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Request for Designation of the South African Weather Service (SAWS) as a Global Producing Centre (GPC)

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Summary and purpose of document

This document "The document describes the proposed nomination of a Global Producing Centre for Long-Range Forecasts."

Request for Designation of the South African Weather Service (SAWS) as a Global Producing Centre (GPC)

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1. Introduction

The South African Weather Service (SAWS) has recently established a state-of-the-art objective multi-model prediction system. This forecasting system includes the ECHAM4.5 atmospheric general circulation model (AGCM) that is routinely run in ensemble mode on the NEC SX-8 computer at the SAWS. The model code was obtained from the Max-Planck Institute for Meteorology (MPI), Hamburg, Germany and has been running operationally at SAWS since 2007 (http://www.weathersa.co.za/LONGTERM/lrf.html).

2. Response to criteria for GPC recognition:

a. Fixed production cycles and time of issuance:

The model is initialized using the atmospheric initial conditions acquired from the European Centre for Medium-Range Weather Forecasts (ECMWF). The AGCM is run as a two-tier forecasting system that uses forecast and persisted sea-surface temperature (SST) anomalies as lower boundary conditions. The forecast SST fields are acquired from the International Research Institute for Climate and Society (IRI) forecasting suite, and the persisted SST fields from optimum interpolation (OI; version-2) data (Reynolds, *et al*. 2002). The AGCM runs once every month to construct a 12-member ensemble for lead-times ranging from 1 to 6 months.

The SAWS's AGCM forecasts therefore have a fixed production cycle and issuance time. The AGCM is configured in such a way that it provides objective global probabilistic forecasts for a wide range of products for three-month rolling seasons updated every month. These products meet the requirements as stipulated by the Manual on the GDPFS and recommended to Vol. 1 Part II, APPENDIX II-6.

b. Limited set of products as determined by the revised Appendix II-6 of the *Manual on the GDPFS*;

In addition to the simulation data mentioned above, 1-month lead-time forecasts were created to produce a 6-member ensemble forecast set over the period 1981 to present. Persisted SST anomalies (IO) were used to force the AGCM. Each ensemble member consists of 6-month hindcasts (i.e., 1-6 month lead-times).

To satisfy the conditions required for Global Producing Centre recognition, operational seasonal forecasts are currently based on 12 ensemble members at 1-, 2- and 3-month lead-times. Forecasts fields are available for:
1. 2 meter air temperature (t2m),
2. minimum temperature,
3. maximum temperature, and
4. precipitation.

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The 12 members are a result of forcing the AGCM with both forecast and persisted SST anomalies with 6 initial atmospheric states each.

In addition to providing probabilistic tercile forecasts for the abovementioned variables, 2 meter temperature and precipitation expressed as anomalies and percentage of normal are also provided for the specified lead-times (http://www.gfcsa.net/saws.html). In addition, 500hPa height, MSLP and the temperature at the 850hPa level are available on request. All parameters are expressed as a seasonal mean of anomalies from the model climate, except for precipitation which is expressed as an anomalous seasonal accumulation. Forecast parameters are provided on a 2.5° by 2.5° global grid in appropriate file format.

c. Provide verifications as per the WMO Standard Verification System for Long-Range Forecast;

Verification was first performed on the simulation (AMIP-2 type) model climate period 1979-2001 for the variables t2m and precipitation and made available on the SAWS web since 2007: (http://www.gfcsa.net/SAWS/SVSLRF/SAWS_SVSLRF.htm).

Following the completion of the 26 years 1-6 month lead-time forecasts, the computation of the verification scores for levels 1 and 2 becomes possible and we are in the process of redesigning the html code to reflect the changes. Similarly these verification scores are ready for submission to the Lead Centre for Standard Verification System for Long-Range Forecasts.

d. Provide up-to-date information on methodology used by the GPC;

The ECHAM4.5 AGCM model description is widely documented in the literature. The operational configuration employs the forecast and persisted SST anomalies as boundary conditions. The forecast SST is an ensemble average of models included in the International Research Institute for Climate and Society (IRI) forecasting suite. The model set-up and other technical aspect have been presented in various workshop and forums. The following publications are also available:

Landman, W. A., M.-J. Kgatuke, M. Mbedzi, A. Beraki, A. Bartman & du Piesanie A. 2008: Performance comparison of some dynamical and empirical downscaling methods for South Africa from a seasonal climate modelling perspective (International Journal of Climatology, in press)

Landman, W. A., Engelbrecht, F., Beraki, A., Engelbrecht, C., Mbedzi, M. & Gill, T. & Ntsangwane, L., 2008: Model output statistics applied to multi-model ensemble long-range forecasts over South Africa, Water Research Commission Report, in press.

e. Make products accessible through the GPC Web-site.

The probabilistic ECHAM4.5 AGCM forecasts are available via the SAWS web site:
http://www.weathersa.co.za/LONGTERM/lrf.html

Additional products related to verification scores are available at:
http://www.gfcsa.net/SAWS/SVSLRF/SAWS_SVSLRF.htm

The SAWS is in the process of implementing a new website over the next few weeks, so these URLs will change soon. Such changes will be announced when they occur.

3. Conclusion

The SAWS adheres to all the criteria, as listed in the Manual on the GDPFS, Vol. I, Part II, APPENDIX II-8 with recommended amendment, to be recognized as a Global Producing Centre of Long-Range forecasts.

3. References

Final Report of the Joint Expert Teams on Long-Range Forecasting (infrastructure and Verification), CBS OPAG on Data Processing and Forecasting Systems (Beijing, April 2008)

Reynolds, R. W., N. A. Rayner, T. M. Smith, D. C. Stokes and W. Wang, 2002: An improved in situ and satellite SST analysis for climate. J. Climate, 15, 1609-1625.

WMO pub. 485, Manual on GDPFS, Volume 1