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On the application of the Analog Ensemble to correct model-based temperature prediction

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Model-based numerical prediction are often affected by bias when compared to local observations. In this study, the European Center for Medium Range Weather Forecasting (ECMWF) data is used to generate the Analog Ensemble (AnEn) prediction over the 15 national weather stations and 274 automatic stations of Beijing, with a focus on correcting ECMWF prediction of the daily maximum and minimum temperature, 1-7 day ahead, twice a day. The analog of a forecast for a given location and time is defined as the observation that corresponds to a past prediction matching selected features of the current forecast. The best analogs form AnEn, which produces accurate predictions and a reliable quantification of their uncertainty with similar or superior skill compared to traditional ensemble methods while requiring considerably less real-time computational resources. An analysis of the performance of ECMWF and AnEn in space and time will be presented. The results demonstrate that a short training period of 60 days may be a good compromise for the computational efficiency and the quality of deterministic predictions. Extending the training periods would further increase the prediction quality than optimizing the environmental parameters, no matter 1-month, 3-month or 6-month optimizations. AnEn correction results in better predictions than the predictions generated by the forecasters, particularly for daily minimum temperatures. AnEn effectively reduces the bias of ECMWF predictions, resulting in a skilled downscaled prediction at the observation location, consistently over time and space. However, AnEn was not as effective in improving predictions of haze, precipitation, and strong winds, which may require a much longer training data set.