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Large scale evaluation of AMSR soil moisture products based on ground soil moisture network measurements.

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This paper presents an evaluation of AMSR (Advanced Microwave Scanning Radiometer) soil moisture products, based on the comparison with three ground soil moisture networks. The selected ground sites are representative of various climatic, hydrologic and environmental conditions in temperate and semi-arid areas. They are located in the south-west of France, in the south-east of Australia and in the Gourma region of the Sahel. These sites were respectively implemented in the framework of the projects SMOSREX (Surface Monitoring Of Soil Reservoir Experiment), SASMAS/GoRex (Scaling and Assimilation of Soil Moisture and Streamflow in the Goulburn River experimental catchment) and AMMA (African Monsoon Multidisciplinary Analysis). In all cases, the arrangement of the soil moisture measuring sites was specifically designed to address the validation of remotely sensed soil moisture in the context of the preparation of the SMOS (Soil Moisture an Ocean Salinity) project.

For the purpose of this study, 25km AMSR products are used, including brightness temperatures at 6.9 and 10.7 GHz and soil moisture. The study is focused on the year 2005. It is based on ground soil moisture network measurements from 4 stations for SMOSREX extended to the SUDOUEST project of CESBIO, 12 stations for GoRex and 4 stations for AMMA.

Temporal and spatial features of soil moisture variability and stability is a critical issue to be addressed for remotely sensed soil moisture validation. While ground measurements provide information on soil moisture dynamics at local scale and high temporal

resolution (hourly), satellite measurements are sparser in time (up to several days), but cover a larger region (25kmx25km for AMSR). First, a statistical analysis, including mean relative difference and Spearman rank, is conducted for the three soil moisture networks. This method is mainly based on the approach proposed by Cosh et al. (2004) for the purpose of the use of ground networks for satellite remote sensing validation. It allows to capture soil moisture variability features and to identify for each site the most representative station. Second, a comparison of AMSR derived and in-situ soil moisture measurements is conducted. Volumetric soil moisture obtained from ground and satellite measurements are compared, for both absolute and normalized values. For the three sites, results suggest that although AMSR soil moisture products are not able to capture the same range of soil moisture values as in-situ measurements, they provide a reliable information on surface soil moisture temporal variability over the three sites. It is shown, however, that the use of radiometric products such as polarization ratio provide better agreement with ground stations, than the derived soil moisture products.