Multi-Model Grand Ensemble Hydrologic Forecasts in the Yangtze River Basin Using Bayesian Model Averaging

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The availability of several global ensemble weather prediction systems through the "THORPEX Interactive Grand Global Ensemble" (TIGGE) archive provides an opportunity to explore new dimensions in early flood forecasting and warning. This research presents a case study using Seven TIGGE ensemble weather prediction systems of the China Meteorological Administration (CMA), Centro de Previsão de Tempo e Estudos Climáticos (CPTEC), Canadian Meteorological Centre (CMC), European Centre for Medium-Range Weather Forecasts (ECMWF), Korea Meteorological Administration (KMA), National Centers for Environmental Prediction (NCEP), and Met Office (UKMO) to drive the Xinanjiang hydrologic model to produce probabilistic river discharge forecasts in the Yangtze River basin in China, at lead times of 6-120 h. Bayesian model averaging (BMA) are applied in the experiment to statistically post-process raw GE runoff forecasts. The results indicate that BMA grand ensemble(GE) forecasts outperform the unprocessed ensemble forecasts (include GE forecasts and single-model ensemble forecasts), and yield more calibrated and sharp predictive probability density functions (PDFs), at lead times ranging from 24 to120 h. The analysis of percentile forecasts in two different flood events shows the great potential and prospects of BMA GE probabilistic river discharge forecasts to raise preparedness and thus to reduce the socio-economic impact of severe flooding events.