

Preliminary Results of Evaluation of Week 3-4 Reforecast Data from Environment Canada

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1. Introduction

This study supports the current experimental Climate Prediction Center (CPC) week 3-4 temperature and precipitation outlooks, which are released once per week and focus on mean climate conditions anticipated for a two week forecast period. CPC is preparing to add realtime forecasts of the Global Ensemble Prediction System (GEPS) from the Environment Canada (EC) to its set of week3-4 forecast tools. An assessment of the GEPS reforecast is a first step in this process.

2. Model and Data Procedure

The GEPS reforecast was implemented at the Canadian Meteorological Center (CMC) of Environment Canada operations in December 2013 (see Gagnon *et al.* 2015). The main goal of the reforecast procedure is to generate a historical dataset that is representative of the current operational GEPS forecast. GEPS forecasts are an integral part of the collaboration with the United States National Centers for Environmental Prediction (NCEP) in the North American Ensemble Forecast System (NAEFS) project.

The reforecast dataset used in this study is the extension reforecast initialized once per week on Thursdays (2016 calendar) out to 32-days. There are 4 members (1 control run with 3 perturbation runs) at 1x1 spatial resolution. We evaluate the variables of 2m temperature, surface precipitation, 500 hPa and 200 hPa heights. We estimate model mean bias as well as derive skill information from the ensemble mean over the reforecast period (1995-2014). For comparing with observations, the verification data used are the CPC's unified temperature, CPC land only gauge-satellite merged precipitation data, and CDAS reanalysis for 500 hPa and 200 hPa heights.

3. Results

In order to assess model forecast ability, mean biases for the week 3-4 forecast period were calculated from model climatology (1995-2014) of the ensemble mean (4 member averaged) for each IC to against the observed climatology. For convenient discussion and easily displaying, seasonal model biases of 4 variables were averaged for DJF, MAM, JJA and SON. The difference of the ensemble mean bias with observations averaged over the CONUS for week1-4 for each initial time was also investigated. In general, there is a cold bias over western North America in 4 seasons and a warm bias over the central U.S. in MAM, JJA and SON. For precipitation, a wet bias is over eastern North America in winter, spring and summer, but a dry bias is indicated over the central CONUS in JJA and SON.

Anomaly correlations were calculated to represent the ensemble mean forecast skill for DJF, MAM, JJA and SON of 2m temperature and precipitation from GEPS. The anomalies are uncalibrated but remove the model systematic errors by the reforecast from 1982-2014. The forecast skill of week3-4 temperature is relatively low on average over the U.S. (see Fig. 1). The forecast skill of precipitation is even lower than that of temperature, which is similar to the assessment results of ECMWF and JMA models.

4. Summary

Since September 2015, CPC has prepared and experimentally disseminated Week 3-4 U.S. temperature and precipitation outlooks once per week. In order to apply bias correction methodologies, it is important to obtain process and evaluate reforecast datasets so that dynamical model systems can contribute to this Week

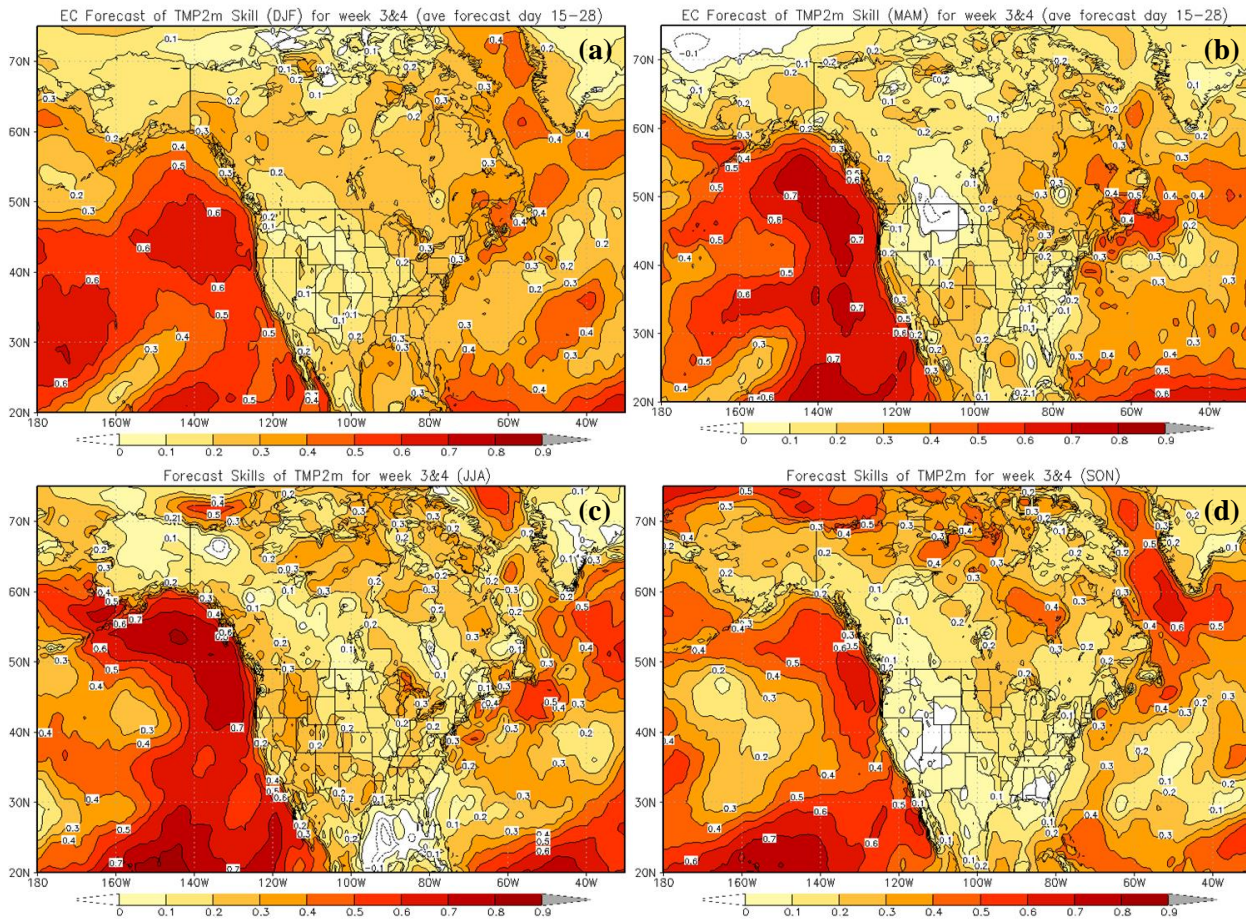


Fig. 1 Week 3-4 forecast skill of 2m temperature for (a) DJF, (b) MAM, (c) JJA and (d) SON seasons.

3-4 effort. We present preliminary results using the Environment Canada (EC) Global Ensemble Prediction System (GEPS) reforecast data that extends to 32 days. These reforecasts are produced once per week, ranging from 1995-2014 and including 4 members. Two meter temperature, precipitation and 500 hPa height were evaluated. Both temporal and spatial verification information is presented. As compared to observations, the GEPS exhibits a cold bias for western North America and a wet bias over eastern North America. The GEPS reforecast skill for Week 3-4 is relatively low, on average, over the U.S. and similar to that of models from other operational centers. Forecast opportunities, however, do exist in some regions and seasons.

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References

Gagnon, N., and Co-authors, 2015: Improvement to the Global Ensemble Prediction System (GEPS) reforecast system from version 3.1.0 to version 4.0.0. Canadian Meteorological Centre Technical Note.