



Trade-offs between parameter constraints and model realism: a case study

Florian Ulrich Jehn (1), Alejandro Chamorro (1), Tobias Houska (1), Lutz Breuer (1,2)

(1) Justus Liebig University, Institute for Landscape Ecology and Resources Management, Giessen, Germany , (2) Justus Liebig University, Centre for International Development and Environmental Research, Giessen, Germany

Tightly constraint parameter ranges are seen as an important goal in constructing hydrological models, a difficult task in complex models. However, many studies show that complex models are often good at capturing the behaviour of a river. Therefore, this study explores the trade-offs between tightly constrained parameters and the ability to predict hydrological signatures, that capture the behaviour of a river. To accomplish this we built five models of differing complexity, ranging from a simple lumped model to a semi-lumped model with eight spatial subdivisions. All models are built within the same modelling framework, use the same data and are calibrated with the same algorithm. We also consider two different methods for the potential evapotranspiration. We found that that there is a clear trade-off along the axis of complexity. While the more simple models can constrain their parameters quite well, they fail to get the hydrological signatures right. It is the other way around for the more complex models. The method of evapotranspiration only influences the parameters directly related to it. This study highlights that it is important to focus not only on parametric uncertainty. Tightly constrained parameters can be misleading as they give credibility to oversimplified model structures.