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Comparison between GLUE and MCMC Uncertainty Methods including Autocorrelation

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One of the important issues in the hydrological modelling uncertainty analysis is the choice of the uncertainty analysis method. In this study a comprehensive comparison between two major uncertainty analysis methods (Generalised Likelihood Uncertainty Estimation (GLUE) method and the Monte Carlo Markov Chain (MCMC) method) was undertaken. The MCMC uncertainty method was done with and without considering autocorrelation in the discharge data. 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.
Despite the fact that both methods are based on completely different concepts, both were able to achieve almost the same goodness-of-fit measured according to Nash-Sutcliffe criteria. Still the parameter sets, that were calculated, differ from one another. This indicates that there exists more than one parameter set, which has a Nash-Sutcliffe criteria near the maximal found criteria. This implies that the concept of equifinality applies here. Taking the autocorrelation into consideration when using the MCMC mothods, a change in the parameter set was noticed. If looking for one of the best parameter sets, calibrating the hydrological modell, MCMC method is an effective and a fast method for finding a single parameter set, but care should be taken when sitting up the system.