CURRENT STATUS AND FUTURE PLANS FOR THE CPTEC GLOBAL ENSEMBLE PREDICTION SYSTEM

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1. Introduction

The CPTEC global Ensemble Prediction System (EPS) was implemented operationally for extended weather predictions at the beginning of the year 2000. This system makes use of the Empirical Orthogonal Functions (EOF) for the perturbation of a deterministic high-resolution control initial condition provided by NCEP. Over the years, the CPTEC global EPS was applied in several research investigations and was subject to improvements and updates. The most important update was perturbation of new variables in target regions. These improvements allowed the CPTEC global EPS to run in operational mode providing extended global weather forecasts (up to 15 days). CPTEC participated in the THORPEX/TIGGE project, thus its EPS has a global visibility and was used in comparison and validation studies along with EPSs of several other providers, like NCEP, CMC, ECMWF, KMA, JMA and MetOffice. The last developments at the TIGGE participating centers regarding the global EPS technique for numerical weather prediction include the application of coupled systems and data assimilation, which allows the perturbations to be updated at each analysis cycle using an ensemble of forecasts in a hybrid method. CPTEC has plans to upgrade its global EPS and is already working in this direction. A review of its current status is given as well as a future perspective envisioning new developments and the demands from the scientific community.

2. Current Status of the CPTEC Global Ensemble Prediction System

In its current version, the CPTEC global EPS uses an improved version of the EOF based perturbation technique, which includes perturbations for the surface pressure, horizontal wind components, specific humidity, and air temperature. These perturbations are applied over the Northern/Southern Hemispheres, the Tropical region and the north and south portions of South America (Mendonça and Bonatti, 2009; Cunningham et al., 2015). Figure 1 shows an example of the Continuous Rank Probability Skill Score for the air temperature at 850 hPa of the current version (oensMB09) in comparison with the previous version (oens_MCGA) and a new test one (oensMB09_mcga4.0).

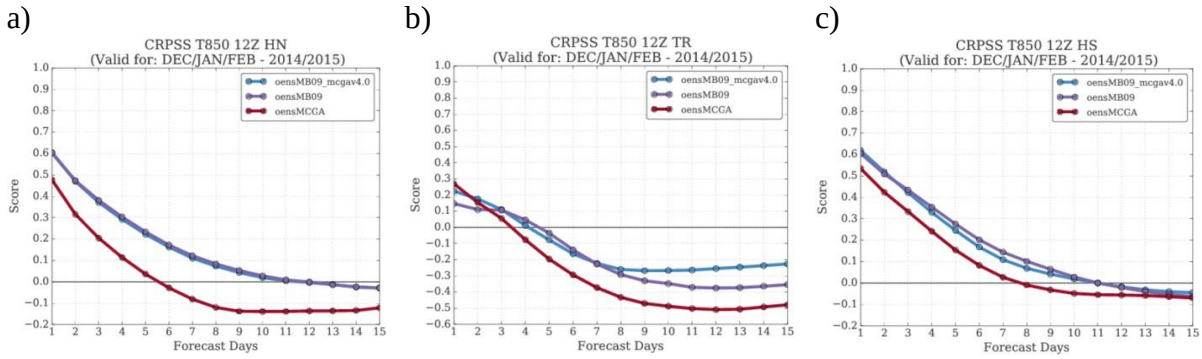

Figure 1. Continuous Rank Probability Skill Score for three different global EPS experiments, using the global circulation model from CPTEC. The oensMB09_mcga4.0 refers to the new CPTEC global EPS with the BAM model (Figueroa et al., 2016), the oens_MB09 refers to the current setup (as of April 2016) of the operational EPS system at CPTEC and the oens_MCGA refers to the previous version (as reported in Hagedorn et al., 2012).

3. Future Plans for the CPTEC Global Ensemble Prediction System

As CPTEC is making plans to move its global data assimilation system towards a hybrid 3DVar, an evolution to its global ensemble prediction system can also be envisioned. Currently, the CPTEC global EPS for extended range is not coupled with any other system (e.g., land-surface or ocean models). In terms of data assimilation, as CPTEC is updating its operational atmospheric data assimilation system, a land-surface data assimilation scheme is also in test to provide updates to the soil moisture conditions used within the BAM model (Figueroa et al., 2016) analysis. A hybrid 3DVar system was already successfully tested with the BAM model and is based on an Ensemble Kalman Filter (EnKF) system to draw the ensemble covariances. Some experiments were made in order to test the ability of this new system to provide a continuous ensemble of analysis for the extended range numerical weather prediction. Although the system was successfully run in a TQ0062L028 model resolution, it was found that a proper choice of the system configuration was needed to achieve at least the same ensemble system performance as using the EOF based perturbation (as shown in Figure 1). This upgrade in the global EPS for CPTEC is under investigation and will be released in the next years. As a main advantage, the upgraded system will benefit of a modern modeling framework in which a data assimilation system will be used to provide the model analysis.

A complete evaluation of the current system is published as an internal report at the National Institute for Space Research (INPE). For the near future, CPTEC has plans to upgrade the model version of the EPS, using the same version that is in use for the deterministic forecast (as reported in Figueroa et al. 2016). This upgrade will also carry an increase in the model horizontal/vertical resolution to TQ00213L042 (roughly 60 km near the Equator). As CPTEC global EPS is moving to a new model version and resolution other minor improvements are being made to the system related to bug corrections and adjustments in the perturbation method. As soon as an initial validation of this new system version is complete, a specific report will be made in order to show the complete system progress to the THORPEX community.

References

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