Use of ESA's ELBARAII L-Band radiometer system for SMOS validation monitoring purposes at the Valencia Anchor Station

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L-band (1 - 2 GHz) microwave radiometry is a remote sensing technique to monitor soil moisture, which is being deployed in the *Soil Moisture and Ocean Salinity* (SMOS) Mission of the European Space Agency (ESA). Performing ground-based radiometer campaigns before launch, during the *Commissioning Phase* and during the operative SMOS mission is important for the validation of satellite data and for the further improvement of the radiative transfer models used in the soil-moisture retrieval algorithms.

One of the selected validation sites is the *Valencia Anchor Station* (VAS) which is located about 80 km west of the city of Valencia, on the natural region of the Utiel-Requena Plateau. The region is a reasonable homogeneous area of about 50 x 50 km^2, mainly dedicated to vineyards (75%), and other Mediterranean ecosystem species (shrubs, olive and almond trees and pine forests). The topography is generally plain (slope angle <2%) with slightly undulated regions (8%-15%). The temperatures range from -15°C in winter to 45°C in summer, with an annual mean temperature of 14°C. The annual precipitation is about 450 mm with peaks in spring and autumn.

Figure 1: ELBARAII-3 radiometer system and view from its 15 m platform in November 2009

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In September 2009 the L-band radiometer ELBARAII-3 was mounted on a 15m tower at the VAS site. Since then, the instrument has been measuring brightness temperatures at horizontal and vertical polarization of thermal radiation from the vineyards observed and representative for the VAS. Measurements are performed automatically at nadir angles between 30° and 70° in steps of 5° every 30 minutes. At 45°, brightness temperatures are recorded every 5 minutes. Additional calibration of the radiometer is performed every day around midnight by means of sky brightness measurements at 150° (60° above the horizon). Simultaneously with the passive radiometer measurements, in-situ soil moisture and temperature are measured at representative locations within the observed footprints.

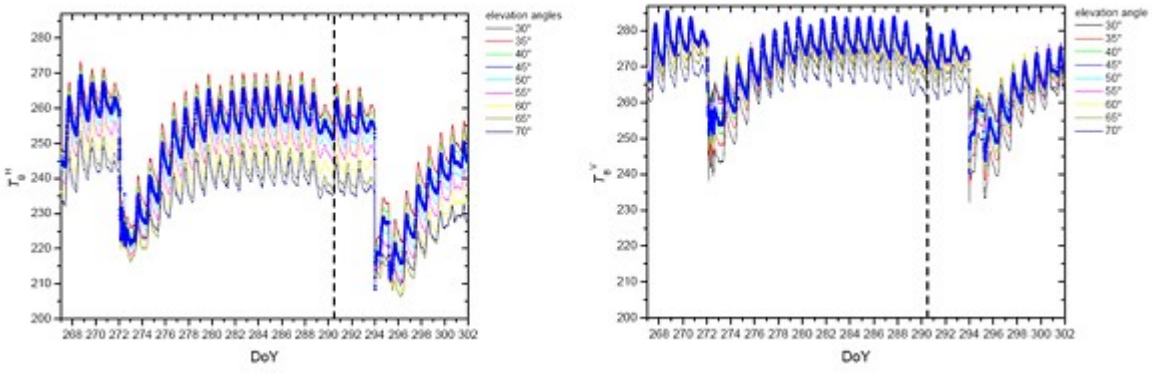

Figure 2: ELBARAII-3 first data set since its installation on 24th September 2009

Figure 3: ELBARAII-3 study area during the vineyard season

On the one hand, this approach allows retrieving surface soil moisture from the tower-based measurements. On the other hand, the field-scale data can be upscaled to the VAS scale for calibrating and validating the radiance measured with the overflying MIRAS radiometer on board the SMOS satellite. Besides these activities, the ELBARAII data will be used to calibrate the soil and vegetation parameters involved in the SMOS Level 2 processor (L-MEB). In particular, short term experiments to estimate vegetation transmissivity at different development stages and SMOS relevant observation angles are planned. This will be carried out by placing a reflective foil on the ground meaning that soil emission will be shielded and only the contribution of the vegetation will be measured. The brightness temperatures thus measured will then be transformed into transmissivities of the vegetation at different stages of the vegetation development and for various sensor configurations in terms of polarizations and incidence angles.