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A Comparison of Skill between Two Versions of the NCAP Climate Forecast System (CFS) and CPC's Operational Short-Lead Seasonal Outlooks

Peitao Peng[1], Anthony G. Barnston[2], and Arun Kumar[1]

[1]*Climate Prediction Center, NCEP/NWS/NOAA, MD*

[2]*International Research Institute for Climate and Society, Earth Institute of Columbia University*

ABSTRACT

Analysis of the relative prediction skills of NOAA's Climate Forecast System version 1 and 2 (CFSv1 and CFSv2), and the NOAA Climate Prediction Center's (CPC) operational seasonal outlook, is conducted over the 15-year common period of 1995-2009. The analyses are applied to predictions of seasonal mean surface temperature and total precipitation over the conterminous United States for the shortest and most commonly used lead time of 0.5 months. The assessments include both categorical and probabilistic verification diagnostics—their seasonality, spatial distributions, and probabilistic reliability. Attribution of skill to specific physical sources is attempted when possible. Motivations for the analysis are to document improvements in skill between the two generations of NOAA's dynamical seasonal prediction system and to inform the user community the forecast products skill of the CFS model now in use (CFSv2) to help guide the users' decision making processes.

The CFSv2 model is found to deliver generally higher mean predictive skill than CFSv1 (Fig. 1). This result is the strongest for surface temperature predictions and potentially may be related to the use of time-evolving CO_2 concentration in CFSv2, in contrast to a fixed (and now outdated) concentration used in CFSv1. CFSv2, and especially CFSv1, exhibit more forecast "overconfidence" than the official seasonal outlooks, despite that the CFSv2 hindcasts have outperformed the outlooks more than half of the time. Results justify the weight given to CFSv2 in developing the final outlooks, which is more than that given to previous dynamical input tools (*e.g.*, CFSv1), and indicate that CFSv2 should be of greater interest to users.

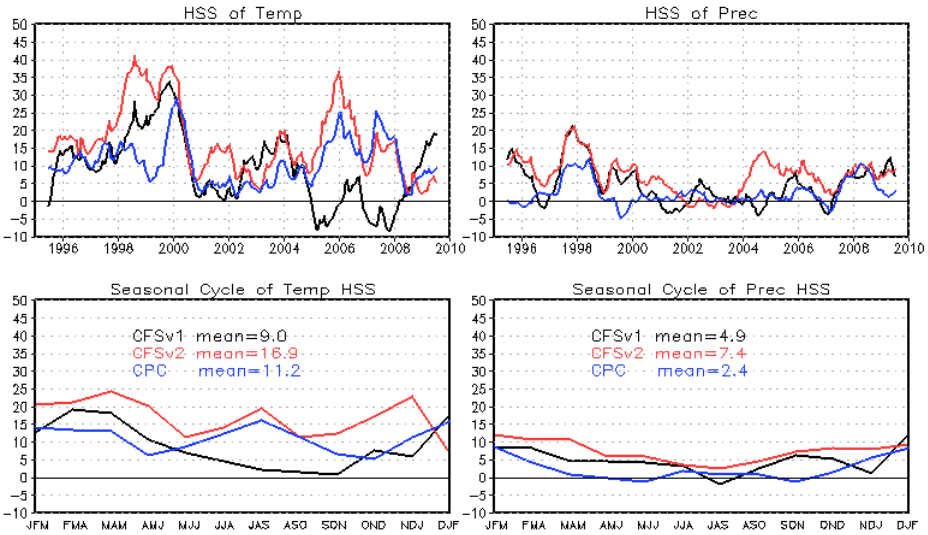

Fig. 1 Time series of spatial mean of Heidke skill score (HSS) over the US for CFSv1 (black), CFSv2 (red), and CPC official seasonal forecast (blue) of temperature (top left) and precipitation (top right); seasonal march of the mean HSS over the 15-year study period for the three forecast sources of temperature (bottom left) and precipitation (bottom right).

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Correspondence to: Peitao Peng, Climate Prediction Center, NCEP/NWS/NOAA, 5830 University Research Court, College Park, MD 20740-3818; E-mail: Peitao.Peng@noaa.gov.