A framework for multi-criteria assessment of model enhancements

Till Francke (1), Saskia Foerster (2), Arlena Brosinsky (2), José Delgado (1), Andreas Güntner (3), José A. López-Tarazón (1), and Axel Bronstert (1)

(1) Universität Potsdam, Institut für Geoökologie, Potsdam, Germany (francke@uni-potsdam.de), (2) GFZ German Research Centre for Geosciences, Section 1.4 Remote Sensing, Telegrafenberg, 14473 Potsdam, Germany , (3) GFZ German Research Centre for Geosciences, Section 5.4 Hydrology, Telegrafenberg, 14473 Potsdam, Germany

Modellers are often faced with unsatisfactory model performance for a specific setup of a hydrological model. In these cases, the modeller may try to improve the setup by addressing selected causes for the model errors (i.e. data errors, structural errors). This leads to adding certain "model enhancements" (MEs), e.g. climate data based on more monitoring stations, improved calibration data, modifications in process formulations. However, deciding on which MEs to implement remains a matter of expert knowledge, guided by some sensitivity analysis at best. When multiple MEs have been implemented, a resulting improvement in model performance is not easily attributed, especially when considering different aspects of this improvement (e.g. better performance dynamics vs. reduced bias).

In this study we present an approach for comparing the effect of multiple MEs in the face of multiple improvement aspects. A stepwise selection approach and structured plots help in addressing the multidimensionality of the problem. The approach is applied to a case study, which employs the meso-scale hydrosedimentological model WASA-SED for a sub-humid catchment. The results suggest that the effect of the MEs is quite diverse, with some MEs (e.g. augmented rainfall data) cause improvements for almost all aspects, while the effect of other MEs is restricted to few aspects or even deteriorate some. These specific results may not be generalizable. However, we suggest that based on studies like this, identifying the most promising MEs to implement may be facilitated.