

→ ESA'S WATER MISSION

smos newsletter

Issue 13 | July 2017



SMOS satellite launched on 2 November 2009

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Highlights

Level 2 sea surface salinity product version v662 is now available

An improved level 2 sea surface salinity dataset, named v662, has been released to the user community on 15th May 2017. Operational and reprocessed level 2 sea surface salinity products v662 are accessible from the ESA SMOS Online Dissemination Service (<https://smos-ds-02.eo.esa.int/oads/access/>). The main improvement introduced with this new

v662 product baseline concerns the mitigation of the Land-Sea Contamination (LSC) effect in the retrieved sea surface salinity (see Figure-1). The read-me-first note available online [here](https://earth.esa.int/documents/10174/1854503/SMOS-Level-2-Ocean-Salinity-v662-release-note) provides further information about additional improvements in the SMOS sea surface salinity product baseline v662. <https://earth.esa.int/documents/10174/1854503/SMOS-Level-2-Ocean-Salinity-v662-release-note>

Stay up-to-date with the ESA SMOS web portal <http://earth.esa.int/SMOS>

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/>

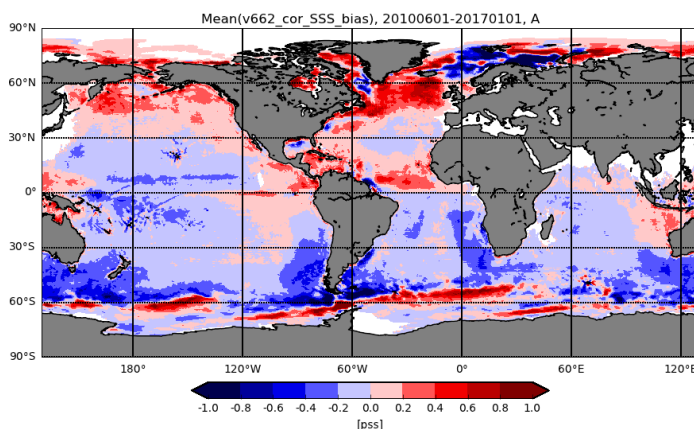
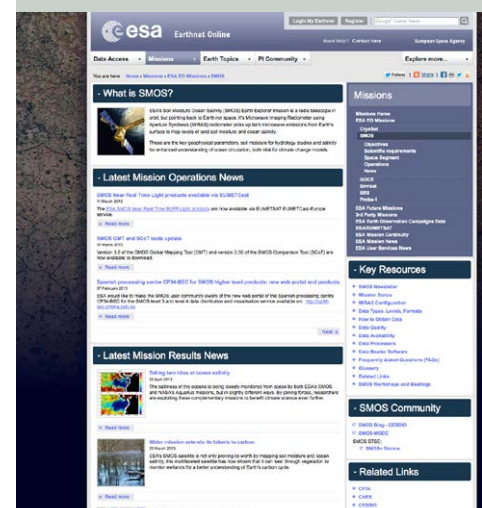


Figure-1: Comparison between SMOS sea surface salinity and ISAS reference salinity at level 3, for the period June 2010 to January 2017. The maps show the global mean differences (SMOS minus ISAS, averaged over time) for the land-sea corrected sea surface salinity. Credit: LOCEAN.



Experimental level 3 SMOS sea surface salinity for high latitudes is now available

A new experimental level 3 SMOS sea surface salinity data product for high latitudes, including Arctic Ocean open water regions, has been released by the Barcelona Expert Center (BEC) using a new methodological approach that substantially reduces land-sea and Radio Frequency Interference (RFI) contamination, as well as other instrumental biases. The new product is based on SMOS brightness temperatures and is a 9-day, EASE NL 25-km resolution gridded salinity map, produced daily for 2011 to 2013 (Figure-2). For more information, documentation and product access please visit: <http://cp34-bec.cmima.csic.es/new-sea-surface-salinity-products-in-high-latitude-ocean-areas>

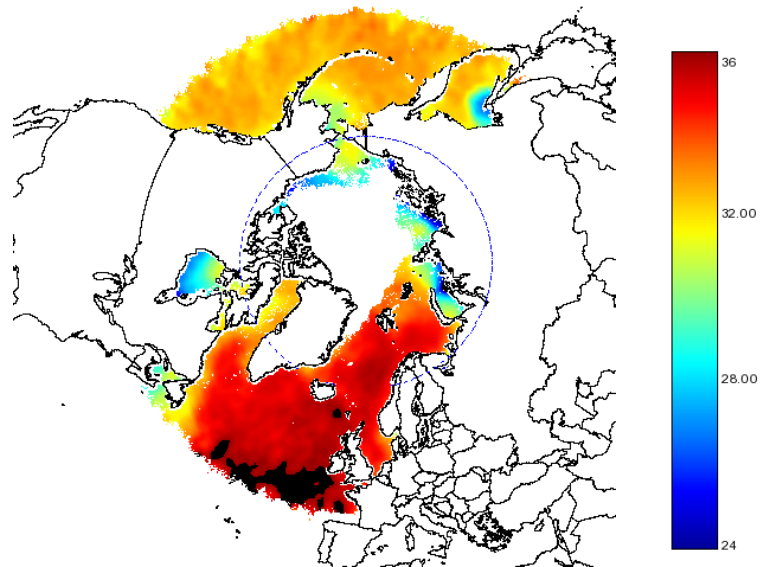


Figure-2: SMOS sea surface salinity map for 1st September 2011 Credit: BEC

Mediterranean sea surface salinity now mapped by SMOS

TScientists from the Barcelona Expert Center (BEC) in Spain and the University of Liege in Belgium with the support of ESA's Support to Science Element (STSE) have addressed the two main problems impacting SMOS measurements in semi-enclosed and marginal seas: land-sea contamination and radio frequency interference. Thanks to a novel experimental strategy for filtering the data and an alternative statistical approach for processing the data, SMOS measurements can now be used to map sea surface salinity in the Mediterranean Sea (Figure-3 and Figure-4). For further information visit the ESA SMOS news on page: http://www.esa.int/Our_Activities/Observing_the_Earth/SMOS/SMOS_brings_Mediterranean_salinity_into_focus.

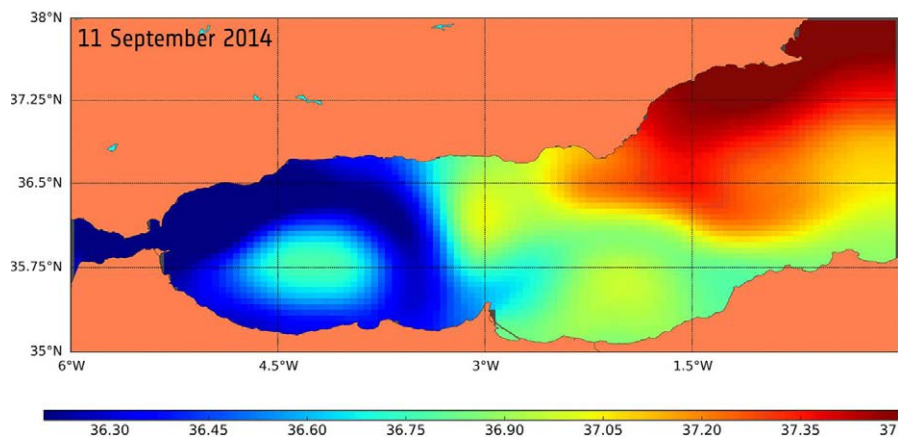


Figure-3: The map shows the detailed structure of the salinity fronts in the surface waters of the Alboran Sea on 11th September 2014. The Alboran Sea is in the westernmost part of the Mediterranean Sea, between the Iberian Peninsula and North Africa. Credit: BEC

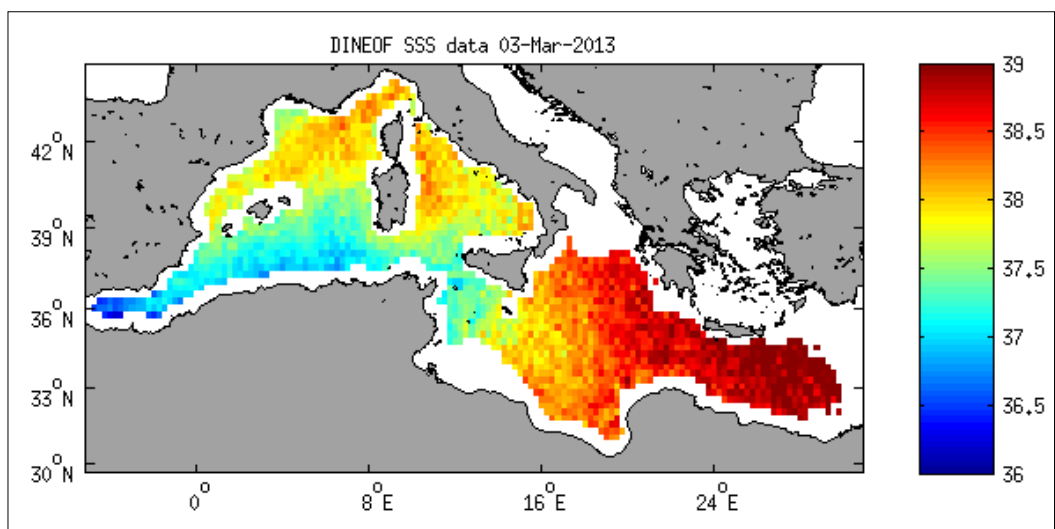


Figure-4: The map shows SMOS sea surface salinity on 3rd March 2013. The fresher water from the Atlantic Ocean flows through the Strait of Gibraltar into the Mediterranean Sea
Credit: University of Liege.



New Level 3 SMOS-CATDS salinity products are now available

A new version of level 3 salinity products are available from the Centre Aval de Traitement des Données SMOS (CATDS), the French ground segment for the SMOS level 3 and level 4 data. The products are corrected for systematic errors (land-sea contamination, seasonal and latitudinal biases) and are available as CATDS-CPDC and CATDS-CEC-LOCEAN data type at the usual spatial and temporal resolution. For more information, documentation and how to access the products please visit <http://www.catds.fr/Products/Available-products-from-CPDC> for CATDS-CPDC data type; and <http://www.catds.fr/Products/Available-products-from-CEC-OS/L3-Debiased-Locean-v2> for CATDS-CEC-LOCEAN data type.

Plan for reprocessing SMOS level 2 soil moisture dataset

A SMOS level 2 soil moisture reprocessing campaign is planned to start in June 2017. The reprocessing campaign will use a new version (v650) of the level 2 soil moisture processor which includes an improved algorithm to better characterise the soil moisture retrieval uncertainties. The reprocessing campaign will also make use of a refined set of auxiliary data files for land coverage, snow extent and an appropriate re-scaling of the ECMWF soil moisture forecast. The reprocessed dataset v650 will be released to the user community in Autumn 2017.

SMOS-wind product update: starting with implementation

ESA in collaboration with OceanDataLab (ODL) and IFREMER has started activities for the implementation of a SMOS wind data service which is planned to be operational by the beginning of 2018. 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. This initiative is largely based on the outcome of the "International Workshop on Measuring High Wind Speeds over the Oceans" (part of the STSE SMOS+ Storms project) that was held at the UK MetOffice on 15th - 17th November 2016. During the workshop, the user community confirmed the benefits provided by the new SMOS-based wind speed estimates in complementing existing measurements, for example from scatterometers, in particular for higher wind speed regimes. The user community also

expressed interest in a systematically generated wind speed data product based on SMOS L-band brightness temperature measurements. The workshop proceedings are available here. (<https://cloud.ifremer.fr/index.php/s/toFVMSb8fuB144V#pdfviewer>).

Pi-MEP - SMOS Pilot Mission Exploitation Platform for Salinity

The SMOS Pilot Mission Exploitation Platform (Pi-MEP) project, led by IFREMER in collaboration with ODL, started recently with a two-fold objective: i) to 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) to 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). Therefore, the Pi-MEP is conceived as a one-stop-shop for scientific validation, monitoring, assessment and exploitation of the SMOS salinity data. The consortium will liaise with a dedicated Scientific Advisory Group (SAG). In a first consultation meeting held in ESTEC on May 3rd 2017, the SAG provided guidance and feedback on various project aspects including the choice of datasets, the scientific assessment and processing criteria, and the extent of the on-demand processing. The platform will open to the wider user community in mid-2018.

Highlights of the Global Ocean Salinity and the Water Cycle Workshop

The workshop was held from 22nd – 26th May 2017 at Woods Hole Oceanographic Institution, Massachusetts. The meeting had a distinct focus on ocean salinity variability and sensing (in-situ, space-borne, modelling) and the related broader science. Relevant outcomes included a survey of state-of-the-art in situ sensors for measuring skin salinity, accurate unbiased measurements of sea surface salinity (SSS) from space (SMOS, Aquarius, SMAP) and plans to assimilate salinity measurements from satellite into ocean forecast systems. Several presentations focused on the enhanced capability of using salinity for characterising the sources and sinks of the oceanic branch of the water cycle, with special emphasis on some recent studies into the use of SSS to predict terrestrial precipitations. The discussions also covered a wide range of oceanic studies and applications that use salinity as a synergistic parameter in oceanographic

processes. Finally, space agencies presented the ongoing efforts being undertaken to ensure long-term continuity of satellite observations of salinity, emphasising once more why it is important that the user community voices their requirements for sustained salinity observations.

Virtual Sea Ice Mission ISSI Working Group

The second meeting of the ISSI "Virtual Sea Ice Mission" Working Group took place on 22nd – 23rd May 2017 in Bern, Switzerland, following on from the meeting held in September 2016. The working group brings together international sea ice experts from research and operational agencies and aims to establish the definition of a unified sea ice emissivity model to be used in parameter retrieval algorithms and as an observational operator for predictive models. For further information please visit the Virtual Sea Ice Mission ISSI web page: <http://www.issibern.ch/workinggroups/seaicemission/>

Barcelona Expert Centre celebrates its 10th anniversary

On 19th June 2017, the Barcelona Expert Centre (BEC) celebrates its 10th anniversary. BEC is a joint initiative of the Spanish Research Council (CSIC) and the Universitat Politècnica de Catalunya (UPC) and aims to contribute to the exploitation of the SMOS mission. The program of the anniversary event is available here: <http://cp34-bec.cmima.csic.es/10-anniversary.html>.



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). 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>.



Data and Processors

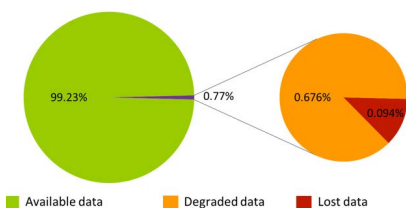
Data availability

The SMOS instrument MIRAS is operating nominally with the exception of some known on-board anomalies (see the anomaly description [here](#)). The cumulative data loss due to MIRAS instrument unavailability since the beginning of the routine operational phase (May 2010) amounts to 0.094% and the degraded data amounts to 0.676% (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 [here](#).

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 available [here](#). During calibration activities science data are not generated, therefore data users should consult the calibration plan for expected data availability. This can be found at <https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/available-data-processing>.

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>. Further information on SMOS data performance can be found in the level 1 and level 2 products read-me-first notes available [here](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:

Processor	Current version In operations since	Previous version In operations since
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 (N RTP)	V6.20 5 May 2015	V5.05 7 March 2012
Level 2 soil moisture	V6.20 5 May 2015	V5.51 24 April 2012
Level 2 ocean salinity	V6.62 10 May 2017	V6.22 5 May 2015

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>.

Since 19th December 2016 an auxiliary dataset from the NOAA Interactive Multisensor Snow and Ice Mapping System (IMS) is used by the SMOS soil moisture level 2 processor to represent snow cover. The NOAA IMS, based on data acquired by various sensors, provides a better representation of the snow cover compared to previous snow density information from ECMWF forecasts. Globally, the impact in terms of soil moisture is not significant.

Future evolution of the operational processors are:

Level 1/N RTP: 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.

Figure-5: SMOS mission data availability percentage since May 2010. Instrument data availability is extremely high, about 99%. Only 0.094% of data is lost due to MIRAS anomalies.

Credits: SMOS FOS/ESA

Level 2 Soil Moisture: The next upgrade of the level 2 soil moisture processor (v6.50) has been finalised and the new processor will be deployed in the SMOS processing ground segment in Autumn 2017. The improvements

focus on refinement of the auxiliary files (usage of the same land cover map as SMAP mission) and use of a better algorithm to characterise the soil moisture retrieval uncertainties.

Level 2 Ocean Salinity: A new version v662 of the processor was deployed in the SMOS processing ground segment on 10th May 2017. The next upgrade of the level 2 sea surface salinity processor (version 7) is under definition.

Radio Frequency Interference (RFI)

Currently more than 75% of the RFI sources detected by the SMOS RFI team have been switched-off, mostly as a consequence of reporting the RFI case to the Spectrum Management Authorities. Currently, there are approximately 400 active RFI sources worldwide, with intensity varying from moderate Brightness Temperature (BT < 1000 K) to very strong Brightness Temperature (BT > 5000 K), the latter being mainly located in Asia and the Middle East as illustrated in Table-1 and Figure-6. 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.u-ps-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 (with high RFI probability) and over the oceans (weekly averaged 3rd and 4th Stokes parameters above the natural variability of $\pm 10K$). 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 V6.20 read-me-first note (https://earth.esa.int/documents/10174/1854503/SMOS_L10Pv620_release_note)

Continent	BT < 1000	1000 <= BT < 5000	BT => 5000	TOTAL
Africa	9	21	4	34
America	49	14	2	65
Asia	52	109	33	194
Europe	28	13	9	50
Middle East	10	28	15	53
Oceania	2	2	0	4

Table-1: Worldwide RFI source distribution per continent and intensity.



Figure-6: Global map of probability of RFI occurrences during the period 27th February to 13th March 2017. The scale indicates percentage of passes when the RFI was detected in a specific area.

Credits: SMOS RFI team at ESA ESAC

Upcoming Meetings & Announcements

Agriculture and Earth Observation Workshop

The workshop is organised by The Netherlands Space Office and will be held on 4th – 6th July 2017 in The Hague. The workshop intends to explore the variety of data sources available and provide a common forum for institutional, scientific and commercial users operating in the agricultural sector. Further information, including details on registration and the current programme, can be found at <https://www.spaceoffice.nl/agrieo>.

1st International Surface Working Group

The inaugural workshop of the International Surface Working Group (ISWG) will be held on 19th – 20th July 2017 at the Moss Landing

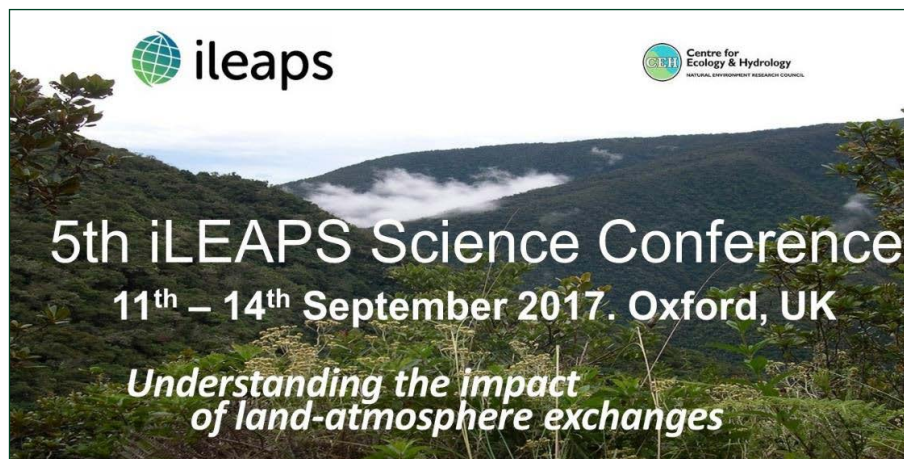
Marine Laboratory in California. The ISWG was proposed by the International TOVS Working Group's sub-group on surface remote sensing and modelling. The ISWG will address

scientific topics for all surfaces: land, ocean and sea ice. Amongst other topics it will focus on retrievals of surface parameters (soil moisture, canopy parameters, snow water equivalent, sea surface wind, salinity, sea ice concentration, etc), radiative transfer model development, and land surface assimilation schemes (modelling and observations). The ISWG will also put forward recommendations for surface properties where monitoring continuity is lacking a cooperative international advocate. Particular examples include satellite based estimation of soil moisture, snow, land surface temperature and surface water body extents. For further information please visit the ISWG web page: <http://cimss.ssec.wisc.edu/iswg/meetings/2017/>.



IGARSS 2017 Symposium

Hosted by the IEEE Geoscience and Remote Sensing Society, the International Geoscience and Remote Sensing Symposium 2017 (IGARSS 2017) will be held on 23rd - 28th July 2017 at the Fort Worth Convention Center in Texas. The conference theme, "International Cooperation for Global Awareness", highlights the need to work together to find global solutions to our most important global problems. For further information please visit the symposium web page: <http://www.igarss2017.org/>.



5th iLEAPS Science Conference

The 5th Integrated Land Ecosystem-Atmosphere Processes Study (iLEAPS) Science Conference will be held on 11th - 14th September 2017 in Oxford. The event is organised by the Centre for Ecology and Hydrology of the Natural Environment Research Council, and has the theme "Understanding the impact of land-atmosphere exchange". For more information please visit: <http://www.cvent.com/events/5th-ileaps-science-conference/event-summary-412288f4ffc64c1eb7d0f2f151fb5882.aspx>.

CCI Soil Moisture Workshop

The workshop will be held on the 18th September 2017, at Vienna University of Technology, Vienna. The workshop is focused on the ESA CCI soil moisture user products. More information can be found here: <http://smw.geo.tuwien.ac.at/>

4th Satellite Soil Moisture Validation and Application Workshop

This workshop is a continuation of the soil moisture validation and application workshop series held previously at ESA, Italy (2013), in Amsterdam (2014) and in New York (2016). The 4th workshop will be held on 19th - 20th September

2017, at Vienna University of Technology, Vienna. The objective of this workshop series is to discuss and reconcile methodological advances in the validation and application of global satellite soil moisture data. The workshop is unique in bringing together satellite soil moisture users and developers to discuss both the derivation and exploration of soil moisture data from both passive and active microwave satellite missions (SMAP, SMOS, ASCAT, AMSR-2, Sentinel-1, and other historic missions). For further information please visit the symposium's web page: <http://smw.geo.tuwien.ac.at/>.

Copernicus Marine Week

The Copernicus Marine Week will be held on 25th - 29th September 2017 in Brussels. The Copernicus Marine Week is a forum for users engaged in creating sustainable value for our oceans. The forum will foster an open dialogue with policy makers, industrials and entrepreneurs, regional authorities and stakeholders, public services and scientists involved in the marine environment and blue growth. For further information please see the Copernicus Marine Week announcement on: <http://marine.copernicus.eu/save-date-copernicus-marine-week-september-25-29-2017/>



EUMETSAT Meteorological Satellite Conference 2017

The 2017 EUMETSAT Meteorological Satellite Conference will take place in Rome on 2nd – 6th October 2017. The conference is a forum that brings together meteorologists, scientists and researchers from around the world to share their experiences and knowledge during plenary, poster and workshop sessions. For further information see:

https://www.eumetsat.int/website/home/News/ConferencesandEvents/DAT_3212307.html

ECMWF/ ESA Workshop on Using Low Frequency Passive Microwave Measurements in Research and Operational Applications

The workshop will take place in ECMWF (Reading, UK) on 4th – 6th December 2017. The workshop will look at applications that can benefit from the synergistic exploitation of low



frequency passive microwave measurements and also the combined usage of active and passive observations. Four topical areas will be addressed: sea ice and predictability in polar regions; sea surface salinity and ocean circulation; soil moisture and flood forecasting; weather forecasting and climate monitoring. Attendance at this workshop is by invitation only due to the limited number of spaces available. If you wish to participate please send a request to the organising committee via the workshop webpage here.: <http://www.ecmwf.int/en/learning/workshops/workshop-using-low-frequency-passive-microwave-measurements-research-and-operational-applications>

ECMWF/ESA Workshop on Using Low Frequency Passive Microwave Measurements in Research and Operational Applications

ECMWF | Reading | 4-6 December 2017



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). 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-ds-02.eo.esa.int/oads/access/>. Further information on accessing SMOS data is available here: <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

The screenshot shows the ESA SMOS Online Dissemination Service website. The header includes the ESA logo and 'European Space Agency'. The main content area is titled 'Welcome to the ESA SMOS Online Dissemination Service' and provides information about the service, including access to SMOS Level 1, Level 2 science nominal and NRT data, and some auxiliary products. It also lists 'Web Access' and 'FTP Access' details.

details and a coverage map please visit: <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/>).

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

