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# Probabilistic Quantitative Precipitation Forecasting over East China using Bayesian Model Averaging

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The Bayesian model averaging (BMA) is a post-processing method that weights the predictive probability density functions (PDFs) of individual ensemble members. This study investigates the BMA method for calibrating quantitative precipitation forecasts (QPFs) from The Observing System Research and Predictability Experiment (THORPEX) Interactive Grand Global Ensemble (TIGGE) database. The QPFs over East Asia during summer (June-August) 2008-2011 are generated from six operational ensemble prediction systems (EPSs), including ECMWF, UKMO, NCEP, CMC, JMA, CMA, and multi-center ensembles of their combinations. The satellite-based precipitation estimate product TRMM 3B42 V7 is used as the verification dataset. In the BMA post-processing for precipitation forecasts, the PDF matching method is first applied to bias-correct systematic errors in each forecast member, by adjusting PDFs of forecasts to match PDFs of observations. Next, a logistic regression and two-parameter gamma distribution are used to fit the probability of rainfall occurrence and precipitation distribution. Through these two steps, the BMA post-processing bias-corrects ensemble forecasts systematically. The 60-70% cumulative density function (CDF) predictions well estimate moderate precipitation compared to raw ensemble mean, while the 90% upper boundary of BMA CDF predictions can be set as a threshold of extreme precipitation alarm. In general, the BMA method is more capable of multi-center ensemble post-processing, which improves probabilistic QPFs (PQPFs) with better ensemble spread and reliability.

KEYWORDS: Bayesian model averaging (BMA); post-processing; ensemble forecast; TIGGE