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Microwave-derived soil moisture over Mediterranean land uses: from ground-based radiometry to SMOS first observations

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This communication will present the main results of a series of airborne and ground-based experiments conducted at the Valencia Anchor Station (VAS) site for the implementation of the SMOS emission model L-MEB (L-band Microwave Emission model of the Biosphere, Wigneron et al., 2007), and will evaluate the performance of L-MEB against SMOS measurements.

The L-MEB model has been implemented in the context of the SMOS mission and through numerous radiometry experiments over different land uses. Within L-MEB, each land use is characterised by model parameterisations that are used to describe the radiative transfer at L-band. They describe, for instance, the attenuation properties of different canopies, or the effect of soil roughness on the surface emission.

In recent years, the Valencia Anchor Station site (VAS) has hosted various radiometry experiments. These were performed at different scales, from the plot scale to the regional scale (up to 50 km), using ground-based and airborne-based radiometry. The main results are discussed in this communication, and some preliminary comparisons with SMOS measurements are presented.

1) Ground-based experiments.

MELBEX-I was a ground-radiometry experiment run in 2005 using the L-band radiometer EMIRAD over a plot of shrub land. We will present results from this experiment (Cano et al., 2009), that highlighted a constant (and small) contribution of Mediterranean shrub land to the overall emission, and investigated the role of exposed rocks in the surface emission.

MELBEX-II was a ground-radiometry experiment run in 2007 using the EMIRAD L-band radiometer over a plot of vineyards throughout the whole vegetation cycle. Vineyards are the main land use at the VAS site, therefore parameterisations for vineyards are key for the validation of SMOS data at VAS. This communication will discuss, in particular, estimates of microwave surface roughness throughout the crop year, and changes in the canopy microwave properties throughout the plant growing cycle.

2) Airborne-based experiments.

2.1) ESA's SMOS Rehearsal 2008. For this campaign an area of 100 km2 of vineyards in winter-like conditions was flown on four days using the EMIRAD radiometer. Soil moisture could be retrieved with good accuracy but only after surface roughness was determined. In fact, the campaign highlighted that close to specular modelling of the surface reflectivity using 0-6 cm measurements of soil moisture underestimated the surface emission. This was observed also in other airborne data sets (Saleh et al. 2009).

2.2) CNES CAROLS campaigns. In 2009, the L-band CAROLS radiometer was flown on three occasions over an area of 1500 km2 covering vineyards, shrub land and Mediterranean pine forest. Main results of CAROLS

2009 will be presented in this communication, and the emphasis will be on comparing local to regional scale results given that CAROLS flights were performed at ∼4000 m above the surface. For soil moisture, SVAT-derived, field soil moisture, and surface-type derived soil moisture will be used as ground truth.

3) SMOS data

Finally, the results of the above mentioned experiments concerning L-MEB parameterisations will be the basis for comparisons between simulated brightness temperatures (TB) and measured TBs from SMOS at the VAS site. These exercises will be 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.

References

Cano A., Saleh K., Wigneron J.P., Antolín C., Balling J., Kerr Y.H., Kruszewski A., Millán-Scheiding C., Søbjaerg S.S., Skou N., López-Baeza E. (2009), The SMOS Medierranean Ecosystem L-band experiment (MELBEX-I) over natural shrubs, Remote Sensing of Environment, in press.

Saleh K., Kerr Y.H., Richaume P., Escorihuela, M.J., Panciera R., Delwart S., Walker J., Boulet G., Maisongrande P., Wursteisen P., Wigneron, J.P. (2009), Soil moisture retrievals at L-band using a two-step inversion approach (COSMOS/NAFE'05), Remote Sensing of Environment, vol. 113, 6, 1304-1312.

Wigneron, J.-P., Kerr, Y., Waldteufel, P., Saleh, K., Escorihuela, M.-J., Richaume, P., Ferrazzoli, P., Grant, J. P., Hornbuckle, B., de Rosnay, P., Calvet, J.-C., Pellarin, T., Gurney, R., Mätzler, C. (2007), L-band Microwave Emission of the Biosphere (L-MEB) Model: description and calibration against experimental data sets over crop fields, Remote Sensing of Environment, vol (107), 639-655.