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Estimation of the soil hydraulic properties from a single upward infiltration curve

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Estimation of the soil hydraulic properties (saturated hydraulic conductivity, Ks, and "alfa" and n parameters of the van Genuchten model), is of paramount importance to simulate soil water flow in the vadose zone. This work demonstrates that the soil hydraulic properties can be estimated from the inverse analysis of a single upward infiltration curve. The existence and uniqueness of the solution was numerically analysed using synthetic upward infiltration curves for a loamy sand, loam and clay soils. The simulations, done in 5-cm high soil columns, run until the wetting front arrived to the soil surface. The method was validated by comparing the optimized Ks, "alfa" and n with the corresponding theoretical values. Next, the technique was applied on 5-cm high experimental cores, and the optimized hydraulic properties were compared to those obtained with pressure-cell experiments. The numerical analysis on synthetic upward infiltration demonstrated, in all theoretical soils, the existence of a unique and well-defined minimum. An accurate relationship was found between the optimized and theoretical Ks, "alfa" and n. Satisfactory results were also obtained in the experimental soil