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Implementation of a Bayesian uncertainty processor for the operational river Rhine flood forecasting system.

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An application of the Hydrological Uncertainty Processor proposed by Krzysztofowicz, [1999] is presented in the context of a Bayesian flood forecasting system for the river Rhine. The flood forecasting system is operated with on-line precipitation, temperature and water level observations as well as deterministic and probabilistic weather forecasts driving a cascade of hydrological and hydraulic models. The hydrologic response of the basin is modeled with the HBV model, while flood routing along the principal river channel is performed with the dynamic wave propagation model SOBEK.

The predictive uncertainty of the forecast is quantified via the Hydrologic Uncertainty Processor on the basis of Bayesian revision of the prior probability distribution on water level observations at the control section Lobith, conditional on level observations at a series of locations further upstream (Düsseldorf and Cologne). We show that for an optional performance of the uncertainty processor the choice of an adequate prior distribution remains of utter importance. Conditioning the prior distribution on additional water level observations at locations upstream of the control section significantly contributes to improving the information content of the posterior distribution and thus of the probabilistic quantitative forecast of water levels at Lobith.