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Ensemble stream flow predictions using the ECMWF forecasts

Adam Kiczko (1), Renata Romanowicz (2), Marzena Osuch (2), Florian Pappenberger (3), and Emilia Karamuz (2)

(1) Warsaw University of Life Sciences, Warsaw, Poland, (2) Institute of Geophysics Polish Academy of Sciences, Warsaw, Poland (emilia_karamuz@igf.edu.pl), (3) European Centre for Medium Range Weather Forecasts, Reading, UK

Floods and low flows in rivers are seasonal phenomena that can cause several problems to society. To anticipate high and low flow events, flow forecasts are crucial. They are of particular importance in mountainous catchments, where the lead time of forecasts is usually short. In order to prolong the forecast lead-time, numerical weather predictions (NWPs) are used as a hydrological model driving force. The forecasted flow is commonly given as one value, even though it is uncertain. There is an increasing interest in accounting for the uncertainty in flood early warning and decision support systems. When NWP are given in the form of ensembles, such as the ECMWF forecasts, the uncertainty of these forecasts can be accounted for. Apart from the forecast uncertainty the uncertainty related to the hydrological model used also plays an important role in the uncertainty of the final flow prediction. The aim of this study is the development of a stream flow prediction system for the Biała Tarnowska, a mountainous catchment in the south of Poland. We apply two different hydrological models. One is a conceptual HBV model for rainfall-flow predictions, applied within a Generalised Likelihood Uncertainty Estimation (GLUE) framework, the second is a data-based DBM model, adjusted for Polish conditions by adding the Soil Moisture Accounting (SMA) and snow-melt modules. Both models provide the uncertainty of the predictions, but the DBM approach is much more numerically efficient, therefore more suitable for the real-time forecasting.. The ECMWF forecasts require bias reduction in order to correspond to observations. Therefore we applied Quantile Mapping with and without seasonal adjustment for bias correction. Up to seven-days ahead forecast skills are compared using the Relative Operation Characteristic (ROC) graphs, for the flood warning and flood alarm flow value thresholds. The ECMWF forecasts are obtained from the project TIGGE (http://www.ecmwf.int/en/research/projects/tigge) to prolong the lead time of the forecasts downstream. Both hydrological models show different performances when forced with raw and de-biased ECMWF ensembles.

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