



# EVALUATION OF THE AGCM-CPTEC AIR TEMPERATURE FORECASTS DURING AN EL NIÑO EVENT



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## ABSTRACT

It was evaluated the 2-meter temperature forecasts (T2m) of the Atmospheric Global Circulation Model (AGCM) of the Center for Weather Prediction and Climate Research (CPTEC) during an occurrence of a heat wave over the Southern part of the South America, during the period of 20 January to 05 February 2003. During this period the atmosphere general circulation was driven by a weak El Niño and in the mesoscale was observed an occurrence of a South America Low-level Jet (SALLJ). The results indicate that the CPTEC-AGCM 24-hour forecasts captured the SALLJ and the heat wave relatively well during the considered period. The implementation of the T2m diagnosis contributed to improve the model prognostics of temperature.

## INTRODUCTION

The air temperature is one of the main climate elements and exerts great influence in many sectors of the society.

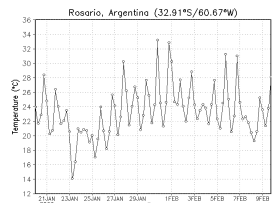
Reliable forecasts could supply mechanisms to the population to avoid adverse effect associated with temperature extremes.

Electric energy distribution also could be better planned by the responsible sector with good short range temperature forecasts.

Moreover, a realistic representation of the diurnal cycle for the air temperature near to the surface is one of the basic requirements for the numerical model prediction performance.

The diurnal variation of the forecast errors might supply informations about problems associated with physical process parametrized.

**Objective:** to evaluate the forecasts of temperatures at 2 meters (T2m) and in the first sigma level temperature (Tems) from the Atmospheric Circulation Model (AGCM) of the Center of Weather Prediction and Climate Studies (CPTEC) for the considered period.



## DATA AND METHODOLOGY

AGCM-CPTEC: resolution T126L28 – horizontal grid 1°X1° latitude X longitude.

Implementation: T2m depends of the surface flows. It was obtained of the AGCM-CPTEC Planetary Boundary Layer (PBL) parametrization scheme.

Considerations: friction velocity ( $u^*$ ) and T scale ( $\sigma$ ) similarity theory of Monin-Obukhov (M-O) (Businger et al., 1971; Arya, 2001).

From the attainment of the  $u^*$  e  $\sigma$  by the M-O theory, it was computed the momentum fluxes at the PBL (Manton-Cotton, 1977).

**Data:**  
Spectral analyses T126L28 from NCEP at 24 hours from 01/20 at 05/02/2003 at 12 UTC;  
3h forecasts up to 120h of T2m e T at the 1<sup>st</sup> sigma level (Tems);  
CPTEC regional Eta model reanalysis (in 40kmX40km horizontal resolution): temperature at 2 m above the ground (T2m) and wind at 850 hPa and 500 hPa.

## RESULTS

Between January 20<sup>th</sup> and February 05<sup>th</sup> 2003 occurred an intense heat wave over Northern Argentina and Southern Brazil that persisted for more than 9 days.

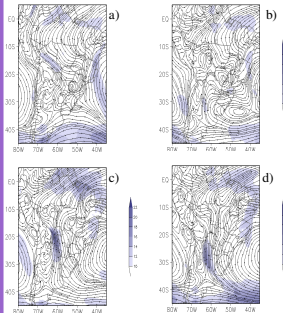


Figure 2: Stream flow and wind magnitude (m s<sup>-1</sup>): a) 20-24 Jan, b) 25-29 Jan, c) 30 Jan-03 Feb, d) 04-08 Feb 2003.

During this period the atmosphere general circulation was driven by a weak El Niño and in the mesoscale was observed an occurrence of a South America Low-level Jet (SALLJ)

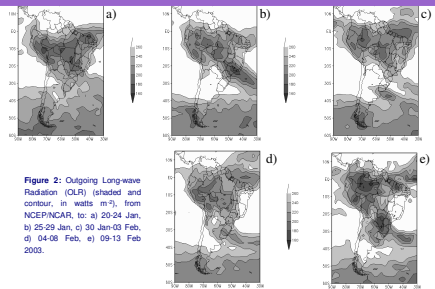


Figure 2: Outgoing Long-wave Radiation (OLR) (shaded and contour, in watts m<sup>-2</sup>), from NCEP/NCAR, a) to 20-24 Jan, b) 25-29 Jan, c) 30 Jan-03 Feb, d) 04-08 Feb, e) 09-13 Feb 2003.

Warm episodes based on a threshold of +/- 0.50C for the Oceanic Niño Index (ONI) in the Niño 3.4 region) are defined when the threshold is met for a minimum of 5 consecutive over-lapping seasons (NOAA, 2007).

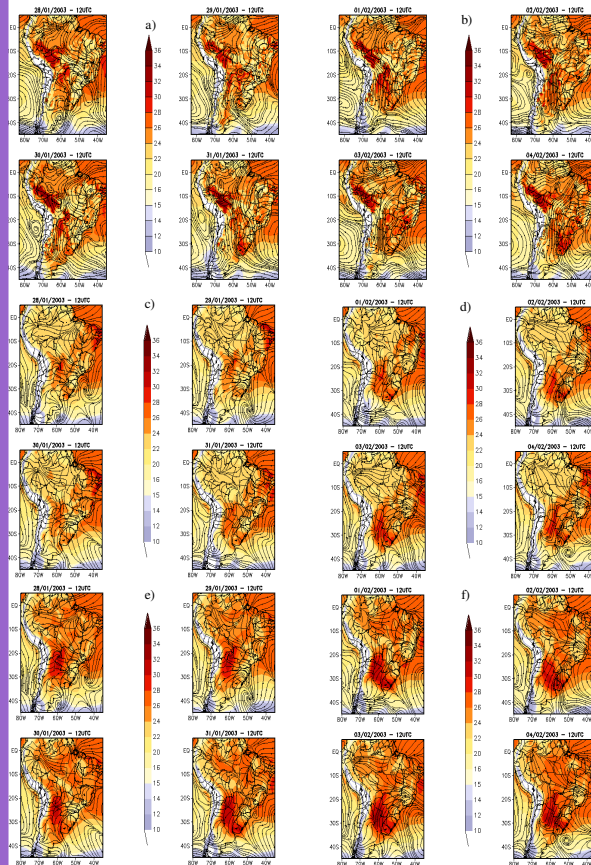


Figure 3: (Top) Stream lines and T2m (C) from Eta-reanalyses to: a) 28-31 January 2003 at 12UTC and, b) 01-04 February 2003; (middle) 24-hour stream lines and T2m (C) forecasts from AGCM-CPTEC valid to: c) 28-31 January 2003 and, d) 01-04 February 2003 at 12 UTC; (bottom) 24-hour stream lines and T2m (C) forecasts from AGCM-CPTEC valid to: e) 28-31 January 2003 and, f) 01-04 February 2003 at 12 UTC.

## CONCLUSIONS

The AGCM-CPTEC underestimate the intensity of the SALLJ, but in general the model predicted the SALLJ in the correct position;

The T2m Eta-fields show relatively higher temperatures since the Northern Bolivia until the Northern Argentina almost every considered period;

In the 24-hour AGCM-CPTEC T2m and Tems forecasts was verified that the region of relatively higher temperatures over the Northern Argentina and Paraguay was well captured by the model during all period;

The Tems forecasts overestimated the values observed in reanalysis, while the diagnosis of T2m agrees better with the reanalysis;

Then, the t2m forecasts present better performance if compared to the Tems forecasts.

There are a tendency of t2m to be lesser than Tems on 12 and 18 UTC (it will be better investigated);

It is necessary a correction to remove the forecast biases to minimize the errors.

## REFERENCES

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