



Monthly Probabilistic Forecast in Ethiopia using GLOBO



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OVERVIEW

Since April 2015, Climate & Geospatial Research Directorate (CGRD) of the Ethiopian Institute of Agricultural Research (EIAR) in collaboration with the Institute of Atmospheric Sciences and Climate (ISAC) of the Italian National Research Council (CNR) launch monthly ensemble experimental forecasts for Ethiopia.

Ethiopian monthly ensemble forecasts are produced once a week using the atmospheric general circulation model GLOBO developed at CNR-ISAC.

The products includes weekly mean sea level pressure, temperature (at 2m & 800hpa), and accumulated precipitation anomalies. 15 day terciles of 2m temperature and accumulated rainfall are also provided.

MODEL DESCRIPTION

The GLOBO model is a grid-point hydrostatic Atmospheric General Circulation Model (AGCM) on a uniform mesh in geographic coordinates.

A full description of the dynamics and physical parameterizations of the model is given by [Malguzzi et al. \(2011\)](#).

The GLOBO model has been revised and updated in several physical and numerical aspects. In particular, upgrades mainly concerning the radiation ([Morcrette et al., 2008](#)), cloud and stratiform precipitation schemes have been introduced recently.

REFERENCES

Malguzzi, P., A. Buzzi and O. Drofa, 2011: The meteorological global model GLOBO at the ISAC-CNR of Italy: assessment of 1.5 years of experimental use for medium range weather forecast. *Wea. Forecasting*, 26, 1045-1055.

Mastrangelo, D., P. Malguzzi, C. Rendina, O. Drofa, and A. Buzzi, 2012: First outcomes from the CNR-ISAC monthly forecasting system. *Adv. Sci. Res.*, 8, 77-82.

Morcrette, J.-J., H.W. Barker, J.N.S. Cole, M.J. Iacono, and R. Pincus, 2008: Impact of a new radiation package, McRad, in the ECMWF Integrated Forecasting System. *Mon. Wea. Rev.*, 136, 4773-4798.

DATA & METHODS

Initial Conditions

Initial conditions are derived from the 00 UTC analysis and subsequent forecasts of the GFS model of National Oceanic and Atmospheric Administration/National Centers for Environmental Prediction (NOAA/NCEP).

Forecasting Strategy

An ensemble of GLOBO forecasts is employed to obtain an experimental probabilistic (ensemble) monthly prediction. A total of 40 forecast members is obtained from GFS-NCEP analyses by using 10 members for each synoptic time of the initialization day.

The model is employed in this ensemble mode with a horizontal resolution of 1.0 x 0.75 degrees, and 50 vertical levels.

The monthly forecasting system is based on an ensemble technique aimed at forecasting the probability distribution of atmospheric parameters in the extended range. Forecast anomaly of a single variable is computed by removing from the forecast ensemble mean the modelled climatology of the month obtained through reforecast simulations initialized with ERA-Interim reanalyses. The forecast method is described in ([Mastrangelo et al., 2012](#)).

The anomalies of the atmospheric parameters are referred to the 1981-2010 climate. They are calibrated based on reforecasts that are initialized every 5 days using the ECMWF ERA-Interim dataset and cover the same 30-year period.

PRELIMINARY RESULTS

Starting from April 2015, the GLOBO model has been implemented to provide experimental monthly ensemble forecast over Ethiopia, which are produced once a week. Some of the forecast products are presented here.

Mean Sea Level pressure

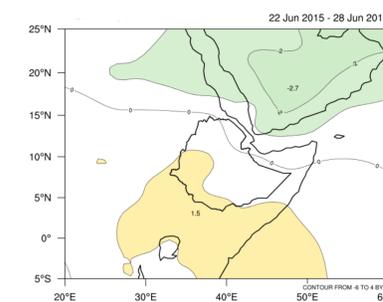


Figure 1: Weekly MSLP forecast ensemble mean (contours) and anomaly (colours)

850 hPa Temperature

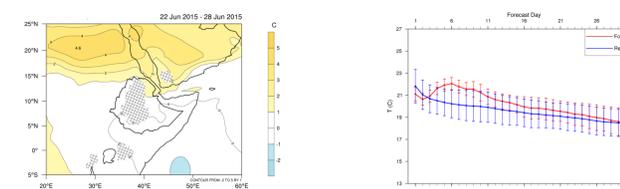


Figure 2: Weekly temperature anomaly at 850 hPa

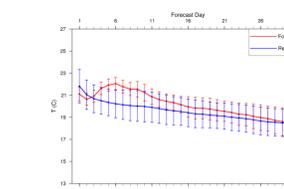


Figure 3: 850hPa temperature Ensemble mean and standard deviation averaged over 2-15N X 32-45E

Accumulated Precipitation

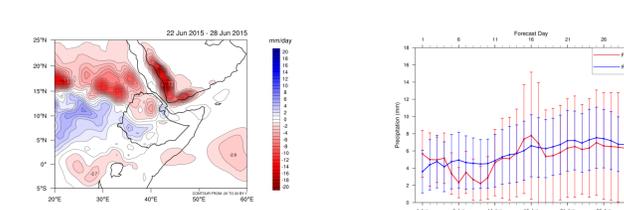


Figure 4: weekly accumulated precipitation

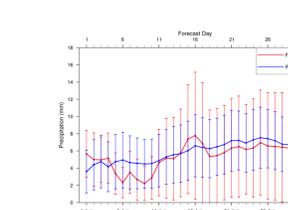


Figure 5: Precipitation Ensemble mean and standard deviation averaged over 2-15N X 32-45E

2 meter Temperature

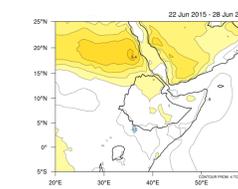


Figure 6: Weekly temperature anomaly at 2meter

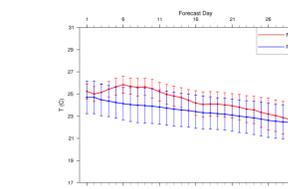


Figure 7: 2meter temperature Ensemble mean and standard deviation averaged over 2-15N X 32-45E

The monthly forecasts archive of all of the products can be found at <http://www.isac.cnr.it/dinamica/projects/forecasts/monthly/eth/#>

THE WAY FORWARD

In the near future, the following issues will be addressed.

- Inclusion of relative humidity forecast product, which is useful in prediction of pest and diseases outbreak
- Research on convection in the tropical belt and its representation in hydrostatic models, & GLOBO in particular
- Forecast verification and calibration
- Establishment of a high resolution experimental forecast using BOLAM limited-area model