



Combination of measurement methods for soil hydraulic properties and how they affect soil water simulations

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The determination of soil hydraulic properties is a sensitive but fundamental task in modelling of soil water dynamics. In widely used modelling instruments, based on the Richards-equation, the properties – water retention and (un)saturated hydraulic conductivity – are described as continuous functions which are defined by a certain number of parameters. For a measurement-based assessment of effective soil hydraulic properties, data over a wide range from dry to saturated are needed. Unfortunately it is not possible to measure both retention and conductivity over the whole moisture range with a single method.

We applied four methods in extensive measurement campaigns to derive data for the determination of soil hydraulic properties. The methods were (i) evaporation method, (ii) dewpoint hygrometer, (iii) hood infiltrometer, and (iv) falling head method for saturated hydraulic conductivity. Together, these methods yield data for a wide range of soil moisture but also demand considerable time and resources. Hence, we wanted to quantify the importance of each used methods and see if all measurements are valuable or necessary. In a sensitivity study we modelled the water balance of experimental sites over five years using soil hydraulic properties derived by different method combinations and pedotransfer functions. The resulting water balance quantities are significantly affected by each method in its certain measurement range.