TerraSAR-X Data Acquired in Pursuit Monostatic Mode during TanDEM-X Commissioning Phase

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Outline

- TanDEM-X Commissioning Phase(s) and Formation Built-Up
- Drift Phase: Moving Objects
- Pursuit Monostatic Phase
  - Interferometry Added
  - Complementary Imaging Configurations
- User Access to Pursuit Monostatic Data
TanDEM-X Commissioning Phase(s) and Satellite Formation Built-Up

LEOP and GS checkout

- 16,000 km @ Launch
- 12,000 km @ 1st Image
- → 20 km for P.S.M. Cf

Orbit drift

1 month

LEOP and Drift Phase

→ 3.6 (!) days after launch: start of TDX data taking and processing with operational TerraSAR-X processing chain
→ commissioning of Kiruna ground station for routine TDX data reception
→ continuation of operational TSX services by Neustrelitz ground station
→ from first day on: very good TDX performance
→ system data taking by instrument team
→ from July 18 on: stop of drift and built up of pursuit monostatic flight configuration

Earth Rotation: 460 m/s @ Eq.
→ full swath offset on ground @ 47s (330 km) distance

animation by M. Bachmann
Drift Phase: TDX-TSX ScanSAR acquisitions separated in time by 110 seconds (~800 km distance)

- scene heading angle difference of 0.4 deg
- azimuth spectra shifted by ~3300 Hz
- ScanSAR azimuth bandwidth ~500 Hz

=> no spectral overlap, no coherence

- but: incoherent cross correlation
Color coded overlay of enhanced ellipsoid corrected intensity images
Motion of sea ice estimated by incoherent cross-correlation

Correlation Coefficient

Evaluation & Visualization by W. Abdel Jaber
Moving Objects in 100 Seconds …

Fischland Darß
Germany

Baltic Sea

TSX/ TDX SM Difference Image
2010-07-14T16:54
... and within 4 Seconds

Nearly in 20km Formation:
- Acceptable Baselines (<4km)
- Spectral Overlap

→ InSAR / DEM Generation!
… and within 4 Seconds

Nearly in 20km Formation:
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→ InSAR / DEM Generation!
TanDEM-X Commissioning Phase(s) and Satellite Formation Built-Up

LEOP and GS checkout

Orbit drift

1 month

TDX monostatic commissioning phase

20 km Formation

2,5 months

Pursuit Monostatic Commissioning Phase

Jul. 22: PSM configuration with 20 km distance (2.6 sec) reached

TDX started its helix flight, 1.3 km width compensated for Earth rotation

acquisition and processing of TanDEM-X data in pursuit monostatic configuration started

operational qualification of Inuvik ground station

TDX calibration and verification

Oct. 5: release of TerraSAR-X mission based on both satellites TSX and TDX
DLR Ground Station
Inuvik, NWT
October Revolution Island Revisited
High Resolution DEMs at 79°N, 96°E
Ice Movement Effects on PSM InSAR Phases / DEMs (ATI)
Large Baseline Interferometry – Submeter Accuracy
Nimrod glacier at 82° South in Left-Looking Mode
Pursuit Monostatic Time Lag → Loss of Coherence for Vegetation and Water Bodies :( 

Mount Ruapehu, New Zealand, 2010-09-07T17:36:40
Pursuit Monostatic Time Lag $\rightarrow$ Loss of Coherence for Vegetation and Water Bodies :(

Mount Ruapehu, New Zealand, 2010-09-07T17:36:40
Pursuit Monostatic Time Lag $\rightarrow$ Loss of Coherence
Used for Flood Mapping (+)  
Pakistan August 2010

Amplitude (Statistics)  Phase  Coherence
Experimental Commanding in PSM: 2 Adjacent, Simultaneous Wide-(8-beam)-ScanSARs

- Highly experimental 8-beam "Wide Swath" ScanSAR:
  - ~30m az. resolution,
  - slant range: 1 - 1.5m
  - >200km swath width

Manual (!) commanding by U. Steinbrecher and D. Schulze (IHR), processing with operational TMSP. *Wide-Swath-SC (and Ultra-Wide-SC) is not an operational mode!*
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SM Dual Pol, Paraguay
25.4S, 54.5W

TSX TDX
HHHV VVVH
2010-09-15T22:08:09

HHHV VVVH
HH
HV
VH
VV

T. Fritz, B. Schättler
ASAR 2011, CSA, June 9, 2010
TDX HS Image over New York
2010-08-15T11:13:25
spot_010R, 20.7° incidence angle
TanDEM-X Commissioning Phase(s) and Satellite Formation Built-Up

LEOP and GS checkout

TDX monostatic commissioning phase

Bistatic commissioning phase

Orbit drift

20 km Formation

Close Formation

1 month ↔ 2,5 months ↔ 2 months

250 - 1000 m

Bistatic Commissioning and Start of Operational Phase

⇒ mid Oct 2010: built up of close formation and start of bistatic instrument operation
⇒ mid Dec 2010: start of operational DEM data acquisition
User Access To TerraSAR-X Pursuit Monostatic Data

TerraSAR-X TDX basic products from pursuit monostatic commissioning phase show nominal TerraSAR-X product performance.

- Upload to EOWEB for TerraSAR-X users is planned.
- Thus:
  Ordering for SSC, MGD, GEC, EEC product generation will be possible.
- Pursuit monostatic pairs are contained.
- Close to 500 single scenes already identified and prepared for upload from ground segment commissioning activities alone.

TerraSAR-X Science Web Page: http://sss.terrasar-x.dlr.de/
User Access To Pursuit Monostatic Data in the TanDEM World

TerraSAR-X TSX/TDX pairs usable as an interferometric TanDEM acquisition shall be also made available for the TanDEM-X world.

Requires

- setup and integration of new systematic workflow: TerraSAR-X raw data pairs => TanDEM-X CoSSC
- reprocessing of TerraSAR-X pairs as TanDEM data takes.

Then

- upload to EOWEB for TanDEM-X science users
- ordering of co-registered SSC pairs

Upload into TerraSAR-X and TanDEM-X world shall be done in parallel.

TanDEM-X Science Service System http://tandemx-science.dlr.de/
Thank You For Your Attention

DLR Ground Station
O‘Higgins (Antarctica)

2010-08-02T23:32:31