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To cite this version:

Claire Gruhier, Patricia de Rosnay, Jean-Pierre Wigneron. Retrieval of soil moisture based on passive microwaves measurements from AMSR-E over a Sahelian region. European Geosciences Union General Assembly, Apr 2009, Vienne, Austria. hal-02753549

HAL Id: hal-02753549

https://hal.inrae.fr/hal-02753549v1

Submitted on 3 Jun 2020

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Geophysical Research Abstracts,
Vol. 11, EGU2009-2497-1, 2009
EGU General Assembly 2009
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Retrieval of soil moisture based on passive microwaves measurements from AMSR-E over a Sahelian region.

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Soil moisture is a crucial variable which influences the land surface processes. The feedback on precipitation is particularly strong over the Sahelian region. Access to soil moisture value is difficult because of its high spatial and temporal variability. Large scale measurements are of great importance for land surface modeling and numerical weather prediction. Remote sensing approaches are the more appropriated to provide land surface informations at continental scale and high temporal frequency. Among all channels available, passive microwaves are the most sensitive to soil moisture variations. This study proposed a retrieval of soil moisture based on AMSR-E (Advanced Microwave Scanning Radiometer - Earth Observing System) measurements over a Sahelian region.

The study area is located in Gourma region in Mali. This site has been instrumented in the context of the AMMA project (African Monsoon Multidisciplinary Analysis). The soil moisture network was specifically designed to address the validation of remotely sensed soil moisture in the context of the SMOS mission (Soil Moisture an Ocean Salinity).
AMSR-E is a passive microwaves sensor launched on AQUA in 2002. It provides brightness temperature at fives frequencies (6.9 to 89GHz) and two polarizations. Its high temporal frequency is particularly appropriated to the quick rainy events. Gruhier et al (2008-a) shows the great sensibility of the 6.9GHz channel over the study area.

The goal of this study is to use the complete temporal series available from AMSR-E from 2002 to 2008 to provide soil moisture values. In a first time, a simple correction is applied to brightness temperature to correct the variations explained by instrument calibration. Secondly, the range of AMSR-E brightness temperatures values is used to identify the range of Soil Wetness Index values on each pixel. Finally, sample ground measurements are used to develop retrieval algorithm, which provide volumetric values. Retrieved soil moisture values are compared to existing soil moisture product based on same remote sensing data set. Product from the Amsterdam University based on AMSR-E observations provides the best estimates of soil moisture values over the study area (Gruhier et al, 2008-b). Results from retrieval are validated using ground measurements not used during the processing. Results show the high capability of passive microwaves measurements from AMSR-E to provide soil moisture variations and absolutes values.

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