

→ ESA'S WATER MISSION

smos newsletter

Issue 10 | October 2015



SMOS satellite
launched on 2 November 2009

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Highlights

2nd SMOS science conference

The 2nd SMOS science conference took place from 25 to 29 May 2015, together with the 3rd SMOS training course on 18-22 May led by the CESBIO team, both at ESAC, Spain. More than 100 abstracts for the conference and 40 applications for the training course were received. The sessions mainly focussed on applications using SMOS data and included several round-table discussions. The summary and recommendations as well as the oral and poster presentations are now available at <http://smos2015.info/>.

A main point raised by the SMOS user community was the need for continuity of L-band data, both in support of operational applications and climate research alike. Several avenues to be pursued towards a potential SMOS follow-on were discussed at the conference (e.g. taking part in the Sentinel Next Generation consultation). Further feedback from the science community focussed on a common approach with SMAP and Aquarius missions on how to deal with Radio-Frequency Interference (RFI). Given

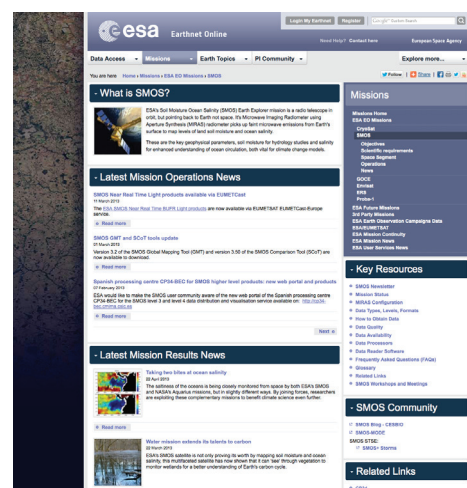
that RFI has impacted, to different extents, all three missions' data quality, a common RFI working group has been suggested, possibly making use of the recent efforts by Technical Committee on Frequency Allocations in Remote Sensing (FARS-TC). This would strengthen a common L-band position in international organizations such as ITU and WRC. In view of merging datasets across SMOS, Aquarius and SMAP the need to work on consolidated cross-calibrated brightness temperatures was discussed, being a pre-requisite for synergistic data use among the three L-Band missions.

SMOS meets ocean monsters

ESA's SMOS measurements are being used with data from two other satellites, NASA's SMAP and Japan's GCOM-W which carry differing low-frequency microwave instruments, to provide new information about sea surface winds under hurricanes and to help predict extreme weather at sea as shown in Figure-1. For further information see here: http://www.esa.int/Our_Activities/Observing_the_Earth/SMOS/SMOS_meets_ocean_monsters

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>



SMOS emerging applications on sea ice and fire

During the 2nd SMOS Science Conference held in May 2015, two emerging applications for SMOS data have been presented. The Diputació de Barcelona has been using SMOS information in their summer forest fire prevention campaigns since 2012. Together with land-surface temperatures, SMOS's daily soil moisture data provide a valuable all-weather tool to detect dry areas susceptible to wildfires (see Figure-2). Over the Arctic, the University of Hamburg has used SMOS data to derive the thickness of sea ice and to develop a prototype navigation system to predict the fastest and most economic routes through the ice-covered Barents Sea (see Figure-3). For further information about these two applications see here: http://www.esa.int/Our_Activities/Observing_the_Earth/SMOS/SMOS_sings_the_song_of_ice_and_fire.

SMOS second mission data reprocessing updates

The 2nd SMOS reprocessing campaign has been completed for the Level 1 and data from January 2010 to May 2015 is now available from the algorithm baseline version v620 (the current processing baseline). See the "Data Access" section of this newsletter for details on how to access the SMOS data. For further information about the Level 1 reprocessing campaign see here: <https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/news/-/article/entire-smos-level-1-v620-dataset-now-available>

The Level 2 reprocessing campaign is presently on-going. The distribution of the complete reprocessed level 2 data set is envisaged for beginning of 2016.

SMOS data quality web page

The SMOS data quality web page has been improved to better show the evolution of the SMOS measurements along the mission lifetime. Level 1 and Level 2 global data maps in video format are now accessible. All the maps are derived with data processed by the new algorithm baseline v620. The Level 1 maps (First Stokes parameter) are available since the beginning of the mission, the Level 2 maps (Sea Surface Salinity and Soil Moisture) are available since August 2015. The Level 2 maps will be further extended in time to cover the entire SMOS mission once the Level 2 reprocessed data will be available.

The SMOS data users can see the videos in order to have a preliminary information on the data availability and data quality over their area of interest. The SMOS data quality web page is available on the following link: <https://earth.esa.int/web/guest/-/data-quality-7059>

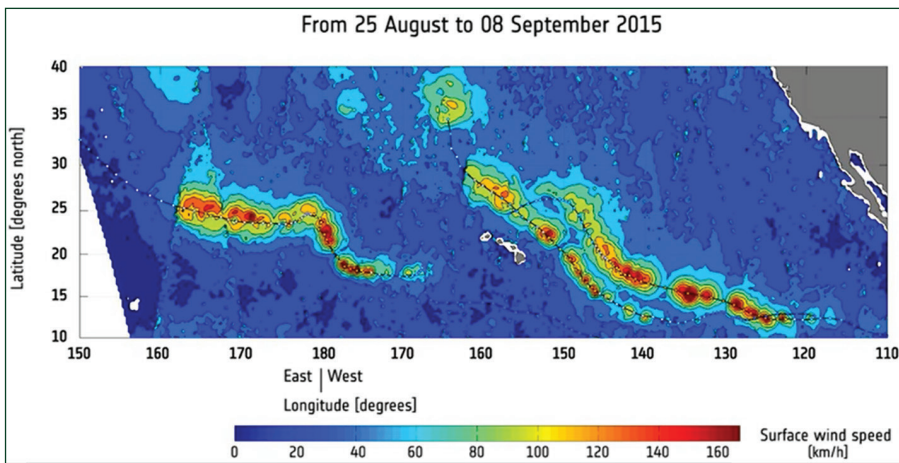


Figure 1:

At the end of August 2015, three category-4 hurricanes developed in parallel near Hawaii. The figure shows the surface wind speed as derived from the measurements of the ESA's SMOS mission and others two satellites (NASA's SMAP and Japan's GCOM-W) in the period from 25 August to 8 September 2015. Combining data from multiple satellites in this way provides a unique view of how the surface winds evolves under tropical storm in unprecedented details. Credits ESA / IFREMER

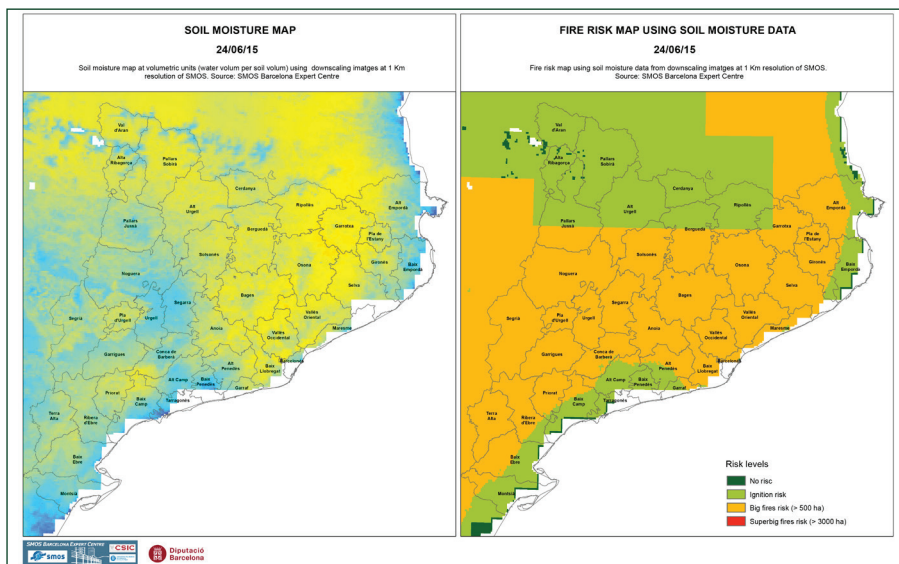


Figure 2:

Soil moisture data from SMOS together with land surface temperature information are being used to provide a valuable all-weather tool to detect dry areas susceptible to wildfires. The image on the left panel shows soil moisture (dry areas in yellow/orange colour), which is used to create the fire risk map on the right panel.

Credits ESA/Diputació de Barcelona /SMOS Barcelona Expert Centre.



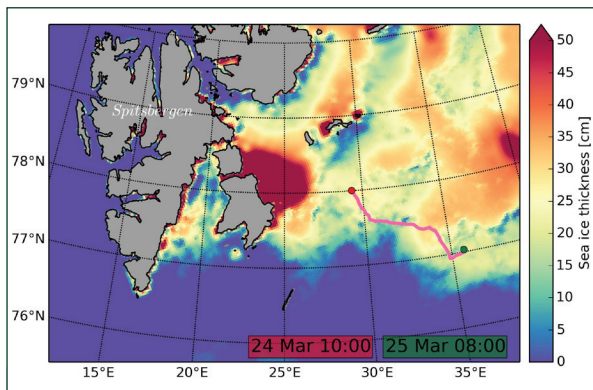


Figure 3:

Sea ice thickness data from SMOS and suggested optimised ship route (pink line) from A (red dot) to B (green dot). Although the route is not the shortest distance, it avoids difficult ice conditions.

Credits ESA/ L. Kaleschke, University of Hamburg

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.

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/c/document_library/get_file?folderId=118493&name=DLFE-5407.pdf]. The cumulative data loss due to MIRAS instrument unavailability since the beginning of the routine operations phase in May 2010 amounts to 0.93% and the degraded data amounts to 0.86% (see Figure-4). 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.

A detailed list of instrument anomalies is compiled on a weekly basis and is available on https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/content?p_r_p_564233524_assetIdentifier=mission-status-7060

Two orbit correction manoeuvres and one collision avoidance manoeuvres were successfully executed since the issue of newsletter #9 (May 2015). The manoeuvres were executed on 23 June 2015, 1 September 2015, and 24 September 2015. During the manoeuvres the MIRAS instrument data were regularly acquired but not processed due to the degraded satellite pointing.

Instrument Calibration

Several calibration activities are regularly performed on board and an overview on the calibration strategy implemented for the

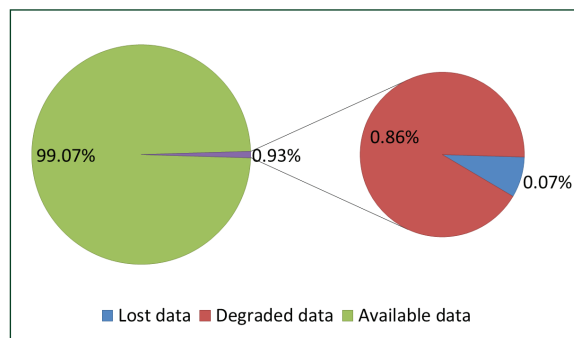


Figure 4:

SMOS Mission data availability percentage since May 2010. The value for the instrument data availability is extremely high, about 99%. Only 0.07% of data is lost due to MIRAS anomalies. Credits SMOS FOS/ESA.

MIRAS instrument can be found on https://earth.esa.int/c/document_library/get_file?folderId=118493&name=DLFE-1732.pdf. 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>,

The Noise Injection Radiometer (NIR) calibration is executed, since October 2014 in the so called "warm-NIR" configuration with the Sun slightly in front of the antenna plane in order to have a better stable thermal environment of the NIRs receiver. This new configuration, together with the new calibration processor version 620, allows a more stable retrieval of the calibration coefficients and improves the overall data calibration for version 620.

Since the issue of newsletter #9 (May 2015), calibration activities were performed in accordance with the routine calibration plan and calibration results are within the nominal range. The summer 2015 Flat Target Response (FTR) has been acquired and used only for monitoring purposes.

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>

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>

Since the issue of newsletter #9 (May 2015) a short period of degraded data had occurred due to a strong Radio-Frequency Interference (RFI) that has contaminated the Noise Injection Radiometer (NIR) calibration in June 2015 (see <https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/news/-/article/smos-level-1-and-2-data-products-short-period-of-degraded-data>). Affected Level 1 data set has been re-processed with uncontaminated NIR calibration and is now available from the nominal SMOS data dissemination service.



Updates on operational processors

The current versions of the operational processors installed in the SMOS ground segment segment are detailed in the table on the right :

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 and NRTP processors since the issue of the previous newsletter #9 (May 2015). A detailed description of the current v6.20 algorithms are presented in the Detailed Processing Module (DPM) documents available here: <https://earth.esa.int/web/guest/-/data-processors-7632>

Level 2 Soil Moisture: No new version has been implemented in the level 2 soil moisture processor since the issue of the previous newsletter #9 (May 2015). A detailed description of the current v6.20 algorithm is presented in the Algorithm Theoretical Basis Document (ATBD) available here: <https://earth.esa.int/web/guest/-/data-processors-7632>

Level 2 Ocean Salinity: No new version has been implemented in the level 2 sea surface salinity processor since the issue of the previous newsletter #9 (May 2015). A detailed description of the current v6.22 algorithm is presented in the Algorithm Theoretical Basis Document (ATBD) available here: <https://earth.esa.int/web/guest/-/data-processors-7632>

Further information on the SMOS data quality can be found in the products read-me-first notes available here: <https://earth.esa.int/web/guest/-/data-processors-7632> SMOS

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 (NRTP)	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	V6.22 5 May 2015	V5.50 15 December 2011

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

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 level 1C measurements are corrupted by RFI by using the RFI flags, available in the SMOS data products. Details about the level 1C RFI flags can be found in the level 1 product specification document available here: <https://earth.esa.int/web/guest/-/data-types-levels-formats-7631> and in the SMOS

newsletter #9 (May 2015) which contains a summary of the RFI flagging approach used for the V6.20 data.

Information with regard to the evolution of the 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 27 September 2015. Thus the user can visually inspect the map to identify areas with strong RFI presence over land.

Figure 5:

Probability of sustained RFI occurrences during the period 20 September – 4 October 2015 for ascending passes.

Credits CESBIO, CATDS.

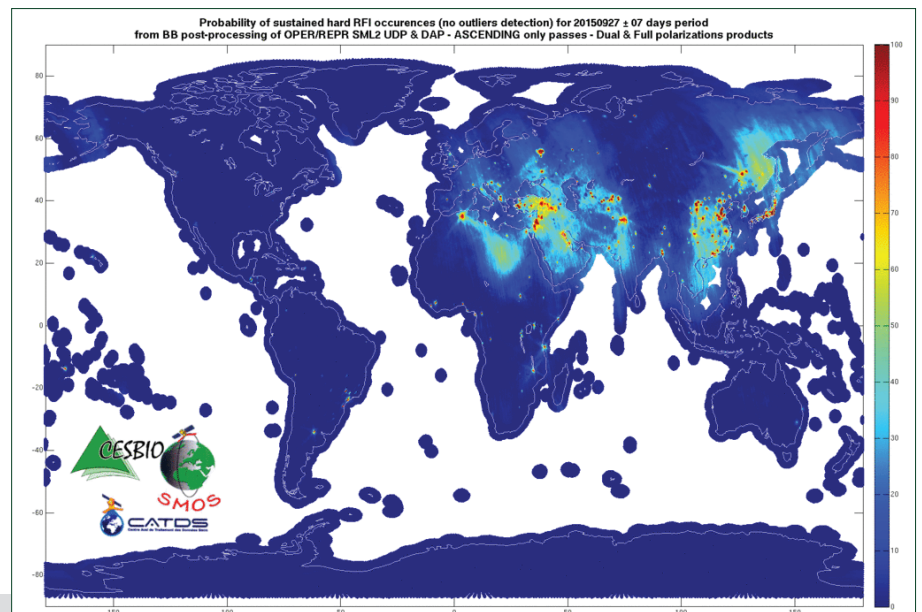
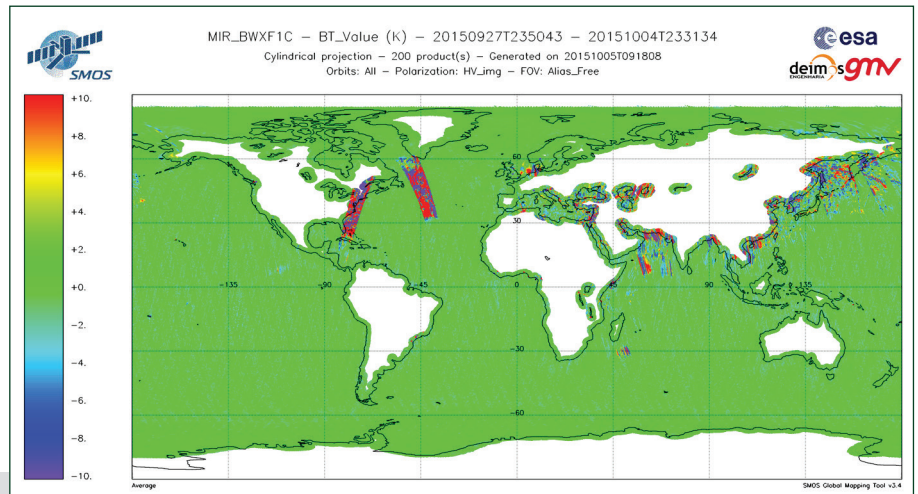


Figure 6:

Weekly average of the 4th Stokes parameter over the ocean during the period of 27 September – 4 October 2015. Areas affected by strong RFI show a 4th Stokes parameter above 10K in absolute value as shown in the map, for example, for two passes over the North Atlantic ocean

Credits ESA.



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

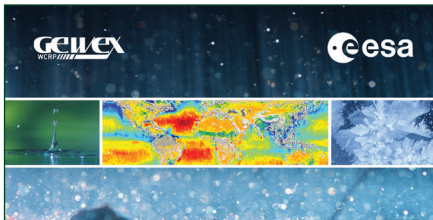
6 shows an example of the weekly map of the 4th Stokes parameter for the week of 27 September – 4 October 2015. The map, for example, identifies the presence of several RFI sources over Pacific and Indian oceans and two passes affected by very strong RFI over North Atlantic ocean. The user can

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 data quality web page: <https://earth.esa.int/web/guest/-/data-quality-7059>.

Upcoming Meetings & Announcements

Earth Observation for Water Cycle Science 2015 Conference, 20–23 October, ESA–ESRIN, Italy

This joint ESA-GEWEX Conference aims: to review knowledge on the water cycle science, to advocate for the development of robust satellite geo-information data products and to foster the improvement of models and data assimilation systems. A detailed description of the programme and organization is available here: www.eo4water2015.info



2016 “Ocean Sciences” meeting, 21-26 February 2016, New Orleans, LA, USA

The 2016 Ocean Sciences Meeting will consist of a diverse program covering topics in all areas of the ocean sciences discipline. Ocean salinity and related applications are intended to be covered by a dedicated session focussing on “Ocean salinity and water cycle variability

and change”

A detailed description of the programme and organization is available here: <http://osm.agu.org/2016>



14th Specialist Meeting on Microwave Radiometry and Remote Sensing of the Environment April 11–14, 2016 Aalto University, Espoo, Finland.

The MicroRad Specialist Meeting, organized alternately in Italy and the United States since 1983, provides an international forum for scientists and engineers to report and discuss recent theoretical and experimental results in the field of microwave radiometer techniques and applications. MicroRad 2016 is sponsored by the Geoscience and Remote Sensing Society (GRSS) of the Institute of Electrical and Electronics Engineers (IEEE), International Union of Radio Science (URSI), the Center for Microwave Remote Sensing (CeTeM) and Aalto University. Proceedings from the MicroRad conference will be archived

by IEEE in IEEE Xplore, with an IEEE special issue/section planned for the Journal of Selected Topics in Applied Earth Observations and Remote Sensing (JSTARS).

For further information please visit: www.MicroRad2016.org

Deadline for Abstract Submissions: **October 15, 2015**



Living Planet Symposium 2016, 9–13 May 2016 Prague, Czech Republic

The 2016 European Space Agency Living Planet Symposium will be held in Prague, Czech Republic from 9-13 May 2016 and is organised in cooperation with the Ministry of Transport, Ministry of Environment and Ministry of Education, Youth and Sports of the Czech Republic and the local support from Charles University in Prague.



The objectives of the ESA Living Planet Symposium are to:

- Present the progress and plans for the implementation of ESA Earth Observation strategy and the relevance of ESA's EO Programme to societal challenges, science and economy.
- Provide an international forum to scientists, researchers and users to present and share state of the art results based on ESA's Earth Observation and third-party mission data.
- Review the development of Earth Observation applications.
- Present the Copernicus space component and operational services.
- Report on ESA's Exploitation Programmes (i.e. Climate Change Initiative, SEOM, DUE, VAE, STSE).
- Introduce the current and future planned Earth Observation missions.
- Outline ESA's international cooperation in the field of Earth Observation.
- Provide dedicated thematic tutorials and demonstrations.

The deadline for abstract submission is **16 October 2015**

A detailed description of the programme and organization is available here:

<http://lps16.esa.int>



Vacancy: Researcher in Carbon Cycle Data Assimilation using SMOS data at Lund University, Sweden



LUNDS UNIVERSITET

The Department of Physical Geography and Ecosystem Science is seeking to appoint a Researcher with a strong background in carbon cycle modelling, data assimilation, remote sensing, applied mathematics or physics to work on assimilating remote sensing data into a terrestrial carbon cycle model.

The position is part of a newly funded project by the Swedish National Space Board. The project will use passive microwave measurements of vegetation properties from the SMOS mission with a terrestrial biosphere model in a Carbon Cycle Data Assimilation System. The data will be used to constrain model parameters in the formulation of the processes regulating the

terrestrial carbon cycle. The results will help to improve estimates of terrestrial carbon and water fluxes.

The researcher will be part of an international team operating and further developing a world-leading system capable of quantifying terrestrial and oceanic sources and sinks of carbon dioxide through the assimilation of various data sources (atmospheric CO₂ concentrations, satellite-derived vegetation cover, etc.).

The post will be available for 24 months, with a preferred starting date of December 2015/ January 2016.

Closing date for applications: **18 October 2015**

For further information, see:

<https://lu.mynetworkglobal.com/en/what/job/jobID:74701/where:4/>

Data Access

If you wish to access science data, please see the following link for the instructions: <https://earth.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 based on standard Digital Video Broadcast DVB-S2 technology please refer to www.eumetsat.int/website/home/Data/DataDelivery/EUMETCast/index.html for service details and coverage map.

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.

