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Comparison of measured brightness temperatures from SMOS with modelled ones from ORCHIDEE and HTESSEL over the Iberian Peninsula

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Remote sensing techniques have brought about a new way to perform data retrieval and the adaptation of data assimilation techniques. Moreover, they allow for the possibility of new methods to validate state variables from land surface models. This study complements a previous one in which soil moisture estimates from the Soil Moisture and Ocean Salinity (SMOS) mission were compared to modelled estimates from the ORganising Carbon and Hydrology In Dynamic EcosystEms (ORCHIDEE) land surface model, over the Iberian Peninsula. The aim is to better understand the inconsistency found between soil moisture's spatial structures in models and observations. To do so, the level 1C product from SMOS, which consists of brightness temperatures (TBs), is compared to two sets of modelled TBs, for the period ranging from 2010 to 2012 over the Iberian Peninsula. These two sets were computed using outputs from two land surface models and a radiative transfer model. The former were the ORCHIDEE and the Hydrology–Tiled ECMWF Scheme for Surface Exchanges over Land (HTESSEL) land surface models. The radiative transfer model used was the Community Microwave Emission Model (CMEM). The reason for performing the comparison with TBs is that these are the main input of SMOS's soil moisture retrieval algorithm. The results show a good agreement in the temporal evolution between measured and modelled TBs. Discrepancies have been found, however, regarding the spatial structures, with an increasing inconsistency between the modelled data and SMOS's observations, specially during the fall and winter seasons. These are found to be dominated by the slow varying changes of surface conditions. It should be noted that they have been detected using two different sets of modelled TB. The work here exposed shows this comparison, as well as a characterisation of the temporal and spatial structures of its error by means of an EOF analysis.