Preliminary subseasonal temperature forecast verification

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SUMMARY

Funded by a NOAA SBIR grant, CFAN has developed a new daily temperature forecast product for U.S. cities, out to 35 days. The forecast is a multi-model solution based on calibrated forecasts from the ECMWF and NOAA CFSv2.

Verification of the seasonal forecasts for daily minimum and maximum surface air temperature (T_{min}, T_{max}) was conducted for the period during May through July of 2018. CFAN's calibration shows significant improvement over the raw model forecasts, particularly for T_{min}, which has large overall errors for both models. The best performing stream for most lead-times in the final solution is the calibrated ECMWF, although inclusion of the calibrated CFS improves the forecast for T_{min} for some regions. When averaging over all U.S. cities, CFAN's multi-model solution is better than climatology for all lead times, with better overall skill for T_{min}. Regional variations show greatest skill for SW (T_{min}), SE (T_{min}), SC, PR, MW (T_{min}). Error statistics also vary with individual locations and for different weather situations. The summer season has typically been characterized by relatively low forecast error; we anticipate different verification statistics for the colder seasons.

INTRODUCTION

In 2015, CFAN received a NOAA SBIR grant to improve subseasonal forecasts for the energy sector. The project is now complete, and CFAN is in the process of implementing these advances into our operational subseasonal forecast product.

CFAN has developed a new subseasonal temperature forecast product for the U.S., which is issued twice weekly for 296 U.S. cities:

- Table data for daily maximum and minimum temperatures, out to 35 days
- Temperature forecast uncertainty plumes out to 45 days
- Heat wave and cold wave probabilities for 4 different thresholds out to 45 days
- Verification statistics for the past 60, 90 days for each lead-time.

This report focuses on the station level daily maximum and minimum temperature forecasts. The forecasts use both ECMWF and NOAA CFSv2 forecasts. A 1-2-4-2-1 filter is applied to each forecast stream. Each filtered forecast stream is then calibrated using the historical hindcasts provided by ECMWF and NOAA and also near real-time station observations. A consensus forecast is obtained using an adaptive regression weighting scheme, using the filtered and calibrated streams from both CFSv2 and ECMWF.

REGIONAL VERIFICATION STATISTICS

Verification statistics (Mean Absolute Error) are provided below, for CFAN's daily T_{min} and T_{max} forecasts for 296 U.S. cities for May through July 2018. Forecast statistics are provided for the entire U.S. and individually for 7 regions (Figure 1).

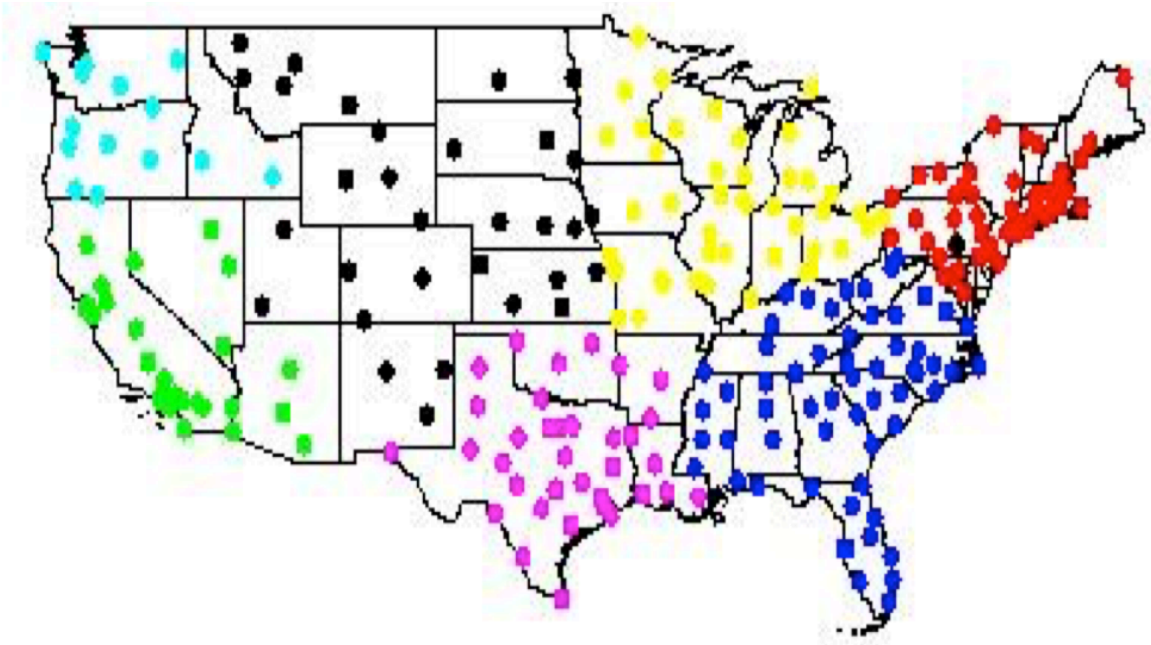

Figure 1. Locations of U.S. cities included in each of the 7 regions. **Northeast**, **Southeast**, **Midwest**, **South Central**, **Plains/Rockies**, **Southwest** and **Northwest**.

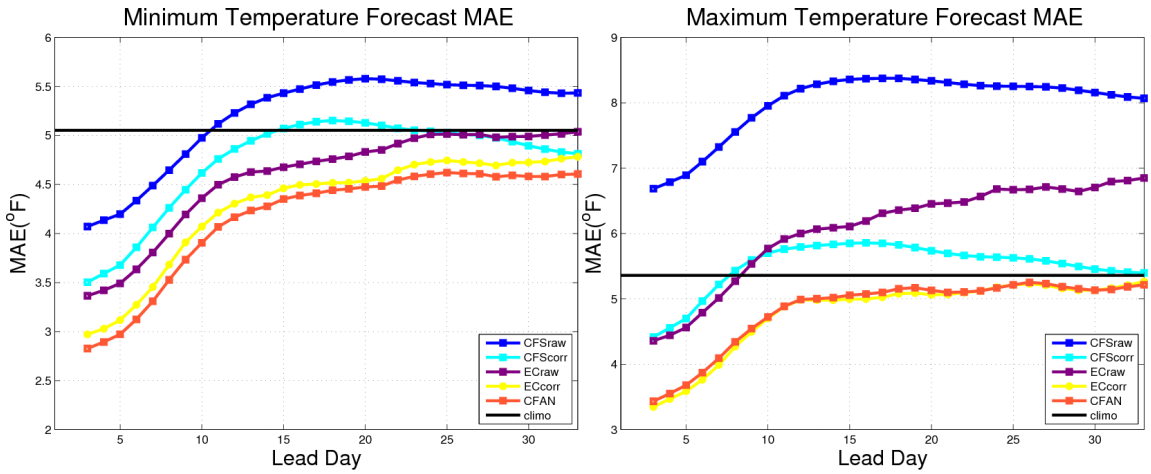

Figure 2. Mean Absolute Error for CFAN's temperature forecasts, for all U.S. cities for the period May – July, 2018.

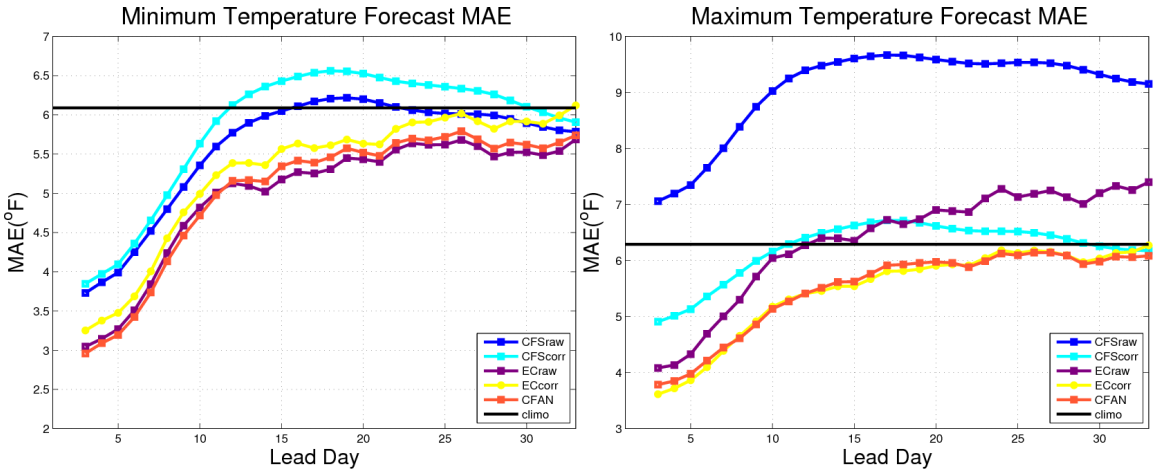

Figure 3. As in Figure 2, but for the Midwest region.

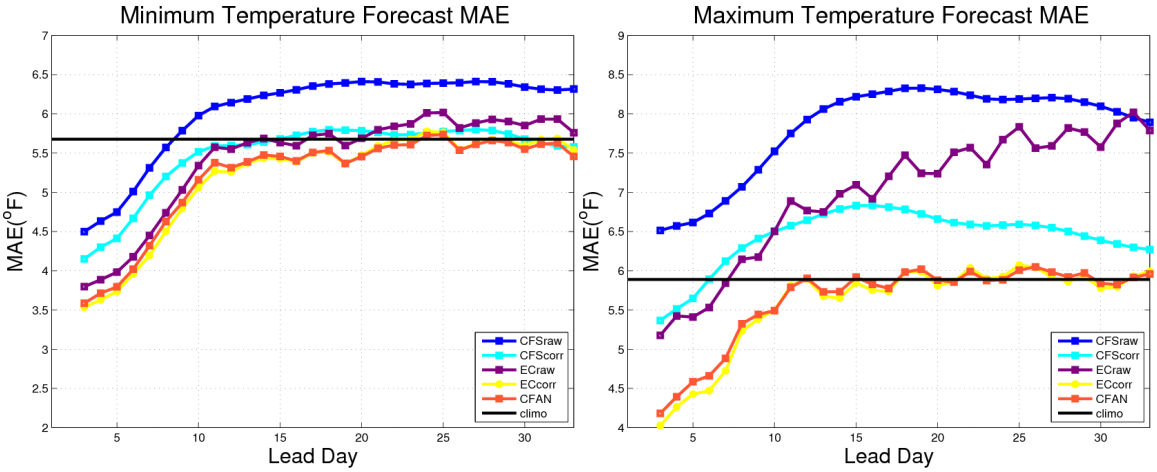

Figure 4. As in Figure 2, but for the Northeast region.

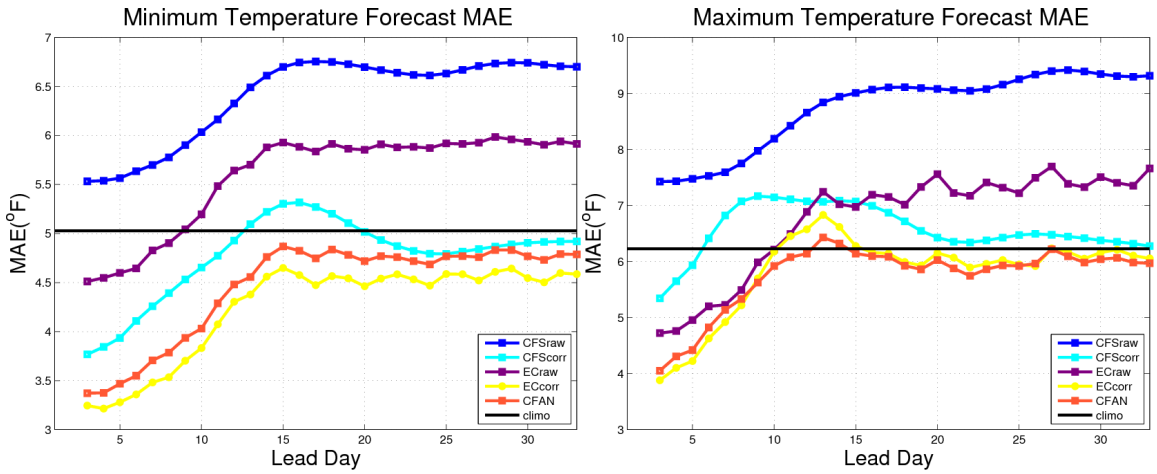

Figure 5. As in Figure 2, but for the Northwest region.

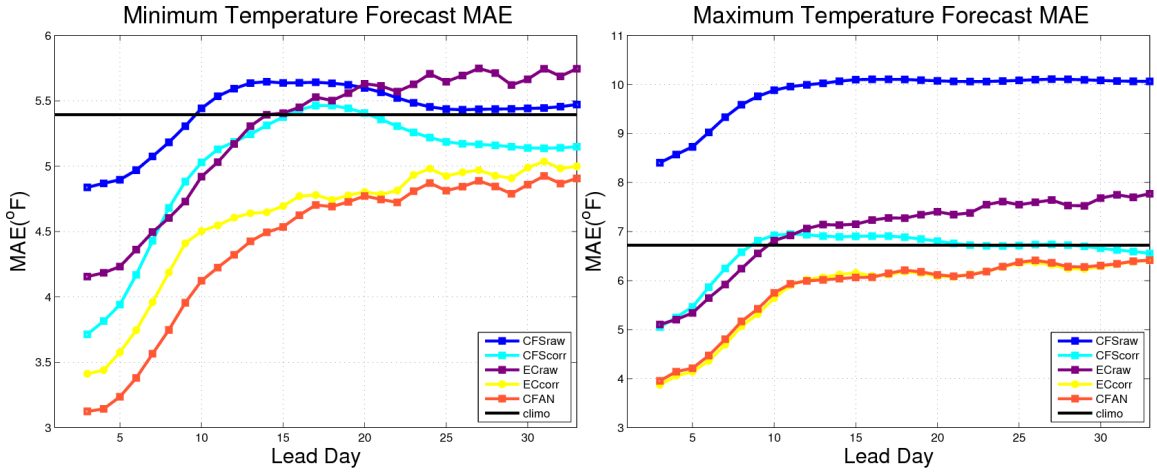

Figure 6. As in Figure 2, but for the Plains Rockies region.

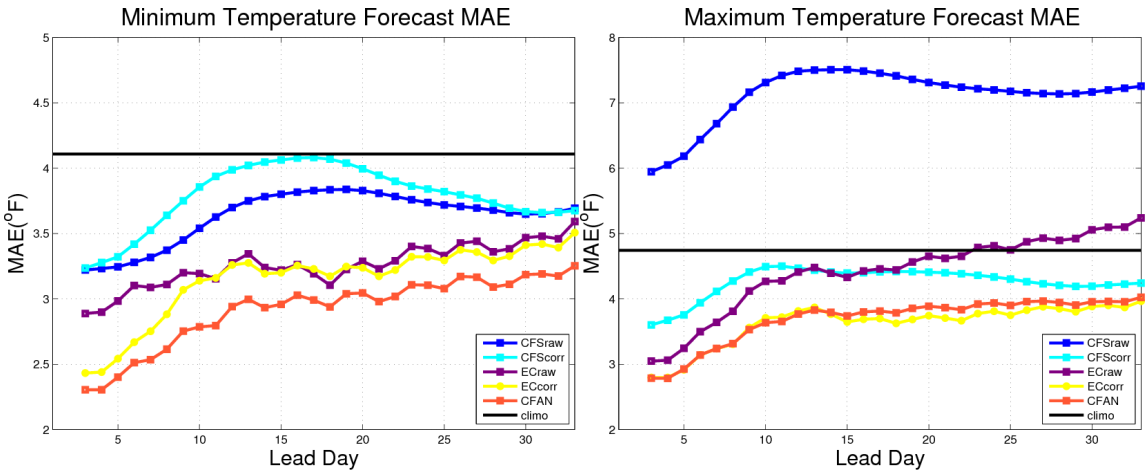

Figure 7. As in Figure 2, but for the South Central Region.

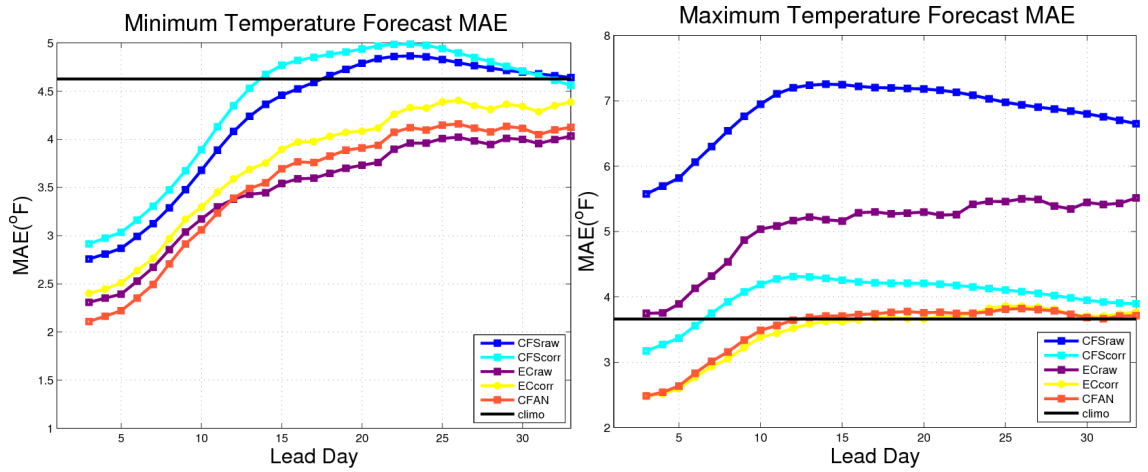

Figure 8. As in Figure 2, but for the Southeast Region.

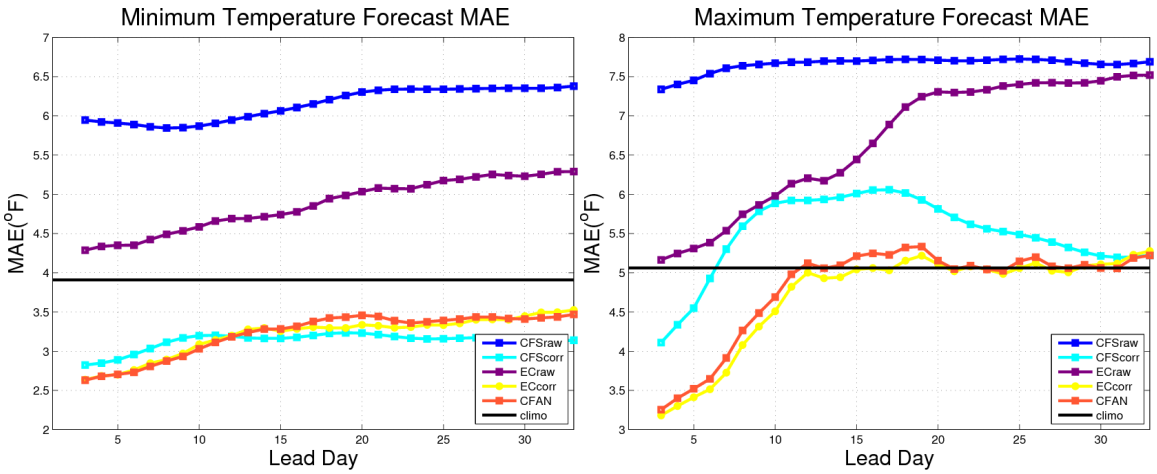

Figure 9. As in Figure 2, but for the Southwest region.