How to get SMOS data –

If you are interested to use data of the Soil Moisture and Ocean Salinity mission for your scientific research you might find the following information helpful to guide you through the registration and ordering process.

1 Which products are available?

The following SMOS data products will be available:

- Level 1A product: calibrated visibilities between receivers prior to applying image reconstruction.
- Level 1B product: output of the image reconstruction of the observations and comprising the Fourier component of the brightness temperature in the antenna polarisation reference frame.
- Level 1C product: multi-angular brightness temperatures at the top of the atmosphere, geolocated in an equal-area grid system. Two different Level 1C products are generated according to the surface type: one containing only sea and the other only containing land pixels. Two sets of information are available: pixel-wise and snapshot-wise.
- For each Level 1C product there is also a browse product containing brightness temperatures for an incidence angle of 42.5°.
- Level 2 soil moisture product: containing not only the soil moisture retrieved, but also a series of ancillary data derived from the processing (nadir optical thickness, surface temperature, roughness parameter, dielectric constant and brightness temperature retrieved at top of atmosphere and on the surface) with the corresponding uncertainties.
- Level 2 ocean salinity product: containing three different ocean salinity values derived from retrieval algorithms using different assumptions for the surface roughness correction and the brightness temperature retrieved at the top of atmosphere and on the sea surface (with the corresponding uncertainties).
- Near-real time product: similar to the Level 1C product but adjusted to requirements of operational meteorological agencies such as ECMWF and MétéoFrance, available 3 hours from sensing. It will contain brightness temperatures at the top of the atmosphere on an ISEA grid with reduced spatial resolution.

In addition a number of calibration and auxiliary data files will be made available. The various data products are described in detail in the product specifications, which can be found in the document library:

- Level 0 Product Specification, SO-TN-IDR-GS-0003 L0 Spec v3.4 2009-04-29.pdf
- Level 1 Product Specification, SO-TN-IDR-GS-0005 L1 Spec v5.9 2009-05-04.pdf

- Level 2 Product Specification, SO-TN-IDR-GS-0006 L2 Spec v4.2 2009-05-04.pdf
- NRT Product Specification, SO-ID-DMS-GS-0002 v2_2.pdf

For a list of the most commonly used SMOS data products, including file names, content and average size of files please see Annex A.

In addition to the above mentioned SMOS data products provided by ESA, there will also be level 3 (global, single-instrument) and level 4 (global, multi-instrument) data products, being provided by national expert centres:

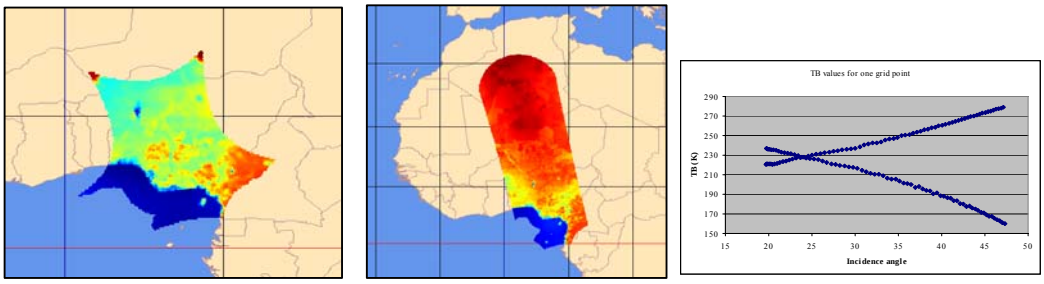
- Centre Aval de Traitement des Donnees (CATDS, France) Soil Moisture Expert Centre, CESBIO **[LINK]**
- Centre Aval de Traitement des Donnees (CATDS, France) Ocean Salinity Expert Centre, IFREMER **[LINK]**
- CP-34 (Spain) Barcelona Expert Centre (BEC) - ICM-UPC **[LINK]**

2 What does the data look like?

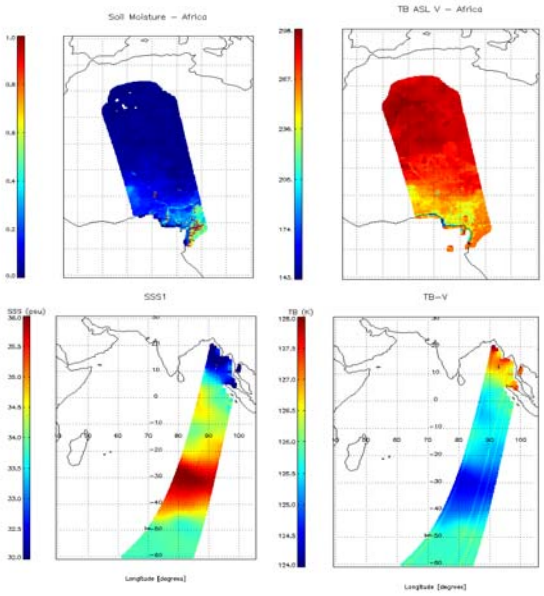
Note: The examples given below are simulated SMOS data (courtesy CESBIO and ACRI).

Level 1 – Brightness temperatures

From left: One snapshot/ simultaneous observation for Level 1C product (H pol); fixed/selected incidence angle ~40ºV pol; Brightness temperature for one grid point (images courtesy CESBIO).



Level 2 – soil moisture and ocean salinity



Soil moisture retrieved over Africa *(left)* and corresponding brightness temperature (V pol) at 42.5º at surface for same overpass (*right)* (images courtesy CESBIO).

Sea surface salinity *(left)* and corresponding brightness temperature (V pol) at 42.5º at surface for same overpass (*right)* (images courtesy ACRI).

3 How to order data?

The data acquired by the SMOS MIRAS instrument are systematically processed into level 1 and 2 products at the Data Processing Ground Segment at ESAC, Villafranca (Spain). A copy of the products is sent to the ESRANGE facility at Kiruna (Sweden) for long term archiving and cataloguing. ESRANGE also provides online access for the most recent products (rolling on-line archive)[1].

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.
2. By searching the SMOS data product catalogue 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 ESRANGE[1].

3.1 Subscribing for systematic data distribution

If your scientific research project relies on a continuous and regular flow of data, you should opt for the systematic distribution of data via a subscription. Systematic dissemination of data is ensured through FPT service, for the user to collect the data

[1] Direct download of data via EOLi will be provided on best efforts basis. This service will definitely be available outside the reprocessing campaigns, whilst reprocessing however some limitations might apply due to technical constraints.

products. The list of data products available for a subscription is provided in Annex A.

After registration and submission of your proposal through the EOPI portal (see below), you will be contacted by ESA's Help Desk (EOHelp@eo.esa.int) which will collect your data requirements and set-up the subscription for you.

The following information will be needed:

- What data products will you require and for which period?
- Does your research project focus on a specific geographical area (polygon coordinates required)?
- If you need near-real-time (NRT) access to the NRT data product, you will need to contact the mission management office (e-mail: susanne.mecklenburg@esa.int) to discuss whether this can be accommodated.
- The nominal procedure for data delivery is via pull from a FTP, i.e. for the user to collect his/her data from a server. If this is not feasible for you please contact the EO Help Desk (EOHelp@eo.esa.int) to discuss alternatives[2].
- Would you like to receive re-processed data once the baseline for the processing of the data products changes?

3.2 Searching and ordering SMOS products using the catalogue

You can search SMOS data products using the EOLi application which can be installed on all major platforms from http://earth.esa.int/EOLi/EOLi.html. EOLi (Earth Observation Link) is ESA's client for Earth Observation Catalogue and Ordering Services. Using EOLi, you can browse the metadata and preview images of SMOS data products. Scientific users with a registered account can order or download products of various processing levels.

Starting from the EOLi main interface (image below) you reach the SMOS data collection by navigating the collection tree on the left panel. Select the collections of interest, specify a date range (bottom left panel), optionally draw an area of interest on the map (using the "set area" mode) and click the "Search Catalogue" button (bottom left).

Please refer to the EOLi quick guide for more detailed information: http://eoli.esa.int/EOLIResources/Other/EOLIv6QuickGuide.pdf. A more complete user manual is also available on http://eoli.esa.int/EOLIResources/Manual/html/frame.html.

[2] Alternative data delivery methods could be: media (CD-ROM or DVD) or pushing data products to your FTP server (your FTP server will need to be accessible 100% of the time, properly sized, and accessible through a fast enough connection). Refer to the table provided in Annex A for indication on the size and throughput for each data product types and let us know frequency in which you would like to receive data.

The SMOS data products available on EOli are a subset of the data products being available via subscription and are split into (see Figure below):

- A catalogue of "historical" data, for the present and past baseline, and
- A "rolling on-line" archive, for the present baseline, data remain in here for at least a week after acquisition.

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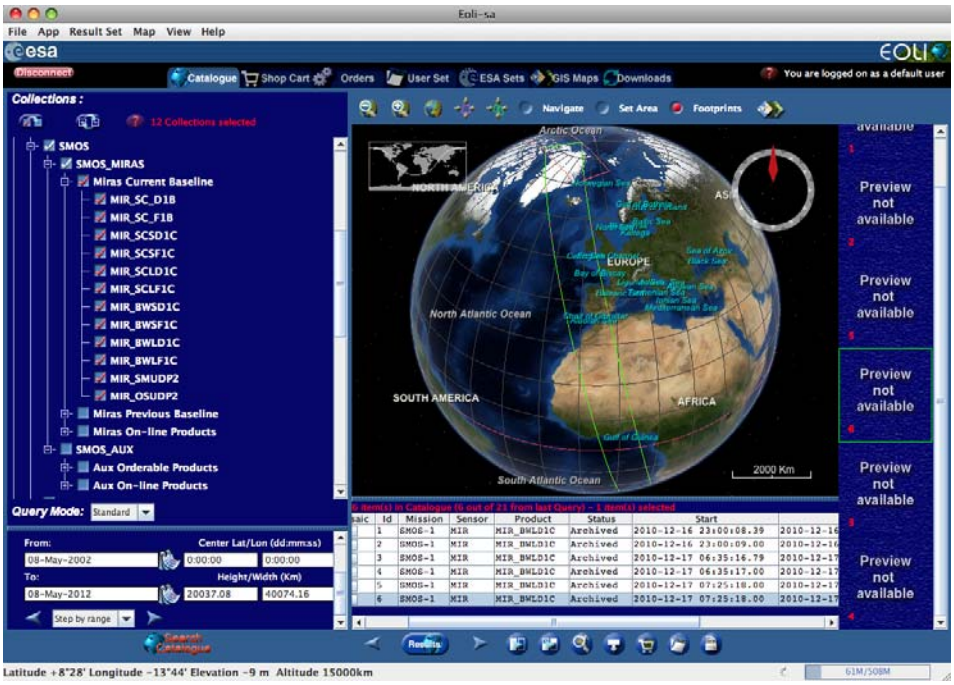
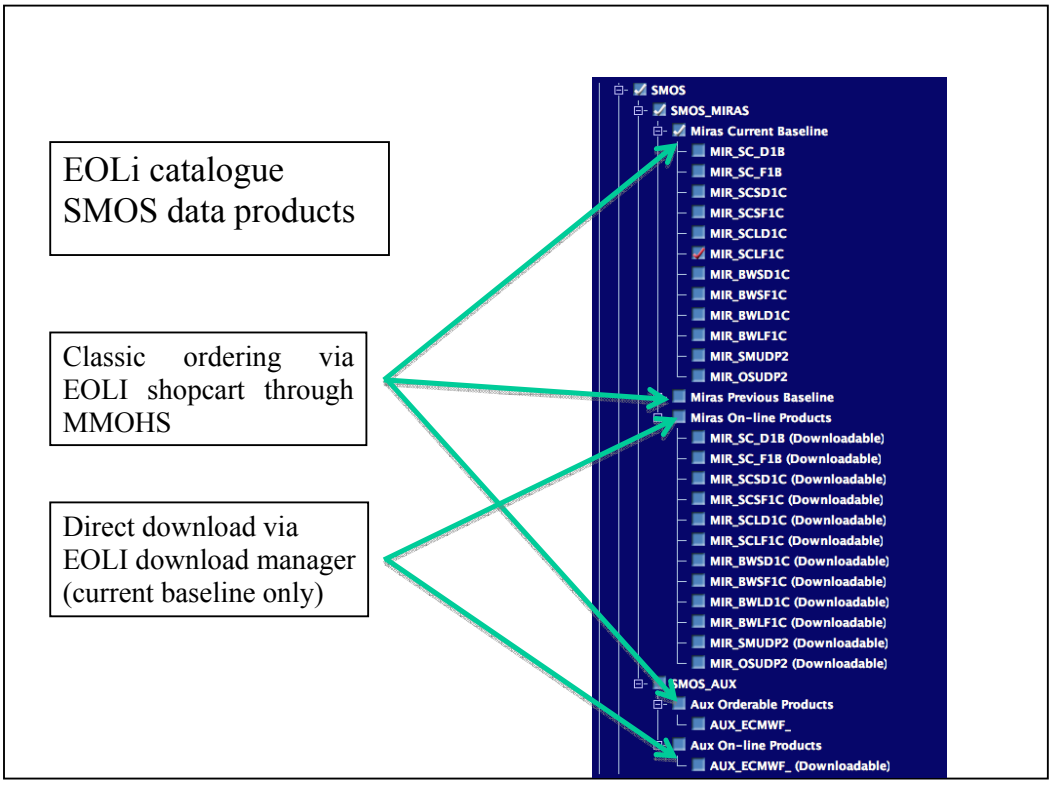
For a list of the respective data products see Annex A.





You can either

- order the data via the EOLi shopcart through the Multi Mission Order Handling Service (MMOHS), for data in the catalogue of the "historical" data, or
- download the data directly via the EOLi download manager (right-clicking on an item in the table below the map), for data in the "rolling on-line archive" and only for the current baseline[1].

The current baseline refers to the present version of the processors being used to process the SMOS data products. Once it is decided to use a new version of processors due to improvements in the algorithms the current baseline will migrate to the previous baseline. Both will be available on EOLi for a subset of data products. The difference between the baselines will be communicated via the webpage.

4 How to register and become a SMOS data user?

Data is available for registered users only.

Most of our present SMOS data users have registered through the Announcement of Opportunity for the SMOS science data in 2007 and receive the data via subscription. If you decide to become a user now, you will need to register on EOPI www.eopi.esa.int → registration. Then you will have to decide whether you want to receive the data on a subscription basis or only for a particular time span, area etc. Before doing so you might like to view the SMOS data on EOLi (see above). If you decide for the subscription service or order data via the "historical" archive on EOLi

you will be contacted by ESA's EO helpdesk to set up the appropriate structure (IP addresses, servers) and sign the Terms & Conditions for Category-1 data use. If you decide to directly download a subset of data from the "rolling on-line" archive, you will still need to sign the Terms & Conditions for Category-1 data use but will then be able to proceed directly with the data downloading.

5 How are the data distributed?

The default distribution of SMOS data products is done through a FTP server (either from ESAC at Villafranca or from the LTA in Kiruna) with the user to collect the data as and when convenient. A notification email with access details will be sent to you. Alternatively, if you are not able to use this data distribution approach, data can be *pushed* to you via FTP or you might receive the data via mail on CD-ROM or DVD media. Allow 1 or 2 days delay whenever electronic transfer is used (i.e. FTP), and a few days, depending on your location, for land shipment.

6 What other tools are available to view SMOS data products?

A number of tools are available to view SMOS data products, ranging from data simulators, prototype processors to software to visualise certain aspects of the data. For a description please see SMOS tools.pdf. The tools can be downloading from:

- SMOS End-to-End Simulator (SEPS-GS)
  http://www.smos.com.pt
- SMOS L1 Prototype Processor & visualisation tool
  http://www.smos.com.pt
- SMOS L2 Soil Moisture Prototype Processor
  ftp://www.array.ca/20090120_L2SM_CoreV4/
- SMOS L2 Sea Surface Salinity Prototype Processor
  http://www.smos.esa.int/
  Tool: http://www.enviport.org:8080/argans/smos/builds/op_03_04/
  (smos, sss2008)
  User manual
  http://www.enviport.org:8080/argans/smos/docs/deliverables/delivered/PPSUM
  (smos, sss2008)
- SMOS Data viewer
  ftp://193.146.123.163/smos/software/SMOSView/
- SMOS Tool Box (BEAM)
  http://www.brockmann-consult.de/beam-wiki/display/SBOX/SMOS+Toolbox+for+BEAM
- SMOS Global Mapping Tool
  ftp://193.146.123.163/smos/software/GMT/
- SMOS Comparison Tool
  ftp://193.146.123.163/smos/software/SCOT/
- SMOS XML R/WAPI
  ftp://193.146.123.163/smos/software/XML_RW_API/

ANNEX A

SMOS data products available via subscription and EOLi

Product Type	Context	Average Product Size per file (MB)	Average # of Products/Day	Average Volume/Day (MB)	Available via subscription	EOli ordering (ordering for historic data, direct download for recent data)[1]
Science data						
MIR_SC_D1A	Level 1A Dual Pol	115	28	3170	X	
MIR_SC_F1A	Level 1A Full Pol	230	28	6340	X	
MIR_SC_D1B	Level 1B Dual Pol	61	28	1705	X	X
MIR_SC_F1B	Level 1B Full Pol	122	28	3410	X	X
MIR_SCSD1C	Level 1C Ocean Dull Pol	284	28	7960	X	X
MIR_SCSF1C	Level 1C Ocean Full Pol	470	28	13100	X	X
MIR_SCLD1C	Level 1C Land Dual Pol	170	28	4780	X	X
MIR_SCLF1C	Level 1C Land Full Pol	290	28	8190	X	X
MIR_BWSD1C	Browse Product Ocean Dual Pol	5.5	28	155	X	X
MIR_BWSF1C	Browse Product Ocean Full Pol	5.5	28	155	X	X
MIR_BWLD1C	Browse Product Land Dual Pol	3.5	28	100	X	X

Product Type	Context	Average Product Size per file (MB)	Average # of Products/Day	Average Volume/Day (MB)	Available via subscription	EOli ordering (ordering for historic data, direct download for recent data)[1]
MIR_BWLF1C	Browse Product Land Full Pol	3.5	28	100	X	X
MIR_SMUDP2	Level 2 Soil Moisture	15	28	415	X	X
MIR_OSUDP2	Level 2 Ocean Salinity	23	28	640	X	X
BUFR	NRT product	180	~20	3660	Available on special request to EOHelp@eo.esa.int	
Varying Auxiliary Data						
AUX_VTEC_P	Predicted VTEC	<1	1	1	X	
AUX_ECMWF	ECMWF data	50	29	1450	X	X
AUX_DFFLAI	MODIS LAI	222	0.125	28	X	
AUX_DGGTLV	Low vegetation optical thickness	48	1	48	X	
AUX_DGGTFO	Forest optical thickness	48	0.03	2	X	
AUX_DGGROU	Land roughness	48	0.03	2	X	
AUX_DGGRFI	Radio frequency interference	63	0.03	2	X	
AUX_DGGFLO	Flood Flag probability	34	0.03	2	X	
AUX_VTEC_C	Consolidated VTEC	<1	1	1	X	
AUX_VTEC_R	Analysis Rapid VTEC	<1	1	1	X	