UPDATED ACTIVITIES ON LONG RANGE CLIMATE FORECAST AT THE BRAZILIAN CENTER FOR WEATHER FORECASTING AND CLIMATE STUDIES (CPTEC/INPE) – 2005 REPORT

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The Brazilian Center for Weather Forecasting and Climate Studies (CPTEC) of the National Institute for Space Research (INPE) is a center that has been developing, producing and disseminating real time weather forecasts, as well as seasonal climate forecasts during the last 10 years. In previous documents prepared to WMO, the basic prediction system and the main Long Range Forecast (LRF) activities were reported. In this workshop, the new implementations at CPTEC referring to Long-Range Forecasts were presented and discussed. One of the changes in the LRF system was the change of the climatology period. The climatology of 10 years (1982-1991) was substituted by a 50 years climatology (1951-2001), and became operational in 2004. The probabilistic forecast is now issued considering 33 years (1965 to 1997) of this 50 years period. Other changes are related to the improvements in the model and new techniques of model results analysis. Some changes are still being tested before operational implementation.

The main results for the LRF are obtained from a numerical model, but a statistical model, SIMOC, is also used for prediction in two regions of Brazil, Northeast and Southern Brazil / Uruguay and Northern Argentina. The current numerical model is the spectral CPTEC/COLA AGCM, with resolution of T62 L28. The initial conditions for the numerical model are taken from global NCEP analysis of 15 consecutive days. The model is run with persisted SST as well as predicted SST anomalies for the same 15 initial conditions.

Climate prediction from the AGCM are issued each month considering one month lead and the forecasting outputs are available up to 6 months. The seasonal forecast is issued one month before the beginning of the validity period and results are presented for each three month combination during the 6-months forecasts. The LRF results are expressed in probabilistic as well as in deterministic form. Deterministic Long-Range Forecasts are presented in maps of anomalies, considering the ensemble mean of all members obtained from the CPTEC AGCM Ensemble Prediction System (EPS). Precipitation, temperature and geopotential anomaly maps are available at CPTEC homepage (www.cptec.inpe.br) for the globe and also for several regions of the world. Global potential velocity forecasting field has been incorporated in the routine outputs. Precipitation and temperature anomalies are also presented in maps with a mask covering regions without statistical significance. A new product, removing the average bias of the previous 3 forecasts has been prepared in an experimental procedure. Preliminary results have shown an improvement in the results.

The probabilistic categorical forecasts are prepared as terciles, for South America, considering the period of 1965 to 1997, for precipitation and temperature. Another new product is the time-series of precipitation anomalies for each member, the ensemble mean, the ensemble standard deviation and the observed anomaly, in a specific region, for every 3-months model simulation results from 1951 to 2000. Then, the results of three-month forecasts are compared, considering the ensemble mean and members anomalies. This shows how the forecasting for that specific 3-months compares to the past period simulation.

New maps of correlation anomalies of precipitation were also prepared considering the 1965-1997 period from the 50 years long-run simulation and CRU dataset. Maps of ranking probability skill score (RPSS) for each three-month were also introduced as a new product for verification. The seasonal prediction has also been performed, in an experimental way, using the AGCM with the Grell ensemble convection scheme, replacing the Kuo scheme. A new AGCM that

has been developed at CPTEC, based on CPTEC/COLA AGCM, but with a different structure of integration, has been tested for climate simulations using resolution of T126L42. The efficiency of this model is much higher than the operational one, and allow higher resolution runs. Model results with other implementations, as soil moisture and new vegetation fields are still being analyzed.

Three-months deterministic prediction of precipitation, temperature and geopotential anomalies for different regions of the world (North America, South America, Australia, Europe, Asia, Africa and Global) are available at CPTEC web site (www.cptec.inpe.br). The probabilistic forecasts are made only for South America, and the consensus categorical forecasts, only for Brazil, indicating probabilities of above the normal/near normal/below the normal rainfall. The final consensus map is prepared together with the Brazilian National Meteorological Institute (INMET), based on forecasts provided by CPTEC dynamic and statistical models, as well as analyzing numerical seasonal forecasts from other meteorological centers. The seasonal forecasts are available by request and several meteorological services in South America access our products regularly.

There is a lack of observed data over South America, mainly from radiosondes. The increase of soundings over the continent would benefit the weather and seasonal forecasts, introducing better initial conditions for the integrations.

Climate research and applications are in continuous development at CPTEC, and new forecasts products are obtained. New techniques and physical parameterizations in CPTEC AGCM are tested and implemented as part of the operational routine activities, as soon as they are validated. Efforts are made to improve the seasonal prediction in several parts of the continent through the application of new methods of model results analysis and data assimilation, together with running improved versions of the model.