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Airborne Passive microwave response to soil moisture: A case study for the Rur catchment

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Soil moisture is a highly variable parameter that affects several environmental and earth surface processes including meteorology, climate, hydrology and agricultural management. Remote sensing of soil moisture from the vantage point of space is advantageous because of its large spatial and temporal continuity. Airborne passive microwave remote sensing in L band provides a feasible option for high resolution mapping of near surface soil moisture that allows both large spatial coverage and high temporal resolution. A series of multi-resolution flights was conducted over the Rur Catchment a TERENO observatory, in the west of Germany. The Rur catchment comprises a distinct variety of topographic and land covers characteristics and therefore represents an excellent validation site for the land component of airborne campaigns and satellite missions. Brightness temperature observed by Polarimetric L-band multibeam radiometer (PLMR) was mapped 3 times at different altitude in descending order (1200m 1000m and 700m). The PLMR spatial resolution (beam spot size) is approximately 0.3 times the altitude, and the swath width is about twice the altitude. The near-surface moisture and temperature of soil were measured extensively on the ground in sampling areas concurrently with aircraft flying over the region. Soil moisture is estimated using the L-band Microwave Emission of the Biosphere (L-MEB) model, which simulates the L-band microwave emissions produced by the soil–vegetation layer. Consequently this study demonstrates that passive microwave remote sensing is potentially an efficient tool to detect landscape soil moisture variation corresponding to spatial and temporal patterns. The overall aim is to combine the PLMR data with data from active SAR sensor(F-SAR by DLR, Germany) for an enhanced soil moisture product.