



# THE IMPACT OF THE PHYSICAL INITIALIZATION IN THE GLOBAL ANALYSIS AND SHORT RANGE FORECAST OVER SOUTH AMERICA USING THE GPSAS-CPTEC/INPE INITIAL CONDITIONS



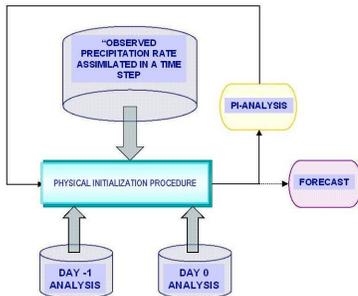
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## Summary

The Brazilian Center for Weather Prediction and Climate Studies seeks to improve its global analysis as well as the short range forecast over South America by assimilating precipitation. The Tropical Rainfall Measuring Mission (TRMM) merged high quality (HQ)/infrared (IR) precipitation estimates were assimilated in the atmospheric general circulation model as an initial test. The experiments were performed using the initial conditions generated by Global Physical-space Statistical Analysis System (GPSAS/CPTEC), for March 2004. Two experiments were carried out: (i) with physical initialization (PI), where the precipitation was assimilated in the region between -40°S to 40°N; and (ii) without physical initialization (no-PI). Evaluations of the impact on the prognostic variables, such as air temperature, specific humidity, and horizontal wind are provided based on comparisons with the control experiment, global analyses, and observations.

### Physical Initialization Procedure



• 24-h pre-integration period of the CPTEC AGCM, with T126L28 resolution;

• Day -1 is referred to the start time of the initialization and Day 0 to the end of the integration and start of the forecast.

• PI domain: region between -40S and 40N;

• "Observed" precipitation: 24-h accumulated precipitation estimation derived of the TRMM satellite.

• PI-CPTEC: includes reverse algorithm for deep convection and Newtonian relaxation.

### CPTEC AGCM 24-h Accumulated Precipitation (mm) - Monthly Mean: March/2004 - IC: GPSAS

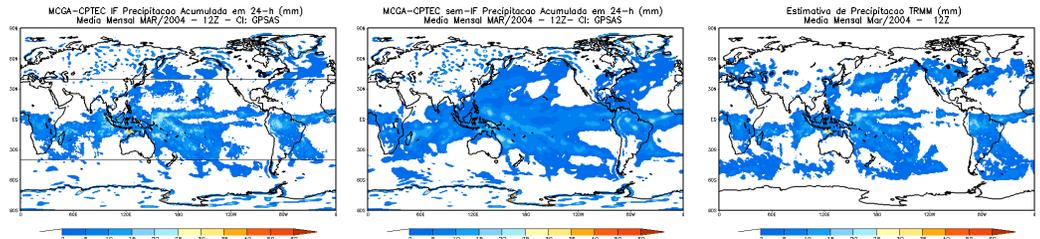


TABLE 1- AGCM-CPTEC vs. TRMM Rainfall Estimation

24-h Accumulated Precipitation (mm): correlation coefficients		
Period	with-PI	no-PI
Monthly Mean: March/2004 (Global)	0.92	0.58

It is observed that the AGCM CPTEC is quite able to assimilate the observed precipitation rain rate, with initial rain rate correlation coefficients exceeding 0.9, while in the control experiment (no-PI), the correlation coefficient were 0.58. These results agree with the results showed in Krishnamurti et al. (1994) and are verified individual cases of heavy precipitation (no presented), as during occurrence Catarina cyclone in the Brazilian coast.

## EXPERIMENTS

• Two experiments were performed: (i) with physical initialization (with-PI) and (ii) without physical initialization or control (no-PI), during month of March 2004. In the period of March 24 to 28 was registered the first hurricane in the of the Brazil, the "Catarina hurricane", with hybrid features of tropical and extratropical systems, which described a significant rainfall episode over South America region.

## RESULTS

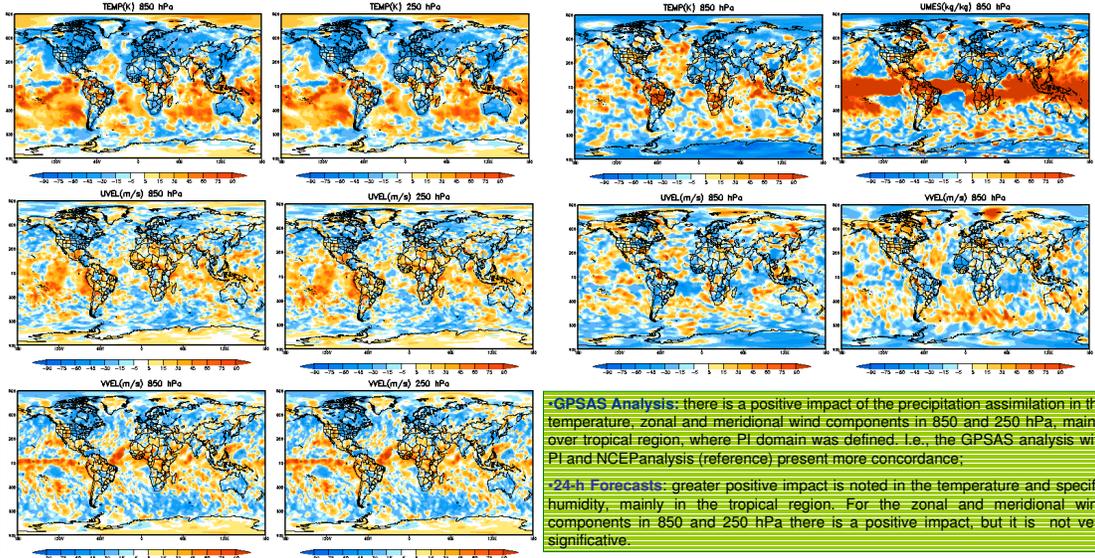
$$IP = \left\{ \frac{\sum_{i=1}^N (C_i - A_i)}{N} - \sqrt{\frac{\sum_{i=1}^N (IF_i - A_i)^2}{N}} \right\} / \sqrt{\frac{\sum_{i=1}^N (IF_i - A_i)^2}{N}}$$

• Comparisons among control experiment, global analysis and observations;

• Sensitivity tests, according to Zapotocny et al. (2005) were applied in order to evaluate the precipitation assimilation impact in the GPSAS Analysis and 24-h forecasts;

• The impact is showed as positive/negative impact in respect to a particular data, in this case, the NCEP global analysis.

### IMPACT OF THE PRECIPITATION ASSIMILATION IN THE GPSAS-CPTEC ANALYSIS AND 24-H FORECASTS



• **GPSAS Analysis:** there is a positive impact of the precipitation-assimilation in the temperature, zonal and meridional wind components in 850 and 250 hPa, mainly over tropical region, where PI domain was defined. I.e., the GPSAS-analysis with PI and NCEPanalysis (reference) present more concordance;

• **24-h Forecasts:** greater positive impact is noted in the temperature and specific humidity, mainly in the tropical region. For the zonal and meridional wind components in 850 and 250 hPa there is a positive impact, but it is not very significative.