

Modelling of the L-band brightness temperatures measured with ELBARA III radiometer on Bubnow wetland

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Microwave radiometry has become the main tool for investigating soil moisture (SM) with remote sensing methods. ESA – SMOS (Soil Moisture and Ocean Salinity) satellite operating at L-band provides global distribution of soil moisture. An integral part of SMOS mission are calibration and validation activities involving measurements with ELBARA III which is an L-band microwave passive radiometer. It is done in order to improve soil moisture retrievals – make them more time-effective and accurate. The instrument is located at Bubnow test-site, on the border of cultivated field, fallow, meadow and natural wetland being a part of Polesie National Park (Poland). We obtain both temporal and spatial dependences of brightness temperatures for varied types of land covers with the ELBARA III directed at different azimuths. Soil moisture is retrieved from brightness temperature using L-band Microwave Emission of the Biosphere (L-MEB) model, the same as currently used radiative transfer model for SMOS. Parametrization of L-MEB, as well as input values are still under debate.

We discuss the results of SM retrievals basing on data obtained during first year of the radiometer's operation. We analyze temporal dependences of retrieved SM for one-parameter (SM), two-parameter (SM, τ – optical depth) and three-parameter (SM, τ , Hr – roughness parameter) retrievals, as well as spatial dependences for specific dates. Special case of Simplified Roughness Parametrization, combining the roughness parameter and optical depth, is considered. L-MEB processing is supported by the continuous measurements of soil moisture and temperature obtained from nearby agrometeorological station, as well as studies on the soil granulometric composition of the Bubnow test-site area. Furthermore, for better estimation of optical depth, the satellite-derived Normalized Difference Vegetation Index (NDVI) was employed, supported by measured in situ vegetation parameters (such as Leaf Area Index and Vegetation Water Content) obtained during the field campaigns. The values of NDVI around ELBARA III radiometer are provided by Sentinel-2 satellite with approximately 10 m spatial resolution and average 10 days of time interval within studied period of time.

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