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# Multimodel hydrologic ensemble predictions of peak flows: lessons learned from the real-time experiment in the upper Nysa Klodzka basin (SW Poland)

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The novel system for issuing the real-time warnings against hydrologic hazards, known as HydroProg (research project no. 2011/01/D/ST10/04171 of the National Science Centre of Poland), has been implemented in the upper Nysa Klodzka basin (SW Poland). The system itself works like a bridge between automatic hydrometeorological observational networks and numerous hydrologic models. Its main objective is to automatically produce and publish flood warnings on a basis of prognoses of river stages calculated from dissimilar models and – most importantly – their multimodel ensembles which are computed in real time within HydroProg. The implementation in question for the upper Nysa Klodzka basin is abbreviated as HydroProg-Klodzko, and is feasible due to the partnership with Klodzko County which maintains the Local System for Flood Monitoring (Lokalny System Oslony Przeciwpowodziowej – LSOP). The HydroProg-Klodzko prototype is continuously, i.e. with 15-minute update, calculating multimodel hydrologic ensemble predictions and publishing them along with prognoses corresponding to individual ensemble members (www.klodzko.hydroprog.uni.wroc.pl).

The real-time HydroProg-Klodzko experiment provided us with a valuable database of predictions as well as their errors and performance characteristics. At present, six hydrologic models participate in the experiment, however two of them (multi- and univariate autoregressive time series models) work uninterruptedly since the launch of the system in August 2013. The present study focuses on the detailed characterization of the real-time performance of the two models in predicting a few significant peak flows that occurred over the entire year of the experiment. In particular, we show how the two models can be weighted to produce skilful multimodel ensemble prognoses of river stages during peak flows. We identify phases of a peak flow in which, in order to improve the predictive skills, one should switch between individual models and their multimodel ensemble forecast. In addition, we attempt to link the accuracy of predictions with characteristics of contributing basins, with a particular emphasis put on their topography.