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Uncertainty assessment via Bayesian revision of ensemble streamflow predictions in the operational river Rhine forecasting system

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Ensemble stream flow forecasts obtained by using hydrological models with ensemble weather products, are becoming more frequent in operational flow forecasting. The uncertainty of the ensemble forecast needs to be assessed, for these products to become useful in forecasting operations. A comprehensive framework for Bayesian revision has been recently developed and applied to operational flood forecasting with deterministic weather forecasts. The Bayesian revision yields a posterior density, conditional on all information available to the forecaster at the onset of a forecast run. This conditional density objectively quantifies the uncertainty.

Here the Bayesian approach is generalized for use with ensemble weather predictions. An end-to-end application of a Bayesian post-processor for ensemble stream flow forecasts in the river Rhine forecasting system is presented. A verification of the post-processor shows good performance when compared in terms of the Ranked Probability Skill Score (RPSS) to non-Bayesian uncertainty assessment, such as ranking threshold exceedance probabilities for members of a stream flow ensemble prediction. In this context it is also addressed how the proposed Bayesian processor can serve in supporting rational decision-making for flood warning under conditions of uncertainty.