Science and Technology Infusion Climate Bulletin
NOAA's National Weather Service
42nd NOAA Annual Climate Diagnostics and Prediction Workshop
Norman, OK, 23-26 October 2017

Developing an NMME Probability Threshold Based Seasonal Forecast Tool

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ABSTRACT

This study examines the feasibility of developing a seasonal forecast tool based on the North American Multi-Model Ensemble seasonal system (NMME) for different probability thresholds. The probabilistic seasonal forecast skill from the NMME (Kirtman *et al.* 2014) for seasonal anomaly precipitation (PREC) and 2 meter temperature (TEMP), including spatial maps and time series of skill over the Contiguous US (CONUS), and its seasonality, are first assessed. Next, the impact of the threshold probability used to define the regions of forecasts with Equal Chance (EC) on (a) forecast skills and (b) corresponding spatial coverage of region with non Equal Chance (nonEC) forecasts are examined. The skill assessment is based on three category probabilities (above, near, and below normal) for the NMME 0-month-lead seasonal forecast in JFM1995-DJF2016. The verification precipitation data is from the CMAP monthly precipitation analysis (Xie and Arkin 1997) and the land surface temperature from the GHCN-CAMS monthly analysis (Fan and van den Dool 2008). The climatology time period is 1982-2010. The skill measures include the Heide Skill Score (HSS) and the Ranked Probability Skill Score (RPSS).

The results show that relative high forecast skills are located over the southwest US. The areas with high (low) skills of HSS are consistent with high (low) skills of RPSS (Fig. 1). In general, most high skills are related to ENSO episodes. The PREC shows higher skills in spring and fall seasons, while the TEMP shows higher skills in summer season. For both PREC and TEMP, the nonEC forecast HSS increases as the

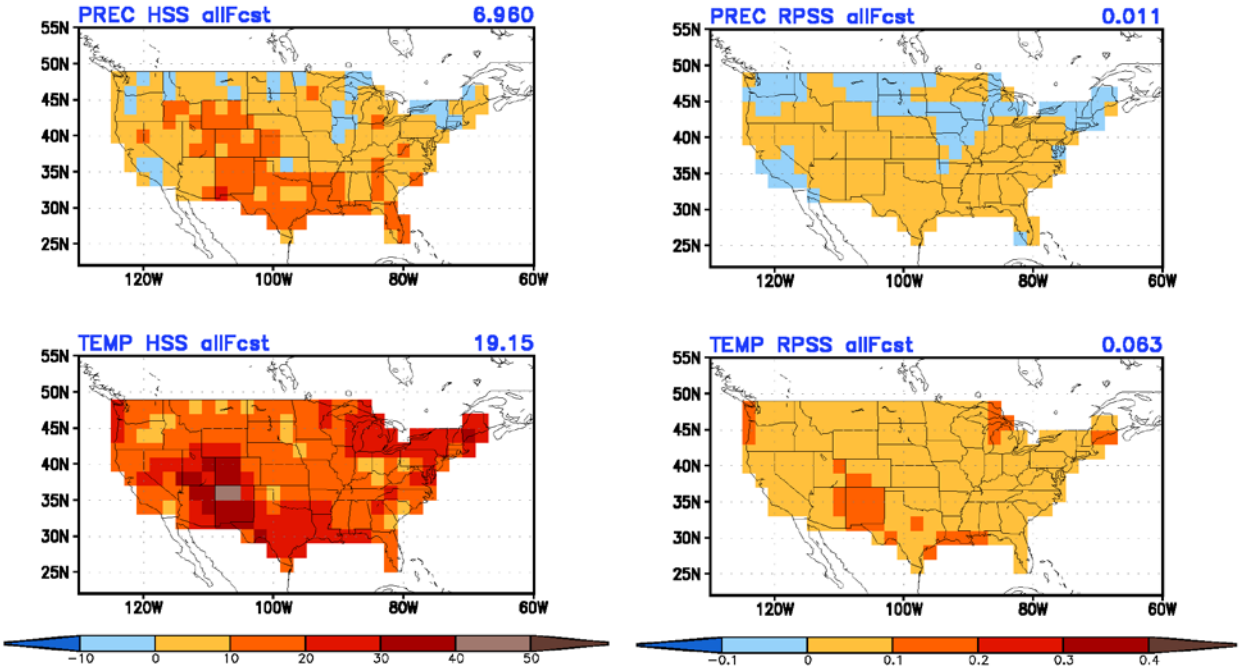

Fig. 1 Spatial maps of HSS (left panels) and RPSS (right panels) in all seasons in 1995-2016 for PREC (upper panels) and TEMP (lower panels). Skills are based on all forecasts.

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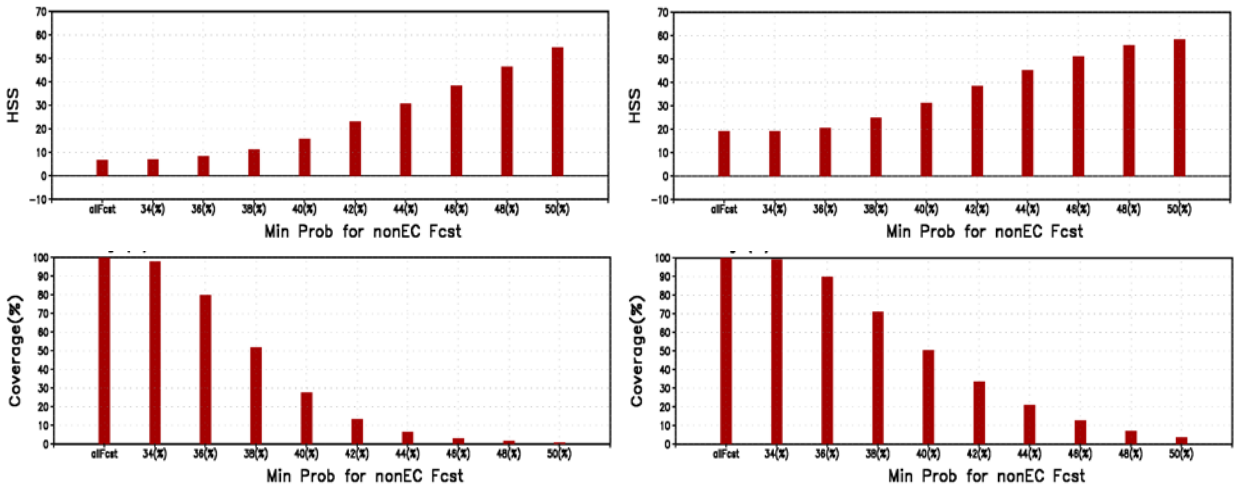

Fig. 2 HSS averaged over the CONUS for all forecasts and nonEC forecasts with different probability threshold used to define the nonEC forecasts (upper panels), and the corresponding coverage of the nonEC forecasts (lower panels). The left and right columns are for PREC and TEMP, respectively.

probability threshold cutoff value increases, while the areal coverage goes down (Fig. 2). Increasing probability threshold cutoff is equivalent to higher confidence in forecasts, higher signal-to-noise ratio, larger shift in the PDF from climatology, and therefore, should equate to higher skill.

Acknowledgments. Thanks to Dr. Emily Becker for providing the NMME seasonal probabilistic forecast data.

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