ESA Exploitation activities for ALOS MISSION

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Status of the European ALOS Data Node (ADEN)

Courtesy of Bianca Hoersch
TPM mission manager
European Space Agency ESRIN
- Acquisition of Data in X-band downlink at 3 Stations
- 3 Production Centres: Tromsoe, Esrin, Matera
ESA has developed the ADEN GS & is responsible to serve any user residing within the ADEN Zone with (worldwide) ALOS data.
- Direct ingestion into ADEN archives
- Data available in ADEN catalogue after ~ 24h
- NRT being implemented
Average time from acquisition to archive availability is around 3 weeks.
STATUS OF ADEN DATA DISTRIBUTION

- Around 300 accepted projects, around 500 PIs

- On-demand production:
  - 15% from ADEN acquisitions, 85% from repatriated data
  - 80% PALSAR, 10% AVNIR-2, 10% PRISM

- Distribution of use
  - 80% for research & application development
  - 5% for commercial use (SARCOM, EMMA)
  - 15% for pre-operational GMES use

- Systematic collections with around 5,000-10,000 products, see following slides
309 Projects: distribution by countries
Distribution by sensor/sensor-mode requests

- AVNIR-2 Nadir product (AV2), 95
- PALSAR Fine Resolution Direct Downlink product (PSR_DSN), 7
- PALSAR ScanSAR product (PSR_FB1 or PSR_FB2), 79
- PALSAR Polarimetry product (PSR_PLR), 136
- PALSAR Fine Resolution Single Polarisation product (PSR_FBS), 165
- PALSAR Fine Resolution Dual Polarisation product (PSR_FBD), 138
- PRISM Nadir (PSM_N), Forward (PSM_F), Backward (PSM_B) or Triplet Prod, 91
- PALSAR Fine Resolution Dual Polarisation product (PSR_FBD), 138

Distribution by sensor/sensor-mode requests
ADEN SPECIFIC COLLECTIONS

1. International Polar Year (IPY)
   - Antarctica systematic processing
   - 5 full cycles+ processed

   - 318 Major European cities in the timeframe 2006-2008 (including larger urban zones) cloud-free, orthorectified
   - 74 cities are covered by ALOS PRISM and AVNIR-2 cloud-free
   - 49 are 100% cloud-free, rest partial cloud-free
   - DLR orthorectifies products

3. Europe full coverage optical 2008/2009: ~ 6 Mio km²
   - Objective is to build up a cloud-free coverage in Europe in the vegetation seasons of 2008/2009 (maybe into 2010 to fill gaps), orthorectified (tbc)

4. (Sub-Saharan) Africa optical 2006-2010: ~ 30 Mio km²
   - Objective is to build up a coverage as cloud-free as possible in Africa in the vegetation seasons of 2009-2010, orthorectified (tbc)
AVNIR-2 COVERAGE AFRICA 2008/2009

6000 products
Of the ~17,000 products

- ca. 14,500 cloudfree (0-5% clouds)
- ca. 700 5-19% clouds
- ca. 1,500 20-49% clouds
- ca. 500 50-80% clouds
2. WORKSHOPS & SYMPOSIA ORGANIZATION
THEMATIC WORKSHOPS & SYMPOSIA

OBJECTIVES

- ESA Principal Investigators reporting exploiting ESA/TPM data
- Scientific exchange / Round tables
- Present state-of-the-art results
- Inform PIs about mission, performance & data quality
- Review and assess the development of applications and services
- Formulate recommendations for R&D

http://earth.esa.int/resources/workshops/
- The 1st ALOS PI Symposium was held successfully in November 2007 Kyoto, Japan.

- The 2nd ALOS PI Symposium was organized by ESA in cooperation with JAXA and with contribution from the nodes (ASF, GA and GISTDA) in Rhodes, Greece (3-7 November 2008)

  - ~200 Attendees from 37 countries
  - 180 presentations
  - 18 thematic session
  - 1 poster session with 60 posters
The 4th International Workshop on Science and Applications of SAR Polarimetry and Polarimetric Interferometry (POLinSAR), was organised in ESRIN, Frascati, Italy on 26-30 January 2009.

- ~200 Attendees from 20 countries
- 75 presentations
- 54 posters
UPCOMING ESA EVENTS

FRINGE 2009
6th International Workshop on Advances in the Science and Applications of SAR Interferometry.

30 November - 04 December 2009, ESA-ESRIN, Frascati, Italy

http://earth.esa.int/fringe09/

SEASAR 2010
3rd SAR oceanography workshop on Advances in SAR Oceanography from ENVISAT, ERS and ESA third party missions

25 - 29 January 2010, ESA-ESRIN, Frascati, Italy

http://earth.esa.int/workshops/seasar2010/
- Follows successful ENVISAT Symposium in Montreux (2007)

- Organised with Norwegian Space Centre and the Nansen Center (NERSC)

- **28 June - 2 July 2010**
  **Bergen, Norway**

- **Deadline for abstracts submission is**
  **15 November 2009**

http://www.esa.int/LivingPlanet2010/
3. TRAINING EARTH OBSERVATION PIS
- Training the next generation of Principal Investigators (PIs)
- Introducing available tools and methods for the exploitation of ERS, Envisat, TPM and Explorers satellite data
- Stimulating and supporting the exploitation of ESA EO and Third party Mission remote sensing data for ocean, land and atmospheric applications
Training/Tutorial sessions for the exploitation of ALOS data with ESA toolboxes have been organised.

- BEAM and PolSARpro toolboxes at ALOS PI Symposium 2008 with 60 participants

- PolSARpro toolbox at POLinSAR 2009 with more 70 participants
Software ‘Toolboxes’ instigated by ESA contracts

Each Toolbox is a collection of software tools to help the remote sensing community to exploit ESA-TPM data

New generation to contain scientific tutorials prepared with Universities and practical case studies using real EO data

Offered to the user community free-of-charge: [http://earth.esa.int/resources/softwaretools/](http://earth.esa.int/resources/softwaretools/)
**BEAM** (BASIC ERS&ENVISAT(A)ATSR AND MERIS TOOLBOX) is an ESA open-source toolbox and development platform for scientific exploitation of ESA and 3rd party optical and multispectral data.

<table>
<thead>
<tr>
<th>Current supported datasets</th>
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<tbody>
<tr>
<td>MERIS L1b/L2</td>
<td>Envisat</td>
</tr>
<tr>
<td>MERIS L3</td>
<td>Envisat</td>
</tr>
<tr>
<td>AATSR L1b/L2</td>
<td>Envisat</td>
</tr>
<tr>
<td>ASAR</td>
<td>Envisat</td>
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<tr>
<td>ATSR L1b/L2</td>
<td>ERS</td>
</tr>
<tr>
<td>SAR</td>
<td>ERS</td>
</tr>
<tr>
<td>CHRIS L1</td>
<td>Proba</td>
</tr>
<tr>
<td><strong>AVNIR-2 L1/L2</strong></td>
<td>ALOS</td>
</tr>
<tr>
<td><strong>PRISM L1/L2</strong></td>
<td>ALOS</td>
</tr>
<tr>
<td>MODIS L2</td>
<td>Aqua, Terra</td>
</tr>
<tr>
<td>AVHRR/3 L1b</td>
<td>NOAA-KLM</td>
</tr>
<tr>
<td>TM</td>
<td>Landsat 5</td>
</tr>
</tbody>
</table>
Main scientific data processors:

- Level 3 Binning and Mosaicing (all sensors)
- Collocation (all sensors)
- EM and K-Means Clustering, Linear Spectral Unmixing (all sensors)
- Radiance-to-Reflectance, Smile Effect Correction, Cloud Probability, SMAC Atmospheric Correction, Case 2 Water Constituents (MERIS)
- Sea Surface Temperature (AATSR)
- FLH/MCI, NDVI (all sensors)
SMOS (SOIL MOISTURE AND OCEAN SALINITY MISSION) and Proba-2 successfully launched on the 2nd November 2009

- Version 1.0 of the SMOS-Box is already available

- Test data and the source code of the SMOS Toolbox found at the SMOS Wiki in the BEAM website

http://www.brockmann-consult.de/cms/web/beam/

BEAM and the SMOS BOX are being developed by Brockmann-Consult of Geesthacht Germany under ESA Contract
NEST (Next ESA SAR Toolbox) is an ESA open source toolbox for scientific exploitation of ESA and 3rd party SAR data processed from Level-1 or higher.

- Shares core architecture with BEAM toolbox

<table>
<thead>
<tr>
<th>Current supported datasets</th>
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</thead>
<tbody>
<tr>
<td>ENVISAT ASAR</td>
</tr>
<tr>
<td>ERS 1 &amp; 2</td>
</tr>
<tr>
<td><strong>ALOS PALSAR</strong></td>
</tr>
<tr>
<td>TerraSAR-X (except SSC)</td>
</tr>
<tr>
<td>RADARSAT 1 &amp; 2</td>
</tr>
<tr>
<td>JERS SAR</td>
</tr>
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</table>

http://earth.esa.int/nest

NEST is being developed by Array Systems Computing Inc. of Toronto Canada under ESA Contract
Some highlights about NEST functions

- Envisat ASAR, ERS 1&2 and ALOS calibration
- Coregistration of detected and complex products
- Multilooking & speckle filtering
- Debursting of ASAR WSS products
- Orthorectification and radiometric normalization
- Mosaicing
- InSAR functionalities (available from 3C)
- PolsarPro Reader
POLSARPRO (The Polarimetric SAR Data Processing and Educational Tool) aims to facilitate the accessibility and exploitation of multi-polarised SAR datasets

- Developed to be accessible to a wide range of users from novices to experts in the field of POLSAR and POL-InSAR
- Educational Software offering a tool for self-education in the field of POLSAR and POL-InSAR data processing and analysis
- Open Source Software Development

<table>
<thead>
<tr>
<th>Current supported Polarimetric datasets</th>
<th></th>
</tr>
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<tbody>
<tr>
<td><strong>Airborne</strong></td>
<td><strong>Spaceborne</strong></td>
</tr>
<tr>
<td>AIRSAR &amp; TOPSAR</td>
<td>SIR-C</td>
</tr>
<tr>
<td>EMISAR</td>
<td>Envisat ASAR</td>
</tr>
<tr>
<td>E-SAR</td>
<td>RADARSAT-2</td>
</tr>
<tr>
<td>Pi-SAR</td>
<td>ALOS PALSAR</td>
</tr>
<tr>
<td>SAR580-Convair</td>
<td>TerraSAR-X</td>
</tr>
<tr>
<td>RAMSES</td>
<td></td>
</tr>
</tbody>
</table>

http://earth.esa.int/polsarpro

POLSARPRO is developed under contract to ESA by a consortium led by IETR at the University of Rennes 1
SUPPORTING ADVANCES in R&D
**Background**

- Need of getting time series of POLSAR data for demonstrating the benefits of SAR Polarimetry and PolInSAR as identified in the POLINSAR series of workshop and in the ALOS PI Symposium (Kyoto, Rhodes)

- Limited number of test sites representative of key applications acquired every cycle ascending/descending

- Initiative proposed by ESA (CAT-1 PROPOSAL ID 5780) and also supported by JAXA (ALOS-PALSAR) and CSA (RADARSAT-2)
17 sites have been selected according to:

- Recommendations from PI scientists (Prof. Eric Pottier, Prof. Shane Cloude, Dr. Kostas Papathanassiou etc.)

- Previous ALOS full-pol PALSAR acquisitions

- "ESA Polarimetric and Interferometric mission and application study" (contract 17893/03/I-LG)

- ESA airborne campaigns

- In situ measurements and other data sources for validation
### Test Sites for PolSAR and PolInSAR Application Demonstration

#### ALOS PALSAR

**New Acquisitions**

Status up to 3/11/2009

<table>
<thead>
<tr>
<th>Test Site</th>
<th>New ALOS POL Acquisitions From 1/11/2008 to 3/11/2009</th>
<th>Old ALOS POL Acquisitions From 16/05/2008 to 31/10/2008</th>
<th>Application</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transneit (Germany)</td>
<td>5 (D) 2(A)</td>
<td>13 (D) 6 (A)</td>
<td>Forest</td>
<td>POLARIMETRIC &amp; INTERFEROMETRIC MISSION AND APPLICATION STUDY 128X128X5 LOS FINAL REPORT (led by DLR)</td>
</tr>
<tr>
<td>Bavisches Wald (Germany)</td>
<td>5 (D)</td>
<td>13 (D) 3 (A)</td>
<td>Forest</td>
<td>POLARIMETRIC &amp; INTERFEROMETRIC MISSION AND APPLICATION STUDY 128X128X5 LOS FINAL REPORT (led by DLR)</td>
</tr>
<tr>
<td>Ronneby (Sweden)</td>
<td>2 (A) 2 (D)</td>
<td>4 (B) 8 (A)</td>
<td>Forest</td>
<td>ESA Campaign BioSAR P.L band with E-SAR (2007)</td>
</tr>
<tr>
<td>SCOTLAND</td>
<td>2 (A)</td>
<td>3 (A)</td>
<td>Forest</td>
<td>Prof. Shane Clusia (AEL, UK)</td>
</tr>
<tr>
<td>South West Australia</td>
<td>1 (A)</td>
<td>1 (A)</td>
<td>Forest</td>
<td>Prof. Shane Clusia (AEL, UK)</td>
</tr>
<tr>
<td>Foulum (Denmark)</td>
<td>2 (A)</td>
<td>2 (A)</td>
<td>Agriculture</td>
<td>POLARIMETRIC &amp; INTERFEROMETRIC MISSION AND APPLICATION STUDY 128X128X5 LOS FINAL REPORT (led by DLR)</td>
</tr>
<tr>
<td>Allgau-DLR (Germany)</td>
<td>3 (D) 2 (A)</td>
<td>10 (D) 6 (A)</td>
<td>Agriculture</td>
<td>POLARIMETRIC &amp; INTERFEROMETRIC MISSION AND APPLICATION STUDY 128X128X5 LOS FINAL REPORT (led by DLR)</td>
</tr>
<tr>
<td>Davos (Switzerland)</td>
<td>2 (A)</td>
<td>1 (A)</td>
<td>Agriculture</td>
<td>ESA Campaign Anisotropic 2006 with E-SAR</td>
</tr>
<tr>
<td>Tianjin district (China)</td>
<td>2 (A)</td>
<td>2 (A)</td>
<td>Forest - Land use: Urban changes</td>
<td>Prof. Eric Pellet (Université de Reims-Champagne, France), Dr. Xun Zhou (CAF, China)</td>
</tr>
<tr>
<td>Jungfrau Alps (Switzerland)</td>
<td>1 (A)</td>
<td>1 (A)</td>
<td>Snow</td>
<td>Swiss Alpine Avalanche SAR Experiment (SASSA)</td>
</tr>
<tr>
<td>Snøhett (Norway)</td>
<td>12 (A) (different phases)</td>
<td>1 (A)</td>
<td>Ice</td>
<td>Geophysical Labs - ESA Campaign, Prof. Torbjorn Elseth (Trondheim University, Norway)</td>
</tr>
<tr>
<td>Tagazt Forest (Ivory Coast)</td>
<td>2 (A)</td>
<td>5 (A)</td>
<td>Forest</td>
<td>Prof. Luciano Dutra (DFRJ)</td>
</tr>
<tr>
<td>Mari Dene - East of Ottawa (Canada)</td>
<td>2 (A)</td>
<td>5 (A)</td>
<td>Wetland mapping and monitoring</td>
<td>Dr. Kevin Tweed (CURED)</td>
</tr>
<tr>
<td>Influenza forest (Australia)</td>
<td>1 (A)</td>
<td>10 (A)</td>
<td>Forest</td>
<td>Dr. Paul Suprajna (University of Massachusetts)</td>
</tr>
<tr>
<td>Duke forest (USA)</td>
<td>2 (D)</td>
<td>2 (D)</td>
<td>Forest</td>
<td>Dr. Paul Suprajna (University of Massachusetts)</td>
</tr>
<tr>
<td>Harvard forest (USA)</td>
<td>2 (A)</td>
<td>12 (A)</td>
<td>Forest</td>
<td>Dr. Paul Suprajna (University of Massachusetts)</td>
</tr>
<tr>
<td>Kusil / Alaska (wetlands and boreal forests)</td>
<td>1 (A) 2 (D)</td>
<td>8 (B) 1 (A)</td>
<td>Wetlands and Boreal forests</td>
<td>Dr. Don Atwood (AUSC)</td>
</tr>
</tbody>
</table>
A Google Earth file gathering all the test sites is available

> TEST SITE OF TRAUNSTEIN IN GERMANY ON GOOGLE EARTH
THANKS FOR YOUR ATTENTION

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European Space Agency ESRIN