Proceedings of 8 ICSHMO, Foz do Iguaçu, Brazil, April 24-28, 2006, INPE, p. 585-586.

THE FIDELITY OF NCEP-CFS SEASONAL HINDCASTS OVER NORDESTE

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1. Introduction

The NCEP climate forecast system (CFS) has shown to have huge improvement in ENSO prediction and simulation over other dynamical systems and statistical prediction tools (Saha et al. 2006; Wang et al. 2005) . The intent of this study is to examine the prediction skill of the Nordeste rainfall variability in the NCEP-CFS. Nordeste rainfall variability at interannual scales has been noted to be a region of high seasonal climate predictability (Misra 2004; Moura and Hastenrath 2004). Numerical model prediction studies that heretofore have been conducted over Nordeste have either been performed in pseudo-forecast model (where observed SST is prescribed to the Atmospheric General Circulation Model) or in tier-2 predictions where the AGCM is forced with forecast SST derived from an independent source (Sun et al. 2006).

2. Design of Experiments

We make use of the suite of CFS hindcasts which includes 15 ensemble members for 23 years from 1981 to 2003. The CFS is described in Saha et al. 2006.

3. Results

In Fig. 1 show the Nordeste domain (NOR) used in the study. We shall be specifically showing results for the February-March-April (FMA) season. In Fig..2 the FMA seasonal precipitation anomalies are shown from the CMAP (Xie and Arkin 1996) and the CFS seasonal hindcasts that started in February (0 lead time; Feb. Start) , January (1 month lead time; Jan. start), December (2 months lead time; Dec. start) and November (3 months lead time; Nov. start). The anomaly correlations with observations are indicated in the legend of the figure. It is seen although the anomaly correlations are reasonable they are less than what was reported in the previous studies that used observed SST to force the AGCM (Misra 2004; Folland et al. 2001). The motivation for this study is to understand why such a deterioration occurred in the CFS? The answer to this question is best encapsulated in Fig. 3 that shows the correlations of the Nino3 mean FMA SST with contemporaneous observed SST from observations and from the CFS. It is clearly seen that the ENSO forcing in the tropical Atlantic in the CFS is rather basin wide and stretches in to both the hemispheres contrary to observations. As a result, the tropical Atlantic teleconnection to the Nordeste rainfall variability is erroneous and contributes in not realizing the potential predictability in the CFS.

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4. Conclusions

Although CFS represents a remarkable improvement in the ENSO prediction, it is yet to realize the potential predictability of Nordeste rainfall interannual variability. This shortcoming of the CFS primarily stems from the erroneous ENSO forcing over the tropical Atlantic Ocean.

Acknowledgements

The authors thank Dr. Bohua Huang for useful discussions during the course of this work. This study was supported by NSF grant ATM9814295, NASA grant NAG5-11656 and NOAA grant NA16GP2248.

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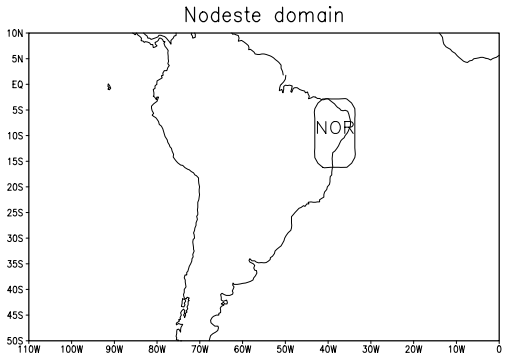


Figure 1: Domain of Nordeste (NOR) is outlined.

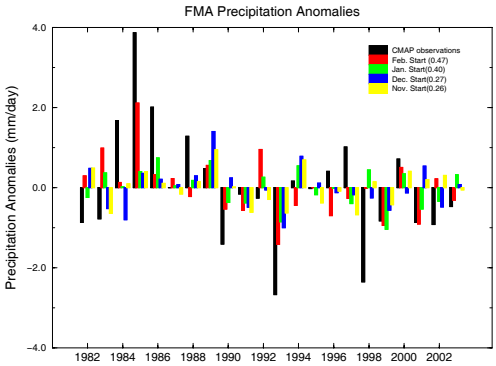
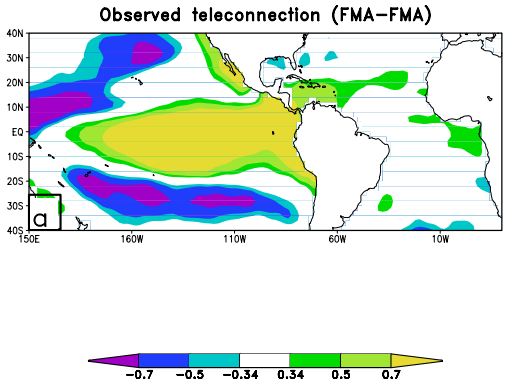


Figure 2: FMA seasonal mean rainfall anomalies from observations (CMAP) and CFS hindcasts at 0 (Feb. start), 1 (preceding Jan. start), 2 (preceding Dec. start) and 3 (preceding Nov. start) month lead time. The anomaly correlations of the seasonal rainfall are indicated in the legend.



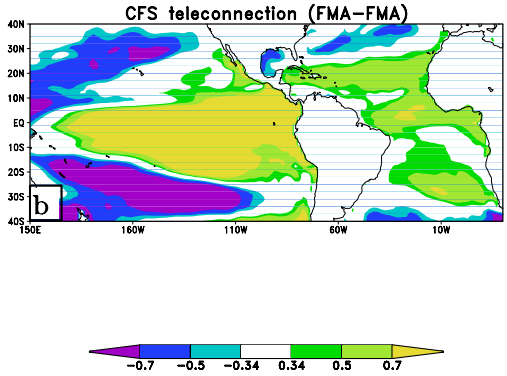


Figure 3: The correlations of the Nino3 mean FMA SST with contemporaneous observed SST from a) observations (ERSST-V2) and b) CFS (Feb. start runs). Correlations at 10% significance level according to t-test are shown.