NMME-SST FORECAST LIKE INPUT ON EMPIRICAL MODEL OF SEASONAL PRECIPITATION BASED ON EOF RECONSTRUCTION METHOD FOR SOUTH AMÉRICA

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ABSTRACT

In this work we propose an empirical-dynamic hybrid approach of seasonal climate forecasting applied to the southern South American domain (SAS). The NMME-SST is used as input variable in the EOF reconstruction model. The approach obtained statistically significant performance for most of the continent. The model showed sensitivity to the Andes, causing low dexterity on the eastern side of this mountainous region. The results show that the model is usual in the scope of the operational forecast over SAS.

RESUMO

Neste trabalho propomos uma abordagem híbrida empírico-dinâmico de previsão sazonal do clima aplicado ao domínio do sul da América do Sul (SAS). O NMME-SST é usado como variável de entrada no modelo de reconstrução de EOF. A abordagem obteve desempenho estatisticamente significante para a maior parte do continente. O modelo mostrou sensibilidade a cordilheira dos Andes, provocando baixa destreza do lado leste desta região montanhosa. Os resultados mostram que o modelo é usual no âmbito da previsão operacional sobre o SAS.

Keywords: Empirical-Dynamic approach, NMME-SST, Seasonal Forecast

1) INTRODUCTION

Statistical models of post-processing of dynamic output are widely used to obtain predictions and simulations that are more consistent with local reality, correcting systematic biases inherent to dynamic models (Wilks, 2011). The most common empirical-dynamic method produces predictions by statistical relationships between local variables and large-scale variables predicted by dynamic models. In this paper we propose another empirical-dynamic hybrid approach. The model predicts precipitation through the reconstruction of climatic variability from empirical orthogonal functions (EOF) and uses the sea surface temperature predicted by the North Multi-Model Ensemble (NMME-SST) as input variable. The domain of the model covers the area below the latitude 10 ° S line of the South American continent, relative to the area of interest of the South American South Regional Climate Center (CRC-SAS).

2) METODOLOGY

We used the precipitation grid data from the Global Precipitation Climate Center (GPCC) with one-degree resolution. Precipitation anomalies were calculated for the period 1980-

2010. The EOF method was applied to precipitation in the period 1961-2014 to obtain the main modes representing the predictable climate signal on the SAS. Linear regression models are adjusted for individual prediction of each mode using NMME-SST as predictor variable. Precipitation is predicted by a linear combination of the predicted modes with the rotations of the corresponding eigenvectors obtained in the EOF. More details on the method, it is recommended to read from Xing et al. (2016) and Wang et al. (2015). The linear regression models and the precipitation forecast went through a cross validation for the January-February-March (JFM) quarter in the period 1983-2010, which is the available hindcast period of NMME.

3) RESULTS

The first six modes of precipitation in the JFM quarter are predictable. All with statistically significant skill (Result not shown). The six modes concentrate 54% of the total variability of the dataset. Figure 1 shows the dexterity field of the model for the SAS domain. In most of the domain the forecast remained statistically significant (blue circles). The best skill is observed over northeastern Argentina, Uruguay, southeast-northeast portion of Brazil and the western side of the Andes mountain range in Bolivia. The regions with low or insignificant skill are the eastern side of the Andes, Chile and the southern tip of the continent. The dexterity of the model evaluated for the other quarters of the year indicates that the model can be an additional tool for the generation of the seasonal forecasts of the CRC-SAS.

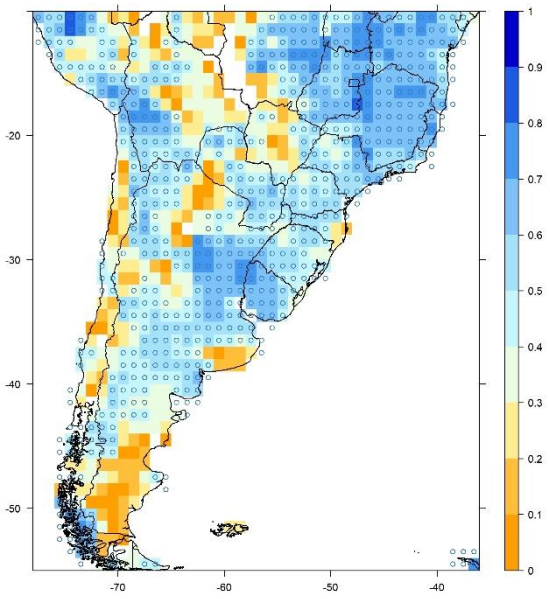

Figure 1 - Skill field for precipitation forecast over South American in JFM quarter.

4) CONCLUSIONS

The hybrid empirical-dynamical approach obtained acceptable performance, with a statistically significant correlation for most of South America. The eastern side of the Andes Mountains obtained insignificant dexterity, which shows that the model is sensitive to this geographic component. In general, the model has shown to be usual in the scope of the operational forecast.

REFERENCES

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