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Towards an operationally capable satellite-based 0-100 cm soil moisture dataset from C3S

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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 introduce the advances in our work on the first operationally capable SWI-based root-zone soil moisture dataset from C3S Soil Moisture v201912 COMBINED product, spanning the period 2002-2020. The uniqueness of this dataset lies in the fact that T-values (temporal lengths ruling the infiltration) characteristic of SWI were translated into particular soil depths making it much more intuitive, user-friendly and easily applicable. Available are volumetric soil moisture values for the top 1 m of the soil profile at 10 cm intervals, where the optimal T-value (T-best) for each soil layer is selected based on a range of correlation metrics with in situ measurements from the International Soil Moisture Network (ISMN) and the relevant soil and climatic parameters. Additionally we present the results of an extensive global validation against in situ measurements (ISMN) as well as the results of investigations into the relationship between a range of soil and climate characteristics and the optimal T-values for particular soil depths.