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First Evaluations of SMOS Observations and Level 2 Land Products Over the Valencia Anchor Station Site

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Ground, remote sensing and meteorological measurements over the Valencia Anchor Station (VAS) area are used as input to the ISBA (Interactions between Soil-Biosphere-Atmosphere) Soil-Vegetation-Atmosphere-Transfer (SVAT) model within the CNRM SURFEX (SURFace EXternalisé) surface code to simulate surface soil moisture (SM). In situ SM measurements from the VAS network were used for calibration and validation of the ISBA model.

A realistic estimation of surface SM in different areas within a SMOS footprint is achieved in the VAS site through a sampling strategy that integrates the relationships between hydrological variables, particularly SM, and the parameters of the landscape at different spatial scales. This strategy and sampling methodology is based on the definition of environmental units that are heterogeneously structured entities which present a certain degree of internal uniformity of hydrological parameters according to climate, soil type, topography, vegetation cover conditions, lithology and elevation, and therefore, they are considered to have similar SM levels. The main assumption for each unit is that the dynamical variation of the hydrological parameters within one such unit should be minimum compared to the dynamics of another unit. The ultimate objective is to maximize resources and time in the elaboration of SM maps for the validation of SMOS data over the area.

Intensive SM sampling has been carried out in the VAS area, at different scales, in the framework of different campaigns, both at ground level and from aircraft, to support the definition of the homogeneous land units as well as the spatialization of SM based on ISBA modeling with the final objective of achieving the full characterization of SM at the scale of a SMOS pixel ($\sim$ 50 km x 50 km).

Before launch, numerous field L-band radiometry experiments (MELBEX-I and –II, Mediterranean Ecosystem L-Band characterization Experiment) have been conducted in order to adapt and calibrate the SMOS Level 2 processor L-MEB (L-band Microwave Emission of the Biosphere) model to the specific Mediterranean ecosystem species that are most common in the VAS site, namely shrubs and vineyards. The two-parameter inversion of L-MEB provides vegetation water content (VWC) together with soil moisture (SM). We also describe here the retrieval of VWC in the VAS site using MODIS data and ground based high-resolution maps. A multi-scale approach has been implemented to retrieve VWC at 1 km resolution with MODIS data. MELBEX-III is the third ground-based radiometry experiment of this series that started in September 2009 using the ESA L-band radiometer ELBARAII-3, mounted on a 15 m tower and fully dedicated to monitoring validation conditions at the VAS site during SMOS lifetime. Since then, the instrument has been measuring brightness temperatures at horizontal and vertical polarization of thermal radiation from the MELBEX-II vineyard area. Simultaneously, in-situ SM is currently being measured at representative locations within the respective observed footprints. The common objective of these experiments, besides retrieving surface SM from the tower-based measurements, is to upscale the field-scale data to the VAS scale for calibrating and validating the radiance measured with the overflying MIRAS radiometer on board the SMOS satellite.

Airborne measurements at L-band have also been used to improve the parameterization of the L-MEB model in the area, to improve the match between measured brightness temperatures by SMOS and simulations using ground SM. For this, please refer to Lopez-Baeza et al. (CNES and ESA CAROLS Airborne Campaigns at the Valencia Anchor Station and Los Monegros site in the framework of SMOS Validation), also at this Symposium

This presentation also shows the use of surface variables from the VAS site to simulate passive microwave brightness temperature in order to have satellite “match ups” for Cal/Val and to test retrieval algorithms. Thus, ground and meteorological measurements available from the VAS site are used to simulate SM using the SURFEX model with the ISBA module. The validation of this approach was made by means of a point-to-point comparison

with ground measurements from which we obtained good agreement between simulated and measured SM. The spatialization method proposed uses all the available data in order to have SM estimates representative of a SMOS pixel. The second step consists in using output data from the ISBA model to simulate surface emission by using the L-MEB model that helps to better understand the exact signification of the SMOS signal, thus giving a first insight of SMOS data. The results of the above mentioned experiments are the basis for comparisons between simulated brightness temperatures (TB) and SMOS measured TBs at the VAS site. These exercises are conducted in order to have an assessment of the L-MEB performance in a highly studied and monitored area, and to help pinpointing future areas of investigation in microwave radiometry.