CLIMATE MONITORING AND PREDICTION AT CPTEC

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Monthly to Seasonal prediction have been performed at CPTEC every month since January 1995, using CPTEC/COLA AGCM. Horizontal resolution of T62 and 28 levels in the vertical are also used in the climate forecasts. The seasonal predictions at CPTEC, during the first 3 years, were results of an ensemble of 4 members, using 4 consecutive days as initial conditions, running the model on the SX3-NEC supercomputer. In 1998 there was an increase in the number of members, with the prediction based on 25 integrations, using the SX4-NEC supercomputer. The application of boundary conditions also changed, from the use of persisted SST anomalies, to predicted SST. The Tropical Pacific predicted SST, performed by the NCEP coupled atmospheric/oceanic model, and the Tropical Atlantic predicted SST performed at CPTEC using the statistical model, SIMOC, are used in months when this statistical model presents high skill (Fig.1). Although the AGCM gives global predictions, the models were designed and focused on two regions considered key for Brazilian economy: Northeast Brazil and Southern Brazil. Regional institutions have direct access to the climate and weather forecasts, so they can be used for planning activities such as weather managing, seeds distribution, etc. A scheme of the climate prediction at CPTEC is shown in Fig.2.

Another model, used in daily weather forecasts, a limited area model, ETA, has been tested for regional climate prediction purposes. Several simulations experiments with the AGCM have been performed   to assess the model response related to interannual variability, mainly to El Nino and La Nina conditions and the anomalies over South America.

Distribution of weather and climate forecast is made by the bulletins issued by CPTEC: Daily weather forecasts regional bulletins and Monthly climate bulletins: Analyses of monthly weather and climate are published in CLIMANALISE journal, directed towards scientific and non-scientific users. Since 1998, the seasonal predictions for the rainy season of Nordeste (Northeast Brazil) have been published in the Experimental Long- Lead Forecast Bulletin, edited by COLA, in two issues during the year (march and december). The predictions are also distributed by mail and are available on internet. In addition, we have continuous and periodical meetings, some of them held via videoconference from CPTEC, for discussions regarding the climate forecasts consensus for Northeast Brasil, and the South-Southeast of South America. Several meetings have been held and the interaction of Brazilian scientists from CPTEC, National Service and universities with their counterparts from Argentina, Uruguay, Paraguay, Chile, and under the sponsorship of the International Research Institute (IRI) have produced climate forecasts for those two regions. This consensus has been made based on climate forecasts from dynamics and statistical models, together with the local input from scientists, and their results are made public via internet and via the press, to all level of users from the central governments, the managers of hydroelectrics, to farmers.

The seasonal climate forecasts from CPTEC have been pretty successful since their implementation. Several agencies have used CPTEC's products for the planning

of agricultural and economic activities during the agricultural year. An example of seasonal prediction is given in Fig.3. The intense drought in Northern and Eastern Northeast during the March-May 1998 rainy season was well forecasted by the model. Observed precipitation is shown in Fig.4. The dipole of anomalies northeast/south which usually occurs in El Nino years, was well reproduced by the model. Seasonal forecasts are issued also for southern Brazil where La Nina tends to produce deficient rainy conditions. Local and central government take this forecasts seriously on their planning activities.

On weather issues, CPTEC also makes a continuous monitoring of weather systems that may be hazardous for human activities such as convective systems that may produce excessive rains and floods in large cities, or cold fronts and cold surges that sometimes bring polar air and freezes on the agricultural areas of southern and southeastern Brazil where coffee, sugar cane, soy bean and oranges are cultivated. Brazil is the main worldwide coffee producer and exporter, and intense freezes such as those of July 1975, and June and July 1994 have affected production and made prices to go up high on the main world stock markets.

CPTEC/INPE products are available at the homepage http://www.cptec.inpe.br. This page contains information on the activities of CPTEC, as well as satelite images, weather forecasts charts from the AGCM and ETA limited area model, monthly observed precipitation and temperature of Brazil, bulletins and seasonal prediction. Application activities have been performed in projects as the monitoring risk of fires in the entire country (PROARCO) and the monitoring of soil moisture conditions and climate conditions in Northeast Brazil (PROCLIMA). PROARCO is an effort between CPTEC and the Brazilian Institute for the Environment (IBAMA) and consist on the monitoring and processing climate and weather conditions to elaborate charts of risk of fire for the entire country, but with main focus on the regional called Deforestation Arc, that includes several Amazonian states and parts of the states in southern Amazonia where "cerrado" (savanna) vegetation type grows, and that are prone to fires. A model implemented by INPE's specialists is used in order to process local observations (conventional, satellite) and to feed a model that produces a map of fire risk. This model also feeds some other ecological models. The PROCLIMA program is an effort between CPTEC and the Agency for Development in Northeast Brazil (SUDENE), and consists in the elaboration of maps of soil moisture produced by water balance models, with the input of more than 800 rainfall stations, soil and vegetation conditions from RADAM BRASIL, and information from the automatic weather and hydrology stations, as well as from satellite, implemented on a GIS framework for the states that are part of the Nordeste region. The level of detail goes from the entire region to the local level. These two programs are response of specific needs of the central Brazilian government, and the products are available via internet free of cost.

PROSUL is another important project, sponsored by IAI, which can bring a great contribution to climate applications in the southeastern South America through the interaction among scientists of several countries, exchange of data, experiences and collaborative studies.