



HAL
open science

Global map of soil roughness using L-band SMOS data

Marie Parrens, Jean-Pierre Wigneron, Philippe Richaume, Al Bitar Ahmad, Arnaud Mialon, Shu Wang, Roberto Fernandez-Moran, Amen Al-Yaari, Yann H. Kerr

► **To cite this version:**

Marie Parrens, Jean-Pierre Wigneron, Philippe Richaume, Al Bitar Ahmad, Arnaud Mialon, et al.. Global map of soil roughness using L-band SMOS data. EGU 2015, European Geosciences Union General Assembly, European Geosciences Union (EGU). DEU., Apr 2015, Vienne, Austria. hal-02742942

HAL Id: hal-02742942

<https://hal.inrae.fr/hal-02742942v1>

Submitted on 3 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.



Global map of soil roughness using L-band SMOS data

Marie Parrens (1,2), Jean-Pierre Wigneron (2), Philippe Richaume (1), Ahmad Al-Bitar (1), Arnaud Mialon (1), Shu Wang (2), Roberto Fernandez-Moran (2), Amen Al-Yaari (2), and Yann Kerr ()

(1) Centre d'Études Spatiales de la Biosphère (CESBIO), UMR5126, BPI 2801, 31401 Toulouse Cedex 9, France, (2) NRA, UR1263 ISPA, F-33140 Villenave d'Ornon, Centre INRA Bordeaux, Aquitaine, France

Since 2010, soil moisture (SM) has been mapped over the Earth by the Soil Moisture and Ocean Salinity (SMOS) satellite. This mission is the first one to monitor SM over land using passive L-band radiometry technique. At this frequency the signal depends on SM and vegetation but is significantly affected by surface soil roughness. Quantifying the surface soil roughness on ground surface emissivity is a key issue to improve the quality of passive microwave large-scale SM products.

The core of the SMOS algorithm permitting to provide SM operational data is the inversion of the L-band Microwave Emission of Biosphere (L-MEB) model that is the result of an extensive review of the current knowledge of the microwave emission. In this model, surface soil roughness is modeled with empirical parameters (Q_r , H_r , N_{rp} , with $p = H$ or V polarizations). These parameters have been estimated by numerous studies but only at local scale using in situ measurements or airborne campaigns. However, these local estimations are not representative at large scale and they are not consistent with the actual surface roughness conditions, especially in agricultural areas and can lead to important errors in the SM retrievals.

In this study, a method has been developed to obtain the first global map of the roughness parameter, by combining the vegetation and soil roughness into one parameter, referred to as TR. SM and TR were retrieved globally using the SMOS L3 brightness temperature and the forward emission model L-MEB for 2011. The effect of vegetation and roughness can be separated in TR using the LAI MODIS data to account for the vegetation. This map could lead to improve soil moisture retrievals for present and future microwave remote sensing missions such as SMOS and the Soil Moisture Active Passive (SMAP).