EMS Annual Meeting Abstracts
Vol. 14, EMS2017-648, 2017

Member-by-member postprocessing of hydrological ensemble predictions, based on reforecasts

Joris Van den Bergh and Emmanuel Roulin
KMI, Meteorological Research and Development, Brussels, Belgium (jorisvdb@meteo.be)

Meteorological ensemble predictions can be used as input for hydrological models to generate hydrological ensemble predictions. These have become a valuable established tool in the disciplines of water management and flood forecasting. Errors remain present in hydrological ensemble predictions, such as bias in the ensemble mean and over- or underdispersion of the ensemble. When training data of past forecasts and corresponding observations are available, such errors can be partly corrected with statistical postprocessing methods.

A hydrological ensemble prediction system is running operationally at the Royal Meteorological Institute of Belgium (RMI) for ten catchments in the Meuse basin. It makes use of the conceptual semi-distributed hydrological model SCHEME and the European Centre for Medium Range Weather Forecasts (ECMWF) ensemble prediction system (ENS). An ensemble of 51 discharge forecasts is generated daily.

We investigate a new postprocessing technique for the discharge forecasts, making use of a set of 10-member ECMWF precipitation reforecasts generated during 2016. These reforecasts are run twice per week, at the original O640 ($\sim$18km) ENS resolution, going back 20 years in the past. We use these as input to create a set of hydrological reforecasts. The postprocessing method is based on the member-by-member (MBM) approach of Van Schaeybroeck and Vannitsem (2015). Ensemble members are corrected individually by a linear mapping, resulting in an overall shifting and scaling of the ensemble mean and spread. MBM retains rank correlations and thus takes correlations between lead times implicitly into account. Regression parameters are determined through minimization of the empirical Continuous Ranked Probability Score (CRPS) for the observations and the corrected-forecast members.

We describe our operational setup and methodology, and investigate the improvement attained though postprocessing. We provide verification results for our MBM method, comparing the postprocessed forecasts with the archived uncorrected 51-member hydrological forecasts, by means of probabilistic and deterministic verification skill scores.