SMOS mission extended till 2017
The SMOS mission operations have been extended to 2017. Both ESA and CNES, jointly operating the mission, have confirmed the extension in their respective reviews. New challenging objectives have been set for this mission extension, focusing on the:

- Synergistic scientific exploitation of SMOS data with other in-orbit and future earth observation missions, e.g. Aquarius, SMAP, Sentinels.
- Need of enhanced process understanding on time-scales exceeding the initial mission lifetime, e.g. for geophysical phenomena like El Niño and El Niña or droughts, and merged data products of SMOS data with other L-band observations for the generation of long-term data sets and thematic data records, given that soil moisture and ocean salinity have been identified as ECV.
- Pre-operational need for continuous observation data sets: Operational and scientific users have expressed the need for data continuity in (semi-) operational applications following the maturation of the SMOS data products.

SMOS second mission data reprocessing updates
The 2nd SMOS reprocessing campaign is presently on-going and will generate, with a state-of-the-art algorithm baseline, a complete and homogeneous set of Level 1 and 2 data products for the entire mission duration. The Level 1 reprocessing will be completed by mid-September, the Level 2 reprocessing by the beginning of 2015. The distribution of the complete reprocessed data set is planned for the first quarter of 2015. See the "Data and Processing" section of this newsletter for a summary of the envisaged improvements in the data.

SMOS soil moisture data supports the USDA’s agricultural drought global monitor programme
The US Department of Agriculture (USDA) Foreign Agricultural Service has started to use data from the ESA’s SMOS satellite for their studies and analysis. Through SMOS, the USDA service acquires timely information on soil moisture patterns, which is a crucial piece of information over areas where few on-ground measurements are available. SMOS data is used within USDA’s prediction model to assess...
The two sampling platforms used during the campaign were the AWI Polar 5 airplane flying the EMIRAD-2 radiometer (from DTU Space) and a snow radar (from AWI) and a NPI helicopter flying their Helicopter-borne electromagnetic sounding (HEM-bird) and stationed on the Norwegian research vessel, LANCE. The data collected by the EMIRAD-2 radiometer has been analyzed by the expert team and the dataset will be delivered with SMOS Ice 2014 campaign preliminary results. The SMOS Ice 2014 campaign took place between March 21-28, 2014, in the sea-ice region Southeast of Svalbard and the main objective was to document the relationship between observed sea ice thicknesses and L-band brightness temperature signatures. (For further details see SMOS newsletter #7 available here: https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/newsletter)

The data collected by the snow radar is currently being processed by AWI and preliminary results will be available in the coming months. With these rich datasets, ESA will support further studies into SMOS-based sea ice thickness retrieval and also synergies with the CryoSat mission. This campaign was a joint effort between ESA, AWI, DTU Space, NPI and Univ. Hamburg.

The data collected by the HEM-bird instrument on the sea-ice thickness and the SMOS sea-ice thickness product shows a good agreement. Figure 3 shows a qualitative comparison of the two data sets. HEM-bird instrument data set will be delivered with the final SMOS Ice2014 campaign report by beginning of 2015 on the ESA’s campaign website: https://earth.esa.int/web/guest/campaigns. The data collected by the snow radar is currently being processed by AWI and preliminary results will be available in the coming months.

University of Hamburg is generating a sea-ice thickness product based on the images of brightness temperature acquired by the ESA’s SMOS mission. The radiation emitted by the ice allows SMOS to “see” through the surface, yielding ice-thickness measurements down to 50 cm mainly for the thinner and younger ice at the edge of the Arctic Ocean. This information, which complements the one provided by the ESA’s Cryosat mission for ice-thickness above 50 cm, is particularly important to control the exchange of heat and...
water between the ocean and the atmosphere as well as for better planning of shipping routes over the Arctic Ocean. The daily product will be available quasi-operationally on the Integrated Climate Data Center (ICDC) web site: http://icdc.zmaw.de/las/getUI.do.

Figure 4 shows an example of the data product. Further details on the SMOS ice-thickness product are available on the ESA web portal: http://www.esa.int/Our_Activities/Observing_the_Earth/SMOS/Versatility_extends_life_of_water_mission.

**Using G-POD for processing SMOS data: reminder for call for proposals**

ESA would like to remind the SMOS user community of the availability of the Grid Processing-on-Demand (G-POD) service [http://gpod.eo.esa.int] for conducting Earth Science research activities. G-POD is offered by ESA’s Research and Service Support [http://wiki.services.eoportal.org/tiki-custom_home.php].

G-POD SMOS proposals need to be submitted directly onto the following Web site: http://eopi.esa.int/G-POD. This is an open call, i.e. proposals can be submitted at any time.

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**Figure 3:**
Upper panel: Sea-ice thickness [cm] from SMOS data acquired on 26/03/14 overlaid with the vessel tracks (in violet) and drifting buoys tracks (in red). Credits: UHH (Lars Kaleschke). Lower panel: Sea-ice thickness [m] from the Helicopter-borne electromagnetic sounding obtained during the two flights on 24/03/14 and on 26/03/14. Preliminary results are very good, both measurements (HEM and SMOS) show the same west-east gradient for the sea-ice thickness, SMOS data being a bit thinner. Credits: NPI (Gunnar Spreen)

**Figure 4:**
Sea-ice thickness in [m] over the Arctic ocean as derived from SMOS brightness temperature acquisition on 16 January 2014 (on the top panel) and 16 January 2013 (on the bottom panel). The Laptev Sea (inside the red circle in the figure) shows a different sea-ice thickness pattern between 2013 and 2014. Credits: ICDC – University of Hamburg (Lars Kaleschke)
**Data and Processors**

**Data availability**
The SMOS instrument – MIRAS – is operating nominally with the exception of some known on-board anomalies [see description of anomalies](https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/con-tent?_r_p_564233524_assetIdentifier=mi-ssion-status-7060). No data loss has occurred during the acquisition of MIRAS raw data at the ground stations since the beginning of the routine operations phase in May 2010. This result has been achieved by implementing an on-board data recording overlap strategy.

**Instrument Calibration**
Several calibration activities are regularly performed on board and an overview on the calibration strategy implemented for the MIRAS instrument can be found on [https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/con-tent?_r_p_564233524_assetIdentifier=mi-ssion-status-7060](https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/con-tent?_r_p_564233524_assetIdentifier=mi-ssion-status-7060).

During calibration activities, science data are not available hence data users should consult the calibration plan for data availability, available from [https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/available-data-processing](https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/available-data-processing).

An orbit correction manoeuvre was successfully executed on 4 August. The evolution of the calibration parameters since the beginning of the mission is available in the SMOS quality reports accessible on the following web page: [https://earth.esa.int/web/guest/-/data-quality-7059](https://earth.esa.int/web/guest/-/data-quality-7059).

The data acquired during the Noise Injection Radiometer (NIR) calibration commanded on 7 July, with the Sun slightly in front of the antenna plane, was not used in the routine processing but instead used to better understand the effect of the thermal environment on the NIR and its calibration response.

**Data quality**
A monthly report summarising significant events in the SMOS flight and ground segment and the SMOS data quality status can be found on: [https://earth.esa.int/web/guest/-/data-quality-7059](https://earth.esa.int/web/guest/-/data-quality-7059).

Since the issue of newsletter #7, no new anomaly has been identified in the routinely generated level 1 and level 2 data.

**Updates on operational processors**
The current versions of the operational processors installed in the SMOS ground segment are:

<table>
<thead>
<tr>
<th>Processor</th>
<th>Current version</th>
<th>In operations since</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1A</td>
<td>V5.04</td>
<td>14 November 2011</td>
</tr>
<tr>
<td>Level 1B</td>
<td>V5.04</td>
<td>14 November 2011</td>
</tr>
<tr>
<td>Level 1C</td>
<td>V5.05</td>
<td>21 March 2012</td>
</tr>
<tr>
<td>Near Real Time processor (NRTP)</td>
<td>V5.05</td>
<td>7 March 2012</td>
</tr>
<tr>
<td>Level 2 soil moisture</td>
<td>V5.51</td>
<td>24 April 2012</td>
</tr>
<tr>
<td>Level 2 ocean salinity</td>
<td>V5.50</td>
<td>15 December 2011</td>
</tr>
</tbody>
</table>

Below are further details on the current versions of the operational processors:

**Level 1/ NRTP:** No new version has been implemented in the Level 1 processor during the period April 2014 – September 2014. Therefore, the algorithm baseline and data quality are as reported for the SMOS newsletter #3 issued in October 2012.

**Level 2 Soil Moisture:** No change has been implemented in the Level 2 Soil Moisture processor during the period April 2014 – September 2014. Therefore, the algorithm baseline and data quality are as reported for the SMOS newsletter #3 issued in October 2012.

**Level 2 Ocean Salinity:** No change has been implemented in the Level 2 Ocean Salinity processor during the period April 2014 – September 2014. Therefore, the algorithm baseline and data quality are as reported for the SMOS newsletter #3 issued in October 2012.

Further information on the SMOS data quality can be found in the products read-me-first notes available on the web page: [https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/con-tent?p_r_p_564233524_assetIdentifier=dat-a-processors-7632](https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/con-tent?p_r_p_564233524_assetIdentifier=dat-a-processors-7632).

SMOS data users are invited to consult the read-me-first note before using the SMOS data for their research activities.

**Summary of improvements to level 1 and 2 processors for 2nd mission reprocessing (planned to be deployed in the operational chain in the first quarter of 2015)**

**Level 1**
The new version of the SMOS Operational Processor (baseline V620) is used for the 2nd mission reprocessing campaign and will be deployed in the ground segment in the first quarter of 2015, including the near real-time processing chain (NRT). The major improvements for the L1OP are the following:

- Better RFI flagging of the level 1C data based on:
  - an RFI detection algorithm that uses both NIR brightness temperature and system temperature measurements to signal the presence of the RFI in the data
  - improved maps of potential RFI detected on the Earth surface to signal the presence of the RFI at the level of the discrete ground grid point
- Better radiometric stability, particularly the long-term stability of the brightness temperature on antenna frame (level 1C data)
- Improved spatial bias after several improvements at calibration and image reconstruction level
- Improved accuracy in the computation of the 3rd and 4th Stokes parameters by a full cross-polarization data processing approach
The Land-Sea contamination effects are unchanged between the level 1 processor v505 and v620.

For the Level 2 soil moisture operational processor the foreseen major improvements are, as reported in the previous newsletter, as follows:

- Better characterization of the auxiliary files generated by the post-processor by splitting the values of Tau, Roughness and RFI probability for ascending and descending orbit, and improved utilization of these data in the L2SM processor
- Enhancement of soil moisture retrieval in forest areas
- Enhancement in the computation of the RFI probability, used to adjust radiometric uncertainty in the retrieval of the soil moisture, by using most recent SMOS observations instead of historical data
- Improvements to UDP reported fields, including enhanced reporting for modelled TB at 42.5°, reporting the distance of the observed target from the satellite track, and several bug fixes with minor impacts on reported values.

For the Level 2 sea surface salinity operational processor the foreseen major improvements are, as reported in the previous newsletter, as follows:

- Ocean Target Transformation (OTT) correction applied on daily basis to better track level 1 radiometric drift and spatial biases
- Estimation through level 1C Stokes 3 measurements of the Vertical Total Electron Content (VTEC) for the descending passes and usage in the retrieval of the sea surface salinity (ascending passes still use the predicted VTEC value from IGS)
- Better RFI detection and flagging, including use of cumulative RFI probability to adjust radiometric accuracy
- Improved roughness model

Further information on the improvements achieved with this processor baseline V62x will be provided in the software release note of the operational processors and in the data release note that will be available just after the deployment of the processors in the operational ground segment.

Radio Frequency Interference (RFI)

Illegal RFI sources operating in the L-band adversely affect the SMOS measurements, rendering the affected SMOS data products largely unusable for scientific applications in the affected areas. Users can check whether data are corrupted by RFI by using the quality flags, available in the SMOS data products, as indicators. A detailed description of these flags was included in the SMOS newsletter #1 issued in May 2012. Additional information with regard to RFI contamination can be found on the frequently updated RFI probability maps, generated fortnightly by CESBIO and available on the SMOS blog [http://www.cesbio.ups-tlse.fr/SMOS_blog/smos_rfi/].

Figure 5 below shows an example of the map generated for the period centred on 18 August 2014. Thus the user can visually inspect the map to identify areas with strong RFI presence over land.

The 3rd and 4th Stokes parameters can also be used to detect RFI. Nominal values for the 3rd and 4th Stokes parameters are expected to be very small for natural targets at L-band. Hence a larger deviation in the 3rd and 4th Stokes parameters, i.e. beyond a few Kelvin, would indicate the presence of RFI. Figure 6 shows an example of the weekly map of the 4th Stokes parameter for the week of 17 - 24 August 2014. The map, for example, identifies the presence of several RFI sources over the North Atlantic Ocean. The user can visually inspect the map to identify areas with possible RFI presence over Sea (i.e. 3rd and 4th Stokes parameters above 10 K in absolute value). Weekly maps of 3rd and 4th Stokes parameter are presented in the SMOS Monthly QC Report available on the following web page: https://earth.esa.int/web/guest/-/data-quality-7059.
Upcoming Meetings & Announcements

Earth Observation for Ocean-Atmosphere Interactions Science 2014 Conference, 28 – 31 October, ESA-ESRIN, Italy

This joint ESA-SOLAS Conference aims at bringing together the EO and SOLAS communities, as well as scientific institutions and space agencies involved in the observation, characterisation and forecasting of ocean-atmosphere interactions and their impacts. A detailed description of the programme and organization is available here: http://www.eo4oceanatmosphere2014.info
Registration deadline is 30 September 2014.

Understanding the Carbon and Water Cycles using SMOS Data and Models, 13 – 14 November 2014, CESBIO Toulouse, France

This land orientated workshop is planned for 13-14 November 2014 at CESBIO, Toulouse, France. The workshop aims at bringing together the EO, SMOS, Earth system science and modelling communities involved in the observation, characterization and forecasting of land surface processes and their impacts. A detailed description of the programme and organization is available here: www.smos4waterandcarbon.info
Registration deadline is 3 October 2014.

Ocean salinity science and salinity remote sensing workshop, 26 – 28 November 2014 Exeter, UK

A dedicated meeting focussing on sea surface salinity, the “Ocean salinity science and salinity remote sensing workshop” is planned for 26-28 November 2014 at the UK Met Office in connection with the STSE SOS study. A detailed description of the programme and organization is available here: http://oceansalinityscience2014.org/
Registration deadline is 1 October 2014.

SMOS training course, 18 – 22 May 2015 ESA-ESAC, Spain

A SMOS training course will be organized by CESBIO and held at the ESA-ESAC premises near Madrid on 18 – 22 May 2015 a week before the 2nd SMOS science conference. The course will provide an opportunity to learn how to work with Level 1 (brightness temperature) and Level 2 (soil moisture and sea surface salinity) data provided by ESA’s SMOS mission. The deadline for applications and contact details will be announced over the course of 2014 on the science conference webpage www.smos2015.info and/or on the SMOS blog: http://www.cesbio.ups-tlse.fr/SMOS_blog.
2nd SMOS science conference, 25 – 29 May 2015 ESA-ESAC, Spain

The 2nd SMOS science conference jointly organised by ESA, CNES, SMOS-MODE is planned for 25-29 May 2015, together with a further SMOS training course led by the CESBIO team for 18-22 May, at ESAC, Spain. A detailed description of the programme and organization is available here: www.smos2015.info

Deadline for abstract submission is 16 January 2015.

Vacancy notice: EUMETSAT Research Fellowship on the “Use of satellite soil moisture information for Nowcasting: Short Range NWP forecasts”. Location: CNMCA Italian National Meteorological Center, Pratica di Mare (Rome), Italy. Duration: The fellowship is offered for one year, with the possibility of extension for up to two additional years. For further information see www.eumetsat.int.

Data Access

If you wish to access science data, please see the following link for the instructions: https://eosth.esa.int/web/guest/-/how-to-obtain-data-7329.

If you wish to access SMOS Near Real Time (NRT) “Light” (BUFR) products via EUMETSAT’s EUMETCast service (by a standard Digital Video Broadcast technology to acquire data over the European region) see http://www.eumetsat.int/Home/Main/DataAccess/EUMETCast/index.htm?l=en

SMOS registered users will be granted access to the service after registration on the EUMETSAT Earth Observation Portal: https://eoportal.eumetsat.int/userMgmt/

If you wish to access SMOS Near Real Time (NRT) “Full” (BUFR) or “Light” (BUFR) product by network over the entire Earth region, please send an email to Susanne.Mecklenburg@esa.int.

NASA will launch a new satellite dedicated to the monitoring of global soil moisture in Nov. 2014. The Soil Moisture Active Passive (SMAP) satellite will carry an innovative L-band (1.41 GHz) radiometer and L-band (1.26 GHz) radar system to measure soil moisture every 3 days at unprecedented resolution and accuracy. The SMAP measurements will be invaluable across many applications, including hydrology, agriculture, climate, carbon cycle, and ecology.

To validate the SMAP microwave observations and soil moisture products, researchers from Monash University in Melbourne Australia, together with its international collaborators, are planning two 3-week long field experiments over the Murrumbidgee River catchment in south-eastern Australia during Feb/Mar and Sep/Oct 2015.

During these campaigns, airborne L-band radiometer and radar observations will be collected over a 71km by 85km study area coincident with SMAP overpasses. Meanwhile in-situ soil moisture, vegetation, and surface roughness will be sampled over six 3km by 3km focus farms. The collected data will be used to validate SMAP products.

Together with the experience of meeting like-minded students and research fellows from around the world, and the opportunity to experience field work in scenic Australia, the volunteers helping in these campaigns will have advanced access to all data collected.

For more information on how to get involved please contact:
Prof. Jeff Walter: jeff.walter@monash.edu
Dr. Nan Ye: nan.ye@monash.edu.