

WORLD METEOROLOGICAL ORGANIZATION

COMMISSION FOR BASIC SYSTEMS

OPAG ON DATA PROCESSING AND FORECASTING SYSTEMS

WORKSHOP OF GLOBAL PRODUCERS OF LONG-RANGE FORECASTS

FINAL REPORT



Jeju Island, Republic of Korea
10-14 October 2005

EXECUTIVE SUMMARY

A Workshop of Global Producers of Long Range Forecasts was held, at the kind invitation of the Republic of Korea, in Ramada Plaza Hotel in Jeju Island from 10 to 14 October 2005. Twenty participants representing operational Long-range Forecast producers and two regional centres attended the workshop.

The purpose of the workshop was explained. Today there were 14 centres producing operationally global long-range forecasts and this workshop was to be a forum for discussions between GPCs and present users. The WMO representative said that in his opinion, one of the WMO roles, was to ensure that GPCs' products were fully used to provide prediction to WMO Members Countries, through their national meteorological services, to contribute to disaster prevention and mitigation (like severe climatic conditions), and to contribute to better social-economic planning that accounts for variable climatic conditions. One outcome of the workshop should be that the exchange of results for use, verification and expected feedbacks become better organized and more defined. The verification system would be explained and debated. The expectations of Regional Climate Centres and National Meteorological Centres would be described and their requirements will be considered. GPCs should also know how to be prepared for recognition by the WMO Commission for Basic Systems. It was suggested to the GPCs' representatives attending the workshop that they consider producing a statement of requirements and a document describing their functions, techniques and production to seek recognition as official GPC by the next CBS session planned for October 2006.

Producers (14 Centres) of operational LRF presented their achievements and some described their plans for the near future. A CD-ROM was produced at the end of the workshop, which contains all the presentations of the participants and some reference documentation. The Centres expressed their observation data needs and clarify products availability. The forecasting techniques were explained: 2-tier versus 1-tier, optimum ensemble, multi-ensembles/multi-models, etc...

Two regional centres: New-Dehli and Nairobi presented their activities as examples of direct users of GPC products, and also as generator of LRF using means other than NWP, which, in fact, were efficient statistical models applied on specific regions.

The whole Standard Verification System for Long Range Forecasts was presented and summarized. Goal, scope and details of the scores exchange were outlined. Examples of application were presented. The three level of the exchange were reviewed. It was stated by the Lead Centre that although they are open to suggestion and modification, the current SVSLRF version was frozen. The participants agreed the existing system should be implemented. The web site was nearly operational and the exchange should begin in the following weeks. The plan for the GPCs, once the exchange has officially started, was to submit Level 1 and 2 the year of the implementation (i.e. 2006). The level 3 and the level of significance is to be added a year after (i.e. 2007).

The workshop considered also the experiments, which took place and those, which were currently developed for using multi-model ensembles for long-range forecasting. The lesson provided by the passed DEMETER project were presented. The ENSEMBLES project was explained and the APEC Climate Centre (APCC) objectives and developments were described.

The workshop was then divided in four discussion sub-groups. Four parallel sessions took place, which elaborated a set of recommendations that were debated in plenary. The Sub-groups and their main recommendations were:

(A) GPCs needs:

- Investigation into the significance of soil moisture evolution on seasonal to interannual prediction.
- Land surface has been demonstrated to have an influence on seasonal to interannual prediction skill – such sets need to be exchanged between GPCs as improved description of the uncertainties in the initial state.
- WMO Resolution 40 – GPCs need clarification on essential and additional data dissemination (essential data may be from list of minimum requirements for GPCs, and additional data may be used for commercial use).
- It is recommended to expedite RCC nominations – they are the main users of GPC products (so that GPCs can know to whom products should be provided).
- Clarification on relative roles of GPCs, RCCs and NMHSs

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REPORT OF THE WORKSHOP OF GLOBAL PRODUCERS OF LONG-RANGE FORECASTS

Jeju Island 10-14 October 2005

Opening

1. A Workshop of Global Producers of Long Range Forecasts was held, at the kind invitation of the Republic of Korea, in Ramada Plaza Hotel in Jeju Island from 10 to 14 October 2005. Twenty participants representing operational Long-range Forecast producers, and two regional centres attended the workshop (see Annex I). The programme of the workshop can be found in Annex II. The workshop was opened Monday 10 October 2005 at 9. a. m. by Dr Byung-Sun Kim, Director General of Climate Bureau of Korea Meteorological Administration (KMA), on behalf of Dr Kyung-Sup Shin, Permanent Representative of the Republic of Korea with WMO.

1.1 Dr Kim welcomed the participants and stressed that there was always a need to move forward in generation, exchange and verification of long-range forecast products. He wished every effort be undertaken to improve long range forecasting to enable users to have more time to prepare and adapt to severe climatic conditions as well as still permit development of economical growth. This workshop had to discuss methodology and techniques, data exchange issues, and make proposals for necessary new actions or activities to be implemented. He also recalled that KMA was hosting the APEC Climate Centre (APCC) and that KMA was fully committed to share information with all the countries to achieve mitigation of effects of all disasters. He wished a good stay in Jeju for all the participants.

1.2 The WMO Secretariat representative, Mr Joel Martellet, expressed the gratitude and appreciation of the WMO to the Government of the Republic of Korea and its Permanent Representative with WMO, for the kind invitation to host this workshop of Global Producing Centres of Long Range Forecasts (LRF). He also thanked all the staff of KMA who helped with the planning and arrangement of the excellent facilities for the event, especially Mr Yun-ang Chung, Mr Dong-chul Shin and Miss Eun-jin Choi. He welcomed all the participants from all over the world and the staff of KMA to this workshop. He recalled that during its last session (February/March 2005), the Commission for Basic Systems stressed the need to move forward in the generation, exchange and verification of long-range forecast products, among global producing centres of LRF and CBS re-stated that it should be discussed in a workshop. Almost all GPCs were represented in this workshop and also some regional centres and national meteorological centres. He said it was most appropriate to hold this workshop in the Republic of Korea, since as GPC and also as host of the APCC centre, the Republic of Korea had special responsibilities and experience in this domain.

1.3 The purpose of the workshop was explained. Today there were 14 centres producing operationally global long-range forecasts and this workshop was to be a forum for discussions between GPCs and present users. The WMO representative said that in his opinion, one of the WMO roles, was to ensure that GPCs' products were fully used to provide prediction to WMO Members Countries, through their national meteorological services, to contribute to disaster prevention and mitigation (like severe climatic conditions), and to contribute to better social-economic planning that accounts for variable climatic conditions. One outcome of the workshop should be that the exchange of results for use, verification and expected feedbacks become better organized and more defined. GPCs should also know how to be prepared for recognition by the WMO Commission for Basic Systems. The GPCs will also express their observation data needs, clarify products availability and refine exchange procedures. The forecasting techniques will be discussed, if possible, like 2-tier versus 1- tier, optimum ensemble, multi-ensembles/multi-models. The verification system will be explained and debated. The expectations of Regional Climate Centres and National Meteorological Centres will be described and their requirements will be considered. The WMO representative wished the workshop would be useful for the participants, for the World Weather Watch Programme as well as for the Climate Programme. He wished the participants an excellent stay in the nice Jeju Island.

3.2 BRAZIL - CPTEC

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.