Geophysical Research Abstracts
Vol. 20, EGU2018-1584, 2018
EGU General Assembly 2018

Semi-automatic calibration of the LARSIM model using the SCEUA method in respect of high-flow simulation

Kai-Feng Chen, Iris Konnerth, Marco Deubler, Michelle Härder, and Markus Disse

Chair of Hydrology and River Basin Management, Department of Civil, Geo and Environmental Engineering, Technical University of Munich

The automatic global optimization method - Shuffled Complex Evolution (SCEUA) has been extensively used for the calibration of conceptual hydrological models. Despite of its high efficiency and robustness, studies have pointed out that automatic calibration, due to the equifinality of parameter sets, will not automatically provide the parameters that are hydrologically most reasonable. This study showcases a semi-automatic calibration procedure, which combines the optimizing strength of SCEUA with a post examination of the performance of selected parameter sets. The objective is to determine parameters that are both meaningful and able to generate the best fit to the observed discharge data in the high-flow domain. In this study, we recalibrate the spatially distributed water balance model LARSIM (Large Area Runoff Simulation Model) of the mesoscale Upper Main Catchment in Upper Franconia, Germany, which is used for flood forecast. Observed hourly discharge at multiple gages is applied between 2010 and 2015 for calibration and between 2005 and 2009 for validation. A sensitivity analysis is conducted to determine the parameters with the greatest influences in respect of flood simulation and we consider these parameters in the semi-automatic calibration process. Instead of acquiring the global optimum parameter set from SCEUA solely, we also assign the algorithm to return the local optimums after each evolutionary loop. Then three criteria, 1) weighted error in the high-flow domain, 2) weighted goal function NSE value from the calibration and validation period and 3) plausibility of the four hydrograph components (fast surface runoff, slow surface runoff, interflow and baseflow), are examined in order to determine the “best” parameter set, by whom the simulation is not only hydrologically reasonable but also corresponsive to the observed discharge data in the high-flow domain. Finally, this study investigates the heterogeneity of calibrated parameter values among the sub-catchments in order to confirm their aimed relation to soil distribution, land use and topography of the catchment. By carrying on this semi-automatic calibration, the determined parameter set is capable of providing a hydrologically meaningful simulation of the watershed, and in our case, the best fit to the observed discharge data in respect of flood simulation.