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High Resolution Soil Hydraulic Properties estimation from remotely sensed soil moisture time series.

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Accurate estimation of soil hydraulic properties, specifically field capacity (FC) and wilting point (WP), collectively known as Water Holding Capacity (WHC), is crucial for effective water resource management in agriculture and the environment. Traditionally, WHC is obtained through soil sampling and laboratory analysis. Pedo Transfer Functions (PTFs) have been developed to estimate WHC from soil composition data, simplifying the process but still relying on accurate soil measurements.

In response, we propose a novel algorithm for dynamic FC and WP estimation based on continuous soil moisture time series from remote sensing. This study includes a preliminary accuracy assessment of the downscaled 100-m soil-moisture time-series obtained from a combination of SMAP and Landsat data against in-situ stations from the International Soil Moisture Network (ISMN) which also include WP and FC measurements. Leveraging these long time series of soil moisture data enables a more nuanced and adaptive characterization of soil hydraulic properties over time. This approach recognizes the influence of factors such as precipitation, evapotranspiration, and land management practices on soil moisture variability.

Furthermore, we perform a comparative analysis with SoilHydroGrids' WP and FC as a benchmark, to underscore the advancements, enhancements and potential limitations of our approach. Our results demonstrate a noteworthy enhancement in the estimation of Field Capacity, reducing the Root Mean Square Error (RMSE) from 0.15m^3/m^3 to 0.09m^3/m^3. Moreover, our algorithm exhibits slightly superior predictions for the wilting point when compared against laboratory measurements. Generally, our approach is capable of identifying a larger range of WP and FC values, which is also seen in the in-situ data.