress. Based on that map of vegetation indices were created and forest condition was analysed. Also, was performed image difference analysis based on the class images of NDVI, NPCI and MSI from years 1984 and 2013. To perform statistical analysis cloud mask was created based on five images. To check the significance of differences in vegetation indices values were randomly selected points. Than Kruskal-Wallis test was performed. The worst condition was noticed in 1984, the best in 2013. It was also condition deterioration in year2010. The vegetation condition was improved from 1984 to 2013. The condition improving was particularly obvious in subalpine areas. The biggest water content was noticed in 2013.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

GEOBIA – Object Based Image Analysis

Tuesday, 17.06.2014, 14:00-14:30, *room 107*

Assessing robustness of fuzzy rule-sets used for semi-automatic object-based classification
of forest types on BlackBridge satellite imagery – the case study in South Poland
  Paweł Hawryło, Piotr Wężyk, Marcin Pierzchalski
  14:00 - 14:15
Monitoring forest cover change in boreal forests: a methodological approach
  Ouns Kissiyar, Svyatoslav S. Bartalev, Frédéric Achard
  14:15 - 14:30

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Assessing robustness of fuzzy rule-sets used for semi-automatic object-based classification of forest types on BlackBridge satellite imagery – the case study in South Poland

Paweł Hawryło[1], Piotr Wężyk[1], Marcin Pierzchalski[2]

p.hawrylo@ur.krakow.pl, p.wezyk@ur.krakow.pl
University of Agriculture in Krakow, Poland
http://www.geo.ur.krakow.pl/

marcin.pierzchalski@progea.pl
ProGea Consulting, Poland
http://progea.pl/

Keywords: customized features, forest mapping, OBIA, RapidEye

Abstract:
Increasing amount of Remote Sensing data triggers the need for new semi-or fully-automatic approaches of image processing and up-dating of the thematic GIS layers. These new methods should be reproducible and reliable as far as possible. One of existing methods is object-based classification approach, is known since one decade as GEOBIA (Geographic Object Based Image Analysis). The study presents, ability to use GEOBIA for semi-automatic classification of forest type (coniferous/deciduous) mask using BlackBridge (RapidEye) satellite images. The study area covers three test sites in South of Poland: "A" in Niepolomice Primeval Forest (~291,5 sq. km; 14. Aug. 2010), "B" close to Olkusz town (190,8 sq. km; 27 Jun. 2010) and "C" near to Chrzanow town (136,3 sq. km; 27 Aug. 2011). The aim of the study was to verify whether the classification rule-sets designed for test site "A", can be also used for test sites "B" and "C". The rule-based method with fuzzy logic approach was used to perform the classification. In the presented study, authors developed the customized segmentation approach based on multi-resolution segmentation algorithm. One of the key differences between proposed GEOBIA method and traditional supervised classification algorithms is possibility of limiting the process to selected classes. The operator is not obligated to choose AOI for all of target classes, but analysis may be limited to classes which operator is interested in. Additional advantage of GEOBIA is no need to distinguish all classes simultaneously, but classes can be identified one after the other. In the first step the image was segmented using developed customized algorithm. Next, the analyzed area was divided into forest and no-forest areas and finally forest class was distinguished to two types: coniferous and deciduous. The forest and no-forest areas were identified based on 5 image features: customized feature based on Red-edge band, customized feature based on Green band, NDVI index, Brightness calculated from RGB bands and Red-edge band ratio (Red-edge band/sum of all bands DN values). For deciduous and coniferous forest identification following features were used: NDVI, Green NDVI and Red-edge NDVI. Main rule set (set of classification rules) was developed for test site "A" and enabled achievement of high classification accuracy with Kappa coefficient approx. 89%. The same rule-set was running on sites "B" and "C" giving Kappa coefficient: 48 and 54% accordingly. This indicated that original rule-set cannot be reused without some changes for other areas to achieve acceptable accuracy. Thus it was necessary to adapt the rule-set for areas "B" and "C". Segmentation algorithm proved to be robust and worked well for all test areas. The adjustment consisted in changing the eight features thresholds values in class descriptions. After small changes, the classification accuracies for sites "B" and "C" increased to: 87% and 88% accordingly. Achieved results indicates that rule-based fuzzy logic classification approach gives possibilities to development semi-automatic classification work-flow, which after small adjustments can be successfully run in other areas using satellite images collected in different time. Further study is required to examine whether radiometric correction technics can significantly limit the number of necessary adjustments.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Monitoring forest cover change in boreal forests: a methodological approach

Ouns Kissiyar, Svyatoslav S. Bartalev, Frédéric Achard

ouns.kissiyar@jrc.ec.europa.eu
JRC Italy

Keywords: Forestry, OBIA, Boreal, Russia, Landsat

Abstract:

The purpose of this study is to develop a monitoring tool for boreal forest cover change on continental level at high resolution. The system is based on Landsat satellite imagery and has been implemented for the period 1990-2000-2010. For the identification and classification of the forest cover within a large amount of satellite imagery, a robust methodological approach combining multi-date image segmentation and cluster based supervised automated classification was chosen. Thus, an object based, automatic classification method with a regional expert validation are combined to produce regional scale land cover statistics over Russia and Mongolia. High resolution satellite imagery is used to accurately estimate land cover and land cover change for the epochs 1990-2000-2010. The overall method consists of four distinct steps: (i) automatic image preprocessing and pre-interpretation, (ii) validation by regional expert, (iii) statistic computation and (iv) accuracy assessment. The automated procedures have as main objective to unequivocally identify the objects so as to maximally reduce the post-classification interventions of manual procedures and of visual interpretation. A total of 14 different land cover classes are defined in the legend. Given the focus on forests, special attention was devoted to the differentiation of 8 different forest cover types, going up to species level.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Poster Session WS Forestry

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

223

Leaf Area Index mapping using LiDAR, Landsat and ground measurements of plant communities in foothills and forest zone of Magura National Park

Sylwia Szporak-Wasilewska[1], Oliwia Krettek[1], Tomasz Berezowski[1], Bartłomiej Ejdys[1], Łukasz Sławik[2], Marcin Borowski[2], Krzysztof Będkowski[1]

s-szporak@levis.sggw.pl, krzysztof.bedkowski@wl.sggw.pl
[1] Warsaw University of Life Sciences, Warsaw, Poland

lslawik@mggpaero.com
[2] MGGP Aero, Poland

Keywords: Leaf Area Index, ALS, LiDAR, Landsat 8, Magura National Park

Abstract:
Plants leaves represent the main surface for physiologically active exchange between forests and the atmosphere and represent the largest proportion in total canopy surface compared to woody forest canopy elements. Leaf Area Index (LAI) defined here as half the total leaf area of the forest canopy divided by the ground area below the canopy is still one of the most crucial parameters describing biological and hydrological processes (e.g. photosynthetic light absorption, carbon fluxes exchange, transpiration or interception). Numerous methods have been developed to measure and estimate leaf area index through remote sensing including passive and active methods. The main goal of this research was to estimate Leaf Area Index for plant communities located within borders of the Magura National Park situated in the area of the Flysch Carpathians, Poland. Examined forests communities belong to two different vegetation layers in altitudinal zonation: foothills zone, up to 530 m a.s.l., and forest zone, located higher. In situ ground indirect measurements of LAI were performed using LAI-2000 Plant Canopy Analyzer. They were performed within scanned swath of the airborne laser scanning (ALS) with density of 4 points/m2 and Landsat images. The ALS data was used to calculate LAI for each canopy. All data of the LAI-2000 measurements and both Landsat and ALS were collected within two weeks' time range in the stage of maximum foliation (August 2013). Several vegetation indices (NDVI, IPVI, MSR among many others) were tested in order to obtain spatial distribution of LAI from Landsat as a comparison to ALS LAI. The results indicate that ALS offers accurate tool for mapping leaf area index for forests at local or regional scale, as well as is suitable for verification of LAI derived through passive optical remote sensing techniques over large areas. The comparison indicates that both LiDAR-derived point density and Landsat vegetation indices are correlated with indirect measured LAI and presents high accuracy of LAI estimations.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Mobile Geographic Information System (GIS)
for Forest Conservation and Surveillance
(Remote sensing applications for Natura2000 areas)

M. Rajamanickam[1], G. Victor Rajamanickam[2]

ramanimano@yahoo.com
[1]Assistant Professor, India
http://www.Prist.in

simpraavictor@gmail.com
[2]Director, India
http:www.prist.ac.in

Keywords: Mobile, GIS, Remote Sensing, Udahai, Nilgiris

Abstract:
Since most GIS software migrated from proprietary data to classic database formats like Relational Database Management System (RDBMS) and programming languages to a visual basic .Net, Java script etc. We are witnessing r rapid advancements in GIS technology,where by users realizing the significance of storing geographically referenced data, as a alternate for storing information in conventional file-based systems.Storing data in file-based system is not only redundant, but holistic view of the entire data is not always available to Senior Management in order to scrutinize the position from a high-level point of view and consequently quick decision making. In the recent day developing of Mobile GIS application, It may possible through capturing, storing and analyzing forestry related data using mobile devices. In most forests, areas to be patrolled on a day-to-day basis are decided at the Range-level, as well as assistant-levels of Beat Guards and Foresters. The State-level and Senior-level Officers will not have time to visit mass forest areas over certain periods of time. Due to this limitation, District forest Officers cannot make any real-time interventions in forest monitoring on a day-to-day basis. Recent technology like Mobile-based GIS application will assist the Forest Departments to resolve issues through spatially referenced decision making. This piece of work highlights how Mobile GIS be able to be used in forest-governance through monitoring, incident management and analyzing of geospatial data.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Development of a remote sensing based fast response system for the handling of calamities in forests (FastResponse)

Oliver Bauer[1], Rudolf Seitz[1], Adelheid Wallner[1], Kathrin Einzmann[2],
Markus Immitzer[3], Andreas Müller[4],

oliver.bauer@lwf.bayern.de, rudolf.seitz@lwf.bayern.de, Adelheid.Wallner@lwf.bayern.de
[1] The Bavarian State Institute of Forestry (LWF), Germany
http://www.lwf.bayern.de/mitarbeiterverzeichnis/a-e/47092/index.php

kathrin.einzmann@boku.ac.at
[2] University of Natural Resources and Life Sciences (BOKU), Austria
http://www.rali.boku.ac.at/22704.html?&L=0

markus.immitzer@boku.ac.at
[3] University of Natural Resources and Life Sciences (BOKU), Austria
http://www.rali.boku.ac.at/markus-immitzer.html?&L=0

andreas.mueller@dlr.de
[4] German Aerospace Center (DLR), Germany
http://www.dlr.de/eoc/en/desktopdefault.aspx/tabid-6205/10524_read-23293/

Keywords: wind throw, active/passive remote sensing, change detection, crisis management

Abstract:
Beside economic losses storm calamities in forests are challenging in ways of crisis management. Fast decisions of forest owners are required considering forest recreation, reasonable use of technical and human resources as well as the stabilization of the timber exchange. A quick detection of wind throw areas in forests is therefore of highest interest. Satellite data in combination with GIS analysis techniques and forestal metadata could provide valuable assistance for the decision maker. Project ‚Fast Response', funded by the German Federal Ministry of Economics and Technology (BMWi), aims to allocate a concept supporting the crisis management of wind throw areas in Bavarian and Austrian forests on a remotely sensed basis. The goal is a first quick estimation of high damaged regions due to size and position within a few days after the storm. Therefore automated data processing techniques and change detection algorithms should be applied. A subsequent GIS analysis of the results and previously generated forest maps (e.g. tree species, timber volume) will provide additional information.

Spaceborne radar sensors (e.g. TerraSAR-X), being independent from illumination and weather conditions, will be applied for a first short-termed estimation. For a more detailed analysis, within two weeks after the storm event, optical VHR data (e.g. WorldView2) will be used. Combiningdata from different sensors is considered to minimize the before and after storm time interval. Newest sensors are able to locate areas down to <1 ha.

The complete resulting concept including remote sensing data, GIS analysis, forest maps and in-structions will be stored in a ‚toolbox'. It will be the basis for a central forestal crisis intervention system (FKIS) to optimize the cooperation between authorities and forest owner after heavy storms.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Method analysis for collecting and processing hyperspectral needle reflctance data for monitoring spruce vitality

Kathrin Einzmann, Wai-Tim Ng, Markus Immitzer, Lea Henning,
Martin Bachmann, Clement Atzberger

kathrin.einzmann@boku.ac.at
Austria

Keywords: needle spectra, in-situ measurements, Norway spruce, tree vitality, spectroradiometer

Abstract:
Bark beetle infestations cause severe damage to forestry. In the context of climate change, inducing substantially warmer and possibly drier summers, this threat is expected to increase. Remote sensing has the capacity to detect large scale changes based on quantitative observations of spectral changes. State of the art very high spatial resolution satellite data offer a great potential for assessing tree vitality. However, a better understanding of the correlation between vitality decrease and its impact on the spectral behaviour of needles is needed. For improving the interpretation of remote sensing data detailed analyses of needles are therefore necessary. Despite, it is still unclear which method for needle spectra collection is most suitable. The scope of this study is to investigate two methods for spectral reflectance measurements of Norway spruce needles (Picea abies, L.). The spectra were retrieved by using portable spectroradiometers applying both a classical fore optics and a (so-called) contact probe. Needle samples were acquired in summer and fall 2013 in Bavaria (Germany) from two forest stands. Tree climbers collected the branches from the top of the crowns. For our study, needles of the four last age groups, from 2010 to 2013, were measured. The measurements were performed in-situ as well as in a laboratory and repeated three times during the growing season. We discuss methods for sample storage, preparation and the influence of sample freshness on the reflectance behaviour. Furthermore, we evaluate the spectral data collection in-situ and in a laboratory environment with different measurement settings and in terms of its practicality. After preprocessing (removal of artificial spikes in the data, outlier detection and smoothing) the data were analyzed statistically using different similarity measure techniques. This research serves as a preliminary study for field campaigns scheduled in 2014 to monitor tree vitality. Our results will be implemented to improve monitoring of tree damage with very high resolution WorldView-2 data as well as airborne HySpex data.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

3D Photogrammetry
TLS
Radar applications in forestry

Wednesday, 18.06.2014, 08:45-10:45, *room 107*

Georeferenced aerial photography and tropical forest parameters collected from a low cost RC quadrocopter in the Democratic Republic of Congo
Jörg Haarpaintner, Fabian Enssle, Stian A. Solbø
08:45 - 09:00

Growing stock change detection based on 3D point clouds from ALS and stereo images
Markus Hollaus, Camillo Ressl, Klemens Schadauer, Christoph Bauerhansl
09:00 - 09:15

3D forest canopy gaps analyses based on WorldView-2 stereo imagery
Jiaojiao Tian, Christoph Straub, Adelheid Wallner, Rudolf Seitz, Peter Reinartz
09:15 - 09:30

Accessing the accuracy of different remote sensors for forest cover mapping and its proxy for biomass estimation in the Dem. Rep. of Congo
Fabian Enßle, Pawan S Datta, Jörg Haarpaintner, Miguel Kohling, Barbara Koch
09:30 - 09:45

Tree detection by row recovery on Eucalyptus spp. plantations from TLS data
Anita Schilling, Hans-Gerd Maas, Christel Lingnau
09:45 - 10:00

Timber volume prediction using airborne laser scanning, aerial photogrametry, TanDEM-X, and TerraSAR-X radargrammetry data
Johannes Rahlf, Johannes Breidenbach, Svein Solberg, Erik Næsset, Rasmus Astrup
10:00 - 10:15

Potential of SAR data for forest change detection in mountains
Ruben Remelgado, Claudia Notarnicola, Ruth Sonnenschein
10:15 - 10:30

Satellite InSAR: Forest monitoring in three dimensions
Svein Solberg
10:30 - 10:45

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Georeferenced aerial photography and tropical forest parameters collected from a low cost RC quadrocopter in the Democratic Republic of Congo

Jörg Haarpaintner[1], Fabian Enssle2, Stian A. Solbø1

joergh@norut.no, Stian.Andre.Solbo@norut.no
[1] Norut -Northern Research Institute Tromsø Norway
http://www.norut.no

fabian.enssle@felis.uni-freiburg.de
[2] Albert-Ludwig University Freiburg, Germany

Keywords: tropical forest, RPAS, Africa, UAV, remote sensing

Abstract:
To support ground reference data collection in the Democratic Republic of Congo, a low cost remote controlled quadrocopter "DJI Phantom" with an attached digital compact camera, a "Canon Powershot S100" was used. Aerial photos were taken with an approximate 45º viewing angle over, or at least in proximity of, forest inventory plots. The individual aerial images were then further post-processed to form geo-referenced image mosaics covering up to 4 ha each that can be used for satellite data validation as well as for extrapolating forest inventory plot measurements. In addition, multi-angle looks allow building point clouds and digital surface models over these areas. Flights over five different field sites were flown with varying take-off location from grassland/savannah, small openings in the forest, as well as from a boat on a river inside an inundated forest area. This paper will summarize the results, i.e. image mosaics, point clouds and digital surface models over the five field sites and compare them with high resolution satellite data from RapidEye. Derived vegetation heights from the aerial data gave reasonable results compared to collected inventory data and visual observations, when vibrations effects in the aerial photos were not too dominant. Individual tree structures could be extracted from point clouds and tree types are identifiable. Finally, we will discuss the pros and contras of this system compared to alternative fixed-wing and/or auto-piloted unmanned aerial vehicles and present already implemented improvements with some more recent examples from other countries.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Growing stock change detection based on 3D point clouds from ALS and stereo images

Markus Hollaus[1], Camillo Ressl[1], Klemens Schadauer[2], Christoph Bauerhansl[2]

markus.hollaus@geo.tuwien.ac.at, Camillo.Ressl@geo.tuwien.ac.at
[1] Vienna University of Technology, Department of Geodesy and Geoinformation, Research Group Photogrammetry, Vienna, Austria

klemens.schadauer@bfw.ac.at, christoph.Bauerhansl@bfw.ac.at
[2] Federal Research and Training Center for Forests, Natural Hazards and Landscape, Department of Forest Inventory; Vienna, Austria Austria

Keywords: LiDAR, image matching, land cover change, growth, exploitation, forest inventory

Abstract:
In the last decade several studies have shown the high potential of high spatial resolution remote sensing (RS) techniques (i.e. airborne laser scanning (ALS), stereo images) to increase the spatial and temporal resolution of various forest parameters (e.g. growing stock, biomass, tree heights) in comparison to traditional sample plot based forest inventories (FIs). The integration of these RS techniques into operational FIs require on the one hand high-performance algorithm to handle the huge amount of data (i.e. 3D point clouds) and on the other hand a certain guarantee of repetitive RS data acquisitions. In the focus of these requirements a research project was jointly carried out by the Department of Geodesy and Geoinformation at the TU Vienna and the Department of Forest Inventory at the BFW Vienna funded by the Austrian Klima und Energiefonds. Within several study areas in Austria the feasibility of using digital stereo images in combination with ALS derived digital terrain models (DTMs) for assessing the growing stock changes was analysed. For deriving dense point clouds from digital stereo images different algorithms (i.e. semi-global matching, feature based matching) and settings (i.e. varying strip overlaps, GSD) were analysed with respect to the achievable quality of the digital surface models (DSMs). For the estimation of growing stock a semi-empirical regression model was applied for different acquisition times, which uses the nDSMs (=DSMmatching – DTMALS) and (=DSMALS -DTMALS) respectively as input. This regression model assumes a linear relationship between the growing stock and the RS-derived canopy volume, stratified according to four canopy height classes to account for height dependent differences in canopy structure. To consider small differences in tree crown representation within each derived growing stock map morphologic operations (i.e. open / close) and a minimum mapping area of 10 m^2 were applied to the growing stock change map. Finally the growing stock change map is limited to the determined forest area e.g. fulfilling the criterions of the Austrian forest definition and the detected changes were divided into exploitation and forest growth. The results of the image matching analyses have shown that for the derivation of high quality DSMs over forested areas a large length (≥80%) and side (≥50%) overlap is necessary to identify reliable changes in the growing stock down to the (dominant) single tree level. The estimated growing stock changes were validated with local forest inventory data and ALS data and additional in-situ measurements of exploited forest areas and show a high overall accuracy. In general it can be concluded that the combination of ALS and digital stereo images are excellent data sources for integrated them into operational forest inventories.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

3D forest canopy gaps analyses based on WorldView-2 stereo imagery

Jiaojiao Tian, Christoph Straub, Adelheid Wallner, Rudolf Seitz, Peter Reinartz

jiaojiao.tian@dlr.de

Keywords: Optical Stereo Data, DSM, Gaps, Shape, Slope

Abstract:
Monitoring of forest by remote sensing techniques is still a fast growing research and application topic since forest ecosystems directly influence carbon stocks and climate changes. Canopy gaps, which indicate the unstocked areas within a forest region, are in this context an important forest property. These gaps are normally formed after tree fall due to disease, windstorm, or human intervention. The existence of these gaps can affect the surrounding forest in many aspects, such as the future forest canopy composition. Various gap characteristics, like size, shape, slope influence the forest in different ways. Traditionally, these gaps are detected and measured with field surveying methods, which is of low efficiency and cannot be applied to large regions. Moreover, some forest regions are very difficult to reach, especially in mountain terrain. Therefore, it is a useful measure to utilize satellite images in this task. WorldView-2 data with 8 spectral bands, and 0.5 meter resolution for panchromatic data and stereo data capabilities might be a suitable data source for large area gap monitoring. In this paper, firstly, Digital Surface Models (DSMs) are generated based on the Semi-Global Matching method. In order to improve the quality of the generated DSM, a novel fusion strategy is proposed especially useful for very high resolution satellite stereo imagery. Secondly, by fusing the height information from DSM and spectral information from original WorldView-2 data, initial canopy gap maps can be generated. Thirdly, these gaps are analysed at object level. Both the 2D and 3D shape features are considered in this step. In a final step, based on these 2D/3D shape features, the canopy gaps are classified into bush land, grass and roads using the random forest classification method. Two datasets captured over the forest region of Gerolzhofen, Germany, have been selected for the experiment. One is a WorldView-2 dataset acquired on 5th August, 2013, the other dataset are aerial stereo images acquired on 27th May, 2011. Evaluation of the proposed approaches is performed by comparing the 2D/3D gap features extracted from WorldView-2 with those extracted from the aerial stereo imagery. The result proves that very high resolution stereo imagery from space is capable to extract the location and major properties of these canopy caps. The extracted 2D/3D shape features as well as the classification result can be very helpful for e.g. further forest ecology analyses and deforestation warning.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Accessing the accuracy of different remote sensors for forest cover mapping and its proxy for biomass estimation in the Democratic Republic of Congo
(A case study in the Mai-Ndombe district)

Fabian Enßle[1], Pawan S Datta[1], Jörg Haarpaintner[2], Miguel Kohling[2], Barbara Koch[1]

fabian.enssle@felis.uni-freiburg.de, pawan.datta@felis.uni-freiburg.de,
barbara.koch@felis.uni-freiburg.de
[1] University Freiburg -Remote Sensing and LIS, Germany
http://www.felis.uni-freiburg.de/

joerg.haarpaintner@norut.no, miguel.kohling@norut.no
[2] NORUT -Northern Research Institute, Norway
http://norut.no/

Abstract:
Robust estimation of Above Ground Biomass (AGB) is still one of the major challenges to support the United Nations REDD program (Reducing Emissions from Deforestation and forest Degradation). According to IPCC guideline, emission reporting should be done by combining Earth Observation (EO) and ground-based forest inventory data. A wide range of EO sensors are available to be used for AGB mapping and each one has different success levels. Important limitation with forest biomass monitoring in the developing countries is on one hand the constrained field data availability, and on the other limitations related to processing large remote sensing datasets. For the sub Saharan African region two publicly available AGB maps were produced by Baccini et al. (2012) and Saatchi et al. (2011). Both the studies have estimated AGB at a spatial resolution of ~ 1km^2. In this paper we discuss the possibility of using standard sensors of higher spatial resolution for coarse scale biomass mapping by calculating the percentage of forest cover and spectral indices within grid cells of 1km^2. Especially in fragmented landscapes the percentage of forest cover in a given grid cell is most likely related to the overall biomass. The hypothesis that a better separation of forest and non-forest fragments gives a sufficient estimation of above ground biomass at coarse scale is tested. In this method, firstly the percent forest cover, spectral information and indices (e.g. NDVI) are tested for correlation with the published biomass estimates (Baccini et al. 2012 and Saatchi et al. 2011). The EO-data sets used for this analysis are located western of the lake Mai-Ndombe in the Dem. Rep. of Congo. The dataset includes Landsat 8, DMCII, RapidEye and PALSAR. Image acquisitions were conducted from 2011 until 2013 (optical) and 2009 until 2010 (Radar) respectively. The different optical and radar based forest non-forest maps are evaluated in order to identify the most suitable sensors and resolutions for estimating the forest biomass at 1km2 resolution. Besides we also test to which amount of AGB the model is not affected by saturation.

Sassan S. Saatchi, Nancy L. Harris, Sandra Brown, Michael Lefsky, Edward T. A. Mitchard, William Salas, Brian R. Zutta, Wolfgang Buermann, Simon L. Lewis, Stephen Hagen, Silvia Petrova, Lee White, Miles Silman, and Alexandra Morel. Benchmark map of forest carbon stocks in tropical regions across three continents. PNAS 2011; published ahead of print May 31, 2011, doi:10.1073/pnas.1019576108

A. Baccini, S J. Goetz, W.S. Walker, N. T. Laporte, M. Sun, D. Sulla-Menashe, J. Hackler, P.S.A. Beck, R. Dubayah, M.A. Friedl, S. Samanta and R. A. Houghton. Estimated carbon dioxide emissions from tropical deforestation improved by carbon-density maps. 2012 Nature Climate Change, http://dx.doi.org/10.1038/NCLIMATE1354, The Woods Hole Research Center

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Tree detection by row recovery on Eucalyptus spp. plantations from TLS data

Anita Schilling[1], Hans-Gerd Maas[1], Christel Lingnau[2]

anita.schilling@tu-dresden.de
[1] Institute of Photogrammetry and Remote Sensing,
Technische Universität Dresden, Germany
http://photo.geo.tu-dresden.de

[2] Departamento de Ciências Florestais,
Universidade Federal do Paraná, Brazil

Keywords: tree detection, terrestrial laser scanning, forest inventory parameters

Abstract:
Precise biomass estimation of trees is of major importance to plantation owners. In recent years, several studies have proven the value of terrestrial laser scanning (TLS) data for forest inventory and forest management tasks. In order to obtain biomass information from TLS data, tree detection is a necessary first step. In contrast to naturally grown forests, trees on plantations are not randomly positioned; trees are planted in rather straight rows at pre-defined distances. We propose to make use of this row-wise alignment in the process of automatically detecting trees from TLS data. First, we apply a variant of the Circle Hough Transform to slices of the input point cloud in order to detect tree candidates in the data. A voting scheme is employed to obtain a set of initial tree positions. Afterwards, a row is determined by a robust estimation scheme (RANSAC) using a 2D line model. Subsequently, other rows are recovered one after another: Unassigned position estimates are projected onto a line orthogonal to the last obtained row. A set of points to determine the next row is selected by evaluating the projection points with respect to the expected inter-row spacing. A line segment is fitted to the selected point set. The procedure is repeated until the plot is fully traversed and all position estimates are assigned to rows. In a following filtering step, rows are tested regarding their plausibility and position estimates are filtered for outliers. Even additional rows may be extrapolated based on the retrieved ones. Finally, points in a corridor around a row line are examined. Trees are easily detected by evaluation of the histogram of point numbers along the line segment as well as histograms along the Z axis at estimated positions. In a next step, simple dendrometric parameters such as diameter at breast height and stem profilescanbe computed for all detected trees. Our approach has been successfully tested with TLS data of 18 plots on Eucalyptus spp. plantations, which comprise about 32 to 84 trees within the defined area of interest. The average detection rate is 97%, which shows its applicability to grid-like planting schemes.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Timber volume prediction using airborne laser scanning, aerial photogrametry, TanDEM-X, and TerraSAR-X radargrammetry data

Johannes Rahlf[1], Johannes Breidenbach[1], Svein Solberg[1], Erik Næsset[2], Rasmus Astrup[1]

johannes.rahlf@skogoglandskap.no
[1] Norwegian Forest and Landscape Institute, Norway

[2] Norwegian University of Life Sciences, Norway

Keywords: Forest inventory, timber volume, 3D remote sensing, Lidar, digital aerial photogrammetry, TanDEM-X, TerraSAR-X, radargrammetry, mixed effects models

Abstract:
At present, airborne laser scanning (ALS) is the 3D remote sensing system which provides the most suitable data for forest parameter prediction. Even though it is already used in forest management inventories, its high costs currently prevent a continuous acquisition over large areas. The increasing availability of high resolution digital terrain models (DTM) enables the use of other 3D remote sensing systems, i.e. methods that do not provide DTM data themselves. Such alternative data can be acquired for a fraction of ALS costs. For example, digital aerial photogrammetry can generate 3D information in similar spatial resolution as ALS, while space-borne synthetic aperture radar (SAR) can provide information for large areas. In this study we compared used data from the following 3D remote sensing methods: airborne laser scanning ALS, digital aerial photogrammetry of aerial images, interferometric SAR (InSAR) from the TanDEM-X mission, and radargrammetry data from the TerraSAR-X mission. The focus was to compareing on their the ability to accurately predict timber volume based on the datasets. The study site was located in a spruce dominated forest in Lardal municipality, southern Norway. We extracted 3D remote sensing data for 170 sample plots, from which we also had timber volume data from field inventory. We fitted linear mixed effects models of timber volume against 3D remote sensing metrics, and compared the accuracy of the remote sensing systems. The resulting relative RMSEs for ALS, digital aerial photogrammetry, InSAR and radargrammetry were 19%, 31%, 42%, and 44%, respectively.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Potential of SAR data for forest change detection in mountains (Contribution for rapid mapping)

Ruben Remelgado, Claudia Notarnicola, Ruth Sonnenschein

ruben.remelgado@eurac.edu, claudia.notarnicola@eurac.edu, ruth.sonnenschein@eurac.edu
Institute for Applied Remote Sensing,
European Academy of Bozen/Bolzano (EURAC) Italy

Keywords: Cosmo SkyMed, RapidEye, Change Detection, Mountains, Forestry

Abstract:
In mountain ecosystems, forest damages are of high importance and a challenge for forest management and conservation. However, a quick assessment of these changes is difficult in complex terrain. In response to this constraint, rapid mapping using earth observation data become an attractive solution. In particular, Synthetic Aperture Radar (SAR) offers a unique opportunity for forest management applications due to its independence of weather conditions. In this study, we evaluated the potential of X-band COSMO-SkyMed Stripmap SAR images for forest change detection in mountainous environments. We chose a forested area in the Southern Alps (South Tyrol) which was affected by a storm event in June 2011. We acquired a time-series of seven images covering the period of 28th of May to 31th of August 2011 with a resolution of 2.16m (range) and 2.24m (azimuth). We mapped the forest changes using a statistical approach (Independent Component Analysis (ICA)). Then, we selected the component which best represented the changes and applied a double threshold (positive and negative) to capture both increases and decreases in backscattering. To evaluate the potential of radar relatively to optical data, we obtained two RapidEye images (31.07.2010, 29.06.2011) and mapped forest changes by thresholding image differences between both years. We applied a forest mask to both change results and compared these for the overlapping area. Additionally, shadow and layover effects were also masked from the radar imagery. We generated a reference data set by orthophoto interpretation. Our results show that optical data offers comparatively better results. Using RapidEye imagery we accurately captured changes with a minimum area of 0.1ha while with COSMO-SkyMed the minimum detectable area was 0.5ha. The difference in results is explained by the high level of speckle noise introduced by the radar image resolution and by the high Local Incidence Angles (LIA) that characterize the study area (55° to 95°). The combination of these two effects introduced an increase in false changes with a small patch size. The advantage of using SAR data is the capability of a quick assessment of changes especially in difficult weather conditions. In mountain environments the use of radar for rapid mapping of forest damages can be limited depending on the acquisition geometry. Topographic shadowing and overlay phenomena caused by very high and very low LIA hinder an accurate mapping of changes. The acquisition geometry need to be chosen properly considering the area topography in order to reduce layover and shadowing effects.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Satellite InSAR: Forest monitoring in three dimensions

Svein Solberg

sos@skogoglandskap.no

Abstract:
Satellite interferometric SAR (InSAR) has a potential for forest resource mapping and disturbance monitoring. SAR is an imaging RADAR system, and InSAR is a method to derive Digital Elevation Models (DEMs) from a kind of stereo imaging. In forestry InSAR data has been obtained with the Shuttle RADAR Topographic Mission (SRTM) in 2000 and recently with the TanDEM-X mission. The obtained DEM is closely related to stem volume and above-ground biomass if it is normalized, i.e. after subtraction of a Digital Terrain Model. In other words, volume and biomass increase closely along with the increase in the height above ground of the centre if the RADAR echo. There are two applications of this. First, if a DTM is available it can be subtracted and the normalized heights, which are also termed InSAR height or Canopy Height Model, can be converted to volume and biomass, and hence be used for forest resource mapping. If a DTM is not available, one can extract temporal changes in forest height, which can be converted to detection of logging areas or changes in biomass and C stocks. The latter application is particularly relevant for REDD MRV. The accuracy in estimated biomass stocks and their changes is high to other satellite remote sensing methods, however, not as accurate as Airborne Laser Scanning (ALS). At the stand level RMSE of biomass estimates is about 18% while at a pixel or plot level the RMSE is about 43%. The relationships are straight linear without saturation. Altogether, InSAR is a satellite technology that can clearly supplement traditional optical data for forest monitoring.

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Forest inventory
TLS
Forest monitoring and GIS analyses

Wednesday, 18.06.2014, 11:15-12:45, *room 107*

Determine the erosion zone using remote sensing in forest areas of Serbia
Mileta M Milojević, Milutin P Stefanović, Zoran S Gavrilović
11:15 - 11:30

Enhancement of MSG fire product by using regionalized thresholds
Ibrahim Sonmez, Erdem Erdi, Fatih Demir, Murat Arslan, Ahmet E Tekeli
11:30 - 11:45

Multi-temporal analysis of forestation changes in Tatra National Park using SPOT images
Beata Weintrit, Joanna Pluto-Kossakowska
11:45 - 12:00

Assessment of forest cover change using Landsat images time series: case study from the Polish Carpathians
Katarzyna A. Ostapowicz
12:00 - 12:15

Dynamics of the forest coverage in Northern Romanian Carpathians – a Landsat time series data analysis
BIANCA-ROXANA NAZARIE, IONUT COSMIN SANDRIC, SILVIA ALEXANDRA USTEA, VLAD TEODOR, Florin MIHAI, Florin DUMITRASCU, Camelia SEMEN
12:15 - 12:30

Forest naturalness assessment using remote sensing and GIS methods
Piotr Pabjanek, Anna Chlebicka, Zenon Sedzikowski
12:30 - 12:45

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Determine the erosion zone using remote sensing in forest areas of Serbia

Mileta M. Milojević, Milutin P. Stefanović, Zoran S. Gavrilović

mmvodomar@yandex.com, milutin.stefanovic@jcerni.co.rs, gavrilovicz@sbb.rs

Serbia
http://www.jcerni.co.rs

Keywords: erosion mapping, erosion zone, erosion, forestry, remote sensing

Abstract:
The only factor under human control that initiates erosion processes is the method of land use. Excessive exploitation of forests results in bare terrain. Improper plowing of slopes is a significant factor of erosion intensification, especially if the plowed base is prone to erosion. "Erosion zone is a soil surface overtaken by apparent processes of erosion. It is also a surface without apparent erosion, but it might occur due to change in land use", There are many problems that need to be addressed when defining erosion zone, in forest-brevity and mountainous regions of Serbia. Forests largely hides erosion processes. A different level of detail of research and the various options that you can explore, require different kinds and different detect Mat for remote sensing. Also it is necessary to find the optimal level of field research, detailed information is observed by remote detection. For determined erosion zone in Serbia creates a special project that offers a whole range of measures wherefrom user chooses the optimal one. In Serbian practice erosion mapping and determine of erosion zone is done by Erosion Potential Method (EPM), which was developed in "Jaroslav Cerni", Institute for the Development of Water Resources.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Enhancement of MSG fire product by using regionalized thresholds (MSG fire product enhancement)

Ibrahim Sonmez[1], Erdem Erdi[2], Fatih Demir[2], Murat Arslan[2], Ahmet E. Tekeli[3]

isonmez@omu.edu.tr
[1] Ondokuz Mayıs University Turkey

eerdi@mgm.gov.tr, fdemir@mgm.gov.tr, muarslan@mgm.gov.tr
[2] Turkish State Meteorological Service, Turkey

ahmetemretekeli1975@yahoo.com
[3] King Saud University, Turkey

Keywords: MSG, fire product, Turkey

Abstract:
Wildfires are among the most harmful disasters that Mediterranean countries suffer. Each year not only remarkable amount of property and settlements are destroyed but also lives of the inhabitants are threatened. Possible effect of wildfires from regional to global scale such as, effecting air/water quality and climate change is another reason to pay specific attention. For these reasons, intense and comprehensive studies about monitoring active fires and fire prone areas are being conducted worldwide. Among these studies, satellite data is gradually used in fire detection and monitoring where various algorithms are proposed for polar orbiting and geostationary satellites data.
Along with the other products, Meteorological Operations Division in EUMETSAT is providing the fire product (FIR) via EUMETCast in 15 minute cycle with the full disc coverage. The FIR algorithm considers the brightness temperatures (BT) of the IR3.9µm and IR10.8µm data obtained from Spinning Enhanced Visible and Infrared Imager (SEVIRI) instrument. The predefined 5 tests in the algorithm uses the BT of IR3.9µm; BT difference of IR3.9µm and IR10.8µm; standard deviations of IR3.9µm, standard deviations of IR10.8µm and difference of the standard deviations IR3.9µm and IR10.8µm. Depending on the preset thresholds, each pixel is classified as either 'possible', 'probable', or 'no fire'.
Considering the 2007-2009 period dataset over Turkey, Sönmez et. al (2013) indicated less than 5 and 10% match between the FIR product and the ground fire records for the 'possible', 'probable' product types respectively. Static thresholds used in the product algorithm for the whole disc area is mentioned to be the main reason for such low detection rates and regionalized threshold use is recommended in the same study for obtaining higher detection rates for the FIR product.
In this study, possible enhancement due to the regionalized thresholds use in FIR product over Turkey is investigated. As the first step of the study, the FIR product is validated using the ground truth data from the Ministry of Environmental and Forestry for the 2007-2009 period. Secondly, the best FIR product algorithm thresholds for the 5 tests that provide the highest match between the FIR product and the ground truth are determined considering the same period. The new FIR product with the regionalized threshold is generated for 2010 using the BT of the IR3.9µm and IR10.8µm for the corresponding tests. The validation of the FIR product and the FIR product with the regionalized threshold versus the ground truth data is performed separately. The contingency tables are obtained on a monthly basis and categorical statistics of probability of detection (POD) and false alarm rate (FAR) are derived for two products' validation purposes and enhancement due to the regionalized thresholds in FIR product is analyzed in detail.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Multi-temporal analysis of forestation changes in Tatra National Park using SPOT images

Beata Weintrit[1], Joanna Pluto-Kossakowska[2]

beata.weintrit@gmail.com
[1] Astri Polska, Poland
http://www.astripolska.pl/

Jkossako@gik.pw.edu.pl
[2] Warsaw University of Technology, Department of Photogrammetry,
Remote Sensing and Spatial Information Systems, Warsaw, Poland
http://telesip.gik.pw.edu.pl/

Keywords: temporal analysis, afforestation, satellite image, SPOT, geodatabase

Abstract:
The goal of this work is the identification of afforestation changes for the Tatra National Park and multi-temporal analysis based on satellite images SPOT 5 and SPOT 6 in period 1992-2012. The whole idea of this study refers to the research made by Geosystems company in 1992, whose results cover the period 1934-1992 and consists in connection of both experiments.

To identify land cover types occurring in the area of interest the photointerpretation key was developed based on SPOT images. Subsequently, a spatial database in GIS technology was created and eventually 13 classes of land cover using photointerpretation were distinguished. Analysis of changes included a comparison of separated classes of land cover, including afforestation evident in image from different years. Furthermore the trend of its changes was studied as well. The analysis of changes in of afforestation was made using digital elevation model with respect to the absolute height, aspect and slope of the terrain. With regard to the results of studies from 10 years ago, executed evaluation is gaining wider context. In the years 1934-1992 there was a significant deforestation of the Tatra National Park. However, the changes that have been occurring over the last 10 years, are beneficial and forested areas slightly increased comparing to 1992. Thereby the positive process of forest succession was proved.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Assessment of forest cover change using Landsat images time series: case study from the Polish Carpathians

Katarzyna A. Ostapowicz

kostapowicz@gis.geo.uj.edu.pl
Jagiellonian University, Department of GIS, Cartography and RS, Kraków, Poland
http://www.gis.geo.uj.edu.pl

Keywords: Landsat, time-series, change detection, forest, the Carpathians

Abstract:

A larger number of earth-observing satellites combined with and improvements in satellite sensors over the past two decades have fundamentally altered the capacity to observe and monitor land change. Current sensors provide daily vast amounts of image data, from low or medium (102-103 m) spatial resolutions (e.g. MODIS) to very high (<10m) spatial resolutions (e.g. SPOT, IKONOS, Quickbird), and image archives with time series starting in the 1970s facilitate long-term change analysis. The aim of this study is to automatically detect and assess rates and patterns of forest cover change (decrease and increase) using dense stack Landsat images time series (1985-2011). The study area is located in the Polish part of the Carpathians. The change detection approach is focused on trajectories analysis looking for trends in spectral values using fitting algorithm which separating longer-duration signals from "year-to-year" noise caused by geometric misregistration, atmospheric effects, sun angle, sensor drift, and phenology.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Dynamics of the forest coverage in Northern Romanian Carpathians – a Landsat time series data analysis

Bianca-Roxana Nazarie[1], Ionut Cosmin Sandric[2], Silvia Alexandra Ustea[1],
Vlad Teodor[1], Florin Mihai[1], Florin Dumitrascu[1], Camelia Semen[1]

rnazarie@esriro.ro
[1] Esri Romania Romania

[2] Esri Romania, University of Bucharest, Faculty of Geography, Bucharest, Romania

Abstract:
The official statistics regarding the evolution of the Romanian forest cover show that during the last two decades the exploitation of the forest was made beyond the sustainable levels. The transition from a centralized system where the forest belonged entirely to the communist state, to the receding of the forest to the former landowners, brought forth serious consequences. We are making use of the capability of multi-temporal Landsat imagery for the past 30 years, in an investigation area of ~10.000 km^2 -Northern Romanian Carpathians. The purpose of the research is to highlight the dynamics of the forest coverage, by taking advantage of both temporal and spatial resolution of the available satellite imagery. The methodology consists first in applying radiometric corrections on the Landsat data (Landsat/TM; Landsat/ETM+). By making use of the spectral signatures we defined samples in order to classify each chosen scene. The comparison of these supervised classifications allowed to determine the annual rate of deforestation. It also proved the capability of the Landsat data in analysing and monitoring deforestation. The perspectives of the research focuses on using advanced change-detection algorithms, in order to highlight changes in the vegetation structure and biomass variations.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Forest naturalness assessment using remote sensing and GIS methods

Piotr Pabjanek, Anna Chlebicka, Zenon Sedzikowski

p.pabjanek@uw.edu.pl
University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland

Keywords: human influence, naturalness, vegation condition, Landsat

Abstract:
Remote sensing was rarely used to assess the level of forests naturalness. The aim of this study was to determine correspondence between vegetation indices from Landsat imagery and naturalness of a lowland forest. Investigation was carried out in Bialowieza Primeval Forest within the boundaries of Poland (595 km^2). Age of stands and area of clearings present in them were used as main criteria of assessment of the forest naturalness. The measurement was performed by manual photointerpretation of orthophotomaps. Minimal mapping unit was 400 m^2. Additionally taken into account GIS data linked with human pressure: a) protection status with four levels: strict reserves, partial reserves, forest of canopies congruent with habitat and forest of canopies incongruent with habitat, b) distance from open areas, c) distance from human settlements and d) distance from transportation lines. Statistical analyses have been carried out subsequently to identify correlations between vegetation indices from Landsat imagery and naturalness indices. There was no association between vegetation indices from Landsat and naturalness indices. Results indicate the role of vegetation condition as reflection to the type and intensity of management or conservation practices implemented on forests. Old or pristine zones of the forest although are reported to have high ecosystem values they do not have exceptionally high condition. High vegetation condition values do not necessarily refer to high biodiversity or greater degree of naturalness.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Joint Workshop
of
EARSeL Special Interest Groups:
3D Remote Sensing
and
Urban Remote Sensing

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

244

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

3D Remote Sensing Session 1

Mattia Crespi

Thursday, 19.06.2014, 09:15-10:55, *room 107*

Opening Session
  09:00- 09:15

COMPARISON OF HEIGHT MODELS FROM HIGH RESOLUTION AERIAL IMAGES AND FROM LIDAR
  Karsten Jacobsen
  09:15 - 09:35
Advances in DSM Generation and Higher Level Information Extraction from High Resolution Optical Stereo Satellite Data
  Peter Reinartz, Jiaojiao Tian, Thomas Krauß, Tahmineh Partovi, Georg Kuschk, Pablo d'Angelo
  09:35 - 09:55
High resolution SAR imagery orthorectification and 3D stereo measurements: development and implementation of an open source Opticks plug-in
  Andrea Nascetti, Gabriele Colosimo
  09:55 - 10:15
Digital Surface Models from ZiYUAN-3 triplet: performance evaluation and accuracy assessment
  Paola Capaldo, Gabriele Murchio, Andrea Nascetti, Martina Porfiri, Francesca Fratarcangeli
  10:15 - 10:35
Quantitative modelling of urban changes using Digital Elevation Models in a time series
  Cornelis Stal, Alain De Wulf, Philippe De Maeyer, Rudi Goossens, Timothy Nuttens, Frederik Tack, Marijn Hendrickx
  10:35 - 10:55

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Comparacion of height models from high resolution aerial images and from LIDAR

Karsten Jacobsen

jacobsen@ipi.uni-hannover.de
Leibniz University Hannover, Germany
http://www.ipi.uni-hannover.de

Keywords: DEM, digital aerial images, LiDAR, Analysis

Abstract:

Digital Surface Models (DSM) have been generated with an Optech Gemini laser scanner with approximately 4 points/m^2 in an area also covered by an UltraCam Eagle with 5cm GSD. Based on the digital images DSM and digital terrain models (DTM) were automatically/interactively produced with BAE SYSTEMS "NGATE" (New Generation of Automatic Terrain Extraction) and also SimActive's "Correlator3D" with 50cm point spacing. A direct comparison of the overlapping LiDAR strips as well as the comparison of the LiDAR data with the height models based on the aerial data showed differences especially in areas covered by vegetation as well as at building boundaries, requiring a filtering for the correct comparison. The same problem exists in another area where overlapping strips from a Riegl LSM-Q680i have been analyzed. As for all height models it is not so simple to specify the accuracy figures. The standard deviation as well as the normalized median absolute deviation (NMAD), LE90 and LE95 by theory is based on normal distributed discrepancies. Normal distributed height discrepancies require corresponding point definition in compared height models and within the height models similar conditions as e.g. flat terrain. Operationally it is very difficult to filter height models in a manner leading to normal distributed values, so the frequency distribution of height discrepancies has to be investigated. The standard deviation is very sensitive for higher number of larger discrepancies which usually can not be avoided. NMAD is not a ssensitive as the standard deviation and describes the frequency distribution of height discrepancies in a better manner. The threshold values LE90 and LE95 are even more sensitive for larger discrepancies as the standard deviation.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Advances in DSM generation and higher level information extraction from high resolution optical stereo satellite data (new results in using high resolution spaceborne DSM for urban area applications)

Peter Reinartz, Jiaojiao Tian, Thomas Krauß, Tahmineh Partovi, Georg Kuschk, Pablo d'Angelo

peter.reinartz@dlr.de
DLR, Germany
http://www.dlr.de/eoc/desktopdefault.aspx/tabid-5297/8940_read-16255/

Keywords: Optical stereo data, DSM generation, Image matching, DTM generation, 3D building extraction, 3D change detection

Abstract:

The automatic generation of digital surface models (DSM) of urban areas from high and very high resolution (VHR) stereo is still a research issue. Image matching algorithms from computer vision havebeenintroducedandadoptedtosatelliteimageryinrecentyears. These algorithms do not work using local optimization like area based matching buttry to optimize a global costfunction. Analysis shows that matching approaches based on epipolar images like semi-global matching (SGM) and new methods using total generalized variation (TGV) yield the best results. Especially satellites like Worldview-2, GeoEye-1 and Pleiades exhibit very high spatial resolution and geometric quality and can therefore be used to generate DSMs with good properties. If several stereo images from one orbit are available, a combination of DSMs generated by different stereo pairs leads to even better results. Using these DSMs, which already show urban area features in high detail, further higher level information can be extracted and new products can be generated.

The main focus of this contribution is to present and analyse several derived information products which can be generated by using the DSMs generated from satellite stereo data together with panchromatic and multispectral images. In many applications the product of interest is not the DSM but the digital terrain model (DTM), which exhibits not the height of objects like buildings or trees but the underlying terrain. In this paper some methods and examples for generating DTM from DSM are presented including evaluation of the results. A further issue is to extract real 3D objects like buildings using DSM and the derived DTM data. Also here different methods have been developed and are presented using typical examples in densely build city areas including validation results. At least larger buildings can be automatically extracted with sufficient accuracy; even the roof shape (gable or flat roof) can be extracted and modelled. Since automatic change detection is generally a very difficult topic in image processing, information on height or 3D properties are of advantage when used in the change detection procedure. Therefore, if stereo data sets from different dates are available, automatic 3Dchange detection can be performed using the corresponding DSMs. Since the change detection results depend very much on the quality of the DSMs they generally have to be improved using the multispectral information. Several methods have been developed and are shown and compared using examples from dense urban and industrial areas. The presented results show that due to the good data quality and resolution of satellite image data and the corresponding DSMs, it has become possible to derive higher level and detailed geo-information regarding 3D relevant object classes and change detection.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

High resolution SAR imagery orthorectification and 3D stereo measurements: development and implementation of an open source Opticks plug-in

Andrea Nascetti, Gabriele Colosimo

andrea.nascetti@uniroma1.it, gabriele.colosimo@uniroma1.it
University of Rome "La Sapienza", Italy
http://www.dicea.uniroma1.it/?q=user/197

Keywords: StereoSAR, 3D measurement, Orthorectification, Open Source

Abstract:
SAR technology provides for low cost, fast data acquisition and processing, independence from logistic difficulties, night-and-day, and all-weather functionality. These features are of crucial importance for the timely monitoring and management of disasters and emergencies such as geological, hydrological and geophysical hazards. Furthermore, the availability of new high-resolution SAR satellite sensors offers interesting potentialities for the acquisition of data useful for the generation of secondary products as Digital Surface Models (DSMs), orthoimages and displacement maps. On the contrary, one of the most critical aspect in order to extract useful and reliable information from SAR data is the image processing. Although several commercial software suites are available, in recent years the open source technology has confirmed a reliable and effective alternative for SAR processing and in general for geospatial information management. In particular, the main open source software and libraries, developed in recent years, are devoted to the InSAR processing (ROI_PAC created by the NASA Jet Propulsion Laboratory or DORIS and RAT Tools developed by the Delft Institute for Earth-oriented Space Research and by the Berlin University of Technology respectively). The goal of this work was to extend the capabilities of the Opticks remote sensing and imagery analysis software developing a plug-in able to exploit the amplitude high resolution of the novel SAR sensors (i.e. COSMO-SkyMed, TerraSAR-X, PAZ, RADARSAT-2). The presented plugin called "3DGeoCode" is able to perform a precise image orthorectification and to retrieve tridimensional information using a stereoscopic approach and at the moment it handles high resolution SAR imagery acquired by TerraSAR-X and RADARSAT-2 sensors.
A complete description of the exploited algorithms is illustrated with particular focus on showing the solutions adopted during the implementation. Moreover, a deep analysis of the accuracy achievable by the plug-in is reported showing the results obtained. In particular, using an high-resolution LiDAR DSM and a TerraSAR-X spotlight stereopair over the area of Trento city (northern Italy), an RMSE of approximately 2-3 meters with respect to the reference LiDAR both for othoimages and 3D stereo measurements was achieved. The 3DGeoCode plugin is under continuous development and other capabilities, aimed to the amplitude processing of SAR data, in the near future will be added.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Digital Surface Models from ZiYUAN-3 triplet: performance evaluation and accuracy assessment

Paola Capaldo[1], Gabriele Murchio[2], Andrea Nascetti[1], Martina Porfiri[1], Francesca Fratarcangeli[1]

paola.capaldo@uniroma1.it, andrea.nascetti@uniroma1.it, martina.porfiri@uniroma1.it, francesca.fratarcangeli@uniroma1.it
[1] Geodesy and Geomatic Division - DICEA - University of Rome "La Sapienza" Italy
gabriele.murchio@e-geos.it
[2] e-Geos S.p.A., Rome Italy

Abstract:
At the beginning of 2012, a new optical satellite, called ZiYuan-3 (ackonim ZY-3), was launched from the Taiyuan Satellite Launch Center. It carries three panchromatic cameras: the nadir camera has a spatial resolution (Ground Sample Distance – GSD) of 2.5 m, whereas the aft and forward cameras, both tilted by 22° degrees, have a spatial resolution of 4 m; moreover this satellite carries a four multispectral bands camera with GSD of 10 m at nadir. The 50 km swath and the ZY-3 along track three-stereo imaging capabilities, allows to generate Digital Surface Models (DSMs) and to produce/update 1:25.000 orthophotos/maps. The goal of this paper is DSMs generation and assessment from a ZY-3 triplet acquired over the city of Bolzano in Alto-Adige province (northern Italy). Two different software (MATCH-T by Trimble, and LPS eATE embedded in ERDAS software) were used at the moment, in order to investigate the effects of the orientation model and the matching strategies on the 3D reconstruction accuracy; actually, in both cases the Rational Polynomial Functions orientation model were used with Rational Polynomial Coefficients supplied by the vendors in the imagery metadata file. The accuracy of the orientation models was investigated through a set of Check Points surveyed by GPS, whereas the extracted DSMs were compared to the public LiDAR Digital Terrain Model – DTM provided by "Provincia Autonoma di Bolzano", with a posting of 2.5 m and a mean elevation accuracy of 0.25 m. The preliminary obtained results show that the geometric potentialities of ZY-3 three-stereo images as regards DSMs generation is at the level of about 10 meters, similar for both software. In the next few months a thorough software comparison, including also SISAR package, will be developed, and the global obtained results will be discussed in this paper.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Quantitative modelling of urban changes using Digital Elevation Models in a time series

Cornelis Stal[1] Alain De Wulf[1], Philippe De Maeyer[1], Rudi Goossens[1],
Timothy Nuttens[1], Frederik Tack[2], Marijn Hendrickx[1]

cornelis.stal@ugent.be, Alain.DeWulf@UGent.be, Philippe.DeMaeyer@UGent.be,
Rudi.Goossens@UGent.be, Timothy.Nuttens@UGent.be, Marijn.Hendrickx@UGent.be
[1] Ghent University, Department of Geography, Ghent, Belgium

Frederik.Tack@aeronomie.be
[2]UV-Vis Remote Sensing Group, Belgian Institute for Space Aeronomy, Brussels, Belgium

Keywords: ALS, Urban changes, DEMs, time series

Abstract:
The construction of time series for the modelling and documentation of urban environments has gained a large interest in the last few years. The growing availability of remote sensing data and sophisticated software tools has enabled the construction of Digital Elevation Models (DEMs) with various spatial and temporal resolutions. For this research, multiple scanned airborne images of the innercity of Ghent (Belgium) were processed for the calculation of DEMs using a conventional digital photogrammetric workflow. The aerial images are acquired during four campaigns: 1965, 1977, 1987 and 1990. All resulting image-based DEMs were compared with a DEM acquired with Airborne Laser Scanning (ALS) from 2009. This comparison allowed a model adjustment by minimizing the systematic shift between the data sets. In order to distinct built-up, destroyed or unchanged buildings over time, a threshold of 2.5 m was applied on the resulting vertically shifted points. Finally, a connected component analysis allowed the removal of outliers in the data. The resulting points were evaluated against a 2D digital cadastre map, which enabled a quantitative determination of difference in urban topography. The procedure to detect these changes, as well as the potentials and challenges of this technique, are elaborated in this contribution.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Assessment of the influence of LIDAR data density on 3D building modelling

Wojciech Ostrowski[1], Wojciech Dominik[2], Krzysztof Bakuła[1]

w.ostrowski@gik.pw.edu.pl, k.bakula@gik.pw.edu.pl
[1]Department of Photogrammetry, Remote Sensing and Spatial Information Systems, Faculty of Geodesy and Cartography, Warsaw University of Technology, Poland

wojciech.a.dominik@gmail.com
[2]Department of Photogrammetry, Remote Sensing and Spatial Information Systems, Faculty of Geodesy and Cartography, Warsaw University of Technology, Poland;
Okręgowe Przedsiębiorstwo Geodezyjno – Kartograficzne OPEGIEKA Elbląg, Poland

Keywords: airborne laser scanning, building modeling, quality, point density, point cloud

Abstract:
Nowadays, airborne laser scanning become more and more common data source in remote sensing and photogrammetric applications, mostly due to high accuracy of this technique and opportunity of a laser penetration through vegetation. The increase in popularity of this kind of data is also related to its availability in regional and country-wide scanning project in many countries in Europe. Reliable "height information" is crucial for remote sensing studies in urban areas. In many cases LiDAR data are used without any pre-evaluation of quality and accuracy. Such activity may lead to selection incorrect parameters in further procedures and, consequently, to erroneous results in created studies.

In this paper, comparison of four different LIDAR dataset for urban area is presented in aspect of 3D modeling. The most popular methods of 3D city modelling -digital surface models as well as digital reconstruction of building models were investigated with usage of mentioned different datasets. The parameter that was examined was points density, which is essential in case of 3D building modelling. This parameter is a consequence of various flight parameters which were also a subject of investigation. The results provide recommendations concerning the potential applications of LIDAR data of different point densities in aspect of the quality of 3D building modelling.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Urban Remote Sensing Session 1

Carsten Jurgens

Thursday, 19.06.2014, 11:30-12:50, *room 107*

Remote sensing change detection in urban environment of Graz/Austria with very high resolution UltraCam data
Wolfgang Sulzer, Andreas Salentinig
11:30 - 11:50
DETERMINATION OF URBAN DEVELOPMENT IN ISTANBUL FROM SPECTRALLY UNMIXED LANDSAT IMAGERIES
Cihan Uysal, Derya Maktav, Christopher Small
11:50 - 12:10
Extraction of road using object oriented approach in an urban area
Shailesh Shrestha, Claire Smith, Zbigniew Bochenek
12:10 - 12:30
Object Oriented Classification for Sustainable Urban Mapping using Remote Sensing and GIS.
Norzailawati Mohd Noor
12:30 - 12:50

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Remote sensing change detection in urban environment of Graz/Austria with very high resolution UltraCam data

Wolfgang Sulzer, Andreas Salentinig

wolfgang.sulzer@uni-graz.at, andreas.salentinig@gmail.com
University of Graz, Austria
http://www.uni-graz.at/geowww

Keywords: Change Detection, UltraCam, Urban Remote Sensing, Graz

Abstract:

This paper deals with Remote Sensing Change Detection through exploitation of very high resolution UltraCam data (2007 and 2011) in urban environments. The main goal was to find out whether the data is suitable to semi-automatically detect landuse/landcover changes in cities, which are characterized by high heterogeneity and rapid change. In addition to the data, which was captured in the visible as well as in the infrared portion of the electromagnetic spectrum, photogrammetrically derived surface models were available. The theoretical approaches and remote sensing change detection principles are treated in the first part of the paper. The number of change detection methods is enormous and therefore a "state of the art" is presented. In addition environmental and sensor specific considerations, which affect the quality if change detection analyses, are discussed. The second main part is devoted to the development of a change detection method for the city of Graz and its application on two test sites, first, and finally the application on the whole city of Graz. An object-based, knowledge based hybrid change detection method, integrating image differencing, image rationing and principal component analysis was developed and tested. The environmental influence and data properties, which have a major impact on the accuracy of the change detection result, of both dates of the study period (September 2007 and June 2011) are as well examined. The last part of this paper deals with the discussion of the results of the change detection analyses in whole city of Graz and the suitability of the achieved methodology for future available UltraCam datasets of Graz (2015).

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Determination of urban development in Istanbul from spectrally unmixed LANDSAT Imageries

Cihan Uysal[1], Derya Maktav[1], Christopher Small[2]

uysalc@yahoo.com, maktavd@itu.edu.tr
[1] Istanbul Technical University, Turkey

csmall@columbia.edu
[2] Columbia University, United States

Keywords: Urban remote sensing, Istanbul, Unmixing, Landsat, Classificiation

Abstract:
One of the major impacts of the globalisation is the rapid growing of urban areas. In this study, Istanbul the biggest city of Turkey has been selected as study area. As a method, the study area will be valuated for urban growth using a spectral mixture analysis. Normally, remotely sensed images provide a fundamental source of land cover and land use data. Nevertheless, this source has loss in spatial detail because every pixel contains just one measurement for the area. Especially, in areas with heterogeneity like urban areas result in misclassificiations. By unmixing a pixel into its component parts, it is possible to enable a more accurate classificiation of the area. Spectral mixture analysis (SMA) uses linear mixture models to provide physical representations of land surface reflectance as continuous fields of spectral endmember abundances. A spectral mixture analysis of a global composite of 30 spectrally diverse Landsat ETM+ subscenes indicates that a wide variety of ETM+ reflectance spectra can be accurately represented as linear combinations of soil and rock substrate, green vegetation, and dark surface reflectance spectra. A wide variety of individual subscene and composite mixing spaces consistently show similar triangular distributions of mixed reflectances bounded by linear mixtures of the substrate, vegetation, and dark surface endmembers. While the three-endmember substrate, vegetation, dark surface (SVD) linear mixing model does not accommodate some significant characteristics of the three-dimensional mixing space, it is able to represent more than 95% of the 30 million observed ETM+ image spectra with misfits of less than 0.04 reflectance units. Linear binary mixing continua between the dark surface endmember and both the substrate and vegetation endmembers indicate the extent to which shadowing and nonreflective surfaces combine with illuminated substrate and vegetationat subpixel scales to modulate spectrally mixed ETM+ reflectances in a wide variety of land cover types. The objective of the study is to determine urban growth of Istanbul using spectral mixture model which acquires not only urban sprawl but also urban density.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Extraction of road using object oriented approach in an urban area

Shailesh Shrestha[1], Claire Smith[2], Zbigniew Bochenek[1]

shailesh.shrestha@igik.edu.pl, zbigniew.bochenek@igik.edu.pl
[1] Institute of Geodesy and Cartography, Poland

cls53@le.ac.uk
[2] University of Leicester, United Kingdom

Keywords: object-oriented, road detection, segmentation, urban area, mathematical morphology

Abstract:
The increased spatial resolution of remote sensing data provides an added opportunity of analysing any area of interest at a local scale with a very high geometrical detail and paves way for commencement of many new applications related to urban areas. Information concerning road location is very important for assisting decision makers in taking appropriate informed decisions related to urban planning. There exists many different techniques for extraction of roads from high resolution remote sensing images, but majority of techniques is based on per pixel-by-pixel analysis. In this paper, we present a method for road extraction using object-oriented approach in an urban area with complex morphology, where buildings and roads are spectrally similar. More emphasis is given for utilizing contextual information for an optimal road extraction from a high-resolution Quick bird image over an urban area in Warsaw, Poland. Objects initially generated with small-scale Multi-Resolution Segmentation (MRS) are optimized with the conditional image object fusion approach and are continually modified as more expert knowledge is available during the analysis phase. After identification of initial seed objects, we used a region growing algorithm to recover road segments that are not classified. Due to coexistence of diverse heterogeneous objects such as cars, traffic pavement markings and complexities associated with road junction, road extracted can be disjointed. Therefore, an approach to join disconnected road segments using combination of mathematical morphology and neighbourhood proximity analysis is demonstrated. Accuracy assessment based on ground truth data showed effectiveness and reliability of the approach with highly accurate extraction of roads.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Object oriented classification for sustainable urban mapping using remote sensing and GIS.

Norzailawati Mohd Noor

norzailawati@gmail.com
Malaysia

Keywords: Urban land use, SPOT 5, Object-oriented technique, urban planning, Remote sensing and GIS

Abstract:
Appropriate urban planning requires the clarity of urban information particularly on the types of land use and proposed zoning. These are very important in helping residents to assess their rights, based on the gazette plan. Urban areas are characterized by a complex spectral of materials predominately made up of various types of land uses, which are mostly heterogeneous. Thus, using per-pixel classification is not feasible in producing a good classification particularly for an urban land use area. This is because every single pixel has different spectral even though the combination of pixels represents an object. This study discusses the applicability of remote sensing and GIS techniques to classify urban land uses in Malaysia based on object-oriented classification, in order to extract the three components of urban areas, namely residential, commercial and industrial. The areas of interest in this study are Kuala Lumpur and Johor Bahru. The satellite data of SPOT 5 with fine spatial resolution of 2.5 meter and temporal resolution of two to three days of the areas is tested. E-cognition software develops the rule sets of thematic layer attributes to extract the types of land use. The result shows that the three components are clearly identified, with low standard deviation of the classification. The variation is not too dispersed from the mean which proves that the result is acceptable. The findings also show that there have been some changes in the total acreage of recent classification due to the rapid development in the study area. Finally, the application of the object-oriented classification confirms the effectiveness of using remote sensing and GIS techniques in classifying urban land uses. This study also put forth some questions for future researches, which can help strengthen the potentials of remotesensing applications, especially in regards of further explorations of urban issues at various administration levels.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

3D Session 2

Karsten Jacobsen

Friday, 20.06.2014, 09:00-10:30, *room 107*

Global-DEM-based computational identification of suitable sites for reservoir construction
  Loukas Papadakis, Thanasis Stamos, Dimitra Vassilaki
  09:00 - 09:20
Large Area Covering LiDAR Height Models
  Gurcan Buyuksalih, Karsten Jacobsen
  09:20 - 09:40
Building Detection with Multi-view Colour Infra-red Imagery
  Charles M P Beumier, Mahamadou Idrissa
  09:40 - 09:55
Deriving a DTM from a DSM by uniform regions and context
  CHARLES M P BEUMIER, Mahamadou Idrissa
  09:55 - 10:10
Generic Epipolar Resampling Method for Perspective Frame Camera and Linear Push-broom Sensor
  Mahamadou Idrissa, Charles Beumier
  10:10 - 10:30

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Global-DEM-based computational identification of suitable sites for reservoir construction

Loukas Papadakis, Thanasis Stamos, Dimitra Vassilaki

loukaspd@gmail.com, stamthan@central.ntua.gr, dimitra.vassilaki@gmail.com
NTUA, Greece

Keywords: water scarcity, sustainable development, hydrology, dam, reservoir, DEM/DTM, SRTM

Abstract:
Water is vital for the conservation of humans and life in general. During the recent years, numerous, natural and anthropogenic, factors (climate change, polar ice melting, overuse, pollution etc) lead to water shortage and degradation. Valley dammed reservoirs and reservoirs in general are one of the standard and efficient ways to achieve water sustainability. They are also a key solution to the problem of water scarcity for areas of the world where there is lack of fresh water (areas with long periods of drought, islands etc). A wall (dam) is constructed at a very narrow point of a river (or a valley). The dam acts as an obstacle which prevents the water from flowing downstream, and forms an artificial lake in the upstream area. Alternatively a physical depression can be used. The site where a reservoir will be constructed is the result of a multi-criterion decision process. Numerous factors ranging from hydraulic engineering standards, to environmental protection issues and socioeconomic criteria must be taken into account. Such issues are the rainfall and the runoff, the geology, the land use or land cover of the reservoir area etc. A primary and decisive criterion is the morphological suitability of thereservoirarea: there servoir area should be a natural depression of Earth's surface. Traditionally, the morphological suitability is based on the visual inspection and study of small and medium scale maps by experienced hydraulic engineers. This paper focuses on the identification of sites of suitable morphology for the construction of valley dammed reservoirs. More specifically, this paper researches: 1) the computational (automated) identification of suitable sites using a Digital Elevation Model (DEM) and 2) the use of global DEMs for this objective. Four computational approaches were developed, evaluated and compared. They were applied to an extensive area (the whole territory of Greece) using the global SRTM DEM. A selection of the computationally identified sites is presented, analyzed and discussed. The sites are automatically exported to GoogleEarth format for verification. The results are quite promising as they show that: 1) the computational identification of suitable sites for valley dammed reservoirs is possible and 2) global DEMs, despite their coarse resolution and low accuracy, can be used for this objective.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Large area covering LiDAR height models

Gurcan Buyuksalih[1], Karsten Jacobsen[2]

gbuyuksalih@yahoo.com
[1]Dept. of Remote Sensing and GIS, Turkey

karsten@ipi.uni-hannover.de
[2]İnstitute for Photogrammetry and Geoinformation, Germany

Keywords: LiDAR, DEM generation, accuracy, filtering, handling, ortho image

Abstract:

The company BIMTAS, belonging to the Greater Istanbul Municipality, generates a dig-ital eleva-tion model (DEM) for the area of the Greater Istanbul Municipality with a Riegl LSM-Q680i full waveform laser scanner with 400kHz and a used field of view of +/-30°. From approx-imately 600m above ground 16 points per m^2 are achieved with a flying speed of 80kn of the used helicopter. Only over the airport area the flying height had to be raised to 1250m, reducing the frequency to 80 kHz. By organizational reasons the flight strips have been limited to a length of 20km with a side-lap of 50%. The imaging system includes a DigiCam 50 mid-format camera. A precise absolute orientation requires ground control points (GCP), presented by height values of gable roofs to allow also an improvement of horizontal shifts. Because of the very high number of flight lines it is not possible to have GCP for any flight line, so sub-blocks of approximately 10 flight lines have been combined by 3D-transformation based on height points on planes. These sub-blocks have been transformed to the GCP. The varying overlap of neighbored LiDAR-strips in the range of 40% allows a three-dimensional transformation of neighbored, but if 10 strips of a sub-block are transformed together this may lead to unfavorable error propagation. The sub-blocks are only shifted to control point groups with points on inclined roofs and on the ground. Nevertheless a check of the transformed LiDAR-strips by check points results in a vertical accuracy of better as 5cm. Another possibility of joining overlapping LiDAR-strips is a filtering of the point cloud, eliminating points on vegetation and at building limits. Such a transformation uses quite more corresponding points as the method based just on planes and is robust also in areas only with few and not well distributed buildings. The result of transformation is on a similar level. In the control areas points are available at the edges of roofs. If they are combined just with points located on planes, this is not causing problems, but if they are compared with filtered height models, discrepancies appear at building limits, where points on roof and on ground are mixed. The major problem of the LiDAR-points is the data amount. With a density of 16 points/m^2 a sin-gle strips has approximately 500 million ground points, exceeding the capacity of several programs.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Building detection with multi-view colour infra-red imagery

Charles M. P. Beumier, Mahamadou Idrissa

beumier@elec.rma.ac.be, idrissa@elec.rma.ac.be
Royal Military Academy, Belgium

Keywords: Building Detection; Digital Surface Model; Digital Terrain Model; Vegetation Mask

Abstract:

In order to deliver precise cartographic data, National Mapping Agencies (NMAs) need to find changes in the land cover by isolating built zones, road elements, vegetation areas, etc. The traditional update by human interpreters becomes too expensive in time and money so that NMAs are now trying to integrate semi-automatic procedures in their production line. Computer assisted building detection has received much attention for more than two decades. Early developments mostly considered land cover classification or simple geometrical features like lines or rectangles (Shufelt, 1999)). Later studies integrated several types of features to improve robustness (Müller and Zaum, 2005). Nowadays most developments exploit the third dimension thanks to a DSM. In the theses of (Niederöst, 2003) and (Champion, 2011), the elevation feature from a DSM is normalised by a DTM to produce a nDSM representing local elevation. This nDSM is directly used to offer building candidates. Then a vegetation mask is created from spectral features (and possibly an outdated building vector database) to filter out false candidates due to elevated vegetation. The present study concentrates on building detection and follows the approach presented in the previous paragraph: a candidate building is a region of the nDSM sufficiently high and not corresponding to vegetation. First, the aerial stereoscopic images are matched to extract a dense DSM with a proprietary method exploiting multiple views and multiple correlation window sizes. The original image pixel values and the dense DSM are used to derive an ortho-rectified color infrared (CIR) image of the study area. Secondly, a DTM is derived from the DSM thanks to an original approach which extracts DSM regions with slowly varying elevation and filters out regions relatively higher than their neighbourhood. Holes in the DTM are filled in by interpolation between retained regions. Thirdly, a vegetation mask is constructed by keeping pixels with high NDVI values. This mask is adapted to include vegetation in shadow areas where the NDVI is usually underestimated due to reduced spectral resolution. The building mask is the thresholded nDSM filtered by the vegetation mask to exclude elevated vegetation like trees. The proposed building detection approach has been applied to the Vaihingen data set of the ISPRS benchmark about building detection and has been validated by the results of the ISPRS evaluation procedure. The method is quite simple and very fast if the time needed for DSM computation is excluded. It seems to capture a large deal of the image potential when quality scores are compared to those of other methods of the ISPRS test. Most of the errors arise in the shadow areas where image matching for elevation and spectral definition for the vegetation mask suffer from the limited radiometric resolution. We plan to integrate the new DTM extraction and shadow adapted vegetation mask, main contributions of this paper, to our project about change detection for database revision for the Belgian National Geographic Institute.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Deriving a DTM from a DSM by uniform regions and context

Charles M. P. Beumier, Mahamadou Idrissa

beumier@elec.rma.ac.be, idrissa@elec.rma.ac.be
Signal and Image Centre, Royal Military Academy, Belgium

Keywords: Digital Terrain Model, Digital Surface Model segmentation, Building detection

Abstract:

A Digital Terrain Model (DTM) is of huge interest for applications such as environment planning, flood risk evaluation, image ortho-rectification for map creation and building detection, to name a few. In the latter case, a common approach to highlight building candidates exploits the difference between a DSM (Digital Surface Model) and a DTM, to measure local elevation on which to apply a threshold for building detection. A DSM is usually obtained directly from LIDAR acquisition or by photogrammetry with aerial or satellite stereoscopic imagery. On the contrary, a DTM acquisition requires more effort (terrain survey, land cover classification). In case no DTM is available, a handy solution consists in deriving the DTM from the DSM. To derive a DTM from a DSM, the ground pixels have to be identified. Some methods exploit pixel classification based on spectral data (Niederöst, 2003) and database vector data (Champion, 2011) while others apply morphological filters to favour lower (ground) pixels. Refer to (Arefi et Al., 2009) for a review on several morphological approaches. In our previous development (Beumier, 2008) we assigned as DTM value to each pixel, the percentile 10 of the histogram of DSM values in a square neighbourhood of 50x50m around the pixel. This method gives satisfying results in case of small size buildings or woods and where the terrain is rather flat. We propose in this paper a new DTM from DSM approach which consists of three steps: DSMregion segmentation, region selection and height interpolation. First the DSM is segmented into regions of limited slope. A gradient filter is applied to the DSM raster to highlight height transitions. A connected component algorithm labels the different regions separated by those transitions. Secondly, regions whose perimeter is on the average higher than their surrounding are discarded. Finally, a hierarchical interpolation procedure fills the holes in the DSM due to high gradients or discarded regions. This approach is particularly well suited to very high resolution imagery (0.1m), since the segmented regions are sufficiently large. In 1 m imagery, small objects like little streets, terraces and gardens have little chance to be retained as ground surfaces. The proposed algorithm has been applied to the Vaihingen dataset of the ISPRS benchmark and qualitatively validated by the results of its independent evaluation procedure for building detection. In the context of change detection for database revision for the Belgian National Geographic Institute, this new DTM extraction was applied on Brussels data at 7.5cm for which ground truth values from LIDAR are available. This reference data allowed the quantitative evaluation of the DTM errors.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Urban Remote Sensing Session 2

Derya Maktav

Friday, 20.06.2014, 11:30-12:30, *room 107*

The Urban Heat Island of Basel – seen from different perspectives
Eberhard Parlow, Roland Vogt, Christian Feigenwinter
11:30 - 11:50
COMBINING REMOTELY SENSED DATA AND GIS IN MAPPING PROCESS OF URBAN
HEAT ISLANDS IN LIBREVILLE CITY IN GABON
Medard Obiang Ebanega, Jean Aurélien Moukana Libongui
11:50 - 12:10
Hyperspectral discrimination of asbestos-cement roofing
*Malgorzata Krowczynska, Ewa Wilk, Piotr Pabjanek, Bogdan Zagajewski, Adrian
Ochtyra, Marlena Kycko*
12:10 - 12:30

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The Urban Heat Island of Basel – seen from different perspectives

Eberhard Parlow, Roland Vogt, Christian Feigenwinter

eberhard.parlow@unibas.ch, roland.vogt@unibas.ch, christian.feigenwinter@unibas.ch
University Basel, Switzerland
http://www.mcr.unibas.ch

Keywords: Urban heat island, urban climate

Abstract:
Since decades thermal infrared satellite imagery is used for climate studies of avariety of geosystems. One of the first thermal infrared investigations integrated day and night time imagery from the Heat Capacity Mapping Mission (HCMM) in the early 80es. This data offered a spatial resolution of 500 m and to the first time made it possible to analyse urban structures and how surface temperatures are modified by land cover types. With the launch of Landsat-TM-4/TM-5, Landsat-ETM-7 and just recently in 2013 the Landsat Data Continuity Mission (LDCM/Landsat-8) offering a spatial resolution of 120, 60 and 100 m the number of urban climate studies based on satellite thermal imagery increased and even today there is a great number of investigations on the urban climate and/or the urban heat island (UHI) effect using Landsat (TM/ETM/LCDM) or Aster thermal infrared data. Most of these studies try to analyse the urban heat island by means of the surface temperature distribution. It seems that the urban heat island is easy to measure, easy to explain, easy to find, and easy to illustrate. Perhaps due to this apparent simplicity many people seem to jump into UHI studies without fully understanding the nature of the phenomenon as far as time and space scales and processes are concerned and the numerous methodological pitfalls inherent to UHI studies. The essential question is, whether a simple approach like the use of thermal infrared satellite data is appropriate to describe the UHI effect because it completely neglects the local radiation and heat budget as well as the complex interactions between Earth surface and boundary layer atmosphere, which is responsible for air temperature distribution etc. This paper tries to point out that the often considered simplicity of UHI effects is in reality very complex and the different approaches used to analyse the UHI come to quite different results.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Combining remotely sensed data and GIS in mapping process of urban heat Islands in Libreville city in Gabon

Medard Obiang Ebanega, Jean Aurélien Moukana Libongui

obiang_medard@yahoo.fr, jalebremouke_7@hotmail.com
Lagrac, Gabon
http://lagrac.uob.ga

Abstract:
The effects of climate changes during the last 50 years have been seen worldwide. These changes occurred in rural, urban areas, coastal and continental cities. The most important effect of climate change is the increase of temperature, and generating of heat. The intensity of heat is ranging from local, through regional to global scale. Coastal and continental cities are experienced the effect of climate change by Urban Heat Islands (UHI). Libreville is a coastal city and it is located in West Central Africa. It is the capital and largest city of Gabon; it has a port on Komo River, inside the Gulf of Guinea. Libreville features a tropical monsoon climate with a lengthy wet season and short dry season. Libreville's wet season spans from September to May, with a heavy amount of rain. The city's dry season lasts from June through August and is caused by the cold Benguela Current reaching its northern most extent and suppressing rainfall. The lack of cooling vegetation, green space and the high density of human activities in urban areas, and is a result of differences in the energy balances of urban and rural, coastal and continental environments. During the day, cities and the countryside receive energy from the sun and from human activities. This energy is reflected or absorbed and stored for release when the temperature of the surrounding environment drops, at night-time. Differences in where the heat is stored, the amount of heat stored, the rate and extent of energy release and what happens to emitted energy combine to create the UHI. With the use of remote sensing technology, climate changes due to urban growth can be detected. Airborne sensors can provide high resolution images that can be analyzed to identify the different components of the surface energy budget. The clearest local indicator of climate changes due to urban grow this an urban/rural convective circulation known as Urban Heat Islands. Usingremotely sensed data of Landsat (TM, ETM7, and ETM8) surface radiant temperatures were derived in order to understand the spatial distribution of Urban Heat Islands in Libreville during the span of twenty years (1990-2010). Several zones were selected and analyzed from each temperature image. Moreover, the spatial variability of temperature of each image was computed by modeling semivariogram and kriging method, so that the spatial variability of surface radiant temperatures caused by the thermal behavior of different land-cover types and landscape pattern characteristics can be better understood. The effect of urban development on the geographical distribution of surface radiant temperatures and thus on the UHI was also investigated. The results revealed four major heat islands, the first in the south, second in southeast, the third southwest and the fourth in north of the city. The areal extent of the UHIs varied as the season changed. Geographical information data related to each land cover pattern characteristics was used to validate kriging modeling. The calculated correlation coefficients between UIH and main land cover uses and land cover changes categories varies from 0.75 to 0.89.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Hyperspectral discrimination of asbestos-cement roofing

Małgorzata Krówczyńska[1], Ewa Wilk[1], Piotr Pabjanek[2], Bogdan Zagajewski[2],
Adrian Ochtyra[3], Marlena Kycko[2]

malgorzata.krowczynska@wgs84.pl, ewa.wilk@student.uw.edu.pl
[1]University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics
and Remote Sensing, Warsaw; WGS84 Polska Sp. z o.o., Milanówek, Poland

p.pabjanek@uw.edu.pl, bogdan@uw.edu.pl, marlenakycko@student.uw.edu.pl
[2]University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland

adrian.ochtyra@uw.edu.pl
[3]University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland
College of Inter-Faculty Individual Studies in Mathematics and Natural Sciences, Poland

Keywords: hyperspectral data, band selection, spectral discrimination, roof coverings, asbestos

Abstract:
Asbestos-containing products are harmful to human health and therefore their usage and production was banned in 55 countries, including EU. Sinceasbestos-cement roofing account for 90% of asbestos used in the world today, an important issue is to determine the possibilities to map, identifiy and distinguish of asbestos-cement roofing from other roof coverings with the usage of remote sensing data. The objective of this study was to determine the possibilities of differentiation of asbestos-cement roofing (ACR) from other roof coverings based on spectral signatures and the subsequently to select the best bands for classification purposes. Spectral signatures were measured for 43 types of roofing coverings using ASD FieldSpec 3. Roofing coverings were varied as to the composition material (metal sheet, ceramic, cement, asbestos-cement, roofing felt), coating (enamelled, lacquered, matt, clayed, polyester), colour and shape (corrugated, flat). Measurements were performed in the laboratory using samples. Samples of asbestos-cement roofing were collected during field visits and others were acquired from distributors of building materials. The similarity between spectral signatures for all 43 roof coverings was computed as Euclidean distance. Analysis of spectral signatures indicates that there is a possibility of discrimination of ACR from all other roof coverings. The best wavelengths for discrimination of roofing were compared with bandwidth of high-resolution satellites. It was concluded that high resolution satellite sensors data may be use for the discrimination of ACR.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Using remote sensing data in mobile robot navigation in urban areas

Okan Okutkan[1], Derya Maktav[2]

okan.okutkan@digiturk.com.tr
[1]Digiturk Krea A.S., Turkey
http://www.digiturk.com.tr/

maktavd@itu.edu.tr
[2]İstanbul Technical University, Turkey
http://web.itu.edu.tr/maktavd/

Keywords: Mobile Robots, Laser Scanner, GPS, Navigation,

Abstract:
In the field of outdoor navigation of mobile robots in urban areas, GPS data as well as LASER scanners, SONAR, RADAR and LIDAR data are becoming increasingly important. These sensors are mainly used for detection of obstacles around mobile robot, obstacle avoidance, real-time positioning and mapping (SLAM). Relationship between robot's surroundings and its location and orientation obtained using these sensors and used in navigation process. Navigation process is a process of trying to answer the questions "where am I ?", "where will I go ?" and "how will I go ?". The answer given to the first phase of the process, "where am I ?" will determine the accuracy of the navigation process. Regardless of the sophistication level of the navigation path planning algorithms that are used, it is obvious that routes will be calculated incorrectly when wrong initial position data is used as input. In high-budget mobile robot projects, very accurate and thus expensive GPS receivers and other sensors are used. Precise and consistent navigation operations can be performed by using this accurate sensor data. Nowadays, low-cost GPS receivers used in low to medium budget robot projects, have a position accuracy of ± 10 meters in urban areas. With this accuracy, determined position of the GPS receiver can be roughly in 400m2 area. For small or medium-sized mobile robots in some scenarios, an area of this size can cover the entire study area. In such a case robot's exact location in the study area cannot be determined and navigation operations cannot be carried out. Therefore improving the accuracy of GPS information used in mobile robot navigation, is of great importance. In this paper we describe the design and implementation of a unique GPS accuracy improvement algorithm that utilizes 2D laser scanner data and satellite imagery. By combining digital image processing, template matching techniques and laser image, high resolution satellite image, compass and inertial measurement unit (IMU) data we implemented a software algorithm to calculate GPS error correction vector to improve erroneous GPS position read from low cost GPS receiver. 2D laser edge map is generated by plotting angle and distance data pairs read from a laser scanner. Compass and IMU data is used to correct orientation of laser edge map. Online mapping service data is used to match ground resolution of laser edge map to satellite imagery. Our method uses high resolution satellite imagery and Canny edge detection method to generate edge map of the robot's surroundings and uses template matching techniques to align laser edge map generated from 2D laser scanner. In this alignment process GPS error correction vector is calculated by using X and Y axis translations. This method is demonstrated in computer simulations and field experiments. We believe that while a single method cannot be used to create a robust and efficient mobile robot localization and navigation system, our method will improve low-cost GPS receivers' position accuracy in urban areas to be used as an input to localization and navigation planning algorithms.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Urban expansion patterns for Bucharest, Romania using remotely sensed open data analysis

Mihaela Aldea, Florian Petrescu

imihaela@utcb.ro, florianp@utcb.ro
UTCB, Romania
http://iudr.utcb.ro

Abstract:
Is there any spatial pattern for Bucharest urban expansion that occurred during the last 25 years, after the end of cold-war? This is the main question the paper attempts to answer. The applied methodology is based on the analysis of satellite data and follows the one published in 2005 within the study entitled The Dynamics of Global Urban Expansion that was conducted for the Department of Transport and Urban Development of the World Bank. The global sample from the above mentioned study included 120 cities all over the world, but neither Bucharest nor any other city from Romania are contained in the global sample. Also, the paper examines the possibility to use the methodology that was applied for producing the Urban Atlas that was developed within the framework of Copernicus (former GMES) Programme.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

5th Workshop

of

EARSeL Special Interest Group

Geological Applications:

Remote Sensing and Geology "Surveying the GEOsphere"

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

268

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Geohazards I

Thursday, 19.06.2014, 09:00-10:35, *room 105*

Opening Session
> 09:00 - 09:15

Semi-automated mapping of landslide changes in Taiwan by means of object-based image analysis
> *Daniel Hölbling, Barbara Friedl, Clemens Eisank*
> 09:15 - 09:35

Terrain motion of selected abandoned hard coal mines at the north-eastern part of the Upper Silesian Coal Basin (Southern Poland) in a view of SAR interferometric data.
> *Marek Graniczny, Zbigniew Kowalski, Maria Przylucka, Albin Zdanowski, Karsten Zimmermann*
> 09:35 - 09:55

Rockfall risk evaluation using geotechnical survey, remote sensing data and GIS. A case study from western Greece.
> *Konstantinos G. Nikolakopoulos, Nikolaos Depountis, Nikolaos Vagenas, katerina Kavoura, Eleni Vlachaki, George Kelasidis, Nikolaos Sabatakakis*
> 09:55 - 10:15

Seismic precursors and climate fluctuations assessment through time series geospatial and in-situ monitoring data
> *Maria A Zoran, Roxana S Savastru, Dan M Savastru*
> 10:15 - 10:35

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Semi-automated mapping of landslide changes in Taiwan by means of object-based image analysis

Daniel Hölbling, Barbara Friedl, Clemens Eisank

daniel.hoelbling@sbg.ac.at, barbara.friedl@sbg.ac.at, clemens.eisank@sbg.ac.at,

Interfaculty Department of Geoinformatics -Z_GIS, University of Salzburg, Austria

Keywords: Object-based Image Analysis (OBIA), Landslides, Change Detection, Optical Satellite Imagery, Taiwan

Abstract:
The island of Taiwan is located in the tropical and sub-tropical climate zones. During summer and autumn, especially from July to October, Taiwan is regularly affected by typhoons. The heavy rainfalls associated with these tropical storms often cause numerous landslides and debris flows, leading to fatalities and severe damages of infrastructure. Nowadays, Earth observation (EO) data reveal a great value for the detection of new landslides after triggering events, especially if landslides occur in remote and hardly accessible terrain. To exploit the full potential of the wide range of available optical satellite imagery, innovative and reliable change detection methods are needed. Traditionally, pixel-based approaches have been predominantly used for mapping changes based on high or very high resolution images. Yet, pixel-based methods only analyze the change in spectral values for the same pixel locations in multi-temporal images. The salt-and-pepper effect in the resulting change maps significantly reduces the ability of pixel-based techniques to adequately depict natural phenomena such as landslides in their full complexity. To overcome these limitations object-based image analysis (OBIA) has recently been employed for EO-based change mapping. Apart from spectral characteristics, OBIA allows the utilization of spatial, contextual and textural properties. Due to the reduced relevance of spectral information, atmospheric and radiometric correction of images seems to be less important for object-based change detection. The presented object-based change detection approach is developed for a sub-area of the Baichi catchment in northern Taiwan. The study area is characterized by mountainous terrain with steep slopes that are highly susceptible to landslides. The focus lies on landslides caused by the typhoons Aere in 2004 and Matsa in 2005. For both events, pre-and post-disaster optical satellite images, i.e. SPOT images with 2.5 m ground sample distance (GSD), are used for the detection of new landslides. The landslide changes are identified by comparing properties of segmentation-derived image objects between two subsequent images in eCognition (Trimble) software. To improve the transfer ability and robustness of the approach, changes are mainly recognized based on the relative difference in values of band-specific relational features, spectral indices (e.g. the Normalized Difference Vegetation Index - NDVI), and texture measures. The use of absolute spectral thresholds is minimized. The presented approach can be applied for the regular update of landslide inventory maps, but also for the fast identification of landslide-affected areas after triggering events. Furthermore, areas potentially susceptible to landslides may be identified by a retrospective analysis of past landslide events. Results might be of interest for local stakeholders and decision makers, as information on the location and spatial distribution of both new and re-activated landslides can be valuable for disaster prevention and risk management.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Terrain motion of selected abandoned hard coal mines at the north-eastern part of the Upper Silesian Coal Basin (Southern Poland) in a view of SAR interferometric data. Surface deformation in the Upper Silesian Coal Basin

Marek Graniczny[1], Zbigniew Kowalski[1], Maria Przylucka[1], Albin Zdanowski[1], Karsten Zimmermann[2]

marek.graniczny@pgi.gov.pl, zbigniew.kowalski@pgi.gov.pl, maria.przylucka@pgi.gov.pl, albin.zdanowski@pgi.gov.pl

[1] Polish Geological Institute – National Research Institute, Poland
http://www.pgi.gov.pl

Karsten.Zimmermann@dmt.de
[2] DMT GmbH & Co. KG, Germany

Keywords: Upper Silesian Coal Basin (USCB), mining, subsidence, hydrogeology, ground monitoring, interferometry, PSInSAR

Abstract:
Application of PSInSAR satellite interferometric method for observations of ground deformations in the north-eastern part of the USCB is presented in this paper. The presented results were obtained during realization of TERRAFIRMA projects (EC FP7). Interferometric datasets came from two different SAR satellites: ERS and ENVISAT. First data set was obtained from Terrafirma 1"Sosnowiec" Project and consist of 54 of the ERS 1 and ERS-2 scenes registered between 1992 and 2003 and processed by Tele-Rilevamento Europa -T.R.E. Second data set was Terrafirma 2 "Bedzin" Project and consist of 31 ENVISAT scenes registered between 2003 and 2010 and processed by Gamma Remote Sensing AG. As test sites four hard coal mines located in Upper Silesian Coal Basin were selected. For "Saturn" and "Paryż" mines exploitation of coal stopped in 1995. Remaining two mines -"Sosnowiec" and "Grodziec" finished exploitation in 1997 and 1998, respectively. After the closure of mine underground waters rising up and return to natural horizon. Therefore, the ongoing process of flooding of the successive levels creates the risks associated with:
• 	Accumulation of large amounts of water in exploited seams and forming underground reservoirs.
• 	Increased water pressure in the previously drained and now water inflowed bedrock.
• 	Change properties of bedrock as a result of damage to the rock structure due to drying and secondary water saturation. Water inflow in the mine may also cause different phenomena like surface instability (subsidence, uplift), induced seismicity and chemical degradation of the water. In Poland the Central Department of Mine Dewatering is responsible for dewatering operations in abandoned mines. The paper presents the relationship between dewatering process in closed mines and surface changes indicated on the satellite interferometric data. The first "Terrafirma Sosnowiec" PSInSAR dataset from 1992 to 2003 shows active mines and indicates values of ground motions from -9.4 to +2.1 mm per year. It is estimated that 97 % of PS points show subsidence. On the other hand second PSInSAR database (Terrafirma "Bedzin") from 2003 to 2010, in the period of abandoned mines shows values from -7.6 to +9.8. Almost 97 % of PS points indicating uplift of the terrain. In common opinion after period of 5 years from mine closure the area is considered as safe. The obtained results show that it is not true, and the ground motions still exist at these area. This may lead to generating potential hazard to people, buildings and infrastructure.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Rockfall risk evaluation using geotechnical survey, remote sensing data and GIS. A case study from western Greece.

Konstantinos G. Nikolakopoulos, Nikolaos Depountis, Nikolaos Vagenas, Katerina Kavoura, Eleni Vlachaki, George Kelasidis, Nikolaos Sabatakakis

knikolakop@upatras.gr, nikosdepountis@hotmail.com, kavoura@upatras.gr, sabatak@geology.upatras.gr

University of Patras, Greece

Keywords: rockfall, geotechnical study, remote sensing, GIS

Abstract:
Rockfalls occur when rocks break away from a slope. The release mechanism can be natural, such as during the freeze-thaw cycle or as result of an earthquake, or anthropogenic, as in an open-pit mine or rock quarry. Rock falls can pose significant hazards to infrastructure such as highways, buildings, and mine open pits and, sometimes, result in personal injury or death. Their prediction (rockfall trajectory simulation) is a difficult task fraught with uncertainty and demanding a multivariate analysis. Rockfall trajectory simulation should take into account the geometry of the slope, the geological material, the shape and the mass of the rock and the maximum dissipated energy upon the impact of the block on a slope segment. Digital Surface models created from airphotos or high resolution satellite stereo-pairs can provide the necessary information in order to simulate as good as possible the relief and the slope geometry. In situ geological mapping and laboratory experiments can provide the necessary geotechnical information the reaction of the geological surface. Specific software is needed to predict the kinetic energy, and run-out distance and the height of bounce of a potential falling rock. Given the large uncertainties of the problem, thousands of trajectories should be taken into account or spatial analysis in GIS environment should be done in order to design effective remedial measures. In this paper a specific example of the synergistic use of geotechnical survey, remote sensing data and GIS for rockfall risk evaluation is presented. The study area is located in Western Greece. Extensive rockfalls have been recorded along Patras – Ioannina highway just after the cable-stayed bridge of Rio-Antirrio, at Klokova site. The rockfalls include medium-sized limestone boulders with volume up to $1.5m^3$. A detailed engineering geological survey was conducted including rockmass characterization, laboratory testing and geological -geotechnical mapping. Many Rockfall trajectory simulations were done. Rockfall risk along the road was estimated using spatial analysis in a GIS environment.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Seismic precursors and climate fluctuations assessment through time series geospatial and in-situ monitoring data

Maria A. Zoran, Roxana S. Savastru, Dan M. Savastru

maria@dnt.ro, rsavas@inoe.ro, dsavas@inoe.ro

National Institute of R&D for Optoelectronics, Romania

Abstract:
Results of recent investigations suggest that climate change tends to exacerbate geo-disasters like as earthquake events. Earthquake science has entered a new era with the development of space-based technologies to measure surface geophysical parameters and deformation at the boundaries of tectonic plates and large faults. Different criteria can be used to select the remote sensed earthquake pre-signals for which there is an evidence for anomalies in the geophysical observables. Observations from Earth orbiting satellites are complementary to local and regional airborne observations, and to traditional in field measurements and ground-based sensor networks. Rock microfracturing in the Earth's crust preceding a seismic rupture may cause local surface deformation fields, rock dislocations, charged particle generation and motion, electrical conductivity changes, gas emission, fluid diffusion, electrokinetic, piezomagnetic and piezoelectric effects as well as climate fluctuations. Space-time anomalies of Earth's emitted radiation (thermal infrared radiation linked to air and land surface temperature variations recorded from satellite months to weeks before the occurrence of earthquakes, radon in underground water, soil and near the ground air, etc.), ionospheric and electromagnetic anomalies are considered as earthquake precursors. At land surface, energy fluxes interact instantaneously with each other in accordance with the prevailing meteorological conditions and the specific thermal and radiative characteristics of the soil surface. This paper aims to investigate changes of the seismic pre-signals (air and land surface temperature, sensible latent heat flux and outgoing long-wave radiation) for some earthquakes recorded in Vrancea seismic region in Romania. Land surface and near-surface air temperature as well as sensible latent heat flux parameters were analyzed both on short-term and long-term intervals and within a year before and after the strong earthquakes. Based on local tectonic geology, hydrology and meteorology, such findings support lithosphere–ionosphere coupling theory.

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Poster Session

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

274

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Landsat ETM+ digital image processing techniques for lithological enhancement, along Qena – Safaga Road, Eastern Desret, Egypt

Abdelrahman Khalifa, Ziyadin Cakir

abdelrahman.geology@gmail.com, Ziyadin@gmail.com

Istanbul Technical University, Turkey

Keywords: Remote sensing, spectral enhancement, band ratio, image transformation, image filtering.

Abstract:
Remote sensing investigations have been applied to study the area around Qena-Safaga Road in central south Egypt covering the area east and west banks of the Road. It is about 12932.5 km^2, which stretches from Latitudes 26º 05'N to 27º 00'N and from longitudes 32º 25' E to 34º 09'E. Therefore, this study highlight some digital image processing techniques using Landsat ETM+ data to show their role in enhancing lithological units which leading to more accurate and improvement of geological mapping. Landsat Enhanced Thematic Mapper Plus (ETM+) imageries among other Satellites provide a number of bands in the visible, SWIR and thermal infrared regions, centred on particular spectral features due to different kinds of surface material. They are available and free of charge via the USGS Global visualization Viewer (http://glovis.usgs.gov). The selection of the imageries was based on the acquisition date, availability and spatial resolution as well as the user need. A total of four ETM+ scenes have been utilized in this study (p175r41, p175r42 (23/1/2000), p174r41 and p174r42 (29/11/1999)). The selected bands include band 1 through band 5 and band 7 (Visible & Reflected Infrared "VNIR") that characterized with 30 m spatial resolution. In addition to band 8 as the Panchromatic band (15 m). The thermal Infrared band 6 has been excluded for its low spatial resolution (60 m). ERDAS IMAGINE 8.6 software package is used in digital processing to enhance the quality of the satellite raw digital data and produce image suitable for visual geological interpretation. Geo-referenced topographical maps (NG – 36 K5a & K5b-named Jabal Wairah and Safaga sheets, respectively) were overlaid on the subset Landsat ETM+ imageries to create a field map (scale 1:100,000) using Arc GIS 10 software. The map facilitated image classification and post-classification processing for geological information extraction. The major role of digital image processing is to increase the extracted geological information through the enhancement of the qualities of tones and hues, image textures, fracture patterns, lineaments and their trends. Based on the objectives and techniques, digital image processing can be categorized into: (i) pre-processing techniques including geometric and radiometric corrections of the satellite raw data; mosaicing and subsetting techniques for the targeted area. (ii) Image enhancement techniques involve procedures for creation of new modified images that contain more information to ease the visual interpretations of certain features (spectral enhancement and spatial enhancement). Moreover, digital image processing ended by the information extraction procedures including image classification techniques. The major problem faced in conventional geological mapping is the accurate delineation of geological boundaries and tracing the regional tectonic structures. This study demonstrated the potential of digital image processing technologies for geological discrimination and enhancement. Landsat ETM+ satellite data were used, to study the area along the Qena-Safaga road. Several digital image processing techniques were applied to improve visual image interpretation for geological purposes, such as Lithological identification. Spectral and spatial enhancements are the main digital image processing techniques. For example, Contrast stretched colour composite images 7, 5, 2 & 5, 7, 4, and 7, 4, 2 set in R, G, B respectively were used to extract the initial geological information. The band ratio colour composite image 2/4*7, 7/1, 5/1 set into R, G, B respectively, showed clear discrimination of felsic and granitic rocks from mafic and ultramafic lithology of ophiolitic origin.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Investigating strong mining-inducted ground subsidence with X-band SAR interferometry in Upper Silesia in Poland. Bytom case study

Maria Przylucka[1], Marek Graniczny[1], Gerardo Herrera[2]

maria.przylucka@pgi.gov.pl, marek.graniczny@pgi.gov.pl

[1] Polish Geological Institute – National Research Institute, Poland
http://www.pgi.gov.pl

g.herrera@igme.es
[2] Instituto Geológico y Minero de España, Spain

Keywords: InSAR, mining-induced subsidence, PSInSAR, Upper Silesia Coal Basin

Abstract:
The Upper Silesian Coal Basin is one of the biggest coal basin in Europe located in southern Poland. Currently there are 30 still operating mines. Underground exploitation of coal deposits causes changes in the rock mass and terrain surface. The mechanical strength of the rocks is reduced and as a consequence surface deformation occur. Deformation after single wall excavation forms a basin on the ground, which biggest subsidence value usually reaches 0,75-2,0 m. Because deformations coming form works operated at different levels are added together, the total displacement in several years could reach several meters. Most of the underground works take place under forests and agricultural areas, not influencing social life in the cities. However there are still many places in urban areas, where damaged is significant. Bytom city is one of such examples, where coal has been exploited science 1902. Now city suffers from ground motion, which often lead to damage to linear structures like roads, railways, gas and water pipelines, electric power lines and buildings. One of the most extreme events happened in July 2011, when 600 people from 28 houses were evacuated because of the threat of collapse of the buildings. Different methods are used for evaluating hazards caused by deep hard coal mining. These methods include mostly geodetic surveying and GPS measurements. Satellite Synthetic Aperture Radar Interferometry (InSAR) data can successfully complement geodetic measurement by providing large coverage of information about value and range of the ground displacement. In this study data from TerraSAR-X satellite were used. Data were obtained within Doris project co-founded by European Commission under FP7/2007-2013 Grant Agreement n. 242212. Processing of 30 images acquired for period 05/07/2011 to 21/06/2012 was done by the Tele-Rilevamento Europa -T.R.E. s.r.l. form Italy. X-band wavelength proved to be very helpful tool for investigating very fast movements, directly connected with underground mining activity. In this study data processed in two InSAR techniques were used: 28 raster differential interferograms and more than 800 000 permanent scatterers (PS) points. Interferograms helped to estimate total displacement values of the subsidence troughs, which were formed during one year of exploitation. Subsidence seen at one interferogram reaches up to 6 cm in 11-days time span. Deformation added from few subsequent interferograms reaches valued up to few decimeters in few months. At the sometime PS points have carried information about the slower (up to minus 14 cm per year) movements that occur on the boarder of mining area, allowing to estimate area under influence of mining-inducted movements.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Wytch Farm Oilfield: evaluation of ISBAS approach for oil production

Anna Klimkowska

akli@pgi.gov.pl

Polish Geological Institute-National Research Institute, Poland

Keywords: Oil Field, InSAR, ISBAS

Abstract:
Oil production is one of the main reasons for land deformation all over the World and has asignificant impact on the land motion and subsidence. Many techniques such as GPS or precise leveling have been implemented to monitor land motion caused by oil extraction. Even though these methods bring precise results, their coverage is relatively poor. As an alternative approach InSAR is being used. This method has been developed to detect changes on the Earth's surface by combining SAR images which were acquired over the same area but at different times. One of the biggest advantages of InSAR is density of executed points and their high accuracy. This disposes many scientists to develop different algorithms to improve the reliability and quality of obtained outcomes.

This paper discuss the usage of ISBAS approach was used to detect any land uplifts or subsidence over the Wytch Farm oilfield, England, between the years 1993-1999. ISBAS method, which is an extended version of SBAS method, was developed to improve results over forests, rural and agricultural terrain. In this technique multilooked, low-resolution approach is used to deriver the linear components of land motion for large scale deformation. Data used in this project was as follows: 34 ERS-2 SAR images provided by European Space Agency (ESA) and SRTM digital elevation model (DEM). Processing was divided into two steps. First, linear analysis was carried out to estimate the mean LOS velocity and height errors. Next non-linear analysis was undertaken to calculate non-linear deformation. Linear analysis suggests that no significant land motion took place in the Wytch Farm oilfield due to oil extraction between 1995 and 1999. Results from non-linear analysis allow to further estimate SBAS approach over the rural areas. Even though results showed no clear evidence for negative impact of oil production on the investigated area, the ISBAS approach allows one to calculate results over a demanding vegetation area, and suggest in which direction further studies should be carried out.

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Geoarchaeological observations in the wider area of Nemea using airphotos and GIS

Konstantina Mexia

mexiak@yahoo.com

University of Patras, Greece

Keywords: GEOARCAELOGY, AIRPHOTOS, GIS

Abstract:
The object of the present paper is to study the flow of river systems Asopos and Nemeas-which are in the wider area of the Nemea archaeological site -in order to understand how the evolution of these rivers in time affected the whole area. The study area is a section of the NE part of the Peloponnese, specifically the zone between the villages of Velo and Vrachati. In order to access our goal aerial photographs and GIS analysis were used. The geomorphological and tectonic analysis of the area and the development and evolution of settlements therein (based on archaeological studies) gave us clues about the form of the terrain over time. The main factors affecting the form of the terrain (intense tectonic activity and retrogressive erosion) were not adequate reasons -in our case -to effect immediate abandonment of the area (since they are fairly slow processes – in the human timescale). Their effect, however, is evident over time, in the form of gradual abandonment of sites, movement of settlements or the creation of new settlements.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Landlside Inventory using a GISMA system extended with statistical adaptive methods

Maria Kordouli, Katerina Kavoura, Konstantinos Nikolakopoulos, Nikolaos Sabatakakis

kordouli@upatras.gr, kavoura@upatras.gr, knikolakop@upatras.gr, sabatak@upatras.gr

Greece

Keywords: GIS, GISMA, LANDSLIDES, WEBGIS

Abstract:
The development of Internet technologies and the applications of global geographic maps, such as Google Maps, have given a rapid development in the field of Geographic Information Systems (GIS). New models like the GISMA (Geographic Information System Multi Administration), where information is administrated from multiple users from different places of the world, have been already studied. In these systems information security, the possibility of extensibility, the ability of self-management and self-development of the system are of vital importance. Thus, each user should have specific rights, be able to receive results from different mathematical and statistical methods, update or not the data etc. In this work we present a GISMA system that has been developed to manage information for Landslides in the region of Achaia. This system follows the basic principles of GISMA. The system has the ability to display information on Google Maps in order to display the information anywhere in the world via the internet. Authorized users in different places of the world, depending on their rights, can enter data in the system, enter new mathematical and statistical processes in order to analyze the data, and additionally add new tables and fields in the database for more complex analysis. Finally, the implementation and evaluation of the system showed that GISMA systems are a flexible solution in the case that GIS systems are handled by several users as research systems for Business Administration or Government Organizations.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Using multi-temporal airborne laser scanning data and the GIS spatial analyses for the study of the morphodynamic processes of the southern Baltic coast (Wolin Island, Baltic Sea, Poland).

Joanna Dudzińska-Nowak[1], Piotr Wężyk[2]

jotde@univ.szczecin.pl
[1] University of Szczecin, Poland

rlwezyk@cyf-kr.edu.pl
[2] University of Agriculture in Kraków, Poland

Keywords: airborne laser scanning, GIS spatial analyses, volumetric cliff changes, coastal erosion, storm surges

Abstract:
Recently observed climate change, in particular the accelerated sea level rise and increased intensity of extreme storm events -cause greater interest in issues relating to the coastal zone. In terms of security of the infrastructure much attention is paid to issues related to the determination of the range and rate of coastal erosion and analysis of the balance of the material supplied from the coast and displaced as a result of sediment transport. The aim of this study was to determine the volume and spatial distribution of changes in the active surface of the cliff and the beach on the basis of GIS-based modeling of the digital terrain model (DTM) generated on a base of multi-temporal data from airborne laser scanning (ALS). The results are discussed in terms of geological, geomorphological, hydrodynamic and hydrological conditions. The study area includes the 2 km long section of the southern Baltic Sea cliff coast, Wolin Island built of Pleisctocene glacial till and glaciofluvial sands with NW exposure and maximum height 93 m. ALS point cloud data series were collected in years: 2008, 2009, 2011 and 2012 and processed to relative align and given the georeference compiled on the basis of the planar surfaces of building roofs. Relative alignment of ALS data sets based on the measurements from 2012 (considered as the reference). Obtained relative deviations of ALS point clouds did not exceed 5 cm in the vertical and several cm horizontally. DTM's for each data set were generated from class "ground" classified in the TerraScan (Terrasolid) software. The 3D spatial analysis on volume changes was carried out using ArcGIS Esri (Spatial Analyst module / CutFill). The results were presented as a maps of spatial distribution of the changes. Comparison of DTM from different years allowed to determine the size of volumetric changes of the coast and their spatial distribution. Large spatial and temporal variability of morphodynamic processes was observed, even on adjacent sections of the coast. The time period 2008-2012 is dominated by erosion expressed by a negative sediment balance of -33,000 m^3. The volume of eroded material was 49,080 m^3, while the volume of accumulated material – 15,678 m^3. The biggest changes were observed in the upper parts of active cliff as a result of mass wasting triggered by loss of the slope stability due to erosion of lower part of the slope. Significant erosion also occurred on the lower part of the cliff and on the beach. The accumulation is a consequence of material deposition on the beach and at the cliff base. Erosion could be correlated with the number of storm events and water levels. The results confirm previous studies on role of factors that regulate the magnitude of coastal erosion, the first being water level rise during the storm events as well as the influence of series of storms. In the case of the cliff coast lithology and hydrologic factors play also an important role. Performed study also confirmed that the state-of-the-art technology like ALS should be used for modeling of very precise DTM even for the forested areas.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Combining geotechnical modeling and persistent scatterers interferometry for landslide study in a small scale inhabited area

Issaak Parcharidis[1], Constantine Stamatopoulos[2], Michael Foumelis[3],
George Benekos[1], Lydia Balla[2]

parchar@hua.gr, benekos@hua.gr,

[1] Harokopio University of Athens, Department of Geography, El. Venizelou 70 Kallithea,
17671 Athens, Greece

info@saa-geotech.gr
[2] Stamatopoulos and Associates Co, Isavron 5, 11471, Athens, Greece

michael.foumelis@esa.int,
[3] European Space Agency (ESA-ESRIN), Research and Development Section, Science,
Applications and Future Technologies Dept., Frascati (Rome), Italy

Keywords: Geotechnical modeling, multi-block model, SAR interferometry, persistent scatterers interferometry, landslides, Central Greece

Abstract:
The aim of this study concerns the development and validation of a methodology by combining, (a) ground deformation monitoring based on PSI (Persistent Scatterers Intrferometry) processing of radar data and (b) geotechnical modeling of the displacement, in order to predict and mitigate the risk of ground displacement cased by slope instability. The study area is located in Kerasia village at Plastiras Lake Municipality (Larissa, Central Greece). The problem under treatment is a creeping landslide in an inhabited area. PSI processing using a data set of ERS-1/2 scenes for the period 1992-2000 was applied to retrieve the displacement history of the of the area for the considered time interval. Geotechnical modeling is based on the sliding-block-model and specifically on the multi-block model. Finally an approach is proposed combining geotechnical analysis and space-based displacement measurements to predict and mitigate landslide risk based on the mechanism of progressive movement of slides.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Hyperspectral

Thursday, 19.06.2014, 11:30-12:50, *room 105*

Using synthetic mixtures of rocks and lichens for detecting the spectral properties of gossans in the Cape Smith Belt, northern Quebec, Canada
Kati Laakso, Benoit Rivard, Derek Rogge
11:30 - 11:50

Hyperspectral Satellite Sensors for Mineral Exploration, new applications to the EnMAP Mission
Christian Mielke, Nina Boesche, Christian Rogass, Hermann Kaufmann
11:50 - 12:10

Sub pixel mapping of alteration minerals using SOM neural network model and Hyperion data
Mohammad Hassan Tayebi, Majid H Tangestani
12:10 - 12:30

High resolution remote sensing stereo-data and GIS for open-pit mine monitoring
Nikos G. Argyropoulos, Konstantinos G. Nikolakopoulos, Konstantina Dimitropoulou
12:30 - 12:50

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Using synthetic mixtures of rocks and lichens for detecting the spectral properties of gossans in the Cape Smith Belt, northern Quebec, Canada

Kati Laakso[1], Benoit Rivard[1], Derek Rogge[2]

laakso@ualberta.ca, Benoit.Rivard@ualberta.ca,
[1] University of Alberta, Department of Earth and Atmospheric Sciences, Edmonton, Canada
http://www.coresensing.net/laakso.html

Derek.Rogge@dlr.de
[2] German Aerospace Center (DLR) Oberpfaffenhofen, Weßling, Germany

Keywords: Gossans, iron oxide minerals, hyperspectral remote sensing, mineral exploration, the Cape Smith Belt

Abstract:
Ore deposits are sometimes covered by oxidized surfaces that form at or near surface where ferrous iron and sulphide minerals are unstable in the presence of weathering agents. Subsequently these minerals are converted to oxyhydroxide, oxide and sulphate minerals to form gossans, where specific iron oxide assemblages can be associated with ore bodies and potentially correlated with a definite host rock composition. Owing to the links between gossans and ore deposits, much attention has been paid to mapping gossans by remote sensing means. In some studies the spectral shape of gossans in the visible-near infrared wavelength region has been exploited for determining their mineralogical composition. However, little attention has been paid to the possible effects of spectral mixing of oxidized surfaces with lichens or host rock substrates. In this study we have investigated the effects of lichens and host rocks on the spectral properties of gossans by means of near-infrared and short-wave infrared hyperspectral data acquired from samples and from airborne data for the Ni-Cu bearing Cape Smith Belt in northern Canada. Fifty-eight rock samples, twenty-three of which are gossans, were collected from the study area across sedimentary, mafic and ultramafic rocks. Spectral measurements were acquired from these samples by means of the ASD FieldSpec 3 spectrometer and Sisurock imaging system that acquires sample imagery at high spatial resolution (0.8 mm in the visible-near infrared region). These measurements were used to build a series of synthetic spectral mixtures comparing gossans to lichens and rocks that do not have an oxidized surface. The analysis was constrained by means of X-ray diffraction, which provided information on the mineralogy of the samples. The synthetic mixtures were used to investigate the effects of lichens and rock substrates on spectra of gossans. Furthermore, the laboratory spectrometry of the gossan samples was compared to 10.7 km2 of hyperspectral airborne imagery acquired over the study area where the objective was to study how lichens affect the spectral properties of gossans at a large scale. Results show that different lichen species have an impact on the spectral shape of gossans in the near infrared wavelength region, consistent with previous studies. Moreover, some gossans are optically thin, meaning that the thickness of the oxidized surface does not completely prevent the transmission of light onto the host rock mineralogy. Implications include: i) the host rock mineralogy can be spectrally mixed with the gossan mineralogy and ii) the host rock mineralogy can be detected by remote sensing means. The latter finding is important from a mineral exploration point of view, especially in areas where there is a known association between specific rock types and ore deposits. However, our findings also suggest that the spectral shape of the iron oxide minerals can only be relied upon as a mineral identification method in the absence of lichens and when the gossans are optically thick.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Hyperspectral satellite sensors for mineral exploration, new applications to the EnMAP Mission

Christian Mielke, Nina Boesche, Christian Rogass, Hermann Kaufmann

chmielke@gfz-potsdam.de

GFZ German Research Centre for Geosciences, Germany

Keywords: EnMAP, Hyperion, Namibia, Exploration

Abstract:
Imaging spectroscopy is a widely used tool in mineral exploration today, with many companies that offer the full service package: (data acquisition, preprocessing and product delivery). These exploration projects rely on airborne imaging spectrometers such as Hymap, AISA or Hyspex. This data is usually scarce and expensive and may not be available to academic research. The only operational spaceborne imaging spectrometer that covers the full spectral range from the visible to the shortwave infrared is Hyperion aboard EO-1, which has been providing data for over a decade now. New and advanced spaceborne imaging spectrometers such as the Environmental Mapping and analysis Program (EnMAP) will provide new data for research in the field of imaging spectroscopy for mineral exploration. This study presents a comparison of the mapping capabilities between the Hyperion and EnMAP sensors, on the basis of simulated EnMAP data. This is shown with an example from a porphyry copper complex in southern Namibia (Haib River). Here the influence of different sensor characteristics (e.g. Signal to Noise Ratio, spectral resolution) on classification routines is demonstrated. A special focus is hereby the influence of preprocessing techniques and sensor parameters on automatic mapping routines and expert systems, such as EnGeoMAP and the USGS Tetracorder/Mica.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Sub pixel mapping of alteration minerals using SOM neural network model and Hyperion data

Mohammad Hassan Tayebi[1], Majid H Tangestani[2]

mhtayebi@shirazu.ac.ir
[1] Ph.D student, Islamic Republic of Iran

tangestani@susc.ac.ir
[2] Associate Professor, Islamic Republic of Iran

Keywords: SOM. Neural network. Sub pixel. Hyperion. Alteration mapping. Volcano

Abstract:
This study applies the self-organizing map (SOM) neural network model for sub pixel mapping of alteration minerals in Masahim volcano, SE Iran,using Hyperiondata. Fourend-membersincluding sericite, kaolinite, epidote, and montmorillonite/illite were identified from the imagery, and based on them training areas were generated and used to train the model. Numerous tests were conducted for selecting optimal neural network architecture. The confusion matrix was calculated to identify the accuracy of map produced by SOM. The confusion matrix indicated that among the different architectures for SOM, the result of 55 × 55 array of nodes with overall accuracy of 83% was the best architecture in describing the spatial distribution of alteration unit. The result showed that classification process of the SOM is slow, and the accuracy level is related to the size of the feature map. The mapping results revealed that kaolinite, sericite and montmorillonite/illite are emplaced at the caldera of volcano and epidote mainly found at northwestern part of caldera. It is concluded that the SOM can be useful in mineral mapping and exploration activities.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

High resolution remote sensing stereo-data and GIS for open-pit mine monitoring

Nikos G. Argyropoulos, Konstantinos G. Nikolakopoulos, Konstantina Dimitropoulou

n.argiropgeo@gmail.com
Greece

Keywords: mine monitoring, photogrammetry, GIS, stereopairs

Abstract:
The scope of this project is the periodic monitoring of the excavation volumes of open-pit mines, using high resolution satellite imagery stereopairs and photogrammetric methods. Two different mines located the first one at North Greece and the second one in Attiki Peninsula compose the study areas. Cartosat and ALOS Prism stereo pairs with 2,5m spatial resolution were used. The CARTOSAT-1 spacecraft launched by the Indian Space Research Organisation in May 2005 is dedicated to stereo viewing for large-scale mapping and terrain modeling applications. It is configured with two panchromatic cameras, AFT (Afterward looking) and FORE (Foreword looking) with a spatial resolution of 2.5 m, which facilitates along-track stereo vision of the imaging scene. It covers a swath of ≈30 km with a base-to-height ratio of 0.62. The time difference between the acquisitions of the same scene by two cameras is about 52 sec. The PRISM sensor onboard ALOS contains three independent optical systems (radiometers) that allow for viewing in the Nadir direction, as well as forward and backward directions. This allows for the production of a stereoscopic image along the satellite's track. Forward and backward radiometers are inclined + and – 23.8 degrees from nadir to realize a base-to-height ratio of one. PRISM data is collected in a single band (panchromatic) with a wavelength of 0.52 to 0.77 micrometers. The spatial resolution of PRISM is 2.5m (when viewing in the Nadir direction). Swath width of PRISM is 70km when viewing in the Nadir direction, and 35km when in triplet mode. The same ground control points were used for the creation of the DSMs from both CARTOSAT and ALOS PRISM stereopairs in order to eliminate horizontal and vertical discrepancies. Using LPS 3D models of the open mines were created. The head and the foot of every plane in the mine was digitized. The final step was the comparison of both 3D models' shapefiles using ArcMap 10.1® in order to calculate the excavation volumes. The excavation volumes were calculated taking into account the area of the planes and the height of every plane and the results are presented in this paper.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Geohazards II

Thursday, 19.06.2014, 14:00-15:20, *room 105*

High resolution space- and air-borne multispectral data combined with borehole information provide insight on slope hydrogeology and seasonal landslide activity
Janusz Wasowski, Marina Dipalma Lagreca, Caterina Lamanna, Guido Pasquariello
14:00 - 14:20

Surface displacements of the 2014 Cephalonia (Greece) earthquake using high resolution SAR Interferometry
George Benekos, Konstantinos Derdelakos, Christos Bountzouklis, Penelope Kourkouli
14:20 - 14:40

Appraisal of the damages caused by the 12th January 2010 Haiti earthquake by ASTER multitemporal imagery analysis
STAVROULA KANAKAKI, Issaak Parcharidis, Maurizio Poscolieri
14:40 - 15:00

Assessing the quality of DSM from ALOS optical and radar data for Hydrological Applications
Konstantinos G. Nikolakopoulos, Christos Choussiafis
15:00 - 15:20

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

High resolution space-and air-borne multispectral data combined with borehole information provide insight on slope hydrogeology and seasonal landslide activity

Janusz Wasowski[1], Marina Dipalma Lagreca[2], Caterina Lamanna[1], Guido Pasquariello[3]

j.wasowski@ba.irpi.cnr.it
[1] CNR-IRPI (National Research Council), Bari, Italy

[2] University of Bari Italy

[3] CNR-ISSIA, Bari, Italy

Keywords: multispectral imagery, surface-water, piezometer data, hydrogeology, landslide activity

Abstract:
We use satellite imagery and airphotos, focusing on water as a critical factor of the recurrent instability of poorly drained slopes in a 15.6 km2 catchment area in the Apennine mountains (Italy) characterized by predominance of clay-rich flysch units and agricultural land use. We expand on our recent study that exploited IKONOS-2 imagery of early spring 2006 for mapping active landslides, investigating their association with seasonally wet zones (areas covered by free surface-water including ponds, migrating surface-water, seeps), and for inferring surface-subsurface water relationships in unstable slopes. In particular, we use sub-meter resolution multispectral orthophotos acquired in late winter of 2011 to map the distributions of active landslides and wet zones. Significant spatial-temporal recurrence of these features is indicated from a comparison of the 2011 and 2006 inventories. Furthermore, by considering the precipitation records and using the extensive subsurface dataset from piezometer boreholes (monitoring since 2009) we show that a number of remotely sensed wet zones are indicative of sites with seasonally persistent very high ground water levels within landslide-prone slopes and on intermittently active landslides. Where such surface-subsurface water linkage can be established, the appearance of the wet zones resulting from groundwater discharge or seepage can be used as a forewarning signal of the increased susceptibility to landsliding, since the hillslopes with shallow groundwater tables are generally more prone to failure. This work also suggests that useful information about surface-water conditions can be obtained in settings with similar topography (shallow slopes), lithology (clay-rich) and land use/land cover (agricultural soils with little woodland).

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Surface displacements of the 2014 Cephalonia (Greece) earthquake using high resolution SAR Interferometry

George Benekos[1], Konstantinos Derdelakos[1], Christos Bountzouklis[1], Penelope Kourkouli[2]

benekos@hua.gr, gs20953@hua.gr, chris-boun@hotmail.com
[1] Harokopio University of Athens, Department of Geography, El. Venizelou 70 Kallithea, 17671 Athens, Greece

kourkouli@gamma-rs.ch
[2] GAMMA Remote Sensing, Worbstrasse 225, CH-3073, Gümligen, Switzerland
University of Leicester, Department of Geography, University Road, Leicester, LE1 7RH, UK

Keywords: SAR Interferometry, DInSAR, Surface displacements, TerraSAR-X, Cephalonia's earthquake

Abstract:
The island of Cephalonia, Western Greece, was struck by two strong earthquake events, with magnitudes, ML= 5.8 and ML = 5.7 which occurred on Jan. 26, 2014 and Feb. 3, 2014 respectively. The first event was located near Argostoli's town, whereas the second one was located at the north part of Livadi village. These two strong earthquake events followed by smaller aftershocks provoking extensive crustal movements and structural damage effects. Differential Synthetic Aperture Radar Interferometry (DInSAR) is a powerful remote sensing tool for ground motion monitoring. The last two decades, DInSAR is widely applied to a variety of applications including natural hazards such as earthquakes. In 2007, a high resolution X-band satellite namely TerraSAR-X was launched. Due to its short revisit cycle of 11 days and its short wavelength, there is a good potential to capture faster surface movements. This study refers to the application of the DInSAR using TerraSAR-X strip map data to monitor the co-and post-seismic surface deformation caused by the second earthquake event. Hence, based on the interferometric processing of multiple scenes, several differential interferograms calculated showing the deformation patterns which caused before and after the seismic event. First results show that the main part of the island shows stability or a small uplift whereas the western part shows a significant deformation pattern. Those results permit to identify the local tectonic setting of the study area and investigate the reasons that some of settlements affected more.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Appraisal of the damages caused by the 12th January 2010 Haiti earthquake by ASTER multitemporal imagery analysis

Stavroula Kanakaki[1], Issaak Parcharidis[2], Maurizio Poscolieri[3]

stavroula_argiro@hotmail.com
[1] Msc. Student (Geoinformatics)

parchar@hua.gr
[2] Dept. of Geography, Harokopio University of Athens, El. Venizelou 70,
Athens 17671, phone: +30 2109549345, Greece

maurizio.poscolieri@idasc.cnr.it,
[3] CNR -Institute of Acoustics and Sensor "O.M. Corbino", Via Fosso del Cavaliere 100,
00185 Rome, phone: +39 06 49934110, Italy

Keywords: Haiti, earthquake, multitemporal images, PCA, NDVI, supervised classification, passive systems, ASTER instrument

Abstract:
A strong earthquake of 7.0 Mw magnitude struck on January 12th 2010, 4.53 p.m. local time, Haiti, causing serious damages to most of its capital, Port-au-Prince and neighbouring areas. Haiti is a Caribbean country that shares the Ispaniola Island with Dominican Republic on the western side of the island, covering one third of it.
Enriquillo-Plantain Garden fault zone is the main fault system that contributed to the 12th January earthquake. It is a prominent strike-slip fault being the result of the relative movement between Caribbean and North-American crustal plates.
This paper studies the impacts of Haiti earthquake on natural and human environments, using satellite imagery acquired before and after the earthquake. In particular, ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) multispectral data sets were employed, exploiting the passive Remote Sensing systems capability of observing the Earth's environment and aiming at pinpointing the damages caused by the strong seismic event.
The imagery consists of ASTER "L1B Registered Radiance at the Sensor V003" data set covering two different areas, the Haiti capital, Port-au-Prince, and the Legoane lake region, located west of the capital. The analyzed ASTER bands are the visible and near-infrared (VNIR) with 15 meters ground resolution, as well as the thermal bands (TIR) with 90 m ground resolution: on the whole nine spectral bands, including the backward looking NIR ones. More specifically, five ASTER scenes (LevelL1B) were used. Two, acquired before the earthquake, coverthe Northern and Southern parts of Port-au-Prince as well as the Miragoane lake area, on the south-western side of the island, while other two, recorded after the earthquake, show the capital centre and the Miragoane lake area.
The ASTER imagery was processed following different steps. First of all, both date stacked VNIR and TIR images were orthorectified, in order to obtain geometrically aligned images. Then, Principal Components Analysis (PCA) was applied to both the pre-and after-quake stacked VNIR bands as well as to the TIR ones, providing the major information about the surface features changes. Moreover, the NDVI (Normalized Differential Vegetation Index) was calculated (where, first, had applied IAR Reflectance calibrationto to Red and NIR bands) to create FCC (False Colour Composites), displaying as Red and Green the NDVI images dated before the earthquake and as Blue the one after the earthquake: this FCC highlights vegetation, as well as other land characteristics, over time. In conclusion, Change Detection procedure, Simple and Percent bands differences of the NDVI images before and after the earthquake and PCA combined with supervised maximum classification method

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

were carried out in order to obtain information about the landscape changes caused by the earthquake. The application of the described image processing techniques to the ASTER multitemporal imagery pointed out severe damages across the capital, consisting mostly of destroyed buildings, and nearby coastline regions, while, as regards the Miragoane region, severe alterations of lake coastline were identified.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Assessing the quality of DSM from ALOS optical and radar data for Hydrological Applications

Konstantinos G. Nikolakopoulos[1], Christos Choussiafis[2]

knikolakop@upatras.gr,
[1] University of Patras, Greece

christos_hous@hotmail.com
[2] National Technical University of Athens, Greece

Keywords: DSM, ALOS Palsar, ALOS Prism, drainage network, accuracy, InSAR, Data fusion

Abstract:

Digital Elevation Model (DEM) data have been used to derive hydrological features which serve as inputstovariousmodels. Currently, elevation data are available from several sources and at different spatial resolutions. This paper investigates the quality and accuracy of drainage network analysis resulted from ALOS optical and radar data. The Advanced Land Observing Satellite (ALOS) has onboard three independent sensors: Panchromatic Remote-sensing Instruments for Stereo Mapping (PRISM), Advanced Visible and Near Infrared Radiometer type2 (AVNIR-2), and Phased Array type L-band Synthetic Aperture Radar (PALSAR). The PRISM is the sensor mainly for mapping. It consists of three independent telescopes for forward, nadir and backward view and each telescope provides 2.5m spatial resolution. These specifications are given to generate precise Digital Elevation Model (DEM), and to achieve the accuracy for 1/25,000 scale maps. PALSAR is an active microwave sensor using L-band frequency, provides higher performance than the JERS-1's synthetic aperture radar (SAR). It enables to conduct cloud-free and day-and-night land observation. Operationmodes of PALSAR are "fine mode" (High resolution) which is 10m or 15m spatial resolution for single (HH, VV) or dual polarization (HH/HV, VV/VH) respectively and 70km swath width, "ScanSAR mode" which is 100m resolution and up to 350km swath with HH or VV, and "Polarimetric mode" which will be operated in an experimental basis. Two PRISM data sets acquired on 2008 and 2009 respectively were used in this study. ALOS data was provided by the European Space Agency. The 2008 set contains three scenes collected from the three radiometers. The 2009 set contains only the nadir and forward images. Thus, four different stereo-pairs were used for the creation of four ALOS DSMs over the same area. Twenty-five ground control points and more than one hundred tie points were used. For all the stereo-pairs the same gcp's were used. Four DSMs with a pixel size of 7,5m were created. No further processing (editing) was done to the four DSMs. SAR Interferometry (InSAR) technique used for the exploitation of ALOS PALSAR radar acquisitions and the production of DSMs. Eleven (11) Single Look Complex (SLC) SAR acquisitions were used (FBS or FBD mode) and 22 interferometric pairs were formed using as master files only the SAR acquisitions in FBS mode. The successful extraction of the drainage network depends on DEM vertical accuracy, the most common characteristic of spatial data quality. However, the DEM produced by single interferometric pair is characterized by low vertical accuracy due to several parameters that affect the final result. In this study, the improvement of the DEM vertical accuracy is attempted through the fusion of multiple interferometric based DEMs. Multiple coverages reduce the height errors as several independent measurements can be combined using the weighted average rule. The used weights derived from the Height Error Maps (HEM). An alternative direct way to obtain a HEM based on the coherence values of an interferometric pair has been proposed. The Root Mean Square Error (RMSE) is used to estimate vertical accuracy of the produced DSMs. The validation of the DSMs is achieved by comparing them with a sufficient number of ground control points of certified elevation as well with an accurate reference DEM. Then Hydrology toolsets in the ArcGIS package were used to extract drainage networks from the DSMs for Alfeios River catchment in the Western Peloponnese Greece. Extracted networks compared with the one derived from erial photographs the official drain age network digitized from the topographic maps 1/50.000. The results are presented in this paper.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Geology – Geomorphology

Thursday, 19.06.2014, 16:00-17:40, *room 105*

The identification of hydrothermal alteration zones in Kösedağ Magmatics (Sivas/TURKEY) using ASTER imagery
  Kaan Şevki KAVAK, Zeynel BAŞIBÜYÜK, Hüseyin YALÇIN, Ömer BOZKAYA
  16:00 - 16:20
Geomorphologic processes of Tigris river and their environmental impacts Using Landsat 8 Dr azhar Abbas Hasan
  Azhar Abbas Azhar
  16:20 - 16:40
Fluvial landforms classification using Object-Based Image Analysis
  Paweł Piekarski
  16:40 - 17:00
Lineament analysis in northern Colombia, South America.
  Mauricio Baquero, Camilo Montes, German Bayona
  17:0 - 17:20
Refining of geomorphological maps of young glacial areas based on geoinformatics and remote sensing
  Karolina Orlowska, Adrian Ochtyra, Adriana Marcinkowska, Elzbieta Wolk-Musial, Bogdan Zagajewski
  17:20 - 17:40

The identification of hydrothermal alteration zones in Kösedağ Magmatics (Sivas/TURKEY) using ASTER imagery

Kaan Şevki Kavak[1], Zeynel Başibüyük[2], Hüseyin Yalçin[1], Ömer Bozkaya[3]

kaank@cumhuriyet.edu.tr, yalcin@cumhuriyet.edu.tr
[1] Cumhuriyet University, Dept. of Geology, 58140, Sivas, Turkey
http://kaank.cumhuriyet.edu.tr

[2] Ahi Evran University, Dept. of Geology Kırşehir, Turkey

obozkaya@pau.edu.tr
[3] Pamukkale University, Dept. of Geology, Denizli, Turkey

Keywords: alteration, ASTER, hydrothermal, Kösedağ syenite, mineralogy, North Anatolian Fault Zone (NAFZ)

Abstract:
Two main hydrothermal zones have been developed in NE-SW direction as a result of intrusion of Kösedağ plutonic rocks into Karataş volcanites during Middle-Upper Eocene at the quadrangle of Zara-İmranlı-Suşehri-Şerefiye (Sivas) on the northeastern Turkey. The study area is also located very close to well-known dextral strike-slip North Anatolian Fault Zone (NAFZ). Kösedağ plutonics are made up of mainly alkali feldspar syenite, quartz alkali feldspar syenite, syenite, quartz syenite, monzonite and rarely granite. Karataş volcanites consist of generally basalt, andesite, trachyte and phonolite. Alterations zones include propylitic/sericitic and argillic type alterations and mineralizations however they were not separated by sharp boundaries. Phyllosilicate/clay minerals (kaolinite, illite, smectite, chlorite, I-S C-S and pyrophyllite), oxides and hydroxides (hematite and goethite) sulphides (galenite, sphalerite, pyrite, chalcopyrite, molybdenite and covellite), carbonates (calcite, dolomite, malachite and azurite), sulphates (barite, alunite and jarosite), phosphates (goyazite) and silica (quartz and opal-CT) minerals were developed in the Kösedağ syenite and Karataş volcanites dependent upon the hydrothermal alteration. The results of the O-H stable isotopes of clay minerals indicate that hydrothermal flows are mainly of magmatic origin. The age of alteration was determined to be 38.0 Ma based on K/Ar radiometric dating from alunite mineral. In this research, ASTER imagery of the study area have been used to determine alteration minerals developed on the contact of Kösedağ plutonics and Karataş volcanites. For that purpose, some spectral enhancement procedures have been performed. Structurally, two different zones in the direction of NE-SW have been observed in field and on imagery. In accordance with these observations, spatial enhancement methods have been also implemented on the ASTER VNIR and SWIR satellite data. In conclusion, hydrothermal alterations within developed on the contact of plutonic and volcanic rocks have been determined in terms of mineralogically as ground truthing studies and utilizing ASTER imagery. Also intersections of intrusion boundaries, structural and hydrothermal zones have been identified with the aid of field and image processing studies as complementary.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Geomorphologic processes of Tigris river and their environmental impacts Using Landsat 8

Azhar Abbas Azhar

rs_gis@yahoo.com
Director of Remote Sensing Center, Iraq

Abstract:
Abstract The rivers the important element of the geomorphological processes and the most effective and impact on the earth's surface and contribute directly to change its features , especially in areas affected by sedimentary processes of river flooding and changes in the river course and the related geomorphological aspects remote sensing technology role the most importance tools for monitor and control the earth resources and the environment due to the advantage of both the multiplicity of wavelengths and coverage of large areas help to study and monitor the rivers , oceans, deserts, and for study the course of the Tigris River and its meandering and its impact on the surrounding area by using satellite images Landsat 8 for study the f meandering of the Tigris River in the area of Al-Azizia, changing to a (Oxbow Lake) with closed water and turning farmland and orchards to the barren salt area which impact on the environment and degradation, and thus affected the population growth and urbanization due to the migration of many families to the big cities and in turn the cause of the decline and decay of farmland and thus lower agricultural production so that the use of remote sensing information are suitable for identifying , assessing . and to monitor the course of the river and focusing and identify the weaknesses point and the areas of potential cutting of the meandering river.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Fluvial landforms classification using Object-Based Image Analysis

Paweł Piekarski

pawelpie@amu.edu.pl
Adam Mickiewicz University, Institute of Geoecology and Geoinformation, Poland

Abstract:
Using Object-Based Image Analysis (OBIA) has been rapidly increasing over the past few years. Combining pixel based classification with additional information like object texture or neighbourhood gives better results, especially with remote sensing data. High-resolution topographic data can also improve classification process. Light and detection ranging (LiDAR) enables detection of various geomorphologic forms based on their different height. Conception of research and first results of the study will be presented. The goal of work is a semi-automated extraction of fluvial landforms like paleochannels, oxbow lakes or meander scroll ridges using remote sensing data with object-based approach. Study area is a 10 km section of Warta river in western Poland. Basic data used in this study contained: digital elevation model (with 0.5 m spatial resolution) and orthoimages (RGB and CIR). Additional data was derived from DEM and orthophotos by calculating land surface parameters. An object-based image analysis was used to classify geomorphic features of floodplain. Fluvial landforms were extracted and results of classification were compared with forms recognized during field studies.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Lineament analysis in northern Colombia, South America.

Mauricio Baquero[1], Camilo Montes[2], German Bayona[1]

mbaquero@cgares.org
[1] Corporacion Geologica ARES, Colombia

[2] Universidad de los Andes, Colombia

Keywords: Lineaments, Colombia, Remote Sensing

Abstract:
Relationships that allow inferring buried structures from surface lineaments can be a powerful tool in research and exploration of natural resources such as water, hydrocarbons, and economic ores. A linear characteristic of a superficial parameter genetically related to a structural, stratigraphic, sedimentary, geochemical or to a combination of these factors is a "lineament". The way lineaments reflect structures depends on the exposure degree of the affected rock. In areas not covered by recent deposits, lineaments directly reflect structures since lineaments are the intersection between planes of discontinuity with the surface. The relationship between lineaments and structures in regions covered by recent deposits may be more complex. Without neotectonics, covered structures can control both the pre-depositional topography and the location of fluids affecting deposits. Both the original materials and its subsequent affectation have the potential to print linear signals to the surface. Derived products of satellite imagery and DEMs were used to identify 46000 km of lineaments in 52000 km^2 of exposed and covered areas. Information on province, age and rock type affected by lineaments was used in grouping directional analyses. This project presents a high density of directional data collected at different scales and from different sources, providing methodological contributions in data processing, particularly in external attribute acquisition. Possible fracture patterns were characterized and applications in hydrocarbon exploration were proposed. The study of patterns of lineaments in regions covered by recent sediments, such as the Cesar-Rancheria basin, and in the adjacent provinces allowed proposing a partitioning mechanism important in predicting buried structures. The characterization lineaments patterns in terms of orientation, density, location and association with the geology of affected rocks, allowed supporting models of evolution and evaluating possible fluid migration paths.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Refining of geomorphological maps of young glacial areas based on geoinformatics and remote sensing

Karolina Orłowska[1], Adrian Ochtyra[1], Adriana Marcinkowska[2],
Elżbieta Wołk-Musiał[2], Bogdan Zagajewski[2]

karolina.orlowska@student.uw.edu.pl

[1] Department of Geoinformatics and Remote Sensing, Faculty of Geography and Regional Studies, University of Warsaw and College of Inter-Faculty Individual Studies in Mathematics and Natural Sciences, University of Warsaw, Poland

[2] Department of Geoinformatics and Remote Sensing, Faculty of Geography and Regional Studies, University of Warsaw, Poland

Keywords: geomorphology, mapping, young glacial forms, Landsat, satellite images

Abstract:
Geoinformatics along with remote sensing are widely used as cartography supporting tools that allows revision and digitalization of analogue maps. The aim of this research was to test an applicability of remote sensing data and geoinformatic software in refining and updating analogue geomorphological maps of young glacial areas. The area of research covered glacial areas of northern Poland caused by Würm glacial period (also called Wisconsin or Vistulian). All analysis were held in ESRI's ArcGIS 10 software. Two types of materials were used: scanned analogue cartographic materials (geomorphological map 1:500 000, geological map 1:200 000, topographic map 1:100000) and digital data (Landsat 5 TM RGB 453 composition and SRTM Digital Terrain Model). During the process a geomorphological map 1:500 000 has been digitalized and rescaled to 1:300 000. All map units has been manually revised, their content updated and borders refined based on information acquired from Landsat 5 TM imagery and SRTM DTM. A coded digital legend has been designed for all of the units. A database with basic geomorphological and spatial information has been attached. The results were: up to date modifiable digital geomorphological map of young glacial areas of Poland 1:300 000 accompanied with database, digital legend of geomorphological units and a printable map layout.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

EARSeL & ISPRS
Young Scientist Days

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

299

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Vegetation 1

Adriana Marcinkowska, Lucie Červená

Monday, 16.06.2014, 11:30-13:00, *room 207*

Analysis of Tatra Mountains' grassland condition based on hyperspectral data
  Aneta N. Modzelewska, Anna M. Jarocińska, Marlena Kycko, Bogdan Zagajewski
  11:30 - 11:45
Different classification methods in analysis vegetation cover changes based on Landsat TM
  Małgorzata Białczak, Monika Kacprzyk, Piotr Multan, Anna M. Jarocińska
  11:45 - 12:00
Hyperspectral data for classification of selected vegetation species above tree-line in the Krkonoše Mts. National Park
  Renáta Suchá, Martina Andrštová, Lucie Kupková, Lucie Červená, Bogdan Zagajewski, Adriana Marcinkowska, Adrian Ochtyra
  12:00 - 12:15
Leaf angles in field crops: measurement methods and effects on spectral reflectance
  Xiaochen Zou
  12:15 - 12:30
Automatic mapping method of the Tatra Mountains vegetation using World View 2 imagery and neural network simulators
  Karolina Orlowska, Adrian Ochtyra, Marlena Kycko, Adriana Marcinkowska, Bogdan Zagajewski, Anna Jarocińska
  12:30 - 12:45
Vegetation condition of non-forest communities in Karkonosze Mountains based on field measurements
  Monika Kacprzyk, Anna M. Jarocińska, Bogdan Zagajewski, Adrian Ochtyra, Adriana Marcinkowska, Lucie Kupkova
  12:45 - 13:00

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Analysis of Tatra Mountains' grassland condition based on hyperspectral data

Aneta Modzelewska, Anna M. Jarocińska, Marlena Kycko, Bogdan Zagajewski

University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Warsaw, Poland
modzelewskaaneta@gmail.com, ajarocinska@uw.edu.pl

Keywords: alpine grasslands, vegetation indices, Tatras, NDVI, LAI,

Abstract:
Tatras are the highest mountain range in the Carpathian Mountains and one of the most unique parts of Poland with alpine relief and vegetation. The main goal of the study was to analyze high mountain vegetation state in Tatra Mountains. Studied vegetation were non-forested, alpine grasslands. The research is based on remote techniques: ground spectrometric measurements and plants biophysical variables. The field measurements were done in August 2013 on 30 test polygons covered with different kinds of alpine grassland, typical for Tatra Mountains, located on Kasprowy Wierch, Beskid and Kondracka Kopa. On each polygon spectrometric measurements were done using ASD FieldSpec 3 and biophysical parameters were collected – LAI and APAR. Based on spectral characteristics vegetation indices were calculated: Normalized Difference Vegetation Index (Rouse et al., 1983), Modified Red Edge Normalized Difference Vegetation Index (Datt, 1999), Water Band Index (Peñuelas et al., 1995), Photochemical Reflectance Index (Gamon et al., 1992), Normalized Difference Nitrogen Index (Fourty et al, 1996), Cellulose Absorption Index (Daughtry et al., 1991) and Normalized Difference Lignin Index (Fourty et al., 1996), to analyze plant condition. Indices values were compared with biophysical variables values: Leaf Area Index and fraction of Absorbed Photosynthetically Active Radiation. The results of plants state analysis will be presented.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Different classification methods in analysis vegetation cover changes based on Landsat TM

Małgorzata Białczak, Monika Kacprzyk, Piotr Multan, Anna M. Jarocińska

University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Warsaw, Poland
m.bialczak@student.uw.edu.pl, kacprzyk.monika@gmail.com, piotr.multan@student.uw.edu.pl, ajarocinska@uw.edu.pl

Keywords: Landsat TM, Support Vector Machine, Artificial Neural Network, Maximum Likelihood, vegetation cover

Abstract:
The contemporary environment is changing rapidly. Using remote sensing tools enable to detect the changes effective and faster than using traditional methods. Natural vegetation and agricultural areas have significant influence on changes in land cover development. It is necessary to develop the accurate classification method to detect changes in vegetation cover. The aim of the study was to execute and compare different methods of image classification and use this method to land cover changes. The analyses were conducted using multispectral Landsat TM images. The most accurate algorithm was used to analyze vegetation cover changes over 6 years. The researches were conducted in the U.S. state of Arkansas, located in the southern region of United States. First of all, the Landsat Thematic Mapper multispectral images were acquired from 5.07.2000 and 6.07.2006. Afterwards were selected test and reference polygons for each class, the same for each classification methods. In this project were used three different methods: Maximum Likelihood, Support Vector Machine and Artificial Neural Network. The first two algorithms were done in ENVI 5.0 software. ANN classification was carried out in fuzzy ARTMAP simulator. All classifications were verified with reference polygons from image. Finally, the best classification was chosen to proceed change detection in vegetation land cover over 6 years. The results was classification with 6 classes (coniferous forest, leafy forest, meadows, root crops, corns and non-vegetation areas) and information about vegetation cover changes. The final results were the maps of vegetation land cover, vegetation cover changes and post-classification statistics.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Hyperspectral data for classification of selected vegetation species above tree-line in the Krkonoše Mts. National Park

Renáta Suchá[1], Martina Andrštová[1], Lucie Kupková[1], Lucie Červená[1], Bogdan Zagajewski[2], Adriana Marcinkowska[2], Adrian Ochtyra[2]

[1] Charles University in Prague, Faculty of Science, Department of Applied Geoinformatics and Cartography, Czech Republic
renata.sucha@natur.cuni.cz, M.Andrstova@seznam.cz, lucie.kupkova@gmail.com, lucie.cervena@natur.cuni.cz

[2] University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Warsaw, Poland
bogdan@uw.edu.pl, adriana.marcinkowska@uw.edu.pl, adrian.ochtyra@uw.edu.pl

Keywords: Hyperspectral data, Classification, Grasslands, Subalpine, Krkonoše, EUFAR

Abstract:
The paper is focused on the classification of vegetation above the tree-line in the Krkonoše Mts. National Park (KRNAP) using hyperspectral data (APEX and AISA Dual). The vegetation above tree-line (altitude above 1350 m) is the unique ecosystem which is characterized by mosaic of subalpine meadows with Nardus stricta and Pinus mugo growths, subalpinepeat-bog, rocks and other areas of the lichen tundra in the highest parts in the Krkonoše Mts. There are biotopes hosting valuable threatened species of plants and animals. Some of them are endemic for the Krkonoše, and another show the relation with Nordic tundra. Preservation of this valuable ecosystem needs knowledge of the development of species and communities abundance. Studying of Pinus mugo and competitive strong grasses (Molinia caerulea and Calamagrostis villosa) expansion to the original meadows with Nardus stricta is very important issue for environmental protection. The aim of this study is to classify two species Nardus stricta and Calluna vulgaris spatial distribution in the western part of tundra in the Krkonoše Mts. National Park. Different classification methods (e.g. maximum likelihood, support vector machine, spectral information divergence or linear spectral unmixing) are used and evaluated. The goal is to find best classification method providing the most accurate outputs. The detailed abundance maps of Nardus stricta and Calluna vulgaris are also produced.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Leaf angles in field crops: measurement methods and effects on spectral reflectance

Xiaochen Zou

University of Helsinki, Finland
xiaochen.zou@helsinki.fi

Keywords: Leaf angle distribution, Digital camera, Field crops, Spectral reflectance

Abstract:
Imaging spectroscopy provides continuous spectrum information which is a useful tool to map vegetation structural and biochemical parameters in large scale. Leaf angle distribution (LAD) is one of the most important canopy structure parameters which LAD affects how incident photosynthetically active radiation is distributed on plant leaves, thus directly affecting plant productivity. Unfortunately, LAD is difficult to quantify, usually, it was assumed as spherical. Recently, a digital photograph method was developed and applied successfully on broadleaf tree species. However, most of the leaves of crops are different from tree species. In this study, we test this photographic LAD measurement in six field crop species. The method, previously applied only to small and flat leaves of broadleaved trees and bushes, was extended to be applicable to the narrow and curved leaves of cereals. The photographic leaf Mean Tilt Angle (MTA) measurements were compared with the MTA measurements from LAI-2000, and we found the MTAs of five out of six species were highly correlated. Airborne imaging spectroscopy data was acquired by AISA spectrometer. We analyzed the correlation between imaging spectroscopy data and these two MTA measurements. The highest correlation between spectral reflectance factor and MTA was found at a wavelength of 748 nm (R = 0.80). The high correlation between MTA and this red edge waveband can be useful for MTA determination from imaging spectroscopy.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Automatic mapping method of the Tatra Mountains vegetation using World View 2 imagery and neural network simulators

Karolina Orłowska, Adrian Ochtyra, Marlena Kycko, Adriana Marcinkowska,
Bogdan Zagajewski, Anna M. Jarocińska

University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Warsaw, Poland
karolina.orlowska@student.uw.edu.pl, adrian.ochtyra@uw.edu.pl, marlenakycko@student.uw.edu.pl, adriana.marcinkowska@uw.edu.pl, bogdan@uw.edu.pl, ajarocinska@uw.edu.pl

Keywords: Tatras, M&B reserve, vegetation, WorldView2, ANN

Abstract:
Due to poor accessibility, changeable atmospheric condition and short vegetation period, terrain high-mountain vegetation mapping is a laborious and difficult to conduct process. High-resolution remote sensing data might provide detailed information about the vegetation and plant communities. Neural network systems are a tool which allows to build elaborate decision algorithms and can be used to conduct analysis of remotely acquired data. Thus, an attempt of applying remote sensing data and neural network system was undertook to create a method of automatic high-mountain vegetation mapping. The area of analysis was Polish part of the Tatras (the Tatra Mountains) which constitute a part of Carpathian range. The analysis was conducted using Fuzzy ARTMAP neural network systems and based on following materials: World View 2 images from August 2013, analogue maps of actual vegetation, digital vegetation map from hyperspectral airborne DAIS 7915 and ROSIS sensors data and Digital Terrain Model with a 1m spatial resolution. The result of the analysis was a map of plant communities of the Tatras in a scale 1:25 000.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Vegetation condition of non-forest communities in Karkonosze Mountains based on field measurements

Monika Kacprzyk[1], Anna M. Jarocińska[1], Bogdan Zagajewski[1], Adrian Ochtyra[1], Adriana Marcinkowska[1], Lucie Kupková[2]

[1]University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Warsaw, Poland
kacprzyk.monika@student.uw.edu.pl, ajarocinska@uw.edu.pl, bogdan@uw.edu.pl, adrian.ochtyra@uw.edu.pl, adriana.marcinkowska@student.uw.edu.pl

[2]Charles University in Prague, Faculty of Science, Department of Applied Geoinformatics and Cartography, Czech Republic
lucie.kupkova@gmail.com

Keywords: vegetation indices, LAI, fAPAR, field measurement, Karkonosze, non-forest communities

Abstract:
Remote sensing tools can be used to analyzing vegetation. Due to non-contact character, these methods are particularly useful in areas that are protected or hard to reach like mountains. In addition, mountains vegetation has different structure and specific adaptation for the climate. The aim of the study was to analyze the condition of mountain grassland in Karkonosze based on field measurements. The study area includes Karkonosze Mountain, located on Polish and Czech border (with Karkonosze/Krkonoše National Park). In the researches were studied non-forests communities. First of all, during the field measurements were collected biophysical parameters (Leaf Area Index, fraction of Absorbed Photosynthetically Active Radiation, Chlorophyll Content Index) and values of spectral reflectance using ASD FieldSpec FR 3. The measurements were done in June, July and September 2012 and in August 2013 on 151 research polygons. Subsequently, using spectral reflectance were calculated vegetation indices to estimate the state of the vegetation and plant condition. The additional step was to analyze the relationship between biophysical parameters and vegetationindices. The correlations between indices and previously obtained biophysical parameters were calculated. The best correlated indices were chosen to estimate the condition of studied plant communities on those polygons, where were not acquired biophysical parameters. Based on the results was estimated vegetation condition of mountainous non-forest communities in Karkonosze and were defined correlation between vegetation indices and biophysical parameters. Additional information was the change in vegetation condition using vegetation season 2012 and 2013.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Vegetation 2

Marlena Kycko, Renata Sucha

Monday, 16.06.2014, 14:00-15:30, *room 207*

The analysis of vegetation changes near Chernobyl based on remote sensing data
Aneta Modzelewska, Anna M. Jarocinska, Paulina Pochrybniak
14:00 - 14:15

Multi-temporal Landsat data analysis for assessment of meadows condition
Anna Chlebicka, Bogdan Zagajewski, Anna Jarocińska, Adrian Ochtyra
14:15 - 14:30

The analysis changes in vegetation related to the hurricane Katrina
Anna Robak, Weronika Rucińska, Anita Sabat, Martyna Wietecha, Anna Jarocińska
14:30 - 14:45

VEGETATION CONDITION CHANGES IN CHITTAGONG HILL TRACTS (CHT),
BANGLADESH, BASED ON LANDSAT IMAGERIES
Salit Chakma, Anna Jarocińska
14:45 - 15:00

Analysis of evapotranspiration using MODIS data
Mateusz Ślązek
15:00 - 15:15

The role of helophytes' rhizomes in shoreline protection on the example of two grass
species: reed sweet grass Glyceria maxima and common reed Phragmites australis
Weronika Kowalik, Kinga Pachuta
15:15 - 15:30

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The analysis of vegetation changes near Chernobyl based on remote sensing data

Aneta Modzelewska, Anna M. Jarocińska, Paulina Pochrybniak

University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Warsaw, Poland
a.modzelewska@student.uw.edu.pl, ajarocinska@uw.edu.pl, paulina.pochrybniak@student.uw.edu.pl

Keywords: Chernobyl, vegetation condition, Landsat

Abstract:
The explosion at the Chernobyl Nuclear Power Plant took place on April 26th 1986 near Pripyat. The radioactive dust with radionuclides was transported throughout long distances and contaminated air, water, soil and plants. The cloud from the reactor contained different radioactive elements such as iodine and cesium. The radioactive cloud was all over Europe. The aim of the study was to analyse the plant condition near Chernobyl based on vegetation indices. In the study were used Landsat images from four research periods: June 13, 1985; July 10, 1992; July 9, 2006 and July 1, 2009 to estimate the plant renewing after lack of human usage. Images from four different periods were acquired. After calibration and atmospheric correction three vegetation indices were calculated: Normalized Difference Vegetation Index, Three Channel Vegetation Index and Moisture Stress Index. Then maps of vegetation condition were created using values of three vegetation indices. Based on these studies were analysed changes in vegetation condition related to the radioactive contamination.

34th *EARSeL Symposium: European remote sensing - new opportunities for science and practice*
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Multi-temporal Landsat data analysis for assessment of meadows condition

Anna Chlebicka, Bogdan Zagajewski, Anna M. Jarocińska, Adrian Ochtyra

University of Warsaw, Inter-Faculty Studies in Environmental Protection, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Warsaw, Poland
anna.chlebicka@student.uw.edu.pl, bogdan@uw.edu.pl, ajarocinska@uw.edu.pl, adrian.ochtyra@uw.edu.pl

Keywords: vegetation indices, precipitation, vegetation condition, Bialowieza Forest, Landsat

Abstract:
Non-destructive remote sensing can be supporting tool for detection changes in plants condition on large areas. The study aims at an assessment of multi-temporal, phonological changes of meadows, which are close to highly protected areas of the Białowieża Primary Forest where National Park (M&B Reserve of UNESCO) is located. Research method was based on Landsat TM, ETM+ and OLI images from years 1986-2013. Satellite images were corrected using ATCOR software and vegetation indices: Normalized Difference Vegetation Index (NDVI; by Rouse et al., 1973), Green Normalized Difference Vegetation Index (GreenNDVI; by Gitelson et al., 1996), Soil Adjusted Vegetation Index (SAVI; by Huete, 1988), Enhanced Vegetation Index (EVI; by Liu, Huete, 1995), NPCI (Normalized Pigment Chlorophyll Ratio Index; by Peñuelas et al., 1994), Normalized Difference Infrared Index (NDII; by Hardinsky et al., 1983), Moisture Stress Index (MSI; by Hunt, Rock, 1989) were calculated. Parallel to this study sum of precipitations of ten-day, twenty-day and thrifty-day sets before the day of Landsat acquisition were calculated. It allows analyzing a water influence for condition of vegetation. Based on this information the values of vegetation indices were corrected. Than using mentioned vegetation indices the vegetation condition was analysed for each year and changes were estimated. Detailed results will be presented during the conference.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The analysis changes in vegetation related to the hurricane Katrina

Anna Robak, Weronika Rucińska, Anita Sabat, Martyna Wietecha, Anna M. Jarocińska

University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Warsaw, Poland
anna.robak2@student.uw.edu.pl, weronika.rucinska@student.uw.edu.pl,
anita.sabat@student.uw.edu.pl, m.wietecha@student.uw.edu.pl, ajarocinska@uw.edu.pl

Keywords: New Orleans, change detection, hurricane, vegetation indices, Decision Tree

Abstract:
Hurricane Katrina struck the coast of the Louisiana, Alabama and Mississippi U.S. states on August 29, 2005. The result was a great flood in New Orleans, approximately 80% was flooded. The aim of the study was to investigate the changes that occurred after Hurricane Katrina in New Orleans and surrounding areas with particular emphasis on changes in vegetation condition. Analyses were conducted on two Landsat 5 satellite images acquired before (22.08.2005) and after (09.10.2005) hurricane. Landsat 5 TM images were calibrated and atmospherically corrected. Using image from 09.10.2005 two different classifications were proceeded to choose more appropriate: Support Vector Machine and Decision Tree. Better results were achieved using method Decision Tree and it was used to carry out classification of both scenes. Classes that were selected on the image after the hurricane: water, flooded vegetation areas, flooded non-vegetation areas and dry areas. After classification on the vegetation areas on both images were performed Tasseled Cap transformation and calculated vegetation indices: NDVI (Normalized Difference Vegetation Index), MSI (Moisture Stress Index) and NDII (Normalized Difference Infrared Index). Based on this information was analysed vegetation condition and change detection was performed. The studies allowed obtaining information about vegetation changes and influence of sea water on vegetation. Flooding caused by Hurricane Katrina has destroyed a large part of vegetation in New Orleans and surrounding areas.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Vegetation condition changes in Chittagong Hill Tracts (CHT), Bangladesh, based on Landsat imageries

Salit Chakma, Anna M. Jarocińska

University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing. Warsaw, Poland
s.chakma@student.uw.edu.pl, ajarocinska@uw.edu.pl

Keywords: Remote Sensing, Vegetation condition, GIS, Vegetation Indices

Abstract:
Chittagong Hill Tracts (CHT) is located in south-eastern part of Bangladesh and contains ten percent of land surface of the country, of which 25 percent is covered by dense forest. Most of which is deciduous forest and little part is covered with coniferous forest. In a country like Bangladesh, where population growth is rapid and climate change has impacts on high magnitude, it is extremely important to have timely and accurate understanding of vegetation changes and relation between human interaction and changes phenomena. Along with vegetated area changes, changes in vegetation condition are also indispensable. Many techniques to detect vegetation changes and vegetation conditions have been developed. The most common technique is to use vegetation indices and in this study four vegetation indices were considered. These vegetation indices are, Normalized Difference Vegetation Index (NDVI), Soil Adjusted Vegetation Index (SAVI), Modified Soil-Adjusted Vegetation Index (MSAVI), and Normalized Difference Infrared Index (NDII). The aim of this study was to analyse plant condition in Chittagong Hill Tracts. Having this aim, six cloud-free Satellite (Land-sat) imageries of 1989, 2001, and 2014 were downloaded. At least two images from same temporal period were required to spatially cover the region of interest (ROI). These images were calibrated and then atmospherically corrected using Dark Object Subtraction (DOS) method. Later they were masked with spatial extent of ROI. Application of vegetation indices yielded in vegetation maps. Images for same year were mosaicked to retrieve vegetation map for ROI. Detection of differences in vegetation areas for three different times resulted in identification of vegetation changes. Following similar method, changes in vegetation condition were also detected.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Analysis of evapotranspiration using MODIS data

Mateusz Ślązek

Faculty of Geography and Regional Studies, University of Warsaw, Poland
mslazek@uw.edu.pl

Keywords: Evapotranspiration, NDVI, MODIS data, catchment of the Liwiec River

Abstract:
Evapotranspiration (ET) is defined as the water lost to the atmosphere from the ground surface, evaporation from the capillary fringe of the groundwater table, and the transpiration of groundwater by plants. ET is one of the main water cycle processes of the river catchment. In some Polish catchments ET makes up as much as 70% of the precipitation and is an important element of the catchment water balance. The objective of this study is to analyse the spatial diversity and temporal variation of evapotranspiration in the catchment of the Liwiec River in the years 2001-2012. Until relatively recently, evapotranspiration calculations were based mainly on point data from meteorological stations. However, progress and development in remote sensing have created new opportunities. Remote sensing has become an important tool for the assessment of evapotranspiration dynamics on different spatial and temporal scales. Estimates are available across the entire globe, using imagery collected by the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument aboard the satellites in NASA's Earth Observing System, Terra and Aqua. The study focuses on assessing the relationship between the values of NDVI and evapotranspiration. The annual ET according to MODIS varied from 392 mm to 458 mm. Deciduous broadleaf forests have a higher ET than other land use categories. The analysis shows a strong correlation between monthly ET and NDVI.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The role of helophytes' rhizomes in shoreline protection on the example of two grass species: reed sweet grass Glyceria maxima and common reed Phragmites australis

Weronika Kowalik, Kinga Pachuta

Warsaw University of Life Sciences, Faculty of Civil and Environmental Engineering, Department of Environmental Improvement Poland
weronika85sier@interia.pl

Keywords: tensile forces, tensile strength, common reed, reed sweet grass

Abstract:
The aim of the research is to assess and compare selected mechanical properties of rhizomes of two different plant species common reed Phragmites australis and reed sweet grass Glyceria maxima. Specimens of Phragmites australis and Glyceria maxima were collected from the plant communities of Urszulewskie Lake. Carefully selected Phragmites and Glyceria specimens were transported to laboratories of the Water Centre of Warsaw University of Life Sciences. The tensile tests on rhizomes of both species of plants were conducted by using Universal Testing Machine Instron 5966. The values of minimum, average and maximum tensile forces and tensile shrengthes for rhizomes of both species were determined. The relationships between chosen mechanical parameters and morphological features were described. The results of the researches were statistically analysed with the help of STATISTICA and Excel 2002. The tensile strength values for Phragmites australis and Glyceria maxima rhizomes were compared to data relating to roots of trees, bushes and herbaceous plants, given by other authors. Conditions of application of both plant species were discussed. Advantages of replacing artificial strengthening of concrete with living plant communities were outlined.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Estimation of photosynthetic activity and pigments in maple leaves during senescence and fungal infection (tar spots)

Anastasia V. Kharcheva, Daria A. Khundzhua, Irina P. Levykina, Vladimir A. Karavaev, Svetlana V. Patsaeva

Faculty of Physics, Lomonosov Moscow State University, Russian Federation
harcheva.anastasiya@physics.msu.ru, dasha.ok@list.ru, spatsaeva@mail.ru

Keywords: chlorophyll, fungal infection, photosynthetic activity, fluorescence, slow fluorescence induction, absorption

Abstract:

Fluorescence emission spectra and slow fluorescence induction (SFI) can be applied for rapid diagnostics of photosynthetic activity of plant cells at the earliest stages of their damages by various chemical agents and physical conditions. However, the effect of pathogenic fungi on the photosynthetic activity of plants has not been studied enough with these methods. The maple trees (Acer platanoides L.) are widespread in the European part of Russia being cultivated as ornamental plants. Freshly harvested leaves from trees growing at the campus of Moscow State University were studied during the autumn color senescence, both healthy and affected by tar spots of maple leaves (Rhytisma acerinum). SFI was measured for leaf segments using broadband blue-light excitation with intensity about 100 W/m2 and registration at 686 nm. To evaluate photosynthetic activity the ratio (FM-FT)/FT was used, where FM is the intensity of Chl fluorescence at the moment of reaching the second peak, few seconds after the light had been switched on; FT is the steady-state level of fluorescence achieved few minutes after the switching on the light. Fluorescence emission spectra were recorded with a luminescence spectrometer Solar CM2203, and the ratio of intensities at 685 and 740 nm (F685/F740) was calculated. The concentration of chlorophylls (Chla and Chlb) was measured in acetone extracts by traditional absorption technique, as well as using fluorescence spectroscopy, providing similar results in pigment concentration. We resume that during autumn leaf senescence the ratio F685/F740 increased monotonically in 3-5 times depending on excitation wavelength as a result of decrease of total Chl content in the leaves. For leaves with fungal infection theratioF685/F740alsochangedsignificantly. Inspiteoftotal Chldegradation theratioChla/Chlb keptal most constant forleaves during senescence, as well as for leaves with developed fungaldisease. If we compare healthy leaves and those infected with fungal diseases with similar total Chl content, the leaves with fungal infection demonstrated SFI parameter (FM-FT)/FT on average 25% lower compared to healthy ones. Therefore fungal infection influenced the photosynthetic activity of the cells, but not the chlorophyll pigment composition.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Methods 1

Adrian Ochtyra, Offer Rozenstein

Monday, 16.06.2014, 16:00-17:30, *room 207*

Assessing specific risk assessments for non-target plants
>   *Justyna Wrzosek-Jakubowska*
>   16:00 - 16:15

Understanding the earth with satellite images – Development of a student-centered learning environment to support the application of remote sensing in schools
>   *Vera Fuchsgruber, Nils Wolf, Kathrin Viehrig, Simone Naumann, Alexander Siegmund*
>   16:15 - 16:30

Spatial and Functional Analysis of Health Services in Dohuk governorate/Iraqi Kurdistan Region
>   *Redar Nabil Abdulrahman*
>   16:30 - 16:45

SPATIAL IMPLICATIONS OF ADOPTION OF SELECTED CRITERIA WIND POWER DEVELOPMENT IN POLAND
>   *Zdzisław Cichocki, Małgorzata Hajto, Agnieszka Kuśmierz, Jan Borzyszkowski, Małgorzata Bidłasik, Cezary Gorczynski*
>   16:45 - 17:00

The advanced 3D modeling of natural monument Oak "Bartek" in Zagnansk (Poland) - based on point cloud from Terrestrial Laser Scanning
>   *Piotr Rysiak, Kamil Pilch, Katarzyna Gądek, Jarosław Wójcik, Piotr Wężyk, Marta Szostak, Piotr Tompalski*
>   17:00 - 17:15

Tree species classification of Białystok city (NE Poland) using Support Vector Machines and AISA hyperspectral image
>   *Anna M. Jarocinska, Małgorzata Białczak, Adriana Marcinkowska, Łukasz Sławik, Bogdan Zagajewski, Tomasz Berezowski, Jarosław Chormański*
>   17:15 - 17:30

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Assessing specific risk assessments for non-target plants

Justyna Wrzosek-Jakubowska, Barbara Gworek, Ewa Kuśmirek

Institute of Environmental -Protection -National Research Institute, Poland
justyna.wrzosek@ios.edu.pl

Keywords: risk assessment, environmental protection, pesticides, non-target plants

Abstract:
Risk assessment of pesticides in the environment consists of an effect assessment and an exposure assessment. The exposure assessment addresses the environmental fate and behavior of the pesticides and their transformation substances to the different environmental compartments (soil, surface water, ground water). For the first tier, a preliminary assessment is conducted using available information. Preference is given to screening data. There should be at least 6 species from different taxa tested at the highest nominal application rate. Spray drift is considered the key exposure route for terrestrial plants located in the vicinity of the treated area. The drift models produced by the BBA for the exposure assessment of aquatic organisms may be used as a surrogate to cover the exposure assessment of terrestrial plants. In this paper we present guidelines for risk assessment for non-target plants including indicator species taken for evaluation.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Understanding the earth with satellite images – Development of a student-centered learning environment to support the application of remote sensing in schools

Vera Fuchsgruber, Nils Wolf, Kathrin Viehrig, Simone Naumann, Alexander Siegmund

PH Heidelberg, Germany

fuchsgruber@ph-heidelberg.de, wolf3@ph-heidelberg.de, viehrig@ph-heidelberg.de naumann@ph-heidelberg.de, siegmund@ph-heidelberg.de

Keywords: Satellite images, Remote sensing in schools, geography, learning platform, adaptive learning

Abstract:
Modern satellite technology presents one of the key techniques of the 21st century. It is applied in weather and earth observation, navigation systems or communication. Therefore, a competent handling of these techniques constitutes an important contribution to the professional qualification of young persons. The application of satellite imagery and other modern geotechnologies is already included in curricula and educational standards in most states of Germany. Nevertheless, the implementation is still reluctant due to the thematic complexity and lack of technical infrastructure and know-how. The project "Learning to understand the Earth -The application of modern satellite image technology for earth observation for students (Space4Geography)" funded by the German Aerospace Centre has the purpose of encouraging, facilitating and increasing the application of satellite imagery in the classroom. On the basis of key issues of national curricula and educational standards, an interactive working and learning environment is developed. It combines curricula-relevant tasks that are analyzed for certain spatial examples using online remote sensing software. Theory parts contain the basics of remote sensing as well as the introduction to the topic. The specifically developed, user-friendly software allows the students to apply the theory by performing simplified, age-appropriate remote sensing analysis using "real" satellite imagery, e.g. RapidEye and TerraSAR-X data. The gained methodological skills can be transferred to other relevant areas with similar contents and questions. Interactive tests at several points of the module that evaluate the students' competence development allow the application of adaptive learning paths to guide the learner through the learning module according to his/her learning style, state of knowledge and personal interests. A future dissemination of the platform and research results is planned, as well as the training of multipliers to facilitate usage of the platform in schools. The current project phase comprises the identification and formulation of possible topics for learning modules, the development of student-friendly remote sensing modules as well as feedback systems to realize adaptive learning paths.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Spatial and Functional Analysis of Health Services in Dohuk governorate/Iraq Kurdistan Region

Redar Nabil Abdulrahman

University of Duhok, Faculty of Humanities, Department of Geography, Iraq
redar_gis86@yahoo.com

Abstract:
The study aims to identifying the reality of health services in Duhok governorate using geographic measurementsthroughspatialdistributionofhealthservicesInstitutesandwhatarethedistribution patterns, In addition to determine the efficiency of health services by using international and local measurements, especially that are used by WHO and Ministry of Health in Iraqi Kurdistan Region. The study suggests a model how to redistributing the new health service institute using model builderin GIS environment. There are more than 7000 employers workingin different health services sectors in 160 foundations, which provide services to 1480000 peoples. The study used spatial analysis and describtion methodology, in addition to regional methodology to compare between 7 districts. The study indicated that there was no clear distribution pattern of health services institutes (Hospitals, Health Centers and Special Health Centers), and there is on balance between the distribution of health services and population.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Spatial implications of adoption of selected criteria wind power development in Poland

Zdzisław Cichocki, Małgorzata Hajto, Agnieszka Kuśmierz, Jan Borzyszkowski, Małgorzata Bidłasik, Cezary Gorczyński

Institute of Evnironmental Protection – National Research Institute,
Department of Environmental Assessments, Poland

Keywords: spatial development, wind power,

Abstract:
Lack of the spatial potential of the Polish wind energy development and the lack of clear criteria for the location of wind turbines led to a violation ofspatial order in the country and also contributed to a number of social conflicts. The study at tempted to assess the potential of wind energy development in Poland and regional diversity and availability ofl and for the location of wind turbines. Assessment was made for the selected criteria defined on the basis of environmental receptors sensitive to the impact of wind turbines. Key criteria were: municipal areas, rural settlement areas, natural protected areas, forest areas, the areas of highest landscape. Analysis was performed using GIS technology. The spatial analyzes assumed different distances (buffers) from building sites, resulting from the need to provide appropriate living conditions of people. Available space for the development of wind energy in the designated country and regions scale is radically limited conditions resulting from the arrangement of settlement systems, the occurrence of natural resources and landscape values. In addition, the adoption of certain distances from settlement systems to ensure "safe" for people localization of wind farms significantly reduces the size of the space. Furthermore, the available surface recognized on a regional scale is not identical to the real areas available for wind turbines. Taking into account a number of specific circumstances identified at the local level individually for a particular object lead to excludes the more areas.

Results of the study found that in Poland there is no possibility to achieve the objectives of EU and the country energy policy, to increase the use of renewable energy can not be based on professional onshore wind farms. The text presents a part of the analyzes carried out at the Institute of Environmental Protection - National Research Institute in Warsaw as part realized in 2013, the research topic "Analysis of the foundations of wind turbines in terms of their impact on the environment" Cichocki Z., Hajto M., Kuśmierz A., Borzyszkowski J., Bidłasik M. Gorczyński C., funded by the statutory IEP-NRI.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The advanced 3D modeling of natural monument Oak "Bartek" in Zagnansk (Poland) - based on point cloud from Terrestrial Laser Scanning

Piotr Rysiak, Kamil Pilch, Katarzyna Gądek, Jarosław Wójcik, Piotr Wężyk, Piotr Tompalski, Marta Szostak

Laboratory of Geomatics, Faculty of Forestry, Agricultural University of Krakow, Poland
geo.rysiak@gmail.com, wezyk.piotr@gmail.com, szostak.marta@gmail.com

Keywords: 3D, Oak "Bartek", laser scanning

Abstract:

In April 2013, the Laboratory of Geomatics (Department of Forest Ecology, Faculty of Forestry, University of Agriculture in Krakow) launched the project under acronym "Bartek 3D" in cooperation with the Research Section of Students from the AGH in Krakow, Pedagogical University and the Jagiellonian University as well. The main aim of the project is to monitor the biggest and probably one of the oldest tree in Poland -Oak "Bartek" (Nr 35/2007 in the register of the natural monuments in Świętokrzyskie Voivodeship; 12 Dec. 2007) in Zagnańsk (50°59'14.96" N; 20°39'0.34" E), based on multi-temporal Terrestrial Laser Scanning (TLS) technology. One of the results of the project should be a 3D CAD model of Oak "Bartek" and detection of the changes in shape of tree. The traditional ground measurements (hypsometers: VERTEX Haglöf; SUUNTO; tape) were performed during the leaf-off season in April 2013 and April 2014 and repeated in leaf-on period in July 2013 using FARO FOCUS 3D scanner (courtesy of AGH in Krakow, IBL Warsaw and TPI Ltd.) Also scanner Leica C10 (AGH) and triangulation scanner RevScan (HandyScan; courtesy Casp System) were used. The Faro Scene ver 5.x software was used to match the 13 single scans performed around the natural monument "Bartek". We used approx 20 spheres to match the 13 scans (293 Mio of points; Oak only 42 Mio points). The resolution of the FARO scanner was ¼ (beam 3mm at 10 m). The point cloud filtration and classification was performed using TerraScan (Terrasolid) and various CAD trial solutions like: 3DReshaper (TECHNODIGIT) and Geomagic (3DSystems). The results based on TLS technology showed some differences comparing to existing data obtained by traditional methods:
Height (H) of the tree: altimeter Vertex (Haglöf) H=29.31 m; HTLS =28.49 m;
• Trunk circumference (L) measured with stretched tape: LT=9.80 m; adjacent along the shape of bark: Ls = 13.70 m; LTLS = 13.51 m;
• The average diameter at breast height (DBH130cm) calculated on the basis of 3D basal area of stem DBHTLS=3.24 m;
• Basal area measured at the 130cm above ground GTLS= 8.24 m2;
• Diameter of trunk (DBH130cm) for directions: N-S=3.25 m and the E-W=3.65 m;
• Tree crown projection area ATLS=604 m2;
• Crown branches ranges for directions: N-S: 37,95 m and the E-W=32.48 m.
• Volume (V): traditional methods 72m3; VTLS=122,5 m3
After modeling of the April 2013 matched FARO scans to triangle model (< 20 Mio of triangles), the goal of the upcoming research is to make 3D print-out in sufficient scale and work-out of the next TLS point clouds from July 2013 and April 2014 to observe some changes.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Tree species classification of Białystok city (NE Poland) using Support Vector Machines and AISA hyperspectral image

Anna M. Jarocińska[1], Małgorzata Białczak[1], Adriana Marcinkowska[1], Łukasz Sławik[2], Bogdan Zagajewski[1], Tomasz Berezowski[3], Jarosław Chormański[3]

[1] University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland
ajarocinska@uw.edu.pl. margaret126@wp.pl, adriana.marcinkowska@uw.edu.pl, bogdan@uw.edu.pl

[2] MGGP Aero, Tarnów Poland
lslawik@mggpaero.com

[3] Warsaw University of Life Sciences, Faculty of Civil and Environmental Engineering,
Department of Hydraulic Engineering, Warsaw, Poland
t.berezowski@levis.sggw.pl, j.chormanski@levis.sggw.pl

Keywords: AISA, tree classification, Support Vector Machines, Białystok

Abstract:
Urban vegetation is an important part of the city. It is changing the microclimate in the city, provides a great amount of oxygen and isolates from the dust and the noise. It is also exposed to stress caused by many factors like air pollution, higher temperatures especially in the summer, strong winds and soil salinisation during winter. Because of that it is important develop method to monitor the plant communities and to monitor the state of the plants. The aim of the study was to classify the trees species in the city based on hyperspectral image using Support Vector Machines classifier, which is the type of machine learning for pattern recognition in classifying high-dimensional data sets. In the study were analysed following tree genera: Tilia, Acer, Aesculus, Betula, Fraxinus, Picea, Populus, Pyrus, Quercus, Salix and Sorbus. The analyses were conducted in Bialystok, city on the north-western Poland. Firstly, the hyperspectral image was acquired on 3.08.2014 using AISA scanner (with 129 spectral bands from 400 to 1000 nm) with spatial resolution 1 m. In the same time field measurements were done – test and reference polygons with tree species. On the image were masked pixels without trees. The test polygons were used to classify tree species on the image using SVM classifier, implemented in ENVI 5.0 software. Finally, the classification was verified using reference polygons from field measurements. The results were the map of tree genera and post-classification statistics.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Poster session

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

322

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Thermal IR imaging in cold air influxes identification and topoclimatological investigations.
Case study from Roztocze National Park

Grzegorz M. Siwek[1], Andrzej Gluza[2], Mirosław Krukowski[3], Krzysztof Siwek[2]

[1] Student Scientific Circle of Geographers, Maria Curie-Sklodowska University, Lublin, Poland
grzegorz.m.siwek@gmail.com

[2] Department of Meteorology and Climatology, Maria Curie-Sklodowska University, Lublin, Poland
andrzej.gluza@umcs.pl, krzysztof.w.siwek@gmail.com

[3] Department of Cartography and Geomatics, Maria Curie-Sklodowska University, Lublin, Poland
miroslaw.krukowski@umcs.pl

Keywords: thermal IR, IR in meteorology, topoclimate, cold air influxes

Abstract:
Located in SE part of Poland, Roztocze Region, is place of Maria Curie-Sklodowska University environmental studies for many years. Among different investigations conducted in this region, especially in Roztocze National Park (RPN), there were also carried out meteorological studies. Despite this fact, knowledge about climate of this area is generally limited to main features definition in general Polish climate classifications. The newest data on Roztocze climate are available in Kaszewski et al. (2002) and Kaszewski&Siwek (2013). However, there is lack of up-to-date research concerning topo- and microclimate spatial distribution in Roztocze National Park. Especially there is no state-of-art phytoclimates recognition on this area. Initial research were held in neighbourhood of forest settlement Florianka, located in the heart of Roztocze National Park. Measurements covered the most specific natural ecosystems of RPN (hail beech, fir forest, glade and deforested plateau). There were conducted continuous measurements of basic meteorological elements. With the aim of detecting locations of cold air influxes and forest influence on deforested areas, there were carried out patrol measurements combined with thermal IR imaging. Such measurement sites distribution enabled authors to find our microclimatic variety between places with differential lay of the land and land cover. Firstly, there were taken thermal IR images of potential places where cold air influxes could be observed. Then patrol measurements of temperature and relative humidity were analyzed using GIS software and related to local topographical conditions and land cover from satellite imaging. As a result of investigation, it was stated that forest influence on grassland phytoclimate can be observed only in limited range and it changes according to weather type. It is also worth emphasizing that use of thermographic camera, GIS analysis and satellite imaging are considerably helpful in research on local climate.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Object Based Image Analysis (OBIA) method for analysis images obtained from UAV

Marta Kołosowska, Anna Zmarz

University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Poland
m.kolosowska@student.uw.edu.pl, azmarz@uw.edu.pl

Keywords: Object Based Image Analysis, Small Format Aerial Photography, Unmanned Aerial Vehicle

Abstract:
The aim of the study was determining the suitability of high resolution images to identify anthropogenic changes induced by sled dog tourism in the area of south-west Spitsbergen. The object classification were conducted using Small Format Aerial Photography, acquired by unmanned platforms X-8, equipped with a autopilot – ArduPilot, with a resolution of less than 5 cm. The researches were conducted in July 2013 in the Adventdalen valley on Spitsbergen, Archipelago Svalbard, located at 71.2°N and 16°E. Object Based Image Analysis uses segmentation algorithms developed raster. These methods shall be decided by the number of generated objects based on pixel brightness values and geometric properties (eg, compactness, shape, grouping pixels in homogeneous objects, etc.). In subsequent stages these objects are classified based on the number depending and properties, such as parameter homogeneity or the ratio of the length of the boundaries to the surface (that is used to detect edges, buildings, parcels, etc.). Object classification may have a hierarchical structure, that is, once grouped objects can be used to generate a new higher hierarchical level. The object classification were done in ENVI 5.0 software.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Geomorphological map of Polish alpine mountains using geoinformatics methods

Radoslaw Gurdak, Elżbieta Wołk-Musiał, Bogdan Zagajewski

University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland
gurdak.radoslaw@gmail.com, eiwolkmu@uw.edu.pl, bogdan@uw.edu.pl

Keywords: geomorphology, landform, Landsat, digital map, Małopolskie voivodeship

Abstract:
The aim of this paper is to present geomorphological map of southern Poland (Małopolskie voivodeship) in scale 1:300 000. Input maps are General Geomorphological Map of Poland 1:500 000, Landsat 5 TM satellite images (RGB 453 composition), Geological Map of Poland 1:200 000, Topographic Map of Poland 1:100 000 and DEM generated by Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global Digital Elevation Model Version 2. These materials were processed into digital form and imported them into the Polish PUWG 1992 coordinate system. The main stage of this study was interpretation and vectorization based on remote sensing and cartographic data. Then polygons, lines and points were coded according to the numbering of J. Borzuchowski (2010). The last stage of this study was the process of designing a legend, editing the map and preparing a composition for printing the map. The effect of the studies is a geomorphological map of Małopolskie voivodeships in scale 1:300 000, and an interactive database in ESRI shapefile format (*.shp). The geomorphological map of Małopolskie voivodeship is a part of a project dedicated to developing a geomorphological map in scale 1:300 000 for whole Poland.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Methods and Techniques applied for the urban growth and for the land use changes in the suburban areas of Warsaw

Jaime Gonzalez Garcia

University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Poland
Spain

j.gonzalez-garcia@student.uw.edu.pl

Keywords: Urban growth, Landsat, satellite images, urban analysis, remote sensing, land use changes, mapping and monitoring

Abstract:
Urban growth is a spatial and demographic process and refers to the increased importance of towns and cities as a concentration of population within a particular economy and society. It occurs when the population distribution changes from being largely hamlet and village based to being predominantly town and city dwelling (Clark, 1982). Through the satellite images we will see changes that have taken place on the periphery of the city of Warsaw, comparing 4 pictures of the study area (1992, 2001, 2007 and 2012) to see the big changes in the periphery of Warsaw.

Urban analysis has been defined as the use of multidisciplinary knowledge and skills with the objective of solving urban problems (Pacione, 1990). The term 'urban analysis' can be applied to the study of an individual city, conceptualized as a collection of various interrelated components (Páez et al.2004). These components include an activity sub-system that determines a city's land-use configuration, transportation sub-system and the interactions between these components (Black, 1981; De la Barra, 1989; Kanaroglou et al., 2002).

Processes of interest in urban analysis include different types of construction (residential, industrial, transportation infrastructure), economic and demographic changes, mobility (travel, residential choice and freight) and environment related processes.

Through Landsat 7-8 ETM/Landsat 5 TM satellite imagery I will study the changes in Warsaw along the past 20 years, from 1992 to 2012. The principal methods used for the study will be the Preprocessing, the Classification and Post-Classification, and the Accuracy assessment. All these techniques will be developed by ENVI software.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Terrestrial Laser Scanning - a new approach of forest inventory method. Case study of Niepolomice Forest, South Poland.

Sara Moroni[1], Valerio Frattura[1], Márton Szabó[1], Piotr Wężyk[2]

[1]LPP ERASMUS students in [2] Laboratory of Geomatics, Department of Forest Ecology, Faculty of Forestry, University of Agriculture in Krakow

Abstract:

Performing a forest management plans of sustainable forest today, it is impossible no to use the proper and updated inventory data. For this reason the goal of presented project was the new approach based on the TLS (Terrestrial Laser Scanner) point cloud. We focused on the usefulness of the scanning system under forest conditions and quality assessment and usability of this state of the art technology. We performed some measurements of selected parameters on inventory plot (area 500 sq m) of all trees using traditional methods for DBH like calliper and tape. This results were compared with data gathered using TLS. Test area was choose in the Niepolomice Primeval Forest, in compartment 113d, in on mixed old grown stand (Pino-Quercetum).

In April 2014, in the first phase of our experiment the tree diameters (BHD 1.3m) were measured with ordinary calliper (all together from 5 directions) and tape. In the second phase the same trees were scanned with FARO FOCUS 3D system from 4 stations. The resolution of scanner was ¼ . We used numbered white spheres with radius of 7.5cm. After scanning the single point cloud were matched using FARO Scene software using automatic approach. In planar view the operator measured the DBH using two methods. First called „pixel" was simply measurement between two pixel of stem. Second method called "Pipe" is fitting the piece of pipe on fragment of the selected stem. The control was performed in 3D View mode.

The results presented on poster show that the need of automation of precise data collection exist and will change soon the traditional ground truth collecting in the forest.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Land cover 1

George Benekos, Ewa Wilk, Dunia Abdul Jabbar Al Khazraji

Wednesday, 18.06.2014, 09:30-11:00, *room 207*

Misiones Province (Argentina) land cover classification based on Landsat imagery
Aneta N. Modzelewska, Aneta Bohdan, Julia Cieślak, Anna M. Jarocińska
09:30 - 09:45
Landsat ETM+ Land Cover Classification using Stuttgart Neural Network Simulator
Edwin Raczko
09:45 - 10:00
Land Cover classification of Warmian-Masurian Voivodeship using Landsat TM images and neural network simulator.
Jakub Olczyk
10:00 - 10:15
Potential of SAR data to ice-jam hazard identification
Helena Łoś, Yves-Louis Desnos, Marek Grześ
10:15 - 10:30
Creating a common symbol classification for a new historical geoportal of Poland
Tomasz Panecki
10:45 - 11:00

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Misiones Province (Argentina) land cover classification based on Landsat imagery

Aneta Modzelewska, Aneta Bohdan, Julia Cieślak, Anna M. Jarocińska

University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Warsaw, Poland
modzelewskaaneta@gmail.com

Keywords: supervised classification, Maximum Likelihood, Support Vector Machine, Argentina

Abstract:
Misiones is province located in northeastern Argentina, surrounded by Brazil, Paraguay and Corrientes province. With its subtropical climate, it is the most humid region of the country. The vegetation here mainly consists of various kinds of forests (like Paraná Atlantic Forest, Araucaria moist forests or river gallery forests) with high biomass. The main goal of the research was to analyze the accuracy of classification algorithms: Maximum Likelihood or Support Vector Machine to classify the land cover. To the analysis Landsat imagery were used. As verification data were used field measurements and Google Earth service. The analysis based on the four Landsat 8 OLI images covering the Misiones region from January 2014. As the first step the atmospheric correction was done. The Dark Object Subtraction algorithm was chosen, as far as it is widely used for Landsat data. Than training polygons to the classifications were chosen. Featured classes were: forests, agricultural areas, build-up areas, water and bare soils. On such processed data, two algorithms of supervised classification were executed – Maximum Likelihood and Support Vector Machine algorithm. The accuracy of the land cover classifications was verified at the beginning of March 2014 on the study area with GPS measurements. The accuracy assessment was proceed for both classifications and compared. The final products were land cover map of the study area. Detailed results will be presented.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Landsat ETM + Land Cover Classification using Stuttgart Neural Network Simulator

Edwin Raczko

University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Warsaw, Poland
edwin.raczko@student.uw.edu.pl

Keywords: Artificial neural network, Landsat ETM+, land cover cassification, SNNS

Abstract:
Land cover classification using satellite imagery is primary source of knowledge about Earth's surface. Standard procedures include manual photointerpretation or supervised classification algorithms (ML, MD, SAM, SVM). Although they are often best for certain problems, in this research different approach was taken. As classification method artificial neural networks were chosen with backpropagation learning algorithm. According to literature they are often slower and require more expertise that more popular classification algorithms. On the other hand they offer benefits that will be shown in this research. To speed up learning, process pixel based approach was chosen. Using Landsat ETM+ data, five different types of land cover were classified. Classified land cover types are as following: forests, surface water, bare soil, urban areas and grass-lands. First neural network was built for all five land cover types. Because of SNNS not being dedicated to image processing, data was specially prepared to be used in SNNS. Learning procedure was conducted on relatively small images (400 by 400 pixels). After learning process, taught neural network was used to classify bigger image (2000 by 2000 pixels). Aim of this research is to show flexibility of this method, showcase artificial neural network ability to generalize and its ability to classify areas that have not been used for learning of artificial neural network. It is also shown how to use SNNS for image classification, coupled with preparing of data and pattern creation.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Land Cover classification of Warmian-Masurian Voivodeship using Landsat TM images and neural

Jakub Olczyk

University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and
Remote Sensing, Warsaw, Poland
j.olczyk@student.uw.edu.pl

Keywords: Artifical Neural Networks, Corine Land Cover, Landsat TM, Land Cover Classification

Abstract:
This study was aimed to develop and test a methodology of semi-automatic land cover mapping from the Landsat TM satellite images. Satellite data processing algorithms and data verification should be operational in a short time to provide fast access to information. The use of neural networks can enable the automation of the process, thereby reducing the costs and time needed to acquire information about land cover. Hypothesis was that the satellite data classified with usage of Stuttgart neural networks imulator will allow for the effective land cove rclassifications of some of the Corine Land Cover classes of third level. Land cover assasment of Warmian-Masurian Voivodeship (area of study) was carried on four satellite images from Landsat TM. For the verification of land cover, reference data was created basing on Corine Land Cover map from 2006. Training and test polygons used to create patterns for neural networks were created by the auth or with a interpretation of satellite images and land cover data. After finding the optimal structures of the network author performed classification of satellite images, with a usage of networks based on different textural windows (no window, 3x3, 5x5 pixels). Results show that only a few of third level Corine Land Cover classes can be recognized by a neural network used in a study. However, this work may be the basis of further analysis of the automated land cover mapping.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Potential of SAR data to ice-jam hazard identification

Helena Łoś[1], Yves-Louis Desnos[1], Marek Grześ[2]

[1]European Space Agency; Science, Applications and Future Technologies Department, Italy
helena.los@esa.int, yves-louis.desnos@esa.int,

[2]Nicolaus Copernicus University in Torun; Faculty of Earth Science, Poland
marek.grzes@umk.pl

Keywords: SAR, river ice, hazard identification

Abstract:
River ice is an element of the natural river regime in Poland. For Vistula – the main Polish river – ice running is accompanied by ice jams which, leaving without control, may lead up to local floods. Therefore for continuous ice cover monitoring for the whole river is necessary until the end of breakup phase. Until today ground observation have been the main source of information about river ice in Poland. In the past aerial reconnaissance was also carried out for selected sections with successful results. Nowadays, satellite – especially SAR (Synthetic Aperture Radar) – data are a promising alternative for aerial photographs by allowing all weather day/night monitoring of the river basin. This kind of data give an overview of situation for a long selection of river and help to choose areas for ground measurements. SAR data might be also used to prepare a path for icebreakers and to monitor progress of icebreaking. The aim of on-going project is to use SAR data to estimate an extent of ice cover, describe its morphology and detect potential ice jams. As area of interest Wloclawek Reservoir was chosen. Its middle and upper part is considered to be the most common location for ice jams in Poland. Ice cover developing in the reservoir blocks frazil ice fields which flow downstream. In that contact zone ice dam occurs very often. In the project we use data from the archive acquired in C-band and L-band by ENVISAT ASAR and ALOSPALSAR sensor respectively. Classification is carried out based on radar back scattering value and texture parameters. In the first results contact zone was correctly detected. Also separation of frazil ice from open water and smooth ice was successful. The Sentinel 1 mission will allow continuous monitoring of the region at C-band in dual polarisation and further operational development of such an application in Poland.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Creating a common symbol classification for a new historical geoportal of Poland

Tomasz Panecki

University of Warsaw, Faculty of Geography and Regional Studies, Department of Cartography, Poland
tpanecki@uw.edu.pl

Abstract:
Crowd-sourcing approach should be implemented into a new historical geoportal of Poland due to its increasing potential in WebGIS. Registered users will be able to acquire spatial data from various map series. As it requires feature classes' harmonization, a common symbol classification should be proposed. It will be based on chosen topographic maps of Polish lands from 19th and 20th centuries. Feature classes derived from archival maps will be standardized and reclassified, but with no information lost. It will be done in four steps which require: data acquisition, maps' content harmonization, feature classes typification and attribute table elaboration. In addition, four methods of data harmonization can be distinguished: symbol sequence, semantic analogies, spatial relations and a combined method. The paper covers elaboration of two thematic layers – roads and railways based on three topographic maps (Austrian 1:75 000, German 1:100 000, Russian 1: 126 000).

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Land cover 2

Karolina Orłowska, Haider Aboud AL-Karaawi, Grzegorz Siwek

Wednesday, 18.06.2014, 11:30-13:00, *room 207*

Land use-land cover maps production using data fusion concept and Geographic Object Based Image Analysis approach - the case study in Krakow city
Paweł Hawryło
11:30 - 11:45
Geographical analysis of the desertification phenomenon in Mahawel District, Middle of IRAQ by using remote sensing and GIS techniques
Dunia Abdul Jabbar Al Khazraji
11:45 - 12:00
Optimal Choice of Sustainable Development Areas in Al-Diwaniyah Governorate in Iraq
Haider Aboud AL-Karaawi
12:00 - 12:15
Analisys of impervious surfaces in Poland
Agnieszka Soszyńska, Małgorzata Krówczyńska, Ewa Wilk, Piotr Pabjanek, Pavol Hurbanek, Konstantin Rosina
12:15 - 12:30
The use of GIS tools in the study of ventilation corridors in Warsaw - the example of frontal area index method
Edyta Bogucka
12:30 - 12:45
Implementation of digital maps and documentation of the site based on Geographic Information System for the selected regions of Szlak Naftowy
Adrianna Góra, Szymon Franczak, Michał Lupa, Marek Solecki, Adam Cygal, Andrzej Świąder
12:45 - 13:00

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Land use-land cover maps production using data fusion concept and Geographic Object Based Image Analysis approach - the case study in Krakow city

Paweł Hawryło

University of Agriculture in Krakow, Poland
p.hawrylo@ur.krakow.pl

Keywords: data fusion, GEOBIA, LiDAR, object-oriented classification

Abstract:
Rapid development of urban areas entails dynamic changes in Land Use and Land Cover (LULC. Classical methods of cartography do not keep up with such changes and the vast amount of data available. Thus there is a need for development of new methods for LULC classification purposes. One of such method used from about decade is Geographic Object Based Image Analysis (GEOBIA). This method enables good performance and gives possibility for integrating data from different sources. The aim of the study was to create Land Use Land Cover map of the western part of Krakow based on GEOBIA approach using aerial images, Normalized Digital Surface Model derived from airborne LiDAR data and GIS-vector data with roads infrastructure. The study area covered 48 sq. km in the western part of Krakow city. Within the city boundaries there are many valuable natural areas such as NATURA 2000 sites and several nature reserves, what reinforces the need for continuous monitoring of LULC structure. During fieldwork photographic documentation for the 443 test plots was made and used for subsequent classification rules development. Aerial or tho photos were resampled from original 0,2m spatial resolutionto1.0 m. Intotal 12 LULC classes were distinguished. Classification workflow consist of several methods characteristic for object-oriented classification. In general, the modular approach was used but for selected LULC classes also the hierarchical fuzzy logic classification was applied. For some classes the spiral classification model proved to be most appropriate. In case of class "allotment gardens" it was necessary to use multiscale analysis concept. For successful classification of 12 LULC classes there was a need to use wide range of object features such as: spectral, geometrical, related to shape, relations between object levels and many others. As an unit for accuracy assessment purposes a single segment was used instead of a single pixel. For each class 50 randomly selected segments was checked by operator. Analysis of confusion matrix showed high accuracy with Kappa coefficient amounted to 0,92. Achieved classification results indicate dynamic and significant changes in research area what can be recognized as threats to the plants and animals species protected under Natura 2000 sites, mainly from expanding urban areas and secondary forest succession.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Geographical analysis of the desertification phenomenon in Mahawel District, Middle of IRAQ by using remote sensing and GIS techniques

Dunia Abdul Jabbar Al Khazraji

University of Tikrit, College of Education, Geography Department, Iraq
dunia.nagi@yahoo.com

Keywords: Desertification, Mahawel District, IRAQ, remote sensing, GIS

Abstract:
Desertification is one of the worsts environmental phenomena; it is starting to spread widely. The interesting of the study and analysis the factors that controlling this phenomenon is increased widely. Also, the planning has been started to utilize the modern techniques that help to determine the environmental changes, climatic variations and human activities, which are playing a role in increasing desertification. The employment of remote sensing is one of the most important techniques used in the analysis of desertification. The study area has been suffering from extreme drought conditions, so that; the desertification phenomenon was increased dramatically during the last years. To identify the most important controlling factors, remote sensing data i.e., Landsat 5 TM image of 1990 and Landsat 7 ETM+ of 2000 and Landsat8 2013, are used and the digital image processing techniques represented by classification and ratio indices by using ERDAS software are carried out. Five models are designed using ERDAS modeling tool to calculate the spectral Image-based index i.e., Normalized Difference Vegetation Index (NDVI), Normalized Difference Water Index (NDWI), Normalized Difference Build-up Index (NDBI), Normalized Difference Bare Land Index (NDBaI), and Crust Index (CI). The results show that, the index of vegetation land area is decreasing for the years 1991, 2000 and 2013 as fellow (25%, 22% and 17%) respectively. This means that the increasing ratio of built-up area in three years is more rapid than the decreasing in the vegetation area and water bodies. These indications refer to the effect of climatic variations, the deficit in the water import and human activities by the growth of the population which leads to the abusing in the land uses by expanding the built-up area over neighboring lands. Four desertification levels have been distinguished in the study area (Low, Medium, High, and Severe). Severe and high desertification levels are widely dominant in the study area.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Optimal choice of sustainable development areas in Al-Diwaniyah Governorate in Iraq

Haider Aboud AL-Karaawi

University of Kufa, Faculty of Education, Department of Geography, Iraq
mww703@yahoo.com

Keywords: Optimal Choice, Sustainable Development, Al-Diwaniyah Governorate

Abstract:

Al-Diwaniyah Governorate in Iraq has primary components of developments such as agriculture, indusial and tourist components. However, it suffers from inequality of spatial development among its regions. It is a result of the negligence, which happened over many years and the absence of integrated development policies. This research aims to study the reality of development at the governorate and to measure the level of development depending on indicators of developmental spatial concepts in order to make changes in the poor regions of the governorate. In addition, it aims to show the development constraints which lead to spatial disparities in some parts of the governorate. Descriptive analytical method with statistical analysis for some indicators of planning was used to measure the level of development standards in Al-Diwaniyah Governorate.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Analisys of impervious surfaces in Poland

Agnieszka Soszyńska[1], Małgorzata Krówczyńska[1], Ewa Wilk[1], Piotr Pabjanek[1],
Pavol Hurbanek[2], Konstantin Rosina[3]

[1] University of Warsaw, Faculty of Geography and Regional Studies, Poland
agnieszka.soszynska@student.uw.edu.pl, mkrowczynska@uw.edu.pl, ewa.wilk@uw.student.edu.pl,
p.pabjanek@uw.edu.pl

[2] Catholic University in Ruzomberok, Slovakia

[3] Slovak Academy of Sciences, Institute of Geography, Slovakia

Keywords: soil sealing, impervious surfaces, land cover, Poland

Abstract:
Increasing urbanization, results in constant enlarging of the artificial area closed to water infiltration. The surface of the impervious area is one of the indicators of the level of anthropopression on the natural environment. Creating databases of impervious surfaces is a novel idea, originating in land cover databases. In 2006-2008 the Soil Sealing Enhancement database was the part of the GMES Fast Track Service on Land Monitoring. The accuracy of the final product should reach at least 85%. Calculating the accuracy of the impervious surface map for Poland, allows for getting acquainted with the situation the country is currently facing, with the respect to the level of imperviousness. Data obtained allow for setting priorities and assignments for local self-government agencies. Orthorectified high resolution aerial photos of Poland were used to develop the reference data. 20 000 random samples were placed on the entire area of the country. In each sample there were 100 reference points chosen, which were classified in to three possible classes of surfaces: natural, artificial and semisealed. Comparison of reference data and original project statistics revealed the values of accuracy, commission and omission errors in the SSE dataset. Although, SSE accuracy in Poland fulfills the criteria set by SSE authors with overall accuracy of 96,3%, the individual analysis for each category reveals many weaknesses. Preliminary interpretation of the mistakes leads to the conclusion that the spatial resolution of pictures used in the SSE project is insufficient. In several cases validation proved that omission mistakes were made in relation to construction sites or recent buildings. It should be stated that the accuracy of Soil Sealing Enhancement for Poland can be treated as the maximum value of impervious surfaces. Further development of this automatic classification can eliminate causes of the high rate of commission errors without the precision reduction. The small number of omission errors suggests that the usage of higher spatial resolution data may lead to more satisfactory results.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The use of GIS tools in the study of ventilation corridors in Warsaw -the example of frontal area index method
(The case of Ventilation Corridor of Pole Mokotowskie)

Edyta Bogucka

Faculty of Geodesy and Cartography, Warsaw University of Technology Poland
e.p.bogucka@gmail.com

Keywords: frontal area index, ventilation corridor, Warsaw

Abstract:
Scientific Project 2012 made by the Student Scientific Association of Spatial Planning placed on Faculty of Geodesy and Cartography Warsaw University of Technology under the title "The use of GIS tools in the study of ventilation corridors in Warsaw -the example of frontal area index method " is a dissertation concerning the influence of different types of land use on the efficiency of ventilation corridors. Our project presents an extensive study of urban ventilation using the model of roughness parameter created with frontal area index and GIS tools. The local climate in Warsaw is greatly influenced by existing ventilation corridors and the urban morphology, including high buildings, green spaces, wide streets and elements of transport's infrastructure. Pole Mokotowskie is the most important Warsaw's ventilation corridor, because it is the only one, which delivers fresh air from suburbs to the center of Warsaw. Unfortunately, during last 20 years the area of corridor and it's overall efficiency has changed dramatically because of the location of new developments. The final work of the Scientific Project is the land development project based on many-sided research and GIS analysis of the topic. Our project include corridor's urban renewal conceptions based on relevant orientation of buildings, new forms of greenery and water areas.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Implementation of digital maps and documentation of the site based on Geographic Information System for the selected regions of Szlak Naftowy

Adrianna Góra, Szymon Franczak, Michał Lupa, Marek Solecki, Adam Cygal, Andrzej Świąder

Poland
adrianna.gora92@gmail.com, franczakszymon@gmail.com, mlupa@agh.edu.pl,
msolecki@geol.agh.edu.pl, cygal@geol.agh.edu.pl, andrzej.swiader@agh.edu.pl

Keywords: GIS, ArcGIS, Petrel, Szlak Natfowy

Abstract:
GIS is a well-organized database storing information about objects and phenomena that occur both on the Earth's surface as well as underground. Nowadays we can observe a rapid technological development, databases (geodatabases) are designed to enable representation of the world but also allow for multi-dimensional analysis of the collected information with regard to space. This solution creates a kind of object-oriented map which includes spatial and numerical data, collected from various sources and compiled to form a coherent geospatial representation. This, in turn, constitutes a rich source of comprehensive information accessible for multiple users, for simultaneous reading and working on the collected data. All these new developments prompted the members of the " KIWON " Scientific Society operating at AGH Faculty of Geology, Geophysics and Environmental Protection to propose the idea of creating a complete documentation of selected areas of the Podkarpackie Region, which over the recent years they has been thoroughly tested. The first stage of the project will be to create a three-dimensional model of the terrain surface based on data obtained from (LiDAR) air scan. The modeled area will cover selected parts of Szlak Naftowy, especially around Bóbrka and Ustrzyki Dolne. Szlak Naftowy is a cross-border route connecting places associated with the origins and history of the oil industry. Its main axis runs through Jaslo -Krosno -Sanok -Lesko -Ustrzyki Dolne while its further part continues on the other side of the Polish-Ukrainian border (unaudited). The main aim of the projectis to develop digital map sfor selected regions of Szlak Naftowy based on Geographic Information System. The maps will integrate information on topographical, geological and environmental occurrence of the selected oil and gas deposits on the stretch between Krosno and the Polish-Ukrainian border. The purpose of our research is to create a three-dimensional map which will detail two areas -the area of the Bóbrka and Ustrzyki Dolne (Polana deposit). The map will present ground surface and three-dimensional ground model, developed on the basis of borehole data. These models will be developed in two independent systems enabling the creation of three-dimensional models of the substrate (ArcScene and Petrel) . In addition, a comparative analysis will be carried out for both output models. While developing a digital model of the terrain surface will be used point clouds acquired by laser scanning LIDAR method. Additionally, we will attempt to create a complementary NMT based on satellite data (InSAR method). The planned result of our work will be a digital interactive map which will allow the analysis of individual layers of oil and gas over the investigated area and a visualization of the terrain surface, which will include natural and anthropogenic objects. Following the results of terra in reconnaissance, up date and verification of locations of pits and natural oil and gas leaks along Szlak Naftowy accompanied by photographic documentation of the research area we aim to develop a database containing the coordinates of GPS waypoints as well as geological and environmental data.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Water

Salit Chakma, Mateusz Ślązek

Wednesday, 18.06.2014, 17:00-18:00, *room 207*

Empirical line atmospheric correction of the hyperspectral data for water quality monitoring
Malgorzata Slapinska, Tomasz Berezowski, Jarosław Chormański
17:00 - 17:15

Analysis of the possibilities of using aerial photographs to determine the bathymetry in shallow coastal zone of the selected section of the Baltic Sea.
Łukasz Cieszyński, Kazimierz Furmańczyk
17:15 - 17:30

Determination of water quality parameters with satellite images
Agnieszka Jenerowicz, Piotr Walczykowski
17:30 - 17:45

Assessment of groundwater potential zones using remote sensing and GIS modeling techniques
Abbas Fadhil Odaid Al-Qaraghuli, Ayad Ali Faris
17:45 - 18:00

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Empirical line atmospheric correction of the hyperspectral data for water quality monitoring

Malgorzata Slapinska, Tomasz Berezowski, Jarosław Chormański

Warsaw University of Life Sciences (SGGW), Poland
m.slapinska@levis.sggw.pl, T.Berezowski@levis.sggw.pl, J.Chormanski@levis.sggw.p;

Keywords: remote sensing, water, Zegrzyńskie Lake

Abstract:

Atmospheric correction of hyperspectral images acquired in the VIS-NIR range is usually performed with the empirical line method, as it do not require any knowledge about the atmosphere parameters. The objective of this study was to analyze the results of the atmospheric correction in a water dominated study site (Zegrzyńskie Lake, Poland) in scope of agreement with at-surface reflectance and influence on water quality modeling. Zegrzyńskie Lake is an artificial reservoir located approximately 30 km north from Warsaw and is one of the tap water sources for the city. The reservoir is fed by two major rivers: Bug and Narew which drains large, trans-boundary, agricultural areas. Therefore the water quality monitoring is a crucial aspect of the reservoir management. Hyperspectral remote sensing data was acquired by the AISA Eagle sensor in August 2013 with the ground measurements campaign conducted two days later. The ground measurements included: spectral reflectance (ASD FieldSpec 3) and water parameters (Secci depth, electric conductivity and chemical contamination). The results of our analysis demonstrate the advantages and disadvantages of the empirical line atmospheric correction for the highly absorptive target – water. We also show that the hyperspectral data calibrated with this method can be further used for spatial modeling of water quality parameters.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Analysis of the possibilities of using aerial photographs to determine the bathymetry in shallow coastal zone of the selected section of the Baltic Sea.

Łukasz Cieszyński, Kazimierz Furmańczyk

University of Szczecin, Faculty of Geosciences, Remote Sensing and Marine Cartography Unit, Poland
cieszak@o2.pl, kaz@univ.szczecin.pl

Keywords: bathymetry, aerial photography, remote sensing

Abstract:
Sunlight illuminating the bottom of a shallow sea basin is weakened with the thickness of the water layer, i.e. depth. Additionally, the amount of light reaching the certain layer depends on the total suspended matter concentration in seawater. Using these two relationships in specific, favorable hydrometeorological conditions the depth of the basin in the shallow coastal zone (up to 3-4 m) can be determined on grounds of aerial photography. Investigating such shallow areas by sonar or echo sounding is unprofitable. Green LIDAR scanning could solve the problem, but it is also still an expensive method. Determination of bathymetry from aerial photography was initiated in the USA (Musgrove, 1969) and the Russia (Zdanowicz, 1963). In Poland this method was used by K.Furmanczyk (1975). Currently, the authors are returning to this concept at another level of recording techniques and image processing. They propose to determine the bathymetry of the Baltic shallow coastal zone using digital vertical aerial photography. By examining the relationship of pixel values and the measured in-situ depth in selected checkpoints, authors have developed a relationship through which it is possible to determine the bathymetry. However, the equation requires a number of adjustments resulting from, e.g., the phenomenon of vignetting, distribution of light, or the collapse of the rays of light at the atmosphere -sea interface. The equation and the package of corrective algorithms consist a program which allows you to get from a digital air image a three-dimensional visualization of bathymetry with digital map easily. In the presentation the authors will describe the results of the analysis and the method accuracy in the grounds of the selected example of the certain area of Polish coastal zone. What is more, preliminary analysis of sea bottom short-term changes will be presented. This analysis bases on the above-mentioned algorithm. Further plans of working on improving the algorithm will be also described.

Musgrove R,G., 1969. Photometry for interpretation. Photogrametric Engineering No. 10. Furmańczyk K., 1975. Możliwości praktycznego zastosowania metody fotogrametrycznej do określania głębokości w strefie brzegowej morza. Gdańsk. Zdanowicz W.G., 1963. Primienienije aerometodow dlia issledowanija moria. Leningrad.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Determination of water quality parameters with satellite images

Agnieszka Jenerowicz, Piotr Walczykowski

Military University of Technology, Faculty of CIvil Engineering and Geodesy, Instittute of Geodesy, Department of Remote Sensning and Photogrammetry, Warsaw, Poland
jenerowicz.agnieszka@gmail.com, pwalczykowski@wat.edu.pl

Keywords: water quality parameters, water pollutants, water contaminants, remote sensing, HICO, MERIS, Landsat, satellite imagery

Abstract:
Monitoring water quality parameters and detecting different water contaminants is important in water management and protection of whole environment. Nowadays water contamination is a major global problem which requires ongoing evaluation of water resource policies at all levels. Modern remote sensing techniques offer great possibilities for the understanding of a great number of changes in nature and enable the monitoring of the state of water reservoirs, their quality parameters and level of contamination. Among many techniques, remote sensing methods can be used for detect and assess several water quality parameters, such as temperature, chlorophyll concentration, turbidity, salinity, content of coloured dissolved organic matter (CDOM), etc. which are key factors in determining water quality. Optical multispectral and hyperspectral sensors mounted on satellites such as Envisat, Landsat or HICO, etc. provide spatial and temporal data necessary for understanding changes in water quality parameters, defined by the Water Framework Directive (2000/60/WE). The usage of different satellite images with different spectral and spatial resolution of Albufera lake in Spain, allowed for determination of different water quality parameters and evaluation of their changes in time. Thereby, with recent launches of sensors with improved spectral and spatial resolutions, greater use of remote sensing techniques to evaluate and monitor many water quality parameters and the detection of biological, physical and chemical water contaminants is possible.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Assessment of groundwater potential zones using remote sensing and GIS modeling techniques
(Diwaniya governorate, Iraq – a case study)

Abbas Fadhil Odaid Al-Qaraghuli, Ayad Ali Faris

University of Mustansiriyah, College of Education, Department of Geography,-Baghdad, Iraq
abbasqaraghuli@gmail.com, ayadfaris@hotmail.com

Keywords: Groundwater, Potential Zone, Remote sensing, GIS, Modeling, Diwaniya Governorate, IRAQ,

Abstract:
Groundwater like any subsurface phenomena, need to be prospected by the analysis and interpretation of indirect evidence, extracted from surface terrain and hydrological features. The extraction of data by indirect evidence depends upon the types, quality of data and the techniques used in preparing the spatial data models. The careful selection of different types of data can play an important role to give evidence about the occurrence of groundwater and help in the delineation of the groundwater potential zones. The study area is located in the upper part of south Iraq; it is bounded by lat. $31^o10'$–$32^o30'$ N and longitudes $44^o27'$–$54^o45'$ E, and extended along 8524 km^2. Geologically the area is covered by lower to middle Eocene, with some deposits of quaternary period. Most of geomorphological features are narrow flood plains along the main rivers, some area are covered by sand dunes. The occurrence of ground water in the study area is controlled by some geological formation and sediment deposits. Because of the absence of the geological survey of groundwater in study area, local people are suffering from the failing of bore wells either in water quality or in the well yield. The current study was conducted to assess the groundwater potential zones, based on remote sensing meteorological data supported by data collected from field work. According to the relative importance of the behavior with respect to the groundwater potential, different classes in different thematic layers are used in building the models, i.e., rainfall, evapotranspiration, surface runoff, infiltration, slopes, geology and geomorphic features (landforms). The models are executed by using ARCGIS v.10.2 and ERDAS 2013. The integrated analyses of the data are clarified the discrimination of the main groundwater potential zones in the study area, and the most important zones are located in the western parts, and most of the recharging amounts of groundwater are coming from the watersheds of the valleys which are flowing into the study area by Euphrates river and some dry valleys out of the study area.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Oceans – tutorials

Rainer Reuter

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

346

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The role of the oceans in climate change
(A tutorial)

Rainer Reuter

University of Oldenburg, Germany
http://www.meeresphysik.uni-oldenburg.de
rainer.reuter@uni-oldenburg.de

Abstract:
The relevance of the oceans for the dynamics of climate change during the last century is discussed with a focus on the following questions: atmospheric temperatures increase, but is there much evidence for ocean warming? If so, how much excess heat is absorbed by the oceans compared with atmosphere and land surface? Land vegetation exceeds biomass in the oceans, but play the oceans a minor role in atmospheric carbon dioxide capture and storage? How much regenerative energy is produced today in coastal waters and where are the limits? In which way is remote sensing useful to deal with these questions?

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

SEOS -EARSeL's e-learning tutorials for science education
(A training course)

Rainer Reuter

University of Oldenburg, Germany
http://www.meeresphysik.uni-oldenburg.de
rainer.reuter@uni-oldenburg.de

Keywords: remote sensing, science education, e-learning

Abstract:
SEOS is an initiative for using remote sensing in science education curricula in high schools funded under the 6th Framework Programme of the European Commission (EC). Eleven partners from several European countries, in cooperation with the European Space Agency (ESA) and teachers from European high schools, created e-learning tutorials for science students across Europe. Based on real examples, the tutorials use remote sensing images and data to involve students in different aspects of current environmental research and monitoring. They cover a broad range of topics, from daily weather data to long-term climatic conditions, landcover changes, marine pollution and environmental hazards, ocean currents, coral reefs and coastal water quality, natural and cultural heritage and conservation, time series analysis, classification, and modelling, to name but a few. Connections between different topics are made clear, and links make it possible for users students to follow their own route through the tutorials according to their own interests. Teaching in high school is facilitated by Enquiry-based Learning, which is also supported by worksheets highlighting an interesting scenario in the environment followed by questions or tasks which can be solved when studying the web-based tutorials. Advanced information on a more complex level is available through links to supplementary pages, which is particularly relevant when used in physics and mathematics classes and at university. Recently, modified tutorials on oceans and coastal waters were offered to users of the GMES-Copernicus service DeMarine as background information on remote sensing. Topics which might be relevant for creating new tutorials A future initiative shall be related to subjects of actual concerns such as, e.g., energy production and use, and climate change in the context of remotely sensed information.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Ocean remote sensing using lasers
(A tutorial)

Rainer Reuter

University of Oldenburg http://www.meeresphysik.uni-oldenburg.de
rainer.reuter@uni-oldenburg.de

Abstract:
Methods of airborne laser remote sensing (lidar) of hydrographic parameters are presented with a focus on several goals: bottom depth measurements and detection of submerged objects; measuring seawater turbidity, dissolved coloured substances and suspended particles; quantifying phytoplankton biomass; depth profiling of temperature and salinity. Each subject is presented starting with the basic physical principles, the relevance in specific applications is outlined, and typical results are illustrated with sample data demonstrating the potential and limitations of laser remote sensing.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Methods 2

Dunia Abdul Jabbar Al Khazraji, Michał Lupa

Thursday, 19.06.2014, 16:00-18:00, *room 207*

Extraction of knowledge from Trained One-Class SVM Classifier
Khelifa Djerriri, Mimoun Malki
16:00 - 16:15
Evaluation of the RFM as a replacement for the Rigorous geometric Model of ASLAT-2A imagery
Issam Boukerch, Mohamed Hadeid, Redouane Mahmoudi, Bachir Takarli, Kamel Hasni
16:15 - 16:30
Evaluation of Time periods Role in modelling the Relationship Between Leishmaniasis Diseases Distribution and Environmental Variables Using GIS and Remote Sensing Techniques
Abbas Alimohammadi, Mohammad Sharifikia
16:30 - 16:45
A matter of scale
16:45 - 17:00
ANALYSIS OF SHADING USING PYTHON AND BLENDER APPLICATIONS
Mateusz Ilba
17:00 - 17:15
Understanding of a dense matching
Marta Kubacka
17:15 - 17:30
Assessment of the Imaging Spectroscopy for Rock Identification of the Karkonosze (Giant) Mountains
Monika Mierczyk, Bogdan Zagajewski, Roksana Knapik
17:30 - 17:45
AGH University of Science and Technlogy in three-dimensional web world
Karolina Materek, Mateusz Jabłoński, Łukasz Parkitny, Michał Lupa, Krystian Kozioł
17:45 - 18:00

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Extraction of knowledge from Trained One-Class SVM Classifier Application to Urban Growth Monitoring

Khelifa Djerriri[1], Mimoun Malki[2]

[1] aDivision of Earth Observation, Centre for Spatial Techniques, Algeria
kdjerriri@cts.asal.dz

[2] EEDIS Laboratory University of Sidi Bel Abbes
malki@univ-sba.dz

Keywords: Classification Rules Extraction, One-Class SVM, Urban Growth Monitoring

Abstract:
In the field of information extraction from remotely sensed imagery we often have to deal with the situation where only a specific land-cover type has to take into account without considering other classes. This situation is known as one-class classification. The most important advantage of one-class classification is that it does not need that all classes that occur in the scene have to be exhaustively assigned label. The class of interest is accepted as target, whereas other classes are rejected as background. Different one-classclassifiers have been proposed during the last decades. One of the most commonly used is the one-class support vector machine (SVM), which tries to enclose the training data by a hypersphere in the multidimensional space. One-class SVM belongs to black-box models as multi-class SVM and neural networks, which provide no understandable or easy to interpret knowledge about the classification model. In the other hand many attentions have paid to knowledge-based methods. Rule-based and decision trees classifiers have known a great success as an alternative supervised classification methodologies, often performing better over many conventional classification techniques. Monitoring of earth surface changes from space by using multi-date satellite imagery was always a main concern to researchers in the field of remotely sensed image processing. The exploiting of simple, easy to memorize and often comprehensible mathematical models such classification IF-Then rules, band-ratios and indices are one of the widely used techniques in remote sensing for the extraction of particular land-cover/land-use like urban and vegetation areas. The results of these models generally only need the definition of adequate thresholds to discriminate between the class of interest and the background. In our research we propose a geometrical approach to extract useful knowledge from trained one-class SVM and use it later to extract urban areas from satellite image series. The model was constructed from single Landsat 5 TM image acquired in 2006 by using training samples extracted with the help of a Quick-bird high spatial resolution satellite image acquired the same day as the Landsat image over the city of Oran, Algeria. The model has been tested to extract urban areas from multi-date series of Landsat TM imagery.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Evaluation of the RFM as a replacement for the Rigorous geometric Model of ASLAT-2A imagery

Issam Boukerch, Mohamed Hadeid, Redouane Mahmoudi, Bachir Takarli, Kamel Hasni

Algeria
issam.boukerch@yahoo.fr

Keywords: ASLAT-2A, Rigorous geometric Model, RFM, orthoimage, DSM

Abstract:
The exploitation of the full geometric capabilities of the High-Resolution Satellite Imagery (HRSI), require the development of an appropriate sensor orientation model. The aim of geometric modelling is to describe the relationship between image and ground coordinates for a given sensor. Before using HRSI for GIS or mapping applications, we must, in first consider the geometric aspect of this satellite imagery product. Several authors studied the geometry modelling and generally we have two categories of geometric models: physical and empirical models. The empirical, implicitorn on parametric models can be used when the parameters of the acquisition systems or a rigorous 3D physical model are not available. Since they do not reflect the source of distortions these models represent the acquisition system as a mathematical transformation (such as rational functions, 2D or 3D polynomials) between object and image spaces. The physical models, also known as rigorous or deterministic models reflects the physical reality of the viewing geometry (platform, sensor, Earth and sometimes map projection); generally in the optical imagery these models are based on the well-known collinearity condition. The Algerian satellite Alsat-2A was launched into orbit on 12 July 2010. It has five push broom sensors, panchromatic and multispectral in four bands. The panchromatic image is acquired with a spatial resolution of 2.5m and a swath of 17.5km at nadir. Multispectral bands have a resolution of 10m with the same swath. A rigorous sensor model (RSM) for ALSAT-2A has been developed; this model is based on the time dependent collinearity which integrates attitude, orbital data and other information extracted from the metadata provided with the images. to handle this geometric model a matlab program has been developed and tested in previous works and provides an acceptable accuracy. But for the practical use of the developed model to orthorectify the imagery or the extraction of DSM from stereo images; this model must be integrated into a dedicated software. since the majority of these softwares supports the rational function model (RFM), this paper deals with the use of the RFM as a replacement of the RSM. After calculating the RSM parameters, we can trace the ray from any image pixel (x,y) to the ground by using the interior and exterior orientation parameters; this ray is intersected at a defined ground elevation (Z) to get the horizontal ground position (X,Y). At least ten well distributed image points are chosen for ray tracing, these rays are then intersected with four different Z level, so at least 40 points are generated and used to calculate the RFM parameters with an accuracy of less than 0.1pixel. the calculated parameters are written in an RPC file that can be read directly by the softwares to generate orthos and DSMs. This approach allow the replacement of the RSM by an equivalent RFM without affecting its accuracy, which permit the use of the resulted RFM to generate accurate orthoimages and DSMs using a commercial software.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Evaluation of time periods role in modelling the relationship between leishmaniasis diseases distribution and environmental variables using GIS and remote sensing techniques
(time periods role in spatial modelling leishmaniasis diseases using GIS and remote densing techniques)

Abbas Alimohammadi, Mohammad Sharifikia

professor, Islamic Republic of Iran
alimoh_abb@yahoo.com

Assistant professor, Islamic Republic of Iran
sharifikia@modares.ac.ir

Keywords: GIS and Remote Sensing, Cutaneous leishmaniasis (CL), MODIS, Exploratory Data Analysis, Multivariate Analysis, Yazd province.

Abstract:
Prevalence and development of diseases, are largely dependent on the conditions of the environment. Knowledge of the environment can be used to protect humans and to control risks of diseases. Leishmaniasis is a parasitic disease that is transferred to humans by the female sandflies and includes two types of visceral and cutaneous leishmaniasis. The prevalence areas of this disease in Iran is mainly concentrated in Isfahan, Fars, Khorasan, Khuzestan, Kerman and Yazd provinces. Accordingly, identification of the main geographic distribution areas and influencing factors is an important task. In this research, by using a combination of GIS, RS and spatial statistical analysis locations with high densities and risks of diseases identified in four time periods including the month, season, 6 months and year in Yazd province. Environmental data including rainfall, temperature, population, relative humidity, longitude, latitude, time of year and MODIS products including the land surface temperature, enhanced vegetation index and gross primary product (GPP) have been used to model the spatial distribution and density of Leishmaniasis. Results showed that the coefficients of determination for time periods of 6 months and year was higher than that of the others and provide better model. Latitude, time, enhanced vegetation index, year, rainfall, relative humidity variables, respectively, had more effective role in disease modelling.

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Analusis of shading using puthon and blender applications

Mateusz Ilba

AGH University of Science and Technology, Poland
milba@agh.edu.pl

Keywords: Cities insolation, 3D graphics, Python, shading analysis, Blender

Abstract:
Shading analysis are performed over a dozen years. They are created based on raster data. The advantage of using the raster is the speed and straightness analysis, big downside are various types of restrictions. One of them is the impossibility of a correct analysis for 3D city. Shading analysis operates on raster data are unable answer the question of what happens to the vertical elements of buildings. The surfaces of these elements (walls) in large cities significantly outweigh the surface of the horizontal and oblique elements, we can save in the form of raster. Only recently have tools available to perform analyzes of shading on 3D models. However, such tools are expensive, have some limitations. Such restrictions are, for example, an ArcGIS difficulty in determining the area of the shaded and their statistics, in the case of Bentley Microstation V8i application does not have any influence on the resulting statistics, Access to the data is generated by displaying the result. They are created add-ons for different applications, but they are paid and also do not give us one hundred percent control over the presentation of the results. Therefore, in this article we will look at the feasibility analysis of the shading of buildings. Was used ray tracing algorithm available in the Blender application shared under the GPL. The author tested the performance of applications on the example of an artificially built part of the city 3D. As a result, the algorithm generates the visualization of the shading with statistics of the shadow of time for a specific day.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Understanding of a dense matching

Marta Kubacka

Faculty of Mining Surveying and Environmental Engineering, AGH University of Technology in Cracow, Poland
m.siostra@gmail.com

Keywords: dense matching, image processing, semi-global matching

Abstract:
Photogrametrists have been using image matching for years as a support for aerotriangulation and DTM measurements. Dense matching however brings a completely different approach that allows complete 3D-modelling from photographs only. It has already been widely applied, yet the process is still not properly understood, as it is more in the IT domain than the geodetic one. The aim of this presentation is to give an overview on how dense matching algorithms proceed and what the essentials of that field of image processing are. Firstly, main idea of a dense matching is introduced in comparison to „loose", more traditional matching. General computational methods are further explained: cost function and cost aggregation function with different examples. It is explained why the intensity of the pixel itself is not enough for matching to work properly and the definitions of disparity and disparity map are given. A key role of epipolar geometry is emphasized, as it immensely simplifies computations. Although dense matching itself is an important step in photogrammetric image processing, it suffers from certain problems such as occlusions and radiometric differences that need to be handled are also described in this work. The major dilemma over implentation between the optimisation and the quality is expressed and Dr. Heikko Hirschmüller's Semi-Global Matching is proposed as a solution. In summary, the role of dense matching in both aerial and close-range photogrammetry is introduced and several applications are described.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Assessment of the Imaging Spectroscopy for Rock Identification of the Karkonosze (Giant) Mountains

Monika Mierczyk[1], Bogdan Zagajewski[1], Roksana Knapik[2]

[1] University of Warsaw, Faculty of Geography and Regional Studies,
Department of Geoinformatics and Remote Sensing, Warsaw, Poland
monika.mierczyk@gmail.com, bogdan@uw.edu.pl

[2] Karkonosze National Park, Jagniątków, Poland
roksana@kpnmab.pl

Keywords: rock identification, Imaging Spectroscopy, hyperspectral airborne imagery, APEX data, Spectral Angle Mapper, Linear Spectral Unmixing, Matched Filtering

Abstract:
The remote identification of rocks and minerals in the 1980s began the era of Imaging Spectroscopy. Today it provides an efficient method of exploring and mapping surface mineralogy. Airborne Prism Experiment (APEX) data was acquired for the area of the Karkonosze Mountains in 2012. The terrain is mainly covered by lichens or higher plants and it presents significant difficulties for rock identification. In this study hyperspectral airborne imagery was used to assess the image classifications of different types of granites, hornfels, mika schist and gneiss in the Polish part of the Karkonosze Mountains. Using the ASD FieldSpec 3, the research was based on the laboratory spectroscopic measurement of rock samples, which showed statistic differences between analysed samples. This stage enabled subspectral classifications of the aerial APEX images for geological mapping of bare ground. The image classification executed was based on: Spectral Angle Mapper (SAM), Linear Spectral Unmixing (LSU) and Matched Filtering (MF) methods. The first algorithm calculates an angle between a match pixel spectrum and a reference spectrum treating them as vectors. The LSU and MF subpixel classifiers produce images of each endmember's abundance. This provided classification maps with threshold values freely created by the user. The reference material was a geological map of the National Park of the Karkonosze Mountains and photo interpretation of APEX data applying RGB Colour Infrared (CIR) composition and an NDVI mask. The post classification statistics indicated the efficiency of mapping methods using confusion matrix and corrections based on images of errors. The result of these studies were sets of maps of rock distribution in the area.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

AGH University of Science and Technlogy
in three-dimensional web world

Karolina Materek[1], Mateusz Jabłoński[1], Łukasz Parkitny[1], Michał Lupa[2], Krystian Kozioł[1]

[1]AGH University of Science and Technology, Faculty of Mining Surveying and Environmental Engineering, Krakow, Poland,
kar.materek@gmail.com, jablonski.mat1@gmail.com, lukasz.parkitny@gmail.com, krystian.kozioł@agh.edu.pl

[2]AGH University of Science and Technology, Faculty of Geology, Geophysics and Environmetal Protection, Department of Geoinformatics and applied computer science, Krakow Poland
mlupa@agh.edu.pl

Abstract:
In this paper we present spatial information system of AGH University of Science and Technology. First part relates to the idea of the system and description of its design. Further we discuss development of Geoportal AGH with main attention to details about collecting data to create vector model and database. The manuscript also presents process of constructing a network of roads, which allows searching paths between setpoints and a design of WebGIS application. At the end we discuss current activities to extend our services of real three-dimensional model of the campus.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Forest

Edwin Raczko, Paweł Hawryło, Kamil Kondracki

Thursday, 19.06.2014, 16:00-18:15, *room 106*

Field hyperspectral techniques for monitoring condition of protected forest species
> *Martyna Wietecha, Marlena Kycko, Bogdan Zagajewski, Adrian Ochyra*
> 16:00 - 16:15

MODELS FOR ESTIMATING LEAF PIGMENTS AND RELATIVE WATER CONTENT IN THREE VERTICAL CANOPY LEVELS OF NORWAY SPRUCE BASED ON LABORATORY SPECTROSCOPY
> *Lucie Cervena, Zuzana Lhotakova, Lucie Kupkova, Monika Kovarova, Jana Albrechtova*
> 16:15 - 16:30

Automatic determination of selected forest inventory parameters of Scots Pine (Pinus sylvestris L.) using GNOM application designed for TLS point cloud processing
> *Michał Ratajczak, Piotr Wężyk*
> 16:30 - 16:45

Accuracy of tree species classification based on WorldView-2 data (Białowieża Forest, NE Poland)
> *Marcin Michalik, Piotr Pabjanek*
> 16:45 - 17:00

Spatio-temporal distribution of active fires from MODIS over Poland for the period 2001-2013
> *Urszula Pytlak, Agata Hościło, Bogdan Zagajewski*
> 17:00 - 17:15

Use of SAR images for assessing forest fires in the Brazilian Amazonia
> *Felipe C Costa, Mahdi Motagh, Olaf Hellwich*
> 17:15 - 17:30

Analysis of burned areas based on the Landsat images
> *Urszula Pytlak, Katarzyna Chełmińska, Anna Jarocińska, Agata Hościło*
> 17:30 - 17:45

Forest biomass estimation with use of selected remote sensing technologies – ForseenPOMERANIA Project
> *Kamil Kondracki, Mariusz Bembenek, Piotr S. Mederski, Maciej Skorupski, Paweł Strzeliński, Sławomir Sułkowski, Andrzej Węgiel*
> 18:00 - 18:15

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Field hyperspectral techniques for monitoring condition of protected forest species

Martyna Wietecha, Marlena Kycko, Bogdan Zagajewski, Adrian Ochyra

University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing (WURSEL), Warsaw, Poland m.wietecha@student.uw.edu.pl, marlenakycko@student.uw.edu.pl, bzagajew@uw.edu.pl, adrian.ochtyra@uw.edu.pl

Keywords: field hyperspectral measurements, vegetation indices, fluorescence, forest species, spectral libraries

Abstract:
The aim of the study is to investigate and compare spectral properties and condition of dominant forest tree species of selected areas in Poland using field remote sensing techniques. The researchers are conducted in the following protected areas: Karkonosze, Beskid Żywiecki (both areas located in SW Poland) and Białowieża, Knyszyńska and Borecka Forests (NE Poland). Field campaign includes measurements in three periods of growing season in 2014. The research method is based on advancedfield measurementsof spectral characteristics, chlorophyllsand fluorescence measurements (Fm, Fo, Fv, t1/2 and Fv/Fm). For this purpose, the hyperspectral ASD FieldSpec spectrometer (spectral range 350-2500 nm), ASD Plant Probe and OS1ppr fluorescence of chlorophyll measurer were used. In addition to spectral properties, the spectra allowed the derivation of remote sensing vegetation indices, like: NDVI, SR, WDVI, SAVI, MSAVI, NLI and NLI2, AVI, PRI. The main intention of a vegetation index is to define a simple relationships between the reflectance measured by a sensor in particular wavelengths and parameter directly characterizing a plant or vegetation stand. Indices were compared with biometrical fluorescence measurements. Spectral characteristics as well as vegetation indices were analyzed with the ANOVA statistical test. The studies of selected tree species allowed to obtain information about general condition of each protected forest communities. The results can be outlined: spectral signatures of each research areas are characteristic for plants in good condition; the most important spectral range for vegetation condition is 500-700 nm (chlorophyll content) and 1500-2500 nm (water content); remote sensing indicators reached different values depending on different periods of growing season; the qualitative and quantitative analysis showed significant difference between analyses species.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Models for Estimating leaf pigments and relative water content in three vertical canopy levels of Norway spruce based on laboratory spectroscopy

Lucie Cervena[1], Zuzana Lhotakova[2], Lucie Kupková[1], Monika Kovarova[2], Jana Albrechtova[2]

[1] Charles University in Prague, Faculty of Science,
Department of Applied Geoinformatics and Cartography, Czech Republic
lucie.cervena@natur.cuni.cz, lucie.kupkova@gmail.com

[2] Charles University in Prague, Faculty of Science,
Department of Experimental Plant Biology, Czech Republic
zuzana.lhotakova@natur.cuni.cz, monika.kovarova@natur.cuni.cz, jana.albrechtova@natur.cuni.cz

Keywords: Norway Spruce, laboratory spectroscopy, Krusne hory Mts., RWC, Chlorophyll, Carotenoids

Abstract:
Unique set of data was obtained during the field campaign in the Krušné hory Mts. (the western part of the Czech Republic) in August 2013. From fifty five representative 80-year-old trees of Norway Spruce (Picea abies L. Karst.) equally distributed on eleven study sites, branches were taken in three vertical canopy levels (sunlit productive upper and lower parts of a tree crown, shaded saturated part of a tree crown) and first three needle age classes were analysed. Spectral reflectance of these spruce foliage samples was measured in the range between 350 and 2,500 nm using an ASD FieldSpec 4 Wide-Res spectrometer in combination with the fibre optic contact probe. Some samples were also measured in the integrating sphere. Photosynthetic pigment (total chlorophylls, total carotenoids) contents and relative water content were determined in laboratory for all samples. The results of analysis of variance (ANOVA) show that the contents of pigments and relative water content are significantly different not only between the needle age classes (what is widely known) but also in the vertical canopy levels. There are only few studies dealing with vertical heterogeneity in Norway spruce canopy. Thus, the main goal of this study is to build and compare the statistically based prediction models for photosynthetic pigments and water content estimation for three vertical canopy levels of Norway Spruce. These results could help in classifications of biochemical and biophysical properties of Norway Spruce stands using hyperspectral remote sensing data. The support of the Ministry of Education of the Czech Republic is acknowledged: Project No. LH12097.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Automatic determination of selected forest inventory parameters of Scots Pine (Pinus sylvestris L.) using GNOM application designed for TLS point cloud processing

Michał Ratajczak, Piotr Wężyk

Laboratory of Geomatics, Faculty of Forestry, Department of Forest Ecology University of Agriculture in Krakow, Poland
http://geo.ur.krakow.pl
gorhydrus+earsel@gmail.com, rlwezyk@cyf-kr.edu.pl

Keywords: search trees, number of trees, diameter at breast height, height of trees, crown base height, the volume of the crown, the volume of a tree trunk, gnom, algorithm

Abstract:
The advances that have been made in the technology of Terrestrial Laser Scanning (TLS) for about 10 last years result in its application in many industries. In forestry it currently begins to be used for forest inventory purposes as well as tree and timber measurement. Tree diameters, tree heights, form factor, stocking or biomass are all examples of parameters that can be determined in forestry practice with use of TLS, with consideration given to financial and time costs. In order to make TLS technology more efficient, full automation of point cloud processing needs to be achieved. The work presents a proprietary solution for the automated measurement of chosen tree parameters on a TLS point cloud. The developed algorithms (GNOM) made it possible to, without felling a tree, obtain information on: tree location in the circle sample plot, breast height diameter, diameters at variousstem heights, treeheight, crown baseheight, stem volume(calculated bysections) andcrown volume. Field works were conducted in Niepołomice Forest District (Poland) in a single-storied and even-aged (147 years) pure pine stand without understory. The works were done shortly before the clear felling of the stand. The GNOM algorithm for tree detection was able to find all the16 pines. The mean error of tree location was only 0,94 ° and 0,18m (where the data obtained in a traditional way were treated as the reference). Breast height diameter was determined in a fully automated way with +2,12% precision compared with measurements taken with callipers. The reference tree heights were measured with use of total station (Leica TC 600). Mean error of automated tree height determination on TLS point cloud was ~ 1,57m. The rather significant error was related to the accuracy of determination of terrain elevation. The measurement of crown base height led to an error of +9,58%. In this case a measurement on a felled tree with use of measuring tape was a reference. As for the determination of crown volume, the discrepancies were quite large as the results obtained with GNOM ranged between 100 and 200% of the reference values (calculated using cone and paraboloid volume formulae). The automated determination of tree volume with use of GNOM gave the error at the level of +6,21%. One should note, however, that the error given by the use of standing tree volume tables by Czuraj (1966) was +8,25%. The processing time for point clouds using the GNOM algorithm did not exceed 10 minutes. The work has proved the high usefulness of TLS technology in forestry, resulting from the high level of automation. The next step of the research is going to be the algorithm improvement with regard to recognition of tree species and timber assortments.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Accuracy of tree species classification based on WorldView-2 data (Białowieża Forest, NE Poland)

Marcin Michalik, Piotr Pabjanek

University of Warsaw, Faculty of Geography and Regional Studies
Department of Geoinformatics and Remote Sensing (WURSEL), Warsaw, Poland
marcinmichalikwwl@wp.pl

Keywords: tree species classification, temperate forest, WorldView-2, Random Forest, Białowieza Forest

Abstract:

The aim of this study was to perform classification of tree species in part of Białowieża Forest, using single WorldView-2 scene and to compare results of different methods. Tree species classification on very high resolution satellite data is not fully investigated topic and only few published researches used WV-2 imaginary, thus its usability in such applications is not fully measured. WorldView-2 scene covers the part of Białowieża Primaeval Forest (BF), in north-east Poland -an area of ca 150 km^2. The Białowieża Primaeval Forest (BF), located on the Polish-Belarussian border is considered to be the best preserved natural forest of European lowlands. The Polish part of the BF includes the Białowieża National Park, with strictly protected 57.26 km^2, and partially protected 45.17 km^2, nature reserves of partial protection (outside BNP) and managed forests. The Białowieża Primaeval Forest is situated within the mixed forest zone. The main forest-forming species are hornbeam Carpinus betulus, oak Quercus robur and spruce Picea abies. Other species are f.e. alder Alnus glutinosa, pine Pinus sylvestris, birch Betula pubescens and Betula pendula and ash Fraxinus excelsior. Forest stands within preserved area are highly heterogenous. Classification was performed using two different algorithms, Maximum Likelihood and Random Forests, with different classifiers settings. 8-band multispectral WorldView-2 satellite scene is used as an input data. The image was ortohorectified, atmospherically corrected using ATCOR algorithm, and spatially adjusted using panchromatic image. Both original 2 m resolution and pansharpened 0.5 m resolution images were used in the classification. Training and test polygons were taken from at least 6x6 meters, spectrally homogenous area represented by singular species, basingon forest inventory data and field measures. The results obtained with different algorithms and different pre-processed data were compared with each other, as well as with similar appliances found in literature.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Spatio-temporal distribution of active fires from MODIS over Poland for the period 2001-2013

Urszula Pytlak[1], Agata Hościło[2], Bogdan Zagajewski[1]

University of Warsaw, Faculty of Geography and Regional Studies
Department of Geoinformatics and Remote Sensing, Warsaw, Poland
Ula.Pytlak@gmail.com

Institute of Geodesy and Cartography, Department of Remote Sensing, Warsaw, Poland

Keywords: active fire product, Modis/ Terra-Aqua, fires, Poland

Abstract:
In Poland, every year as a result of natural causes and human activities over 8000 fires break out. There are two fire seasons observed in Poland namely spring fires (from March to May) and late-summer fires (August-September). Nowadays in Poland, fire monitoring system is based explicitly on ground data. Remotely sensed data and products provide valuable information on fire hazards, location, extent, intensity of fires thus in many countries this information is incorporated into the fire monitoring systems. The aim of this study is to investigate the possible use of active fire product derived from satellite sensor Modis/Terra-Aqua in analysis of spatio-temporal distribution offiresin Poland. The analyses were performed for the period 2001-2013. The locations of Modis active fires were validated with the in situ data available in the National Forest Fire Information System. Additionally, the national Corine land cover 2006 map was used to extract information on the type of the land cover particularly affected by fires over the investigation period.

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Use of SAR images for assessing forest fires in the Brazilian Amazonia

Felipe C. Costa[1], Mahdi Motagh[1], Olaf Hellwich[2]

[1] GFZ Potsdam, Germany
felipe@gfz-potsdam.de, motagh@gfz-potsdam.de

[2] TU Berlin, Germany
olaf.hellwich@tu-berlin.de

Keywords: SAR forest fire wildfire

Abstract:
This research within the framework of a master thesis (MSc.) aims to address the use of SAR (Synthetic Aperture Radar) images for monitoring forest fi res in the Brazilian Amazonia. For this purpose, time-series SAR C-Band images from Envisat and ERS (European Remote Sensing) satellites are analyzed regarding the amplitude value of the backscattered signal ("backscattering coefficient"). The backscattering coefficient will be correlated to a climatic index, the so called Daily Drought Index (DDI). This step will be done by applying the Pearson correlation which shall subsequently render a Map of Proneness to Fire. The set of SAR imagery is provided by ESA. It plays an important role as a complement of ongoing monitoring systems based on optical sensors (ESA, 2013). Maps of burnt areas generated by BSI algorithm (Burn Scar Index) applied on Landsat TM imagery will be used as a validation data. The information contained in SAR images combined with the aspects of pre-fi re conditions, surface temperature maps, physical properties and weather conditions can lead, for instance, to more accurate 'Fire Vulnerability Maps', resulting in a more efficient Fire Alarm System.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Analysis of burned areas based on the Landsat images

Urszula Pytlak[1], Katarzyna Chełmińska[1], Anna M. Jarocińska[1], Agata Hościło[2]

[1] University of Warsaw, Faculty of Geography, Depatment of Geoinformatics and Remote Sensing, Warsaw, Poland
Ula.Pytlak@gmail.com

[2] Institute of Geodesy and Cartography, Department of Remote Sensing Poland

Keywords: fires, Landsat TM, vegetation changes, vegetation indices

Abstract:
August 26, 1992 in Rudy Raciborskie in Poland happened a fire, which is considered the largest fire, in the Central and Western Europe in the last two decades As a result of the fire nearly 10 000 ha were burned. The aim of the study is to analyse the possibility of use Landsat images to detest and analyse burned areas. Firstly were acquired Landsat images: first in the time of fire and second one year after the fire. Using different methods of classification burned areas were detected. In the study were analysed Maximum Likelihood and Decision Tree algorithms. Area of research was divided into three classes: burned area, water and other. Based on the two images and calculated vegetation indices were analysed changes in the vegetation cover caused on burned areas.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Forest biomass estimation with use of selected remote sensing technologies – ForseenPOMERANIA Project

Kamil Kondracki, Mariusz Bembenek, Piotr S. Mederski, Maciej Skorupski,
Paweł Strzeliński, Sławomir Sułkowski, Andrzej Węgiel

Poznań University of Life Sciences, Faculty of Forestry, Poznań, Poland,
kamil.kondracki@up.poznan.pl

Keywords: remote sensing, ALS, terrestrial laser scanning, forest biomass, ForseenPOMERANIA

Abstract:
ForseenPOMERANIA is the acronym of the international project entitled: "Development of trans-border decision support system for remote and model assessment of forest dendromass in Pomerania Region" co-financed by the European Union in Operational Programme Objective 3, Cross-Border Programme for Territorial Co-operation 2007-2013 Mecklenburg-Western Pomerania, Brandenburg and Poland (Region Zachodniopomorskie) (Interreg IVA).

The project was realized in the 2011-2013 with involvement of selected institutions from Germany (Landeskompetenzzentrum Forst Eberswalde - project leader, Ministerium für Landwirtschaft, Umwelt und Verbraucherschutz des Landes Mecklenburg-Vorpommern, Landesforst Mecklenburg-Vorpommern A. ö. R.) and Poland (Forest District Drawno, Poznań University of Life Sciences, Regional Directorate of the State Forests in Szczecin).

The objective was to develop remote method of forest biomass estimation using mathematical models and interactive Internet applications. The practical dimension of the project was to build trans-border IT system 'Biomass' supporting sustainable forest management and nature conservation in Pomerania.

For the purpose of forest biomass estimation selected remote sensing technologies were applied: terrestrial and airborne laser scanning, aerial photography, satellite images and also hemispheric photography. For validation of data obtained with remote methods, terrestrial (reference) data were collected on selected forest sample plots.

As a part of fulfilment of the Project's tasks, research plots were established on the Drawno Forest District (north-western Poland) in 60 Scots pine stands (Pinus sylvestris L.) that represent 3 age groups (3rd, 4th and 5th age class) with varying tree density (from ca 400 up to more than 900 trees per hectare). For 10 of these sample plots, 10 model trees were chosen that represent the range of DBH variation (including height of trees). Model trees were scanned by terrestrial laser scanner and precise 3D models were created. Then the model trees were felled and biomass was estimated for each fraction. In addition, a high resolution terrestrial laser scan was made in the middle of each research plot. The point clouds obtained were processed with automatic calculation of biometric parameters (eg. diameter at any height, height and volume of trees) and quality-dimensional classification.

An aerial laser scan of the entire Drawno Forest District was also made with resolution of 4 points per square meter and, for some chosen areas, with resolution of 16-25 points per square meter. GPS and a total station were used to measure coordinates of sample plot corners and location of model trees. These data were used for the selection of airborne laser scans that represent plots and model trees.

Point clouds were analysed (eg. using TIFFS software), with automatic filtration of point clouds to DTM, DSM and nDSM. Segmentation of tree crowns was conducted to automatically determine basic parameters such as: number of trees, area of crown projection, coordinates of crown top, radius of crown, volume of crown and height of tree.

Extracted parameters of model trees, combined with measured biomass of every fraction of model trees, were used to construct mathematical models that allowed estimation of the biomass of every tree from aerial laser scanning. This also allowed estimation of forest biomass at the stand and landscape scales and development of growth models for forecasting of change in forest biomass.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Urban

Yetkin Ozum Durgun, Edyta Bogucka, Martyna Wietecha

Friday, 20.06.2014, 08:45-10:45, *room 207*

Quantitative modelling of urban changes using digital elevation models in a time series
Cornelis Stal, Alain De Wulf, Philippe De Maeyer, Rudi Goossens, Timothy Nuttens, Frederik Tack, Marijn Hendrickx
08:45 - 09:00

Comparison of spatial development patterns for selected European cities using on remote sensing data and spatial metrics
Leopold Michał Leśko, Michael Wurm, Michael Wiesner, Jan Peter Mund, Hannes Taubenboeck
09:00 - 09:15

Semi-automated building extraction from Airborne Laser Scanning data
Marcin Marjasiewicz
09:15 - 09:30

The Assessment of Landsat MSS and OLI Sensors for Urban Change Detection in Chinese Metropolises
Radoslaw Gurdak, Monika Mierczyk, Martyna Golenia, Anna Jarocinska, Adrian Ochtyra
09:30 - 09:45

MEASUREMENT OF URBANISATION CHARACTERISTICS OF CHITTAGONG CITY, BANGLADESH BASED ON LANDSAT IMAGES
Salit Chakma, Anna Jarocińska, Adrian Ochtyra
09:45 - 10:00

Environmental and recreational potential of Lublin city
Paulina Owczarek, Szymon Chmielewski
10:00 - 10:15

Analysis of the phenomenon of uncontrolled city spreading on the example of Warsaw's district Bialoleka
Edyta Bogucka, Aleksandra Radecka
10:15 - 10:30

The Potential of 3D GIS Tools and satellite imagery in Strategic Urban Planning Process; as an Approach for Sustainable Development in Algeria
Bouhadjar MEGUENNI
10:30 - 10:45

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Quantitative modelling of urban changes using digital elevation models in a time series

Cornelis Stal[1], Alain De Wulf[1], Philippe De Maeyer[1], Rudi Goossens[1], Timothy Nuttens[1], Frederik Tack[2], Marijn Hendrickx[1]

[1]Ghent University Belgium
Cornelis.Stal@UGent.be, Alain.DeWulf@UGent.be, Rudi.Goossens@UGent.be,
Timothy.Nuttens@UGent.be, Marijn.Hendrickx@UGent.be

[2]Belgian Institute for Space Aeronomy Belgium
Frederik.Tack@Aeronomie.be

Abstract:
The construction of time series for the modelling and documentation of urban environments has gained a large interest in the last few years. The growing availability of remote sensing data and sophisticated software tools has enabled the construction of Digital Elevation Models (DEMs) with various spatial and temporal resolutions. For this research, multiple scanned airborne images of the inner city of Ghent (Belgium) were processed for the calculation of DEMs using a conventional digital photogrammetric workflow. The aerial images are acquired during four campaigns: 1965, 1977, 1987 and 1990. All resulting image-based DEMs were compared with a DEM acquired with Airborne Laser Scanning (ALS) from 2009. This comparison allowed a model adjustment by minimizing the systematic shift between the data sets. In order to distinct built-up, destroyed or unchanged buildings over time, a threshold of 2.5 m was applied on the resulting vertically shifted points. Finally, a connected component analysis allowed the removal of outliers in the data. The resulting points were evaluated against a 2Ddigital cadaster map, which enabled a quantitative determination of difference in urban topography. The procedure to detect these changes, as well as the potentials and challenges of this technique, are elaborated in this contribution.

34ᵗʰ EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Comparison of spatial development patterns for selected European cities using on remote sensing data and spatial metrics

Leopold Michał Leśko[1], Michael Wurm[2], Michael Wiesner[2], Jan Peter Mund[3], Hannes Taubenboeck[2],

[1]Poland
leopold.lesko@gmail.com

[2]DLR Germany
Michael.Wurm@dlr.de, Michael.Wiesner@dlr.de, Hannes.Taubenboeck@dlr.de

[3]HNEE Germany
Jan-Peter.Mund@hnee.de

Keywords: Urban sprawl, Remote Sensing, Landscape Metrics, Capitalism, Socialism, Urban settlement pattern

Abstract:
The most obvious effect of urbanization is the spatial expansion and morphological change of cities. There are many individual factors influencing the physical urban growth, however it can be observed, that almost every capital city in Europe increases in area over time. In this study we aim to find similarities and differences in spatial growth dynamics, dimensions and patterns of selected European capital cities. Therefore we focus on three cities, namely Berlin (Germany), Vienna (Austria), and Warsaw (Poland). By means of multi-temporal Landsat satellite imagery (MSS, TM and ETM+ data) we classify the spatial urban footprint for four points in time namely 1975, 1990, 2000 and 2010, hence, over 40 years of urbanization can be monitored and quantified in a consistent way throughout the cities. Urban footprint classifications are derived using hierarchical, object based image analysis. For the quantification of the particular urban patterns we apply various spatial metrics like the patch density or largest patch indices as well as the indices like Shannon's Entropy. The goal of study is to assess and compare urban sprawl among above mentioned cities. The presentation aims at answering the research question whether any significant differences in spatial development of the selected European cities exist. Additionally we will focus on possible changes in spatial development of selected cities driven by Capitalistic and Socialistic system. Conducted study shows various spatial pattern as well as diverse sprawl magnitude depending on system which influenced particular city.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Semi-automated building extraction from Airborne Laser Scanning data on the example of the Central Campus of Warsaw University of Technology.

Marcin Marjasiewicz

Association of students "Geoida" http://www.geostudent.pl
marjasiewicz.m@gmail.com

Keywords: LIDAR, RANSAC, CityGML, 3D modeling, visualization

Abstract:
The main idea of this project is to introduce a conception of method of semi-automated building extraction from Airborne Laser Scanning data. The effects will be presented on the example of the Central Campus of Warsaw University of Technology. Airborne LIDAR has become a very popular technique for acquisition of terrain elevation models and lately, also of covering the area. Creating studies based on LIDAR data is more and more universal solution in commercial, marketing, scientific, architectural and engineering fields. Due to the high density of acquired points and increasing received accuracy, this method is very useful in generation of three-dimensional models of cities, regions or individual objects of the highest level of detail possible to achieve. The main goal of realized project was to find the most effective algorithm of automatic acquiring planes for roofs. Effects of this algorithm were proceeded in software such as ArcGIS, SketchUP to generate roofs and finally to make complete building models. Based on partly semi-automatic and partly manual method, can provide models at the level of detail LoD 2 CityGML standard.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The Assessment of Landsat MSS and OLI sensors for urban change detection in Chinese metropolises

Radoslaw Gurdak, Monika Mierczyk, Martyna Golenia, Anna Jarocińska, Adrian Ochtyra

University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing, Warsaw, Poland
gurdak.radoslaw@gmail.com, monika.mierczyk@gmail.com, martyna_golenia@interia.pl, ajarocinska@uw.edu.pl, adrian.ochtyra@uw.edu.pl

Keywords: change detection, urban growth, land cover change, Landsat MSS data, Landsat OLI data

Abstract:
Due to recent rapid environmental and climatic changes, urban expansion has increasingly attracted the attention of the scientific community. Currently, it is possible to produce land-use maps in a quick, economical and accurate manner with the application of remote sensing technology and the availability of recent high-resolution satellite imagery. The aim of this study was to analyse multi-temporal Landsat imagery to indicate the growth of urban areas. In this case three major metropolises of China were analysed, including Shanghai, Tianjin and the special administrative region of Hong Kong. The selected cities represent some of the fastest growing ports of Eastern China and play a significant role in international trade. For each district two images, captured at least 30 years apart, were analysed. The research was based on Landsat MSS (1979, 1981) and OLI data (2013). After basic image processing (calibration, geometric and atmospheric correction) the supervised pixel classification was executed. The algorithm used was Maximum Likelihood with appropriate thresholds for four classes: urban areas, vegetation, soil and water. The land use areas were chosen considering the visual interpretation of all of the studied areas. Lastly, change detection was utilised to evaluate the urban growth. These analyses produced a set of four maps for each city: classifications of MSS and OLI data, a map of land cover change and a map of urban growth.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Measurement of urbanisation characteristics of Chittagong city, Bangladesh besed on Landsat images

Salit Chakma, Anna M. Jarocińska, Adrian Ochtyra

University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics and Remote Sensing. Warsaw, Poland
s.chakma@student.uw.edu.pl, ajarocinska@uw.edu.pl, a.ochtyra@student.uw.edu.pl

Keywords: Remote Sensing, GIS, Urbanisation, Statistics, Shannon's entropy

Abstract:
Urbanisation is a process of shifting from rural areas to urban areas. Because of attractive job opportunities and availability of social services, during last few decades, rapid urban growth and urbanisation have been observed in Chittagong city, the economic capital and second largest city of Bangladesh. As an expanding metropolitan city in a developing country, this city is facing substantial challenges in infrastructural development, environmental preservation, traffic congestion and urban planning. In order to mitigate effects of rapid urbanisation it is important to understand the characteristics of urbanisation. Therefore, the primary objective of this research is to quantify degree-of-freedom, degree-of-goodness, and degree-of-sprawl of urbanisation in Chittagong city by using Landsat images of 1989, 2001, and 2013. It is possible to measure urbanisation from remotely sensed data by utilising GIS techniques and statistical measurements. Downloaded satellite images were radiometrically calibrated and later atmospherically corrected by utilizing Dark Object Subtraction (DOS) method. As next step of processing, they were masked by spatial extent of study area. Each image was processed with supervised classification method for classifying into four land cover classes; built-up, bare land, waterbodies, and vegetation. Accuracy of classification was assessed with satisfactory result. Mosaicking images for same year resulted in land cover map for respective year. Urbanisation was detected in eight directions by slicing land cover map into eight pieces of a pie. Degree-of-freedom and degree-of-sprawl were determined from Pearson's chi-square test and Shannon's entropy method, respectively. Degree-of-goodness was also calculated to check the status of urbanisation of Chittagong city.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Environmental and recreational potential of Lublin city

Paulina Owczarek, Szymon Chmielewski

University of Life Sciences in Lublin Poland
paulina.m.owczarek@wp.pl, up-szymon@wp.pl

Keywords: environmental valorization, environmental potential, bonitation method, GIS, LiDAR, Lublin

Abstract:
In the contemporary world the urban area around us changes all the time and this together with the dynamic development has an impact on the framework and the operation of a city. The aim of this work is to evaluate environmental and recreational potential of Lublin city. In this case as the potential webearin mind accessibility to the civic, green sites which are perfect for the in habitants to spend their free time in an active way. The evaluation was done by means of the bonitation method with using theory of basic fields (a hexagonal grid). The method allowed to get some data about valorization. Among main sources there were LiDAR (the ISOK project), digital or tho photography and the data of OSM. The evaluated components were both environmental such a srivers, relief, high, average and low greenery and anthropogenic for instance bicycle paths or playgrounds. According to proportional contribution of each component's range to the basic, analyzed area, for each of the components there was used a punctual scale from 1 to 5 points. Total result of the bonitation was presented by means of cartogram. It was asserted that areas of high recreational potential were located mainly in the central part of the city and it amounted to 1,76% of its territory. The high environmental and recreational potential of these places is a result of a revitalization project undertaken there. This kind of project would be appropriate also for other places. It would intensify a connection between different areas of recreation within the borders of the city. Based on studies about the framework and the operation of the landscape it was noticed that the valorization of the recreational potential forms some corridors which coincide into a specified recreational loop. The corridors had been designed as a recreational system of Lublin city.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Analysis of the phenomenon of uncontrolled city spreading on the example of Warsaw's district Bialoleka

Edyta Bogucka, Aleksandra Radecka

Faculty of Geodesy and Cartography, Warsaw University of Technology Poland
e.p.bogucka@gmail.com, aleksandra.radecka1@gmail.com

Keywords: urban sprawl, suburbanization, Bialoleka

Abstract:
The Scientific Project of 2013 made by the Student Scientific Association of Spatial Planning placed on Faculty of Geodesy and Cartography Warsaw University of Technology under the title "Analysis of the phenomenon of uncontrolled city spreading on the example of Warsaw's district Bialoleka" is a dissertation concerning the phenomenon of uncontrolled suburbanization – urban sprawl. Due to the wide territorial and problematic spectrum of the phenomenon its characteristic have been presented in a scale of a city and a district, as well as in a scale of a selected part of a housing estate. In the result of conducting many-sided research and analysis of the topic Members of the Student Scientific Association of Spatial Planning drew a conclusion of the existence of urban sprawl phenomenon on the analyzed area and pointed out the negative features of land development being the result of urban sprawl. The final work of the Scientific Project is the Local Area Development Plan project of the selected part of Warsaw's district Bialoleka presenting the proposed way of proper land development.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The Potential of 3D GIS Tools and satellite imagery in Strategic Urban Planning Process; as an Approach for Sustainable Development in Algeria

Bouhadjar Meguenni

Algeria

bmeguenni@cts.asal.dz

Keywords: 3D Urban GIS, Urban planning, Sustainable development, Remote sensing

Abstract:
The objective is to show the advantage of using a 3D Urban GIS (geographic information system, three-dimensional) for the urbanism sector in Algeria. Indeed, 3D GIS have gained importance due to the evolution of computing has greatly contributed to the improvement of software and tools to facilitate the tasks of planning and management of cities. GIS is one of the most important results of this development through their capacity to manage, organize and" integrating several aspects of their spatial and temporal components. GIS technology is currently converging with several other technologies like remote sensing image to provide new level so accessibility and functionality. Urban planning assumes that we have access to reliable and continuously updated data. In developing countries, these data are rarely available because traditional ways of collecting information are expensive and too often beyond the financial possibilities of the main responsible for planning. This is even more prejudicial than the rate of growth of large cities are sometimes breathtaking (that can reach 6 to 10% perannum) which often lead stoun controlled spatial extensions. The aim of this work is to study the potential of 3D GIS applications in supporting strategic planning process for effective urban governance in sustainable urban development projects in Algeria The main application is to the setting up a system to monitor the progress of construction sites of habitat for several urbanism departments in Algeria, by the use of a 3D GIS and remote sensing images of very high resolution (eg, QuickBird resolution 0.6 meter). A methodology is adopted that starts with the correction and integration of data from CAD formats, then the realization of 3D models of buildings according to the four main stages of construction, to supply gradually our spatiotemporal database, and each step will be confirmed by using the methods of photo-interpretation multi-temporal satellite images. 3D GIS are becoming increasingly instead of ordinary GIS, indeed cities are currently represented in the form of 3-D virtual cities where is possible not only to navigate, but also move as a pedestrian, as a bird. In addition to all that, we can realize environmental simulations such as urban heat islands.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Agriculture

Michał T. Chiliński, Karolina Materek, Monika Kacprzyk

Friday, 20.06.2014, 11:15-12:15, *room 207*

Identification and characterization of Biological Soil Crusts in a sand dune desert environment across Israel-Egypt border using LWIR emittance spectroscopy
> *Offer Rozenstein, Arnon Karnieli*
> 11:15 - 11:30

The Effect of Fertilizer Application of Granulated Organic - Mineral Fertilizers Formed from Spent Mushroom Substrate on Soil
> *Ewa Kuśmirek, Ewa Kuśmirek*
> 11:30 - 11:45

Nutrient management on farms of various types of production.
> *Agnieszka Czopowicz, Ewa Kuśmirek, Aneta Perzanowska*
> 11:45 - 12:00

Beauty of Polish Village
> *Ewa Kuśmirek, Beata Rutkowska, Justyna Wrzosek – Jakubowska, Aniela Dzięcioł, Agata Kaczmarek*
> 12:00 - 12:15

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Identification and characterization of Biological Soil Crusts in a sand dune desert environment across Israel-Egypt border using LWIR emittance spectroscopy

Offer Rozenstein, Arnon Karnieli

The Jacob Blaustein Institute for Desert Research, Ben-Gurion University of the Negev Israel
oferroz@yahoo.com, karnieli@bgu.ac.il

Keywords: Biological Soil Crusts, Emittance spectroscopy, LWIR, Thermal remote sensing

Abstract:
Biological Soil Crusts (BSCs) are critical components of desert ecosystems worldwide. While all BSCs significantly modify the surfaces they occupy, the manner in which they affect their environment depends on the composition of the microphytic community. The aim of this paper is to study the hyperspectral thermal emissivity signatures of BSCs in order to identify and characterize them in a sand dune environment. The research was conducted in the northwestern Negev dunes. Measurements of several types of BSCs and bare soil were obtained using ground hyperspectral thermal sensors. We present an ability to spectrally separate different types of BSCs from bare sand, and to rank them according to successional development. Based on this ability, we created a spectral index for the discrimination of sand and BSCs of different types and applied it to multispectral remote sensing thermal images. This newly acquired ability to map different BSC types, using remote sensing, may lead to future applications of habitat and ecological function spatial mapping. We also demonstrate how a fusion of reflective and thermal data can be used to map different land-cover features in a sand dune environment. Our proposed thermal index not only discriminates sand and BSCs, but also enhances the signal from limestone pebbles more than other indices, based on reflective data. Unlike remote sensing in the reflective spectral region, thermal remote sensing is unconstrained by solar illumination. High resolution emissivity signatures of land cover are unaffected by environmental variables, as opposed to land-surface temperature that depends on the time of day and the season.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Nutrient management on farms of various types of production

Agnieszka Czopowicz, Ewa Kuśmirek, Aneta Perzanowska

Poland

agnieszka.czopowicz@tlen.pl

Keywords: farms, nutrient cyrculation, nutrient management

Abstract:

Objective of the study is development of models for evaluation of quality and efficacy of nutrient managment in various farming systems. Project is covers the area of Mazowieckie Voivodeship. From 25 farms I chose representative group of 15 – 3 farms of 5 types: Ecological farms, plant farms, dairy cattle farms, pig farms, poultry farms. For each farm I make a bilans it reveals stages of farm cyrculation where nutrients are being lost. Nutrient circulation on a farm is analysed using Schröder's model [2003].This model shows the ratio of nutrient outflow to nutrient inflow on a farm (in kilos per ha per year). The study is divided into three one-year cycles. Is shows the cyrculation of chemical elements between: Nutrients remaining on a farm, nutrients supplied onto a farm in the form of mineral fertilizers, animal feeds, seed lots, farm animals purchased from outside, nutrients leaving a farm in the form of sold plant and animal products.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

The effect of fertilizer application of granulated organic mineral fertilizers formed from spent mushroom substrate on soil

Ewa Kusmirek, Beata Rutkowska, Justyna Wrzosek-Jakubowska,
Agnieszka Czopowicz, Aneta Perzanowska

SGGW, Warsaw, Poland
ewazofia@op.pl

Keywords: Spent Mushroom Substrate, Soil, Organic-Mineral Fertilization

Abstract:
The aim of the research is to estimate the consequent influence of granulated organic mineral fertilizers formed from spent mushroom substrate (SMS) on the selected macronutrients and micronutrients content in soil. Fertilizers and composted spent mushroom substrate are using on two doses on account of applicationed nitrogen content, these doses are 100 and 200 kg N ha-1. The fertilizers combinations on three replications are used in experiment. After harvest were estimated content of these nutrients. Statgraphics 4.0. program was using to statistic data processing of the results.

34th EARSeL Symposium: European remote sensing - new opportunities for science and practice
EARSeL SIGs Workshops: Forestry, 3D RS & URS, Geological Applications, EARSeL & ISPRS Young Scientist Days
University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, 16-20 June 2014

Beauty of Polish Village

Ewa Kusmirek, Beata Rutkowska, Justyna Wrzosek-Jakubowska,
Agnieszka Czopowicz, Aneta Perzanowska

Warsaw University of Life Sciences, Warsaw
ewazofia@op.pl

Abstract
Poland is a beautiful country, with a rich history, original culture and extraordinary nature. We have a lot of magnificent places. One excellent example is Siedlec near Łęczyca (near Piątek – Centre of Poland). Aim of Researche: Siedlec, although it has an interesting history, did not live to be a comprehensive, full monographic studies, taking into account preserved, but even the raw archives. The deep time will inevitably crumble, human memory becomes unreliable, why would save from oblivion this interesting piece of history. Indeed, Historia magistra vitae est, and the same region deserves greater dissemination also because of the valuable natural, social and Cultural Studies. Monographic publication would spread, systematize and deepen knowledge of this beautiful region, located in the Polish Centre.
Siedlec is located at the intersection of ancient trade routes, in the Warsaw-Berlin Urstromtal. First information source in 1243 and first wooden church was built in 1350.
In the nearby village Goszczynno found the Vesslels terra sigillata, belonging to the Przeworsk culture. Terra Lanciciensis Łęczyca Land has own distinct folk culture: own distinct customs and national costume. Łęczyca Folk Sculpture has a specific theme sculpture (example: Christ in Distress)
Polish Salt Marsches are located near Kołobrzeg and near Siedlec – Salt Marshes Reserve Błonie. In this reserve is Glasswort (polish name: Soliród zielny) (Salicornia europaea L.).
Eminent Poles like a prof. Wacław Felczak (The Henryk Wereszycki and Wacław Felczak Award), The Felczak Family (Zygmunt Felczak, Kazimierz Felczak, Anna Łobarzewska), prof. Tadeusz Pruszkowski (Rector of Academy of Fine Arts in Warsaw), The Szypowski Family were connected with Siedlec.