Geophysical Research Abstracts
Vol. 20, EGU2018-3793, 2018
EGU General Assembly 2018

Ensemble Forecasting and Verification of Extreme Temperature Events in China

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Ensemble forecasting of extreme high/low temperature events in China was conducted and verified, based on the real-time forecasts of 2m temperature from the T639 global ensemble forecasting system of China and the reforecasts from the GEFS of NCEP in U.S., by estimating the climatic percentile distribution for both the forecasts and analysis data. Our results shows that the forecasted climate percentile distributions at different lead days is basically the same as those of the analysis for a given region, but which are different to some degree between different regions and different seasons. Results of the Talagrand distribution shows that there is a warm or cold bias existing in different areas and the ensemble members usually show a relatively low spread in either of the two forecasting systems. Based on the definition of historical climate percentile, the extreme events for high temperature and low temperature can be identified in both the forecast and analysis data. The TS score is used to verify the ensemble forecasting of extreme temperature events and the results show that the two forecast systems have a certain performance for forecasting the extreme high/low temperature events in China. The prediction skills have an apparent region dependence and model dependence. Overall, the extreme high temperature event has higher skills in the south of the Yangtze River, Northeast China, and Tibetan Plateau, but the extreme low temperature event has higher skills in the northern and southern parts of China. Comparisons of the three ensemble forecasting methods of the extreme event show the differences of prediction skills. That is to say, the ensemble mean method has a smoothing effect on the extreme signals and gives relatively lower prediction skills, compared to the other two. The ensemble mode method improves evidently the extreme low temperature skill, while the method of using maximum or minimum in all ensemble members can amplify the extreme signals and increase significantly prediction skills of extreme high temperature events, but such an improvement is not clear for extreme low temperature events. These indicate that a proper extraction of extreme information in ensemble forecasting is of crucial importance.