Comparison of dielectric models in SMOS soil moisture retrieval

Arnaud Mialon, Philippe Richaume, Delphine Leroux, Al Bitar Ahmad, Yann H. Kerr, François Cabot, Jean-Pierre Wigneron

COMPARISON OF DIELECTRIC MODELS IN SMOS SOIL MOISTURE RETRIEVAL

Mialon A.[1], *Richaume Ph.*[1], *Leroux D.*[1], *AlBitar A.*[1], *Kerr Y.H.*[1], *Cabot F.*[1], *Wigneron, J.-P.*[2]

[1] are with the CESBIO, 18 Av. Edouard Belin, 31401 Toulouse, France
[2] is with INRA Ephyse, bordeaux, France

Contact : arnaud.mialon@cesbio.cnes.fr

ABSTRACT

The SMOS mission [1] provides global estimations of surface soil moisture over land [2] since 2010. The algorithm to derive the soil moisture is based on comparing L-band brightness temperatures acquired by the instrument (1.4 GHz) to modelled ones [2]. The latter are obtained using the L-MEB (L-band Microwaves Emission of the Biosphere) radiative model [3]. The emission of the surface is controlled by the soil moisture content of a soil and by its physical properties, especially its dielectric constant. An empirical approach was developed by [4] to compute this dielectric constant. This model has been widely used and was implemented in the SMOS level 2 retrieval algorithm [5, 2]. Recently, a new approach has been proposed [6, 7] known as the Generalized Refraction Mixing Dielectric Model (GRMDM). This model was developed covering a wider range of soil texture (clay and sand content) than the Dobson's approach which was not optimized for sandy soil.

The aim of this communication is to test these two models in the framework of the SMOS level2 soil moisture retrieval. Both models are used in the SMOS level2 retrieval algorithm and the derived soil moisture are then compared. The results suggest that the two approaches present a limit around a soil moisture value of 0, which can be a problem as the algorithm is based on minimizing a cost function. A symetrization is proposed to bypass this problem.
The differences in terms of retrieved soil moisture between the two options is not clear when compared to in-situ measurement (over US and West Africa site). However, the use of the Mironov's model leads to higher soil moisture values than those obtained with Dobson's model over Australia (Figure 1) which is in accordance with the in-situ observations. The main differences are observed for sandy and dry soil, and

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the Mironov's approach seems the most adapted for the SMOS soil moisture retrieval.

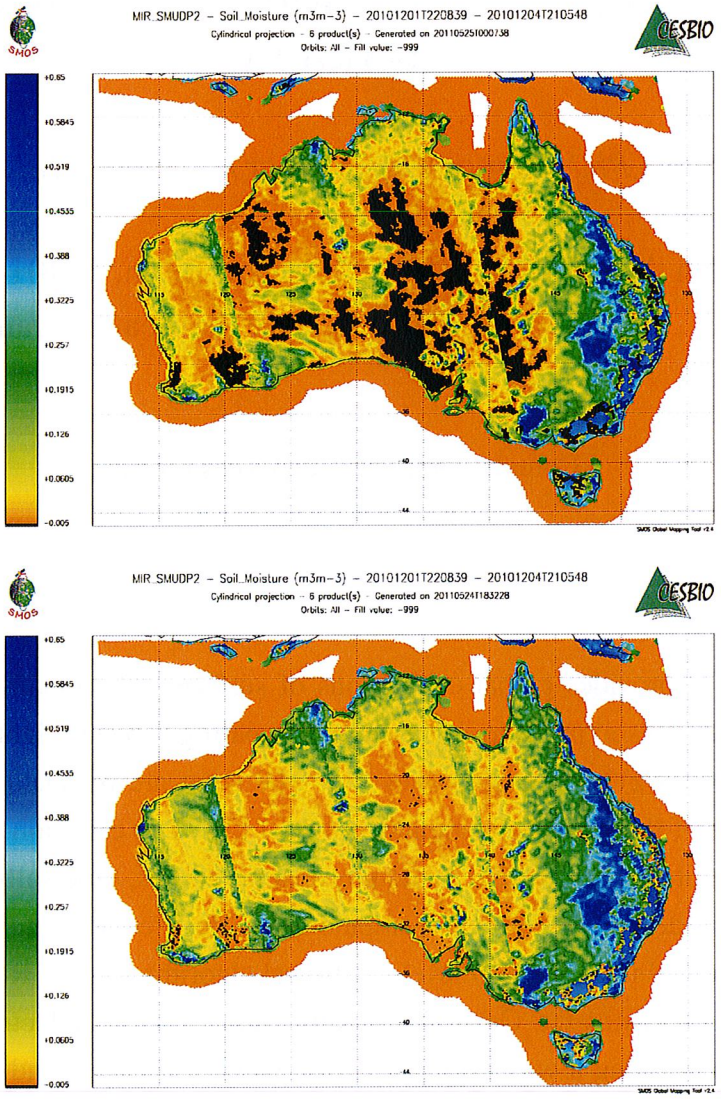

Fig. 1. 3 days composite image of SMOS soil moisture, 1 Dec. 2010 to 4 Dec. 2010. The top figure are the results of the retrieval when using **Dobson**'s model and the bottom figure when using **Mironov**'s model

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