Forecast of the December-January-February 2011 precipitation in Sotheastern South America Using the NCEP CFS v1 Forecasts of Atmospheric Circulation

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In this work we use hindcasts and forecasts of atmospheric circulation fields obtained with the NCEP CFS (Saha et al. 2006), which are publicly available on line. The NCEP CFS hindcasts and forecasts considered here are initialized with oceanic and atmospheric conditions assimilated during November of each year from 1981 to 2003. Our focus is on precipitation of Southeastern South America (SESA) during DJF, for the purposes of this work the SESA region spans from 36.5ºS to 27.5ºS and from 60ºW to the Atlantic coast. It is found that precipitation rate obtained from the NCEP CFS v1 hindcasts doesn't have statistically significant skill in this region, at least when the 1998 DJF season is excluded. (The 1998 DJF case had very extreme anomalies of precipitation at SESA and may be considered as not representative of the average predictability.) Very recently, hindcasts of CFS v2 were released by NCEP, and we found that this version predicts DJF precipitation at SESA with statistical significant skill above 95% (even when the 1998 case is excluded). However, real time forecasts of this version, although are going to be available very soon, are not available right now.

We found that CFS v1 hindcasts of DJF zonal wind anomaly at 200 hPa are actually significantly correlated with simultaneous precipitation at SESA. Figure 1a shows the correlation between CMAP precipitation (Arkin Xie 1997) at SESA and 200 hPa u from NCEP CFS v1 hindcasts initiated during November, from 1981 to 2003. The regions with statistical significance above 95%, (computed with a t-Student test of 22 degrees of freedom) are shaded. The 1998 DJF case is excluded. At this figure we also show the SESA region and a region northward of SESA were the averaged 200 hPa u has a correlation of 0.40 with SESA precipitation. We call this average predictor index. Figure 2 shows, for all the years from 1981 to 2003, the predictor index vs. The DJF CMAP precipitation at SESA. The DJF 2011 forecast of anomalous 200 hPa u is shown at Fig. 1b. We find that the correspondent anomalous predictor index for this year is -2.64 m/s. There is only one case among the hindcasts which has lower value of this index.

We consider the nine cases of most negative values of the anomalous predictor index in the 1981-2003 record as the most reasonable sub-population analogous to the to DJF 2011 in terms of expected 200 hPa anomalous circulation around South America. The precipitation median of this sub-population is 305 mm, and it has 6 cases out of 9 with precipitation lower than the median of the total population of hindcasts, which is 358 mm. Considering this, we propose a median of 305 mm for the expected precipitation over SESA during DJF of 2011, and a chance of 0.67 of precipitation below the median of the total population.

In summary, in SESA, we expect a moderate negative shift of the expected DJF precipitation.

NOAA NCEP makes available numerical data of retrospective and actual forecasts from the CFS, as well as the CMAP precipitation analysis.
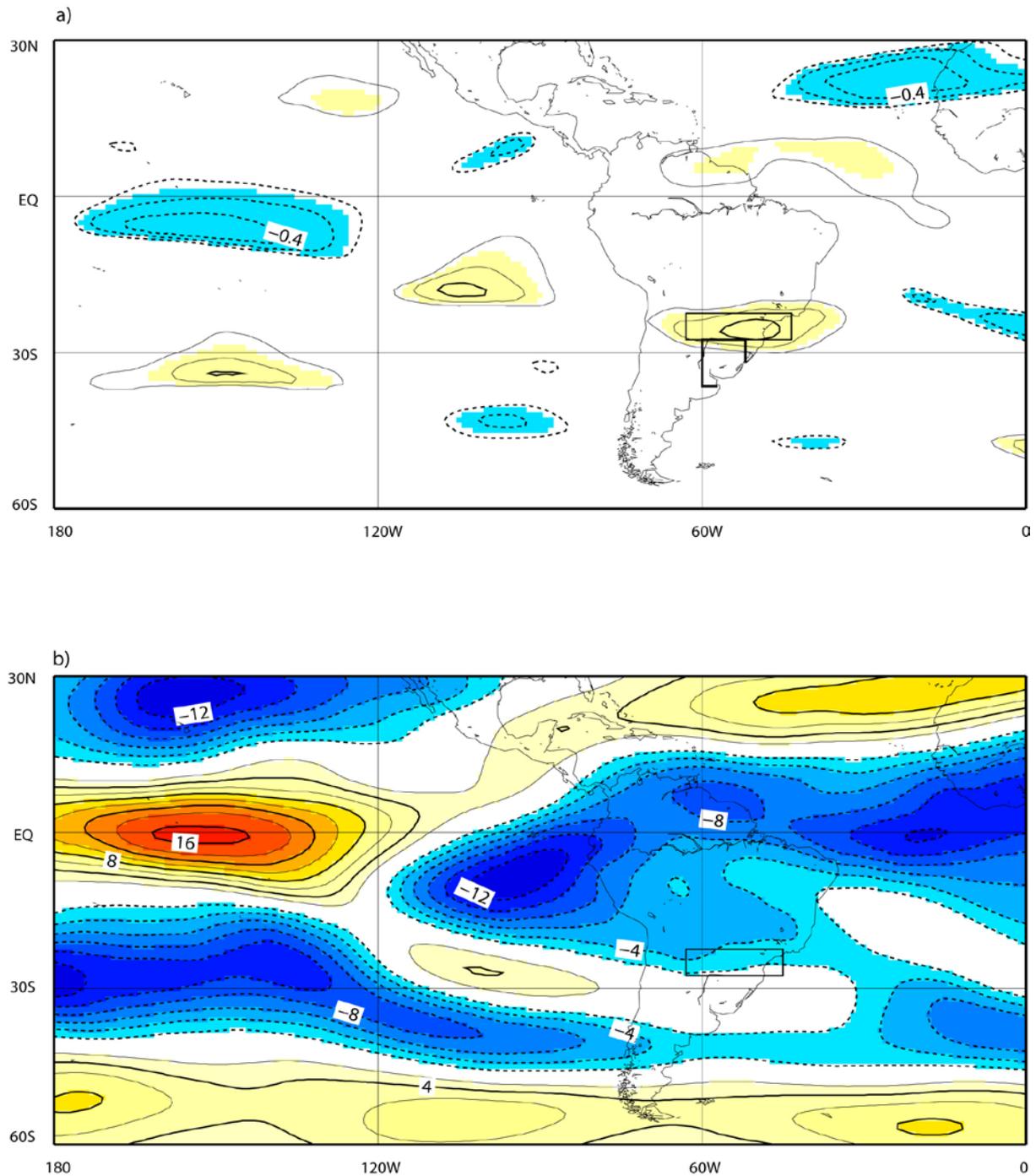
Figure 1: **a**. Correlation of DJF CMAP precipitation at SESA and hindcasts of the simulatenous 200 hPa zonal wind obtained from NCEP CFS v1 initialized during the inmediatly prior November. SESA reguion is indicated with thick black lines. Years considered are from 1981 to 2003. Contour interval is 0.5. Only values above 0.3 or below -0.3 are shown. Regions were the correlation has statistical significance levels of at least 95% are shaded. The region considered for computing the predictor index is indicated with narrower black lones. b: NCEP CFS v1 forecasts initiated dutring November 2010, of 2011 DJF anomalous 200 hPa zonal wind.
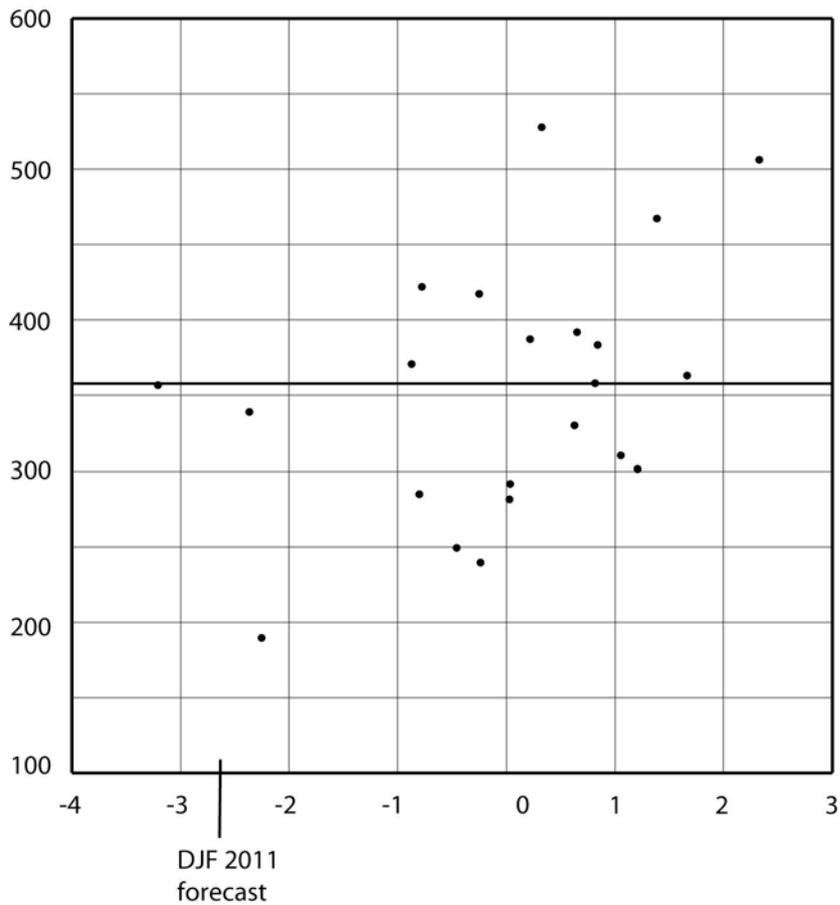
Figure 2: a: DJF predictor indexes from 1982 to 2004 vs. CMAP precitation at SESA during the same seasons. The median of the precipitation of these cases and the value of the 2011 DJF predictor index are indicated.

References:

Saha, S., S. Nadiga, C. Thiaw, and others, 2006: The NCEP Climate Forecast System. *J. Climate*, **19** (15), 3483-3517.

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