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Constraints on parameterisation of soil hydraulic properties for modelling

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Physically based hydrological models are used in science to understand and quantify the soil and water interaction at different scales. For this, a huge set of process representations has been built up within models, which have to be fed by hard data gained in the field. But the problem to parameterize soil hydraulic properties of field soils and the influence of land use is still unsolved. This is not only the case for regionalisation, the problem starts while gaining physically based soil parameters. The uncertainty of measured values, their transformation into model parameters and the model results are immense.

This study shows the simulation results of different parameterisation strategies for water retention and saturated hydraulic conductivity. For this, a 1D-model with dual-porosity concept for modelling water flow within matrix and macro pores was applied to simulate rainfall experiments at the small plot scale. The intention was to gain additional information on processes involved on runoff generation. Within a second set of experiments and their evaluation, a bulk model was used to simulate runoff processes and soil water fluxes on different land use types.

Data parameterisation strategies included measurement of soil physical conductivity in laboratory, infiltration measurements in the field and the application of pedotransfer functions for estimation of van-Genuchten parameters and soil hydraulic conductivity.

The results confirm on the one hand the high variability of parameter estimations depending on the method applied. On the other hand, a high influence of the different data sources on simulation quality was detected. There was no regularity recognisable in parameter use depending on land-use or soil type. Furthermore, results indicate that

there is a lack in knowledge on process interaction between surface and atmosphere or soil, or between the different pore types at field scale.