

# FIRST RESULTS FROM THE USE OF THE AQUA SOUNDING SYSTEM IN THE CPTEC GLOBAL DATA ASSIMILATION/FORECAST SYSTEM



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## DATA ASSIMILATION IN THE CPTEC

The Center for Weather Forecasting and Climate Studies of the National Institute for Space Research (CPTEC/INPE) is responsible for producing weather forecast in Brazil. The key issue for numerical prediction is related to provide good estimation of the initial conditions for the Numerical Weather Prediction Model. Nowadays, remote sensing data have become the predominant source of information at CPTEC/INPE. The CPTEC operationally uses information from ATOVS/NOAA sounding system to supply the lack of vertical atmospheric profiles. For these reasons a constant effort is made towards incorporating more observations into the operational analysis. This paper presents first results from the use of the AQUA sounding system in the CPTEC global data assimilation/forecast system. Experiments using these data have been conducting to evaluate its impact on weather analysis and forecasting.

## EXPERIMENTAL DESIGN AND VERIFICATION METHODOLOGY SYSTEM

- Analysis: Physical-space Statistical Analysis System (PSAS) , Cohn et al. (1998).
- Forecast: Spectral Atmospheric Global Circulation Model (CPTEC/COLA), Cavalcanti et al. (2002).
- Resolution: T126L28, 100 km in the horizontal with 28 levels in the vertical sigma coordinate.

### EXPERIMENTS

#### CONTROL:

- Conventional data, GTS (T, P, u, v, q);
- ATOVS (temperature and humidity);
- QuikScat data (u and v over the ocean surface);
- Total Precipitation Water (TPW).

#### EXPERIMENT 1:-

- Add vertical profiles from the AQUA sounding system (version v4 of the algorithm retrieval);
- Convert T(p), q(p) to thickness
- Considers the first guess height field for the anchoring of the AIRS/AMSU geopotential profile;
- Height of surface, which would be exactly the first guess is not included in the observation vector.

#### EXPERIMENT 2:-

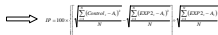
- Add vertical profiles from the AQUA sounding system (version v4 of the algorithm retrieval);
- Used directly AIRS/AMSU geopotential profile;
- The height of surface is included in the observation vector.

#### PERIOD:

- March, 2004.

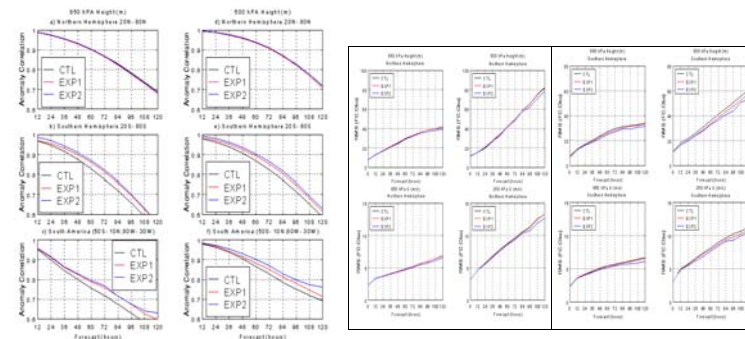
#### VERIFICATION

- Anomaly Correlation; Root Mean Square (verification against observation);
- Impact statistics as in Zapotocny et al., 2005



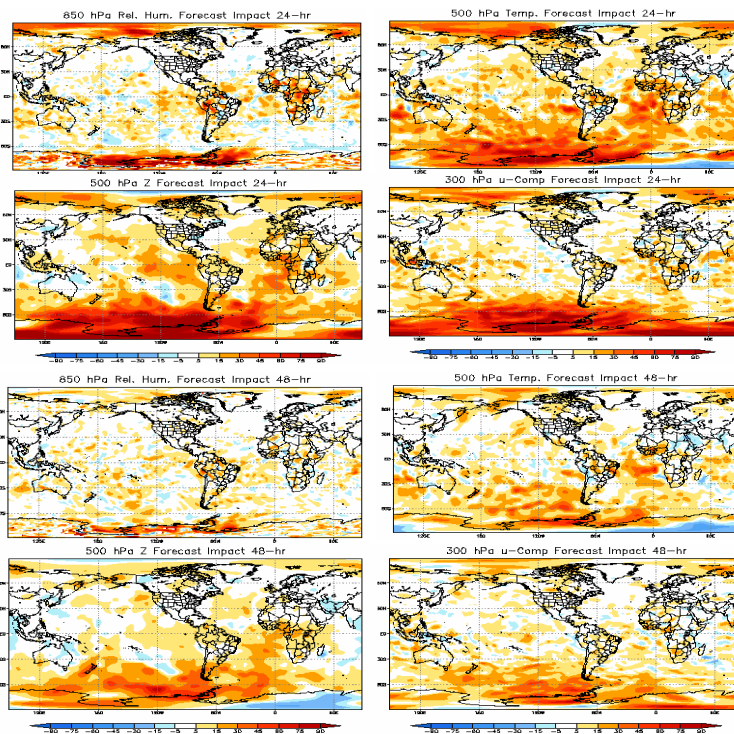
## RESULTS

The results from the initial experiments using AQUA data indicate significant improvements in forecast skill over the Southern Hemisphere, more specifically over South America, compared with the experiment without AIRS/AMSU retrievals. The improvement in forecast skill at four days in Southern Hemisphere is equivalent to gaining an extension of forecast capability of six hours. In agreement, the impact analysis clearly indicate an improvement in the quality of the forecasts, mainly in the South Hemisphere, when AIRS/AMSU retrievals are enclosed in the assimilation/forecast system.

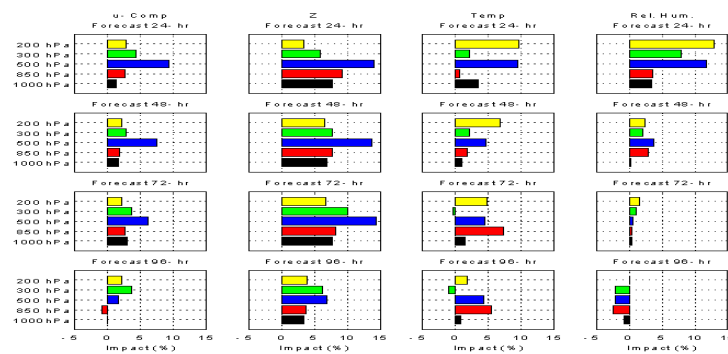


Geopotential anomaly correlation scores at 850 hPa and 500 hPa, over Northern Hemisphere (1a and 1d), Southern Hemisphere (1b and 1e) and South America (1c and 1f).

Geopotential at 850 hPa, and 500 hPa, and zonal wind components at 850 hPa, and 250 hPa, forecasts errors as verified against radiosondes, over the northern hemisphere (right) and southern hemisphere (left).



Geographic distribution of the forecast impact (%) for the 850 hPa relative humidity, 500 hPa temperature, 300 hPa zonal wind component, and 500 hPa geopotential. Forecast periods: 24 and 48 hours.



Forecast impact (%) for the zonal wind component, the height geopotential, the temperature, and the relative humidity at 1000 hPa, 850 hPa, 500 hPa, 300 hPa, 200 hPa levels. Forecast periods: 24, 48, 72, and 96 hours.

## REFERENCES

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- Kelly, G., et al. OSE of all main data types in the ECMWF operational system. *Third WMO Workshop on the Impact of various observing Systems on Numerical Weather Prediction*, WMO, Austria, 9-12, March, 2004.
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## ACKNOWLEDGEMENTS

