Impact of Multi-Temporal MOS Methods on Temperature Forecasts in Ningxia: Postprint

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Abstract

Mastering the temperature forecasting capabilities of NMC and local objective products is of significant importance for improving the quality of urban weather forecasts in Ningxia and its national ranking. Based on T639 and ECMWF model products from January 2009 to December 2014, along with temperature data from 20 national-level observation stations in Ningxia, two MOS methods dividing data by month and by season were employed to forecast maximum and minimum temperatures for the subsequent 168 h. Utilizing Ningxia' s current verification and evaluation methodologies, the forecast performance from January 2015 to June 2016 was assessed and compared against forecaster (YBY) and NMC guidance products. The results demonstrate that MOS methods for temperature forecasting in Ningxia exhibit superior overall performance relative to NMC, with month-divided MOS forecasts surpassing season-divided counterparts. ECMOS-month and T639MOS-month constitute the optimal objective products for maximum and minimum temperatures, respectively. In minimum temperature forecasting, YBY outperforms T639MOS-month, while in maximum temperature forecasting, ECMOS-month outperforms YBY. The consistent physical quantities across both optimal objective forecast products encompass equivalent potential temperature or pseudo-equivalent potential temperature, temperature, moist potential vorticity, and geopotential height concentrated within the middle-lower troposphere or at the surface, although each product additionally incorporates distinct key selected factors that influence the forecasting of maximum and minimum temperatures.

Full Text

Preamble

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Abstract

To master the temperature forecast capabilities of NMC, local subjective and objective products in temperature forecasting is of great significance to improve the quality of urban weather forecasting in Ningxia Province, China and its national ranking in weather forecasting. Based on the two model products of T639 and ECMWF with the temperature data of 20 national observatories in Ningxia from January 2009 to December 2014, the highest and lowest temperatures of the coming 168 hours were predicted by adopting two MOS methods which grouped the data by month or by season. The verification was done on the forecasted results for the time period from January 2015 to June 2016 using the current inspection and evaluation method adopted in Ningxia, and the comparisons with YBY and NMC were also conducted. The results show that the whole effect of the MOS method is superior to the NMC, and its forecast effect with monthly grouped data is superior to that when the data was grouped in season. The T639 MOS by month and ECMOS by month is the optimal objective products of the highest and lowest temperature. For predicting the lowest temperature, compared with the optimal objective product, the forecast by YBY is better than that of T639 MOS by month. For predicting the highest temperature, the forecast of ECMOS by month is better than that by YBY. The physical quantities of the two best objective predictive products are the equivalent temperature, or the potential pseudo-equivalent temperature, the temperature, the wet potential vorticity and the height, which are concentrated in the middle and lower layers or the ground. However, there are some factors that play a key role in the forecast of the highest and lowest temperatures.

Keywords: MOS method; different data partition; inspection and evaluation; Ningxia

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Figures

Fig. 3. Production inspection of every quarter both subjective and objective temperature forecasting in 2015

Fig. 4. Test about average absolute error of both subjective and objective temperature forecast products in January 2015 to June 2016

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Note: Figure translations are in progress. See original paper for figures.