



SCAT-SAR Soil Moisture: A Data Fusion Approach to Close the Spatial and Temporal Scale Gaps between MetOp-ASCAT and Sentinel-1 Observations.

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Earth observation (EO), and more specifically, spaceborne radar remote sensing had made much progress toward its high potential to retrieve Soil Moisture (SM) at different scales. However, for a single sensing system there always exists a trade-off between spatial and temporal resolution of the observations. While scatterometer-derived SM products can well describe temporal soil moisture dynamics, they lack of spatial details. They do not facilitate analysis of local hydrological patterns, such as effects from convectional rains and topography and thus miss the requirements of many users. Contrary, SM products from SAR sensors can resolve dynamics at this level. However, they observe individual locations less frequently and are thus not suitable for acquisition of short-term variations.

To overcome these spatial and temporal scale gaps, a data fusion approach is developed that fuses SM derived from the MetOp ASCAT scatterometer (25km) and SM derived from the Sentinel-1 SAR at Interferometric Wide Swath mode (S-1 IWS, 150m), yielding new SM data benefitting from both their high temporal and spatial resolution, respectively. With a spatial resolution of 1km, these so-called 1km SCAT-SAR SM products bear great potential for operational use, even at local scale.

A test case study over Austria is carried out with the SCAT-SAR data, analysing values in Surface SM (SSM) and Soil Water Index (SWI, estimating the profile soil moisture). Results are validated against alone-standing ASCAT and S-1 data, as well as against in-situ measurements at the Hydrological Open Air Laboratory (HOAL) in Petzenkirchen, Lower Austria.