DEMMIN
Test site for calibration and validation of remote sensing missions, sensors, data and value added products

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Content

General conditions of remote sensing
• Fleet of Earth observation systems for GMES
• Analysis of conditions and test sites designed for remote sensing

Observatory characteristic needed for remote sensing
• Site characteristic and natural conditions of test site DEMMIN
• Heterogeneity of test site conditions

Data basis of observatory DEMMIN
• Data basis derived from precision farming management
• Scientifically campaigns by airborne / space borne remote sensing

Potential for cooperation
• Integration of the test site in national and international programs
• Cooperation aspects
Development of Remote Sensing

Development of space segment in the framework of European Earth observation in period 2006 to 2020. (Schreier et al., 2009)
Deficits / Problems of Remote Sensing

Information requirements of users:
• Repetition rate is often too low for time-critical applications,
• Duration of processing of value added product is often too long,
• Continuous quality of value added products is often insufficient
• Standardization of information is insufficiently developed

Calibration/Validation aspects concerning remote sensing:
• Insufficient standardization of in-situ-data (statistical basis is often too small)
• Insufficient amount of available in-situ-data (in kind and quantity)
• Unqualified measuring strategies for calibration / validation of remote sensing data

Operational stage of applications in the remote sensing:
• Processors are often prototypically (insufficient operationally usable),
• Insufficient validation strategies for operational processors
A Test Site for Remote Sensing?

Operational Test Sites In Europe

**Thematic Objective**
- Meteorology
- Remote Sensing

**Land Use**
- Meadow / Pasture
- Wood / Forest
- Natural Vegetation
- Crops

**Analysis Moment**
2009
Requirements for a Remote Sensing Observatory

Cooperation partners
• Agricultural companies
• Universities, colleges of technology

Local and regional preconditions
• Natural environmental configuration (agricultural, forestry, and environmental)
• Local variability of environmental site parameters vs. field size (statistical basis)
• Variability of the land use within the test site (characteristically for a larger region)

Technical requirements
• Automated measurement and archiving of environmental parameters
• Calibration equipment for operational remote sensing missions (automated)
• Control and quality check of data processing procedures
Durable Environmental Multidisciplinary Monitoring Information Network (DEMMIN)

- approx. 30,000 ha
- 3 Agricultural Joint-Stock Companies
- 3 Agricultural Ltd's
Formation of observatory DEMMIN with respect to landscape zones
(http://www.umweltkarten.mv-regierung.de/script/)

Landscape Zones

Rückland der Mecklenburgischen Seenplatte
- hilly country / ground moraine

Vorpommersches Flachland
- flat country / end moraine

Legend

0a – Beltsee
0b – Arkonasee
1 – Ostseeküstenland
2 – Vorpommersches Flachland
3 – Rückland der Mecklenburgischen Seenplatte
4 – Höhenrücken und Mecklenburgischen Seenplatte
5 – Vorland der Mecklenburgischen Seenplatte
6 – Elbetal

Festland
Grenze des Testfeldes DEMMIN

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Hydrology

characterized by
• diffuse, undeveloped water network,
• internal drainage areas,
• innumerable lakes,
• many bifurcation,
• numerous hollow forms (germ: sölle)

Rivers: Trebel, Tollense, Peene
Lakes: Kummerower lake - 0.2 m over NN
       Malchiner lake      - 0.6 m over NN

Peene: approx. river depth 2 - 3 m;
       approx. river slope (Malchin to Peene mouth 0.03%)

Natural peat bogs formed by through flow along Peene

Peene in the region of old peat-ditches. Especially notable are the natural meander.
Hydrology - Ground water

Isolines of ground water depth in DEMMIN
(http://www.umweltkarten.mv-regierung.de/script/)

Artesian areas in DEMMIN
(http://www.umweltkarten.mv-regierung.de/script/)
Soil Cover

Heterogeneity of soil cover within the test site DEMMIN. Sandy and loamy soils are dominant.
(http://www.umweltkarten.mv-regierung.de/script/)

Proportional quotas of the soil type in IG DEMMIN.
Relief

Look in the Tollense valley near the village Buchholz

Altitude profile across along the look in the Tollense valley. The red Pointer assigns the river bed of the Tollense river.
Climatic Conditions

Longtime mean of monthly accumulated precipitation measured by weather station Demmin and climate station Teterow of DWD (Period 1961-1990; DWD, 2006)

Longtime monthly mean of temperature measured by DWD climate station Teterow (Period: 1961-1990; DWD, 2007)

Cultivation Structure of IG Demmin

Main crops and average cultivation structure of the IG Demmin.
Data Availability by Precision Farming Techniques

Yield-Measures

Geo-statistics

Regular soil investigation (cycle 4 years)

Em38 – Soil conductivity

N-sensor for measuring Nitrogen content of crops

N-sensor for measuring Nitrogen content of crops

Yield mapping

Data Availability by Precision Farming Techniques

Em38 – Soil conductivity

Trunk & Zabel, 2005

Automatic Meteorological Network

- 16 meteorological stations
- measurement interval 15 minutes (programmable)
- data transfer between meteorological station and data server is realized by telemetry transfer
- web-based data access on data server

Win Speed / Wind Direction (Height: 2 m)
Air Temperature / Air Moisture
Leaf Wetness
Rain Gauge

Transmitter

Pyranometer
Solar Radiation (0.305 – 2.800 µm)

Energy Supply and Control

Pyrogeometer
Thermal Radiation (4.500 – 42.00 µm)

Soil Moisture : 0, 5, 10, 20, 50 cm Depth
Soil Temperature : 0, 5, 10, 20, 50 cm Depth

Energy Supply and Control

Transmitter
Automatic Meteorological Measurement Network

Earth Observation Satellites (e.g. ENVISAT, IRS)

Receiving Station and Data-Server for Transferring In-situ-Data

Agrarian Meteorological Network

Transferring Remote Sensing Data

Value added Earth Observation Data Products

Development / Validation of Value Added Products

Internet

Meteorological Data

Transferring Remote Sensing Data

Value added Earth Observation Data Products

Development / Validation of Value Added Products

Internet

Meteorological Data
Validation of Remote Sensing Data

LANDSAT 7 / ETM+

LANDSAT-Pixel (30 m X 30 m)

Plant height / density

Leaf Area Index
## Available Data Basis of DEMMIN

<table>
<thead>
<tr>
<th>Temporal Scale</th>
<th>Spatial Scale</th>
<th>point</th>
<th>field</th>
<th>region</th>
<th>over-regional</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>sporadic data</strong></td>
<td>quasi-continuous data</td>
<td>over-seasonal data</td>
<td>biomass, leaf area, (destructive), plant height, plant density, nitrogen, soil parameters, spectrometer measurements</td>
<td>electric soil conductivity</td>
<td>ESAR- flight campaigns</td>
</tr>
<tr>
<td><strong>dynamic data</strong></td>
<td></td>
<td></td>
<td>annual field campaigns: measurements of soil vegetation parameters, spectrometer measurements</td>
<td>micro- / macro nutrients</td>
<td>annual hyperspectral flights (z.B. HyMap)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>seasonal data</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>continuous data</strong></td>
<td></td>
<td>daily data</td>
<td>agro-meteorological data soil moisture / temperature</td>
<td></td>
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<tr>
<td><strong>permanent data</strong></td>
<td>quasi-static data</td>
<td></td>
<td>field geometrics drainage maps</td>
<td>geology, soils, hydrology, morphology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>static data</td>
<td></td>
<td>soil samples (substrate)</td>
<td></td>
<td>geology, soils, hydrology, digital elevation model</td>
</tr>
</tbody>
</table>

- **Spatial Scale**
  - point
  - field
  - region
  - over-regional

- **Temporal Scale**
  - sporadic data
  - dynamic data
  - continuous data
  - permanent data

- **Data Types**
  - static data
  - soil samples (substrate)
  - agro-meteorological data
  - biomass, leaf area, (destructive), plant height, plant density, nitrogen, soil parameters, spectrometer measurements
  - field geometrics drainage maps
  - electric soil conductivity
  - micro- / macro nutrients
  - annual field campaigns: measurements of soil vegetation parameters, spectrometer measurements
  - annual hyperspectral flights (z.B. HyMap)
  - agro-meteorological data soil moisture / temperature
  - crop structure application data yield data vegetation stages
  - field database cultivation data application data yield maps
  - soil samples (substrate)
  - geology, soils, hydrology, morphology
  - geology, soils, hydrology, digital elevation model
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- **Operative Systems**
  - satellite flights (campaigns)
  - satellite data (operative systems)
Development of DEMMIN

The Test site DEMMIN is listed in the following catalogues:

TERENO: http://www.tereno.net
ESA: ftp://pcf:Ciqcsp01@uranus.esrin.esa.int/PH/Deliverables/
Potential of Cooperation

Calibration / Validation:
- Remote sensing sensors,
- missions,
- processors,
- processing chains,
- products,
- data for environmental models

Thematic objectivities:
- Biomass modeling
- Balance of carbon
- Hydrological parameters
- Soil parameters

Processors, Data, Products:
- Development / Implementation
- Calibration / Validation

http://www.tereno.de
Literature

Papers:


Web-Sites:

http://www.umweltkarten.mv-regierung.de/script/

http://www.dwd.de/bvbw/appmanager/bvbw/dwdwwwDesktop?_nfpb=true&_pageLabel=dwdwww_start&T3200039671164966383319gsbDocumentPath=Navigation%2FOeffentlichkeit%2FKlima__Umwelt%2FKlimadatenzentren%2FNKDZ%2Fkldaten__akt%2Fausgabe__mittelwerte__node.html__nn%3Dtrue
Thank you for your attention!