Comparing upper soil moisture estimates from SMOS and a land surface model over the Iberian Peninsula

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The recent availability of remotely sensed products for soil moisture opens new possibilities for validating land surface model state variables. Here we compare the Soil Moisture and Ocean Salinity (SMOS) level 2 products with the output of the ORCHIDEE land surface model. ORCHIDEE is well suited for this exercise as it has a very high vertical resolution and simulates soil moisture over the nominal penetration depth of SMOS (5cm) with 5 layers. Over the Iberian Peninsula, the annual cycle and the response to rainfall events of the simulated and remotely sensed products are in good agreement. In a small sub-catchment of the Duero basin (REMEDHUS), the two soil moisture products are highly correlated to the in-situ observations as well. On the other hand, spatial correlations between modelled and remote sensed upper-soil moisture are weak. An analysis of the spectral signatures of both soil moisture estimates has shown that over some parts of the Iberian Peninsula the amplitude of the annual cycle can be very different. An examination of the co-variance of precipitation and upper soil moisture showed that some rainfall patterns do not impact soil moisture in the same way in both products. This allows to propose some hypothesis for the low spatial correlation noted between the SMOS and ORCHIDEE upper soil moisture.