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Combined Calibration of a conceptual Rainfall-Runoff-Model and a Groundwater Model

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The project "RIVERTWIN" aims at adjusting, testing and implementing an integrated regional model for the strategic planning of water resources management in twinned river basins under contrasting ecological, social and economic conditions. In such integrated models, which try to simulate all relevant processes in a river basin simultaneously, water balance models play a key role. One of the main problems herein is the coupling and parallel calibration of rainfall-runoff- and groundwater models.

In this approach the HBV model was adapted to allow for a spatially highly discretized simulation of daily groundwater recharge and the identification and modification of the main processes of runoff generation and concentration. Spatially distributed modeling using distributions of parameters instead of lumped parameters and smoothing functions also permits to simulate the effects of changes in the land use pattern and not only the effects of a changed land use distribution. Therefore and for the prediction in ungauged catchments this paper is trying to show that similar patterns of catchment characteristics lead to similar hydrologic behavior.

The simulated recharge is transferred to a groundwater model which returns modeled base flow to the flood-routing module of the rainfall-runoff-model. The large number of parameters required the setup of a regionalisation method but the representation of model parameters by transfer functions of catchment characteristics enables a consistent parameter estimation. By establishing such relationships, the model was calibrated for the parameters of the transfer functions instead of the model parameters themselves. Simulated annealing using weighted Nash-Sutcliffe-coefficients of variable temporal aggregation assists in an efficient parameterisation. The results are compared to observed discharge and groundwater recharge simulations in the mesoscale

Neckar catchment.