Analysis of the performances of methods for the evaluation of soil hydraulic parameters and of their application in two hydrological models

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Daily measurements of evapotranspiration, mean soil moisture in the root zone and percolation out of the root zone collected in a cropped maize field in North Italy (Landriano-PV) were used to test the performances of two models: SWAP, a widely used model of soil moisture dynamics in unsaturated soils based on Richards equation, and ALHyMUS, a conceptual model of the same dynamics based on a reservoir cascade scheme. Each model is implemented with four different sets of hydraulic parameter values obtained with four different methods: one using parameter optimization to fit retention and hydraulic conductivity data of the experimental site; the remaining parameter sets were derived by applying three common Pedo-Transfer Functions to the texture and organic matter measurements collected at the same site. Simulations were run with each model and each parameter set using meteorological inputs measured at the experimental site for the time period June - October 2006. The results confirm the existence of a wide range of variation of the parameter values in the different sets, remarkably in the case of hydraulic conductivity. This is reflected in a high variability of the output variables of each model, which often is larger than the difference between the same outputs of the two models. Finally, the comparison shows that a good agreement of soil moisture patterns may occur even if evapotranspiration and percolation fluxes are significantly different; therefore multiple output variables shall be considered to test the performances of methods and models.