

Probabilistic flood forecasting with the European Flood Awareness System (EFAS) using weather forecasts from the ECMWF

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Abstract

The main objective of a probabilistic flood forecasting system is the reliable and sharp estimation of the predictive uncertainty, which contains all information available of the forecast variable given the history of observed and simulated values. Therefore it should comprise all different sources of uncertainties, which are naturally inherent in a flood forecasting system like imprecise data collections and measurements, simplified modelling assumptions and incorrect model forcing taking the output from Numerical Weather Predictions (NWP) as model input. The Hydrological Uncertainty Processor (HUP) is intended to cover the measurement and modelling uncertainties, whereas the uncertainties caused by the NWP can be estimated by running different forecast systems and Ensemble Prediction Systems (EPS).

A wavelet based error correction method has been developed in order to minimise the differences between the observations and model simulations. Fitting a Vector Autoregressive Model to the different levels of decomposed observations and simulations accounts efficiently for forecast errors with scale properties of unknown source and statistical structure. The corrected simulations/forecasts are combined with the HUP in order to derive posterior uncertainties.

Recently this post-processing method, which has been implemented in the EFAS and is running now operationally at the ECMWF, has been further developed regarding the forcing uncertainties by deriving optimal weights for the combination of different NWP. Therefore the Non-homogeneous Gaussian Regression (NGR) model, the Bayesian Model Averaging (BMA) and an empirical method has been tested in order to correct the bias of the forecast and derive the predictive uncertainty. Thus the final post-processor of the forecast system includes (1) a minimisation of the model error and (2) a correction of forecast bias. First results of this further development demonstrate the importance of such forecast combination methods.