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Quantification of the predictive uncertainty in hydrologic simulation with a metamodel

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Hydrological prediction is quite complex and difficult because of many uncertainties. Especially in large river basins, it is rather time-consuming to make predictions; therefore, securing golden time plays a significant role in flood warning and risk mitigation. To reduce the forecasting time and quantify the uncertainty caused by many sources, this study adopts a highly efficient metamodel based on Polynomial Chaos Expansion (PCE) theory for hydrological simulations, coupled with a rainfall-runoff model (MIKE11-NAM model). The PCE method is then able to estimate the degree of uncertainty (in this study, many uncertainty sources of input, model parameters, initial condition, etc. will be addressed). Regarding the reduction of the output uncertainty, the GLUE (Generalised Likelihood Uncertainty Estimation) method is used to optimize the sets of parameters. Some of these parameters will be only used to estimate the parameters of the metamodel. A comparison of results between the NAM model and the metamodel is illustrated. The results analyzed with metamodel on the basis of PCE method are as good as those given by NAM model, while the results of the NAM model with GLUE show a smaller range of uncertainty and more accurate hydrological values than those without it.

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