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Estimation of Hydraulic Soil Properties Using Near-Surface Information

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A number of instruments and methods are available for measuring the water content of the soil surface and they continue to be developed further. These methods differ with respect to the thickness of the layer for which their results are representative, and with respect to their temporal resolution. Typical thicknesses range from a few millimeters to a few tens of centimeters and temporal resolutions range from a few seconds to several days. High-resolution time series of measured surface water contents, together with a corresponding precipitation record, offer an opportunity to estimate the effective soil hydraulic parameters at the respective site.
Using synthetic data, we explore the conditions under which such estimates are feasible and we investigate the attainable accuracy. We further look into the impact of reduced temporal resolution, on possible remediations, and on the feasibility of a temporal resolution of dynamically changing soil properties.
Data from a field site are then used to apply the findings of the numerical studies and to discuss limitations that are imposed by vegetation and soil heterogeneity.