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Towards long-term satellite root-zone soil moisture: 40-year Soil Water Index dataset from ESA CCI COMBINED Soil Moisture product.

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Multiple satellite-based global surface soil moisture (SSM) datasets are presently available, these however, address exclusively the top layer of the soil (0-5cm). Meanwhile, root-zone soil moisture cannot be directly quantified with remote sensing but can be estimated from SSM using a land surface model. Alternatively, soil water index (SWI; calculated from SSM as a function of time needed for infiltration) can be used as a simple approximation of root-zone conditions. SWI is a proxy for deeper layers of the soil profile which control evapotranspiration, and is hence especially important for studying hydrological processes over vegetation-covered areas and meteorological modelling.

Here we present the first long-term SWI dataset from ESA CCI Soil Moisture v04.5 COMBINED product, covering a 40-year period between 1978 and 2018. The ESA CCI dataset is unique because of its long-term global coverage based on merged observations from both active and passive sensors. The SWI is calculated for eight T-values (1, 5, 10, 15, 20, 40, 60, 100), where T-value is a temporal length ruling the infiltration; depending on the soil characteristics it translates into different soil depths.

Primary results show promise for pursuing development of an operational SWI product. Here, we present the results of SWI validation against data from the International Soil Moisture Network (ISMN) using the QA4SM framework, as well as results of the attempt to establish relationship between T-values and particular soil depths.