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# Field scale effective hydraulic parameterisation obtained from TDR time series and inverse modelling

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Due to the large heterogeneity in the hydraulic properties of natural soils, estimation of field scale effective hydraulic parameters is difficult. Past research revealed that data from accurate but small scale laboratory measurements could hardly ever be transferred to the field scale. In this study, we explore an alternative approach where hydraulic properties of a layered soil profile are directly estimated from hydraulic inverse modelling using a time series of in situ measured soil water contents obtained from time domain reflectometry. Simulations were conducted for natural boundary conditions and run for a one-year time period including both wet and dry soil conditions. The upper flux boundary condition encompassed precipitation and evapotranspiration. It was derived from meteorological data which were measured near the instrumented soil profile.

For the time period used for inversion, the model is able to reproduce the general evolution of water content in the different soil layers reasonably well. However, distinct drying and wetting events could not be reproduced in detail which we explain by the complex natural processes that are not included in the rather simple model, e.g. an accurate site-specific representation of the evapotranspiration process and - potentially - preferential flow. The study also reveals the large importance of a correct representation of the various processes occuring in the soil-plant-atmosphere continuum.

From the results of our study we conclude that – for time periods where measured data for calibration are available – this simple estimation of effective hydraulic properties from in situ data may be a good alternative to lab measurements for describing unsaturated water movement in field soils which are not dominated by complex processes like preferential flow.