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The ESA SMOS web portal provides a comprehensive access point for all SMOS related information. Users are encouraged to visit the SMOS portal for announcements, updates on ground segment operations and scientific mission achievements. Recent SMOS newsletters are available on the ESA web portal: https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/newsletter.

Highlights

“Using Low Frequency Passive Microwave Measurements in Research and Operational Applications” workshop took place for 4-6 December 2017 at ECWMF, Reading, UK. The workshop was jointly organised by ESA and ECMWF with approximately 60 participants from the carbon, ocean, land, and polar research communities. A number of operational agencies and services were represented, including the UK MetOffice, Météo France, the Finish Meteorological Institute, the Danish

Figure-1: Using Low Frequency Passive Microwave Measurements in Research and Operational Applications’ workshop's participants. Credit: ECMWF.
Meteorological Institute, EUMETSAT, the Copernicus Marine Environment Monitoring Service and Mercator.

In four dedicated sessions key applications and scientific achievements based on low frequency passive microwave remote sensing were discussed. A wide range of operational applications have been presented: sea ice monitoring and ship routing, fire risk estimates and food security, Numerical Weather Prediction, and ocean monitoring and a number of pre-operational services are being developed (e.g. in the field of hydrology, agricultural monitoring and severe storm forecasting).

All service providers require continued observations especially in L- and C-band to guarantee high-quality, synergistic products. Participants recommended that missions with at least similar or better performance than SMOS, SMAP and AMSR shall be implemented as soon as possible minimizing the risk of a data gap for operational applications already being based on such measurements. The key outcomes of the workshop discussions across the different domains and applications is available on https://www.ecmwf.int/en/learning/workshops/workshop-using-low-frequency-passive-microwave-measurements-research-and-operational-applications.

Joint Workshop of the International Surface Working Group (ISWG) and Land Surface Analysis Satellite Application Facility (LSA-SAF)

On 26-28 June, 2018 at the Instituto Português do Mar e da Atmosfera (IPMA) in Lisbon, Portugal the Joint Workshop of the 2nd International Surface Working Group (ISWG) and 8th Land Surface Analysis Satellite Application Facility (LSA-SAF) meetings was convened. This workshop saw over 15 countries represented by a dynamic, diverse and engaging group with lively discussions.

The aim of the International Surface Working Group (ISWG) is to gather requirements specific to surface observations to enhance both our understanding and ability to monitor the components of the Earth system including land, vegetation, snow, ice, and coastal and open waters. The presentations and final plenary actions and recommendations will be collected in a special issue “Advancing Earth Surface Representation via Enhanced Use of Earth Observations in Monitoring and Forecasting Applications” in the journal Remote Sensing. Finally, the tentative schedule for the following ISWG-3, is early July in 2019 in Montreal, Canada.

SMOS reveal recent climate-induced carbon losses in African drylands

SMOS L-band vegetation optical depth products have been used in a recent research published in the journal Nature Ecology & Evolution (http://www.nature.com/natecolevol/). The study has demonstrated, the applicability of L-band vegetation optical depth to quantify and to monitor the evolution of the aboveground biomass-carbon changes in sub-Saharan Africa region between 2010 and 2016 (see Figure-3). Scientist, from different international university, on the basis of calibrated relationships between SMOS L-band vegetation optical depth and an existing benchmark map, have analysed temporal patterns of carbon gains and losses in different humidity zones of sub-Saharan Africa due to weather variations. Results have shown the importance of the highly dynamic and vulnerable carbon pool of dryland savannahs for the global carbon balance, despite the relatively low carbon stock per unit area. In next future, SMOS L-band vegetation optical depth product might become a complementary data source for the quantification and monitoring of carbon stocks for national reports and largescale efforts, such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC), especially for semi-arid regions with little inventory data. To access the study: http://www.nature.com/articles/s41559-018-0530-6

Contributions in this area and related areas of research will be collected in special issue “Advancing Earth Surface Representation via Enhanced Use of Earth Observations in Monitoring and Forecasting Applications” in the journal Remote Sensing. Finally, the tentative schedule for the following ISWG-3, is early July in 2019 in Montreal, Canada.

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Figure-2: International Surface Working Group (ISWG) and Land Surface Analysis Satellite Application Facility (LSA-SAF) joint workshop's participants
Credit: ESA/ISGW/LSA-SAF

Figure-3: Changes in carbon stocks for 2010–2016. Left panel: pixels with significant positive (green) and negative (red) changes in SMOS L-band vegetation optical depth as a proxy for aboveground biomass changes in sub-Saharan Africa region between 2010 and 2016 (see Figure-3). Scientist, from different international university, on the basis of calibrated relationships between SMOS L-band vegetation optical depth and an existing benchmark map, have analysed temporal patterns of carbon gains and losses in different humidity zones of sub-Saharan Africa due to weather variations. Results have shown the importance of the highly dynamic and vulnerable carbon pool of dryland savannahs for the global carbon balance, despite the relatively low carbon stock per unit area. In next future, SMOS L-band vegetation optical depth product might become a complementary data source for the quantification and monitoring of carbon stocks for national reports and largescale efforts, such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC), especially for semi-arid regions with little inventory data. To access the study: http://www.nature.com/articles/s41559-018-0530-6

Six years of new SMOS sea surface salinity maps in the Mediterranean Sea now available

The new L4 product has been developed by the Barcelona Expert Center and the GHER group at University of Liège (Belgium), under the ESA STSE project “SMOS sea surface salinity data in the Mediterranean Sea (SMOS+ Med)”. A new methodology has been used combining several processing technique in order to reduce the system errors produced by the contamination of the land over the sea, to mitigate the seasonal time dependent biases and to increase the SMOS data resolution (see Figure-4). To download the new L4 product see: [http://bec.icm.csic.es/six-years-of-the-new-smos-sss-maps-in-the-mediterranean-sea-now-available](http://bec.icm.csic.es/six-years-of-the-new-smos-sss-maps-in-the-mediterranean-sea-now-available).

**Figure-4:** Sea surface salinity derived from SMOS data for October 2012 over Western Mediterranean Sea. Sea surface salinity dynamics described by the new L4 SMOS product agrees quite well with available in situ measurements. Credit: BEC

SMOS-wind product update

ESA in collaboration with OceanDataLab (ODL) and IFREMER has started in January 2018 the implementation of a SMOS wind data service. The service will provide, in near real time, surface wind speeds over oceans derived from SMOS data, initially for a period of two years of operations, with an optional one year extension to follow. The service implementation has well advanced with the design of the near real time processor. The project is now approaching its major milestones: the critical design review which will be held in ESRIN on 1 August. Data will become available after the operational readiness review foreseen by end 2018.

**Pi-MEP - SMOS Pilot Mission Exploitation Platform for Salinity**

The SMOS Pilot Mission Exploitation Platform (Pi-MEP) for Salinity project, launched in 2017, aims to:

i) serve as an enhanced sea surface salinity validation platform, complementing the efforts of the SMOS Expert Support Laboratories (e.g. exploring satellite performances at different spatial/ temporal scales or against various ground-truth data) and

ii) offer a testbed to enable and monitor oceanographic process studies, capitalising on SMOS salinity data in synergy with additional satellite products (e.g. SST, WS, currents, rain rates).

The Pi-MEP Salinity is a one-stop shop for scientific validation, monitoring, assessment and exploitation of SMOS salinity data. The consortium is constantly liaising with a dedicated Scientific Advisory Group (SAG), which provided feedback for scientific requirements and implementation in two consultation meetings held in May 2017 and May 2018.

A test-platform was made available for early adopters in May 2018. Following interest from NASA, options to enlarge the scope of the platform under joint ESA-NASA activities have been discussed.

A parallel dedicated effort for a Pilot SMOS Mission Exploitation Platform (SMOS Pi-MEP) for Soil Moisture is under preparation and due to start towards the end of 2018.

**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](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](http://wiki.services.eoportal.org/tiki-custom_home.php)). This is an open call, and therefore G-POD SMOS proposals can be submitted at any time, directly through the following website: [http://eopi.esa.int/G-POD](http://eopi.esa.int/G-POD).

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### Data and Processors

#### Data availability

The SMOS instrument MIRAS is operating nominally with the exception of some known on-board anomalies described in the MIRAS anomaly document. The cumulative data loss due to MIRAS instrument unavailability since the beginning of the routine operational phase (May 2010) amounts to 0.09% and the degraded data amounts to 0.60% (see Figure-5). No data loss has occurred during the acquisition of MIRAS raw data at the ground stations since the beginning of the routine operational phase (May 2010). This result has been achieved by implementing an on-board data recording overlap strategy. SMOS Flight Operations Segment (FOS) reports and the detailed list of instrument anomalies compiled on a weekly basis are available at [https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/content/-/asset_publisher/t5Py/content/mission-status-7060](https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/content/-/asset_publisher/t5Py/content/mission-status-7060).

**Figure-5:** SMOS mission data availability percentage since May 2010. Instrument data availability is extremely high, about 99%. Only 0.09% of data is lost due to MIRAS anomalies. Credit: SMOS FOS/ESA
Instrument calibration and data quality

Several on-board calibration activities are performed regularly and an overview of the calibration strategy implemented for the MIRAS instrument can be found in the SMOS calibration summary document. During calibration activities science data are not generated, therefore data users should consult the calibration plan for expected data unavailability.

Monthly reports summarising significant events in the SMOS flight and ground segments, evolution of calibration parameters and SMOS data quality can be found at [https://earth.esa.int/web/guest/-/data-quality-7059](https://earth.esa.int/web/guest/-/data-quality-7059).

Further information on SMOS data performance can be found in the level 1 and level 2 products read-me-first notes available at [https://earth.esa.int/web/guest/-/data-processors-7632](https://earth.esa.int/web/guest/-/data-processors-7632). SMOS data users are invited to consult the read-me-first notes before using SMOS data for their research activities.

Status of the SMOS operational processors

The current versions of the operational processors installed in the SMOS ground segment are listed on the table below.

A detailed description of the current baseline algorithms used to process the SMOS data are presented in the Algorithm Theoretical Basis Documents (ATBDs) available here: [https://earth.esa.int/web/guest/-/data-processors-7632](https://earth.esa.int/web/guest/-/data-processors-7632).

Future evolutions planned for the operational processors include:

**Level 1/NRTP:** The next upgrade of the level 1 processor (version 7) will include improvements for the data calibration stability, image reconstruction, direct Sun estimation and Radio Frequency Interference (RFI) flagging.

**Level 2 Soil Moisture:** The next upgrade of the level 2 soil moisture processor (version 7) will include improvements for characterisation of retrieval parameters uncertainties (DQX), refinement parameterisation (omega, roughness) for specific land classes, possible usage of simplified retrieval algorithms, and implementation of a better dielectric constant model for organic soil.

**Level 2 Ocean Salinity:** The next upgrade of the level 2 sea surface salinity processor (version 7) will include improvements for the estimation of an unbiased sea surface salinity anomaly based on SMOS measurements, Sun and galaxy correction, wind speed characterisation (source and uncertainties) and upgrade of the dielectric constant model for cold waters.

**Radio Frequency Interference (RFI)**

Active RFI sources are continuously monitored in terms of intensity and geographical distribution as illustrated in Figure-6 and Figure-7.

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**Processor | Current version In operations since | Previous version In operations since**
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**Level 1A** | V6.20 - 5 May 2015 | V5.04 - 14 November 2011
**Level 1B** | V6.21 - 5 May 2015 | V5.04 - 14 November 2011
**Level 1C** | V6.20 - 5 May 2015 | V5.05 - 21 March 2012
**Near Real Time processor (NRTP)** | V6.20 - 5 May 2015 | V5.05 - 7 March 2012
**Level 2 soil moisture** | V6.50 - 15 November 2017 | V6.20 - 5 May 2015
**Level 2 ocean salinity** | V6.62 - 10 May 2017 | V6.22 - 5 May 2015

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Information about the evolution of the RFI contamination can be found on the frequently updated RFI probability maps for land surfaces, generated fortnightly by CESBIO and available on the SMOS blog (http://www.cesbio.ups-tlse.fr/SMOS_blog/smos_rfi). Weekly maps of the 3rd and 4th Stokes parameter over ocean surfaces can be found on the SMOS data quality web page (https://earth.esa.int/web/guest/-/data-quality-7059). The user can visually inspect the maps to identify RFI contamination over land and over the oceans (areas with weekly averaged 3rd and 4th Stokes parameters above the natural variability of ±10K). The level 1C product contains several RFI flags that can be used to remove contaminated measurements. Details about the level 1C RFI flags can be found in the level 1 product specification document (https://earth.esa.int/web/guest/-/data-types-levels-formats-7631) and in the SMOS level 1 v620 read-me-first note (https://earth.esa.int/documents/10174/1854503/SMOS_L1OPv620_release_note)

Upcoming Meetings & Announcements

IGARSS 2018
The International Geoscience and Remote Sensing Symposium will take place in Valencia, Spain on 23–27 July 2018. The theme for IGARSS 2018 highlights the pressing demands for "observing, understanding and forecasting the dynamics of our planet". Dedicated SMOS/L-Band (with Aquarius/SMAP) sessions for land and ocean are present including tutorials for land and ocean. A dedicated SMOS event “SMOS – an ESA Earth Explorer satellite: From technology demonstrator to operational applications” is scheduled for Tuesday 24 July (programme on https://igarss2018.org/SMOS_Program.pdf). For further details please visit the IGARSS 2018 web page: https://igarss2018.org.

2018 Ocean Salinity Science workshop
The workshop will take place in Paris, France on 6–9 November 2018. The workshop aims to review progress and ongoing work and to identify the next frontiers in the fields of ocean salinity and freshwater cycle science. For further details please visit the 2018 Ocean Salinity Science workshop web page: https://nikal.eventsair.com/QuickEventWebsitePortal/2018-ocean-salinity-science-conference/esa-2018

AGU 2018 Fall Meeting
The AGU 2018 Fall Meeting will take place in Washington DC, USA on 14–15 December 2018. A session on "The global water cycle: linkages of ocean salinity with the atmosphere and terrestrial hydrology" has been organized. The session highlights water cycle research that describes linkages between the ocean, atmosphere, and land hydrology. Contributions are invited on all aspects of water cycle research including analyses undertaken using in situ and satellite missions observations, estimates based on numerical models, data assimilation systems, and climate model projections. The early abstract submission deadline is 25 July 2018, and final deadline is 1 August 2018. For further details and abstract submissions please visit: https://fallmeeting.agu.org/2018/abstract-submissions.

Remote Sensing special issue: “Ten Years of Remote Sensing at Barcelona Expert Center”
BEC recently celebrated its 10th Anniversary. This year, the Remote Sensing journal is celebrating its 10th Anniversary. To celebrate both events, the Remote Sensing Journal and BEC have organized a Special Issue entitled “Ten Years of Remote Sensing at Barcelona Expert Center”. This Special Issue is mainly devoted to papers on new scientific results covering topics, such as: Microwave radiometry, scatterometry, SAR, GNSS-R, Sensor calibration, Image reconstruction, Ocean Remote Sensing: salinity, winds, sea ice, currents, temperature, Soil Moisture and retrieval algorithms. Deadline for manuscript submissions is 30 June 2019. For further details please visit http://www.mdpi.com/journal/remotesensing/special_issues/BEC_rs
### Data Access

**ESA SMOS Online Dissemination service**

Since March 2016, the SMOS online dissemination portal has been providing a single point entry for all SMOS level 1 and level 2 data products, including both Near Real Time (NRT) level 1C and soil moisture neural network products. The online service facilitates data access with enhanced catalogue functionality for data navigation and selection by data type, acquisition time, geographical area and data format (i.e. ESA Earth Explorer Format (EEF) or NetCDF format for level 2). Once selected, the data can be downloaded immediately using different protocols. Level 1C and level 2 quick-look images are also available for reference. The ESA SMOS Online Dissemination service is accessible here: [https://smos-diss.eo.esa.int](https://smos-diss.eo.esa.int).

Further information on accessing SMOS data is available here: [https://earth.esa.int/web/guest/-/how-to-obtain-data-7329](https://earth.esa.int/web/guest/-/how-to-obtain-data-7329).

**SMOS Near Real Time Data through EUMETCast**

SMOS Near Real Time (NRT) “Light” (BUFR) and soil moisture neural network products can be accessed via EUMETSAT’s EUMETCast service based on standard Digital Video Broadcast (DVB)-S2 technology. For service details and a coverage map please visit: [www.eumetsat.int/website/home/Data/DataDelivery/EUMETCast/index.html](https://www.eumetsat.int/website/home/Data/DataDelivery/EUMETCast/index.html). SMOS registered users will be granted access to the service after registration on the EUMETSAT Earth Observation Portal [https://eoportal.eumetsat.int/userMgmt](https://eoportal.eumetsat.int/userMgmt).

If you wish to access SMOS NRT “Full” (BUFR) products by network, please send an email to SMOS mission manager: Susanne.Mecklenburg@esa.int.

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**2019 Living Planet Symposium**

The Living Planet Symposium will take place in Milan, Italy on **13–17 May 2019**. The Symposium will focus on the latest scientific findings on Earth’s environment and climate derived from satellite data, and on Earth observation’s role in building a sustainable future and a resilient society. The deadline for abstract submission is **11 November 2018**. For further details please visit: [https://lps19.esa.int](https://lps19.esa.int).