# Challenges of regional hydrological modeling in the Elbe River basin Investigations about model fidelity on sub-catchment level

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Abstract

Within a research project about future sustainable water management options in the Elbe River basin, quasi-natural discharge scenarios had to be provided. The semi-distributed eco-hydrological model SWIM was utilized for this task. According to scenario simulations driven by the stochastical climate model STAR, the region would get distinctly drier. However, this thesis focuses on the challenge of meeting the requirement of high model fidelity even for smaller sub-basins. Usually, the quality of the simulations is lower at inner points than at the outlet.

Four research paper chapters and the discussion chapter deal with the reasons for local model deviations and the problem of optimal spatial calibration. Besides other assessments, the Markov Chain Monte Carlo method is applied to show whether evapotranspiration or precipitation should be corrected to minimize runoff deviations, principal component analysis is used in an unusual way to evaluate local precipitation alterations by land cover changes, and remotely sensed surface temperatures allow for an independent view on the evapotranspiration landscape.

The overall insight is that spatially explicit hydrological modeling of such a large river basin requires a lot of local knowledge. It probably needs more time to obtain such knowledge as is usually provided for hydrological modeling studies.