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Vegetation effects on airborne passive microwave response to soil moisture: A case study for the Rur catchment, Germany

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Soil water content stored in the upper soil layer, is a key determinant of a large number of applications, including numerical weather prediction, flood forecasting, agricultural drought assessment, water resources management, greenhouse gas accounting and civil protection. Passive microwave sensors implemented on airborne and space-borne platforms have been shown to provide useful retrievals of near-surface soil moisture variations at regional and global scales. Polarimetric L-band Multibeam Radiometer (PLMR2) of the Forschungszentrum Jülich was flown in line with the F-SAR sensor from the German Aerospace Center (DLR) in the TERENO (Terrestrial Environmental Observatories) Rur site, Germany to prepare for the calibration and validation of the NASA Soil Moisture Active and Passive (SMAP) satellite mission. Brightness temperature observed by the PLMR2 was mapped at three different altitudes (1200m 1000m and 700m). The L-band Microwave Emission of the Biosphere (L-MEB) model was used to retrieve surface soil moisture (SSM) from the PLMR2 brightness temperature measurements. Leaf Area Index (LAI) was estimated from multispectral RapidEye imagery of the same day with 5m resolution. Different approaches were analyzed for transferring the LAI into vegetation opacity. Comparison of SSM to ground measurement at different test sites within the TERENO observatory shows that most of the captured soil moisture values are in good agreement with ground measurements.