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A simplified Procedure to Separate Input and Parameter Uncertainty in Hydrological Modelling

H. Shbaita and M. Rode

Helmholtz-Centre for Environmental Research - UFZ, Department of Aquatic Ecosystem Analysis and Management, Magdeburg, Germany (haytham.shbaita@ufz.de, + 49 391 8109699)

To separate the different uncertainty sources, i.e. input uncertainty and parameter uncertainty, a comprehensive two nested Monte Carlo based uncertainty analyses of complex hydrological models are needed. In order to reduce the huge computation cost of such methods a simplified method is presented to separate the parameter uncertainty from the input uncertainty, in this case rainfall uncertainty due to measurement error. The simplification allows first to sample from both parameter and rainfall in the first Monte Carlo run. Afterwords the best parameter set is chosen and for the second Monte Carlo run rainfall only is sampled. For the purpose of testing the new concept a normal distribution of the measurement error was assumed for each rainfall measurement. The study was conducted using the hydrological model WaSiM-ETH, which includes the Topmodel approach, with a daily time step on different catchments, with catchment areas varying from 100 km^2 to 2000 km^2 and catchment characteristics ranging from flat land till the lower mountain range. In addition to the different catchment areaś and characteristics, the effect of different aggregations of the spatial data was also studied.
The results show a high dependence of the predictive uncertainty on the rainfall measurement error. The larger the catchment area becomes, the less the effect of the rainfall uncertainty on the predictive uncertainty. Different aggregations of the input data (spatial resolution) has no effect on the predictive uncertainty The concept has a huge potential in helping researcher understand the interaction between different uncertainty sources.