Brightness Temperature and Soil Moisture Validation at Different Scales During the SMOS Validation Campaign in the Rur and Erft Catchments, Germany

The European Space Agency's Soil Moisture and Ocean Salinity (SMOS) satellite was launched in November 2009 and delivers new brightness temperature and soil moisture products over terrestrial areas on a regular three-day basis. In 2010, several airborne campaigns were conducted to validate the SMOS products with microwave emission radiometers at L-band (1.4 GHz). In this paper, we present results from measurements performed in the Rur and Erft catchments in May and June 2010. The measurement sites were situated in the very west of Germany close to the borders to Belgium and The Netherlands. We developed an approach to validate spatial and temporal SMOS brightness temperature products. An area-wide brightness temperature reference was generated by using an area-wide modeling of top soil moisture and soil temperature with the WaSiM-ETH model and radiative transfer calculation based on the L-band Microwave Emission of the Biosphere model. Measurements of the airborne L-band sensors EMIRAD and HUT-2D onboard a Skyvan aircraft as well as ground-based mobile measurements performed with the truck mounted JÜLBARA L-band radiometer were analyzed for calibration of the simulated brightness temperature reference. Radiative transfer parameters were estimated by a data assimilation approach. By this versatile reference data set, it is possible to validate the spaceborne brightness temperature and soil moisture data obtained from SMOS. However, comparisons with SMOS observations for the campaign period indicate severe differences between simulated and observed SMOS data.

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