SMOS validation and retrieval team workshop

Susanne Mecklenburg, Catherine Bouzinac and Steven Delwart

ESRIN, 29-30 November 2010
The first year of SMOS …

2 November: Launch from Plesetsk, Russia,

3 November: Antenna deployment

17 November: Instrument switch-on,
1st download over ESAC, first image

Commissioning phase finished at the end of May

Now in operations phase since June 2010
SMOS status

Space and ground system have been tested in the commissioning phase

→ Payload and platform functioning well with minor anomalies
→ Ground segment is acquiring and processing data up to level 2 and providing data in NRT to ECMWF

Data availability

→ First Level 1C products (and some data sets for level 2) released to cal & val PIs mid April
→ Official release of level 1C products in July 2010
→ Official release Level 2 products in Oct 2010
→ First entire reprocessing of data up to level 2 foreseen for Q2 of 2011
→ Re-processing of data from commissioning ongoing
- 30 proposals involving soil moisture
- 14 proposals involving ocean salinity
- 3 proposals involve soil moisture and ocean salinity
- 3 proposals involve brightness temperature only
- 1 proposal for calibration of geolocalisation biases

~ 50 PIs from 19 countries

- Soil moisture test sites
- Ocean salinity test sites

See session “Level 2 soil moisture validation”
→ presentation Y. Kerr, W. Mauser, E. Lopez-Baeza, T. Jackson, T. Pellerin, de Rosnay ....

See session “Level 2 ocean salinity validation”
→ presentation J. Boutin, J. Tenerelli, F. Gaillard, Ch. Gommenginger ...
**Campaigns during 2010**

**Airborne campaigns**
- ESA campaign – similar to rehearsal campaign, to validate L1 brightness temperature and L2 soil moisture retrieval with SkyVan, in May-June 2010.
- SW Australia – Jeff Walker, University of Melbourne, campaign performed in Feb 2010.
- CAROLS: Combined Airborne Radio-instruments for Ocean and Land Studies, over South-West France and Bay of Biscay, funded by CNES – over Valencia Anchor Site, funded by ESA; campaign from April to July 2010, with ATR-42.

**Ground campaigns**
- In-situ measurements and upscaling to SMOS pixel at individual PI sites in different areas of the globe (e.g. Sahel, Tibet, Duero, Oklahoma).

See session “Level 2 soil moisture validation”
→ presentation C. Montzka, W. Mauser, E. Lopez-Baeza, J. Walker, M. Zribi …
ESA key validation sites for soil moisture

Valencia Anchor Site, Spain
- typical Mediterranean sparse vegetation ecosystem, mainly bare soil and limited vegetation;
- the vegetation consists mainly of vineyards, pine trees and shrubs and is thus comparatively uniform with regard to hydrological parameters;
- the site is well instrumented and has been the location of other field campaigns.

Upper Danube Catchment, Germany
- Typical temperate continental ecosystem;
- Field measurements include three eddy correlation towers for wind, H2O and CO2 and 60 time delay reflection soil moisture probes for continuous measurements.

ELBARA – L-Band ground based radiometer

Image © E.Lopez Baeza

Image © A.Loew
ELBARA in Sodankyla (ARC-FMI) initially for one year : Sept2009-Aug2010
Nominal measurements since 09 Oct 2009, extended now for 2 years.
Technical failure at the beginning of October; component was successfully replaced.

ELBARA near Munich (LMU) initially for three years : Sept2009-Aug2012; Nominal measurements since 01 Oct 2009, now decided to terminate measurements and shift instrument to Vercor (Some problems in the V-pol channel due to dust and water during sky measurements)

ELBARA near Valencia (VAS) for three years : Sept2009-Aug2012
Nominal measurements between mid Oct and mid Nov 2009
Technical failure due to unstable power; repair and restart mid Feb 2010

See session “Level 2 soil moisture validation”
→ presentation W. Mauser, E. Lopez-Baeza, K. Rautiainen
Five networks have been inventoried in detail for Phase I:

- MESONET
- REMEDHUS
- SMOSMANIA
- OzNet (2)
- International Soil Moisture Network Data Base

See session “Validation of Level 2 soil moisture” → presentation W. Wagner, W. Dorigo
Observations at DOME-C station

- **Objectives**
  - Provide an external ice-sheet target calibration reference, and serve as a basis for calibration monitoring
  - Validation of Tb SMOS products
  - Extension of sampling time during all 2010 minimum (Annual cycle spanning summer/winter)

- **Experiment details**
  - Radiometer RADOMEX has been developed by IFAC Florence (I)
  - Thermal subsystem has undergone major upgrade wrt DOMEX-1 version, with the support of the ESTEC Thermal Division.
  - Measurements since end 2008
  - Analysis of SMOS Tb compared to RADOMEX Tb and monitoring of variations

Illustration of stability of brightness temperature with time

- Antarctic plateau around Dome C good candidate for stability monitoring and across fov consistency check

© IFAC Florence

See session “Calibration of Brightness Temperature and Level 1 Processor” → presentation G. Macelloni
Study objectives:
- Operational monitoring of global NRT brightness temperatures
- Quantification of the impact of SMOS observations on the forecast skill

Integration of SMOS data into ECMWF forecasting model

First guess departure: observation – model for 12 hours and all incidence angles

See session “Calibration of Brightness Temperature and Level 1 Processor” → presentation J. Muñoz
How to get SMOS data

- All SMOS data are systematically processed into L1 and L2 products at the DPGS/ESAC
- Copy of data products is sent to LTA at Kiruna for long term archiving and cataloguing
- LTA also provides online access for the most recent products (rolling on-line archive)
- Registered users can obtain SMOS data products in two ways:
  1. By subscribing to the systematic distribution of products ("subscription service"): all data products required by the user are made available via FTP, to be collected by the user, or
  2. By searching the data product catalogue (EOLI) and submitting an order for selected archived products (limited to 20 products per orders). The catalogue also provides access (immediate download) to the most recent data through the rolling on-line archive at LTA

**Subscription**

- (= your research project relies on a continuous and regular flow of data)
- L1 (A,B,C) and L2 data products
- 10 auxiliary data types
- submission of your full proposal through the EOPI portal
- ESA’s Help Desk (EOHelp@eo.esa.int) will contact you to collect your data requirements and set-up the subscription for you.
- data delivery via pull from a FTP

**EOLI**

http://earth.esa.int/EOLi/EOLi.html.

- (= your research project relies on a one-off data ordering/ you need limited amount of data)
- L1 (B,C) and L2 data products (present and previous baseline)
- limited amount of auxiliary data types
- registration through the EOPI portal
- search entire SMOS data catalogue, order or download data directly (both limited access)
- ESA’s Help Desk (EOHelp@eo.esa.int) will send notification where data can be collected.
### SMOS Tools

<table>
<thead>
<tr>
<th>Tool</th>
<th>URL</th>
<th>Description</th>
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<tbody>
<tr>
<td>SMOS Data viewer</td>
<td>ftp://193.146.123.163/smos/software/SMOSView/</td>
<td>Microscopic &amp; detailed view for products and auxiliary data files</td>
</tr>
<tr>
<td>SMOS Tool Box (BEAM)</td>
<td><a href="http://www.brockmann-consult.de/beam-wiki/display/SBOX/SMOS+Toolbox+for+BEAM">http://www.brockmann-consult.de/beam-wiki/display/SBOX/SMOS+Toolbox+for+BEAM</a></td>
<td>Enables reading, visualisation and basic analysis of SMOS L1C &amp; 2 products</td>
</tr>
<tr>
<td>SMOS Global Mapping Tool</td>
<td>ftp://193.146.123.163/smos/software/GMT/</td>
<td>Macroscopic view for L1 and L2 Products</td>
</tr>
<tr>
<td>SMOS Comparison Tool</td>
<td>ftp://193.146.123.163/smos/software/SCOT/</td>
<td>SCoT provides a “Delta” view for L1 Products</td>
</tr>
<tr>
<td>SMOS XML R/WAPI</td>
<td>ftp://193.146.123.163/smos/software/XML_RW_API/</td>
<td>Library in C++ to read and write SMOS Products and auxiliary file</td>
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### SMOS webpage

- [earth.esa.int/smos](http://earth.esa.int/smos)

**Information on**

- Data quality, products and release dates
- Processors and relevant documentation
- Instrument configuration (commissioning and routine)
- Mission planning
- Events (SVRT workshop etc)
- Available tools (Toolbox, Data viewer and others)
- Link to CESBIO SMOS blog

**Data access**

- eopi.esa.int (proposal or registration)
- [http://earth.esa.int/EOLi/EOLi.html](http://earth.esa.int/EOLi/EOLi.html) (catalogue)

**Campaign data**

- [earth.esa.int/campaigns](http://earth.esa.int/campaigns)
Monday 29 November 2010

9:00 Welcome, Logistics, Programme (S. Mecklenburg, ESA-ESRIN)
9:10 SMOS Mission Status and overview on cal/val (S. Mecklenburg, ESA-ESRIN)
9:20 Soil Moisture Validation Overview (Y. Kerr, CESBIO, France)
9:40 Ocean Salinity Validation Overview (J. Boutin, LOCEAN, France & J. Font, ICM, Spain)
10:00 SMOS Calibration (Manuel Martin-Neira, ESA-ESTEC)

10:20-10:50 coffee/tea

10:50-12:10 Session on Calibration of Brightness Temperature and Level 1 Processor
Chair: Manuel Martin-Neira

12:30-13:30 Session on Validation of Level 2 Sea Surface Salinity (Part 1)
Chair: Catherine Bouzinac and Jacqueline Boutin

13:30-14:30 Lunch

14:30-16:00 Session on Validation of Level 2 Sea Surface Salinity (Part 2)

17:00-19:00 Posters Session & Tool Demonstrations
  ➔ Demos for tools
  ➔ Aperitivo at 18:00 (canteen)
09:00-13:00 Session on Validation of Level 2 Soil Surface Moisture
Chair: Steven Delwart, Yann Kerr, Zoltan Bartalis and Jennifer Grant

13:40-14:40 Lunch

16:00-16:30 Final Conclusions & Recommendations
Thank you for your attention!

For further information

SMOS webpage
earth.esa.int/smos
(technical details)

http://www.esa.int/esaLP/(LPsmos.html
(mission overview)