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Bayesian uncertainty analysis for distributed hydrological modelling: application to a small lower mountain range catchment in central Germany

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Bayesian approach is largely applied nowadays for estimating parameters and uncertainty of simple, lumped, conceptual hydrological models. Fewer studies applied instead these methods to estimate uncertainty of complex, distributed physically based hydrological models due to limitations of input data and time computing. This work presents the application of a Gibbs within Metropolis MCMC algorithm to estimate parameters and uncertainty of the WASIM-ETH model in a small catchment (100km^2) of Weisse Elster basin in Germany. Simulation has been done for the 200m grid size as current results showed that this is a good compromise between time computing and model efficiency. The use of a statistical likelihood function led to well identified posterior distributions of the parameters and further enabled computation of both parametric and predictive uncertainty of the simulated discharges. The model performed well in both calibration and validation periods, with reliable performance proven by small uncertainty bounds. More than 85% of the observed discharge values find themselves within the predictive uncertainty bounds while only 10% of these find themselves within the parametric uncertainty bounds. This is one of the limitations of the present method and could be an effect of not considering the errors in the input data in the calibration approach. Current work focuses on extending the Bayesian methodology in order to take into account the input uncertainty into the calibration approach. This will allow obtaining more robust parameters and reliable model performances.