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Comparison of remote sensing and in-situ soil moisture measurements: 6 years survey of SMOS data and agrometeorological stations in Eastern Poland

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Long term measurements of soil moisture on a large scale provide important information about not only periodical changes in water content, but also its contribute to better understanding of water cycle in environment. In addition, if in the studied area occurred extreme weather conditions or even anomalies, it is scientifically challenging to compare and validate data from two such different techniques like remote sensing and in-situ measurements.

The aim of our research was to compare data of independent soil moisture measurements from SMOS (Soil Moisture and Ocean Salinity) satellite and 9 agrometeorological stations installed on Eastern Poland (Polesie and Podlasie regions). Those regions have similar climatic and topographic conditions, however, different vegetation covers and soil properties. Radiometric SMOS data contain surface water content values (approx. 45 km) for the area corresponding to the positions of chosen agrometeorological stations. For the purpose of those studies only morning satellite overpasses (ascending) were used. In-situ sensors in stations measure precisely soil moisture at 5-10 cm depth, but each only in one point. Both datasets were 7-days averaged in order to standardize. Analysis of a long term data is very interesting, especially because of occurrence of flood and drought events during the analyzed period of time. For example, the analyses revealed clear rainfall trend between ground and satellite data. Some shifts between SMOS and ground measurements were also observed, what may be explained by impact of different depths of SMOS measurements (<5 cm) and layer measured by sensors in the stations (0-10 cm). The influence of different sensing depths for both techniques is also reflected in bigger variability of SMOS data as they came from shallower layer of soil that have smaller “inertia” (in terms of soil moisture variability) than deeper in situ measurements.

The results from SMOS and those obtained with the soil moisture sensor for Eastern Poland in 2010-2016 including rainfall and air temperature data will be presented and compared for compliance using classical statistics methods and Bland-Altman test.

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