Application of the CFSR to calibrate and enhance GEFS Anomaly Forecast Products

Malaquias Peña
IM Systems Group at the Environmental Modeling Center, National Center for Environmental Prediction

Yuejian Zhu, Bo Cui and Bo Yang
Environmental Modeling Center, National Center for Environmental Prediction

For many years, EMC has provided ensemble-based probabilistic forecasts to guide medium range predictions. While ensemble mean and spreads are the most common products for general users, the detection and prediction of extreme weather events is another useful product to obtain from the ensemble. Obtaining extreme weather-related information from the ensemble is complicated by the fact that the probabilities derived from the ensemble do not reveal whether a certain value is an extreme in the observed climatological probability distribution. Several approaches have been applied including the Extreme Forecast Index (EFI) developed at ECMWF. In the EFI scheme, the probabilities are compared to the model climate (so called M-climate) distribution for the chosen location, time of year and lead time. The assumption here is that, if a forecast is anomalous or extreme, relative to the M-climate, the forecast weather is also likely to be extreme compared to the real climate. Another method is to rank forecast anomalies according to local climate (Hart and Grumm, 2001). In this approach, a normalized departure from climatology is defined based on reanalysis data. The most extreme events (and highest ranking) will be those with the largest departure from climatology.

The probability and anomaly forecasts derived from the NCEP Global Ensemble Forecast System (GEFS) are bias corrected (the first moment only) and then related to the climatological probabilities. Thus, this product depends heavily on the accuracy to compute climatologies at each gridpoint. Currently, climatologies are derived from the NCEP/NCAR 40-year (1959-1999) reanalysis data (Zhu and Toth 2005). Figures of probabilistic forecasts for certain variables are posted in a non-operational website: http://www.emc.ncep.noaa.gov/gmb/yzhu/html/opr/pqpfeval.html. Plans to enhance this product include standardizing the ensemble distribution using the NCEP Climate Forecast System Reanalysis (CFSR) archive from 1979 to 2010 (Saha et al. 2010) and perform statistics of the success of these products. A description of the method and comparison with other similar products such as the Extreme Forecast Index will be presented. Tests of the methods with the GEFS and NAEFS forecasts for week-2 and beyond are been tested.

Corresponding Author:

Name: Malaquias Peña
Organization: IM Systems Group at the Environmental Modeling Center, National Center for Environmental Prediction
Address: Room 807, NOAA World Weather Building (WWB), Science Center,
5200 Auth Road
Camp Springs, MD 20746-4304
USA