



HAL
open science

Validation of SMOS level 3 soil moisture

Arnaud Mialon, Al Bitar Ahmad, Lucie Berthon, Simone Bircher, François Cabot, Maria-José Escorihuela, Delphine Leroux, Olivier Merlin, Nathalie Novello, Thierry Pellarin, et al.

► **To cite this version:**

Arnaud Mialon, Al Bitar Ahmad, Lucie Berthon, Simone Bircher, François Cabot, et al.. Validation of SMOS level 3 soil moisture. IGARSS 2012 Symposium, Institute of Electrical and Electronics Engineers (IEEE). USA., Jul 2012, Munich, Germany. n.p. hal-02809234

HAL Id: hal-02809234

<https://hal.inrae.fr/hal-02809234>

Submitted on 6 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

VALIDATION OF SMOS LEVEL3 SOIL MOISTURE

Mialon A.¹, AlBitar A.¹, Berthon L.¹, Bricher S.², Cabot F.¹, Escorihuela M.-J.³, Leroux D.¹, Merlin O.¹, Novello N.⁴, Pellarin Th.⁵, Wigneron J.-P.⁴, Kerr Y.H.¹

contact : arnaud.mialon@cesbio.cnes.fr

¹ CESBIO, 18 Av. Edouard Belin, 31401 Toulouse, France

² KU Kobenhavn Universitet

³ isardSAT, Barcelona

⁴ INRA Ephyse, bordeaux, France

⁵LTHE, Grenoble, France

ABSTRACT

The SMOS mission [1] was launched in November 2009 and allows to measure the surface soil moisture over continental land, covering the entire surface in 3 days. The ESA's DPGS (European Space Agency's Data Processing Ground Segment) has been delivering the so-called level 2 products, consisting of 1/2 orbits data. The CNES (Centre National d'Etudes Spatiales) has developed the CATDS (Centre Aval de Traitement des Données SMOS) ground segment that now provides global maps of soil moisture and ocean salinity, known as the level 3 products. The data are mapped on the EASE grid (Equal Area Scalable Earth grid) with a spatial resolution of $\sim 25 \times 25 km^2$ [2]. The database is available at different temporal resolutions as daily and 3-days products, decade composites (as minimum, maximum and median values) and monthly averages.

The soil moisture retrieval algorithm [2, 3] is based on the L-MEB (L-band Microwave Emission of the Biosphere) radiative model. It is close to the level 2 algorithm [4, 5] with improvements to account for previous overpasses [6, 7]. Considering 2 revisits (one before and one after the considered day over a time window of 7 days [3]) increases the number of brightness temperatures used as inputs of the retrieval process. The vegetation optical depth is also considered correlated in time (over a 7-day time window, [6]) enhancing the retrieval. It will be shown here that the number of nodes for which a soil moisture is retrieved, increases in comparison to the level 2 results.

The aim of this communication is then to present this database and how it has been validated. We also compare the L3 soil moisture to in-situ measurements available at different in-situ sites (Australia, US, south west of France, Spain, Denmark, West Africa, French Alps), spanning different surface conditions. Figure 1 is a short temporal variation of the soil moisture acquired at the in-situ site of SMOSREX (South West of France). The SMOS soil moisture (both L2 from DPGS and L3 from CATDS) are presented and compared to in-situ measurements. The vegetation optical depth is also depicted (bottom figure) and one

IGARRS 2012. Norwich

22 - 27 July 2012

Paper 3104

can notice the slight differences between the two.

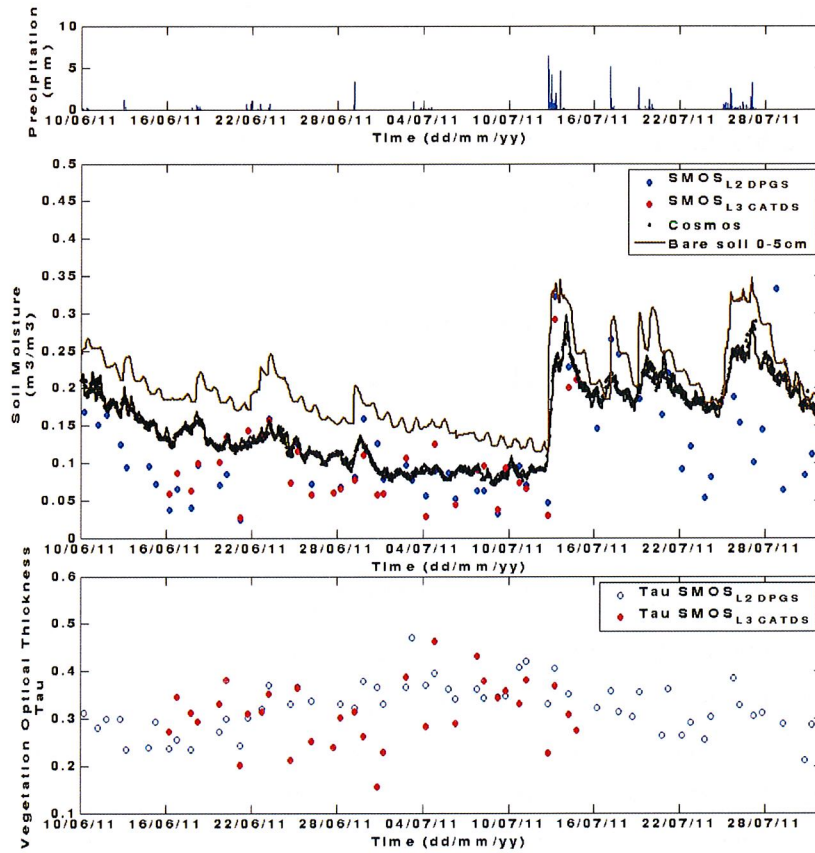


Fig. 1. Example of SMOS products compared to in situ measurements acquired at the test site of SMOSREX (South West of France). The figure in the middle shows the soil moisture data : level 3 products from the CATDS (red dots middle panel), the level 2 product from the DPGS (blue dots) and the in-situ measurements (brown and black lines middle panel). The bottom figure are the vegetation optical depth, L3 CATDS (red dots) and the L2 DPGS (blue dots).

1. REFERENCES

- [1] Y. H. Kerr, "Soil moisture from space: Where are we?" *Hydrogeology Journal*, vol. 15, pp. 117–120, 2007.
- [2] E. Jacquette, A. Al Bitar, Y. Kerr, A. Mialon, A. Quesney, F. Cabot, and P. Richaume, "Overview of SMOS CATDS level3 soil moisture products," in *IGARSS 2010, July 25-30, Honolulu, USA*, 2010.
- [3] E. Jacquette, A. Al Bitar, A. Mialon, Y. Kerr, A. Quesney, F. Cabot, and P. Richaume, "SMOS CATDS level 3 global products over land," in *Proc. SPIE 7824, 78240K (2010)*, 2010.
- [4] Y. H. Kerr, P. Waldteufel, P. Richaume, J.-P. Wigneron, P. Ferrazzoli, and R. Gurney, "SMOS level 2 processor for soil moisture - Algorithm Theoretical Based Document (ATBD)," CBSA, Tech. Rep. SO-TN-ESL-SM-GS-0001, Issue 3.e, 2011, 121 p. [Online]. Available: <http://www.cesbio.ups-tlse.fr/fr/indexsmos.html>
- [5] Y. H. Kerr, P. Waldteufel, P. Richaume, A. Mahmoodi, J.-P. Wigneron, P. Ferrazzoli, A. Al bitar, F. Cabot, D. Leroux, A. Mialon, and S. Delwart, "The SMOS soil moisture retrieval algorithm," *IEEE Geosc. Remote Sens.*, 2011, accepted, SMOS special issue.
- [6] A. Al Bitar, E. Jacquette, O. Merlin, Y. Kerr, A. Mialon, A. Quesney, F. Cabot, and P. Richaume, "Multi-orbit inversion of SMOS surface soil moisture," in *IGARSS, 25-30 July 2010, Honolulu, USA*, 2010.
- [7] A. Al Bitar, E. Jacquette, Y. Kerr, A. Mialon, F. Cabot, A. Quesney, O. Merlin, and P. Richaume, "Event detection of hydrological processes with passive L-band data from SMOS," in *Proc. SPIE 7824, 78240J*, 2010.

