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BMA probability quantitative precipitation prediction of landing typhoon precipitation in Southeast China

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The uncertainties of prediction can lead to a considerable missed or false warnings. Numerical weather forecasts without uncertainties specified are hard to be incorporated into operations and decision making of other downstream applications such as early warning of floods and rainfall induced geological hazards. The ensemble forecasting technique provides an effective way to quantify those uncertainties. In this research, The probability of quantitative precipitation forecast(PQPF) of three Bayesian Model Averaging models based on three raw super ensemble prediction scheme were established, which through calibration of their parameters using 24h to 72h precipitation ensemble forecasts from three super ensemble integrated by the EPSs of global numerical forecast centers (CMA, ECMWF and NCEP) and rain gauge data during three landing typhoon in the southeast China from 1 July to 30 September 2013. The comparison of PQPF show that the performance was better in the BMA predictive models than that in raw ensemble forecasts. Compared with the raw super ensemble integrated prediction, the mean absolute error(MAE) is reduced by 12.4% on average, and its continuous ranked probability score(CRPS) is reduced by 26.2%, respectively. The BMA predictive models for the grant ensemble EPS performed better than any of the other BMA probability forecast model and the three raw super EPSs. The most obvious performance is the probability quantitative precipitation prediction result of BMA based on the grant ensemble EPS is significant reducing the false alarm, and the performance of the probability precipitation prediction above 10.0mm grade is better than that of the other EPSs. For quantitative precipitation forecast with different forecasting lead time, the BMA probability forecast improves the raw ensemble forecast, especially the BMA probability forecast corrected the location of the rainfall forecast and reducing the phenomenon of false alarm significantly. Although the BMA probability prediction tends to underestimate the prediction, in view of the perspective of probability prediction, the probability that the effective prediction interval of BMA probability prediction includes observed precipitation is greater, which is of great significance for the early warning of precipitation and its induced secondary disasters.