Performance of MaxT, MinT, and Td Model Guidance for Extreme Southwestern California for December 2007 through January 2008

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Introduction

The intent of this effort was to provide forecasters information on the performance of selected model inputs to MaxT, MinT, and Td forecasts during the cool season and to evaluate the performance of these inputs relative to the official forecasts. This two month period (Dec. 2007 – Jan. 2008) was characterized by alternating periods of drier, offshore flow and moist onshore flow, sometimes with precipitation. This is quite typical of the winter season in Southern California. Without a consistent, dominant pattern, bias correction would be expected to perform poorer than during times of the year with a more persistent pattern.

Models evaluated included DGEX, ECMWF, GFS40, MOSGuide, NAM12, SREF, WRF (local workstation WRF model run at 4-km horizontal resolution with NAM12 boundary conditions), and their respective bias-corrected (BC) forecasts.

Each field was evaluated across all land areas of the NWS San Diego forecast area (Figure 1). In addition, each field was also evaluated across four smaller, geographically similar areas (coast, valleys, mountains, deserts). The intent was to determine if performance of a particular model was similar across the entire forecast area or was better for some areas and not as good for others.

Evaluation was performed using BOIVerify 2.0 (Barker, 2007).

Performance for MaxT

In evaluating performance for MaxT (Figures 2-4), a number of items of interest were noted:

- Bias- correction provided improvement for each model at all time periods
- The best guidance was better than the official forecast at all time periods, but by less than one degree at all time periods
- NAM12BC and MOSGuideBC were better than the official forecast at all time periods for which each were available
- MOSGuideBC, GFS40BC, and NAM12BC performed similarly through Day 3 and were all better than the official forecast
- For Days 4 and 5, GFS40BC was slightly better than MOSGuideBC
- For all of the better guidance, performance was similar for each of the smaller geographic areas

One odd thing noted in the official forecasts for days 4 through 6 was a deviation from the typical pattern of the forecast errors slowly increasing with time. During this period, it appears the night shift forecasts improved the inherited day shift forecasts. It is not known if some difference in grid population strategies of different foreasters might have contributed to these results.

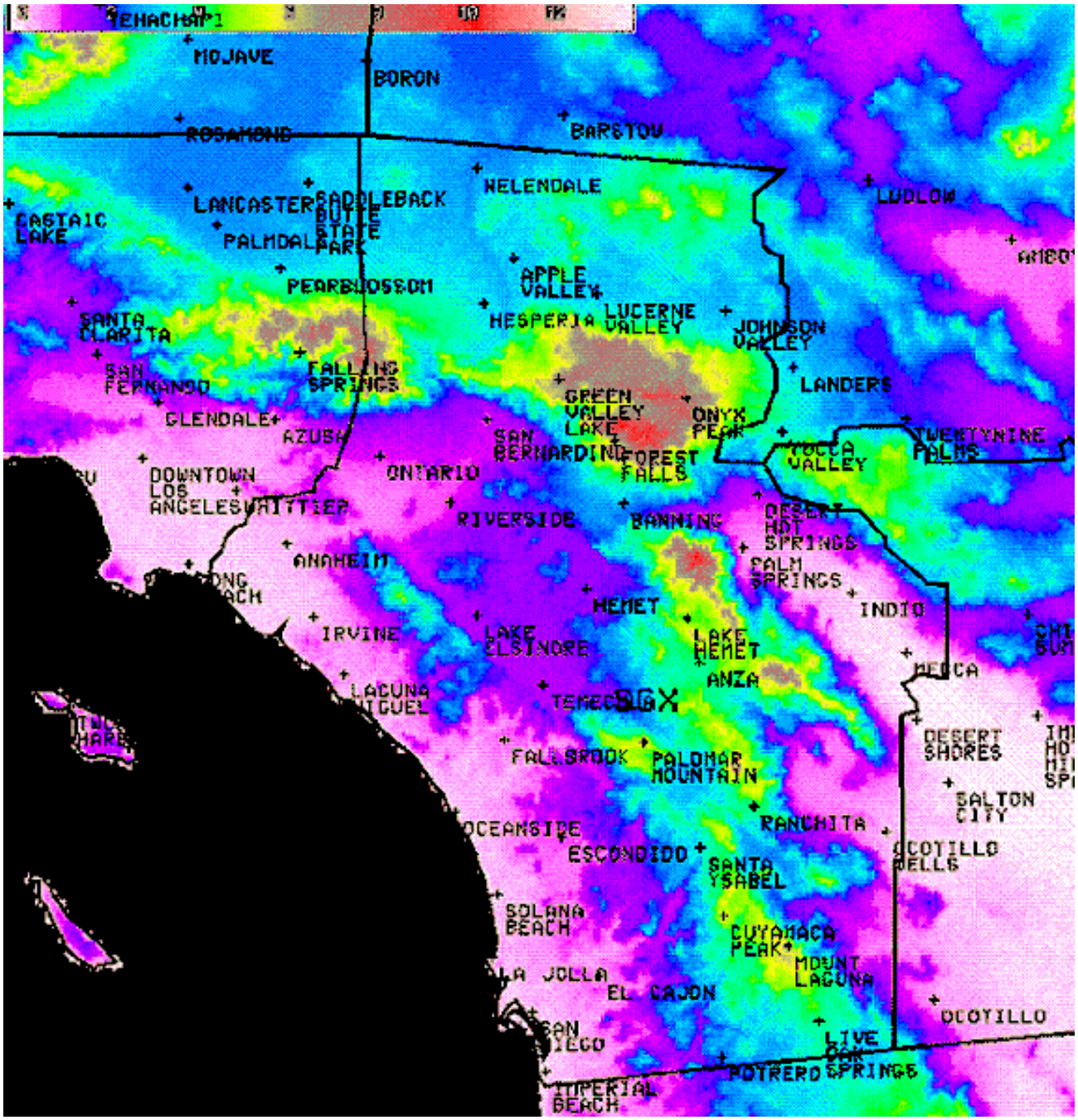

Figure 1 – Terrain map of the WFO SGX CWFA. Color coding in the legend is in thousands of feet MSL.

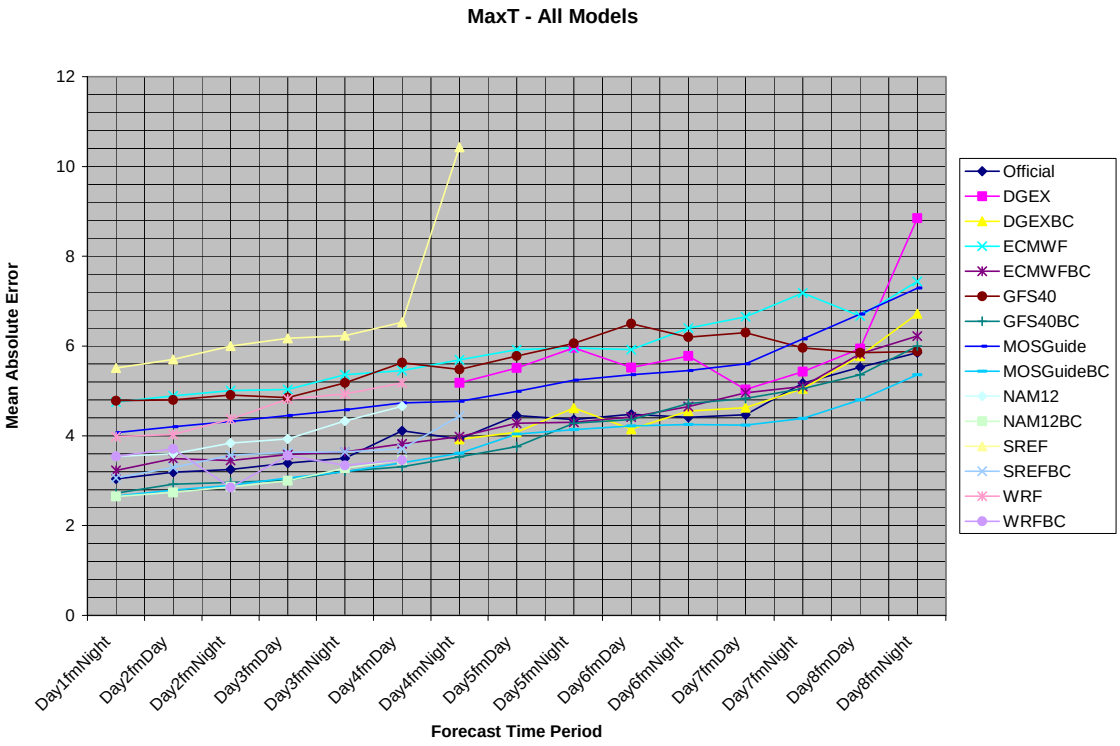

Figure 2 – MaxT - All Models

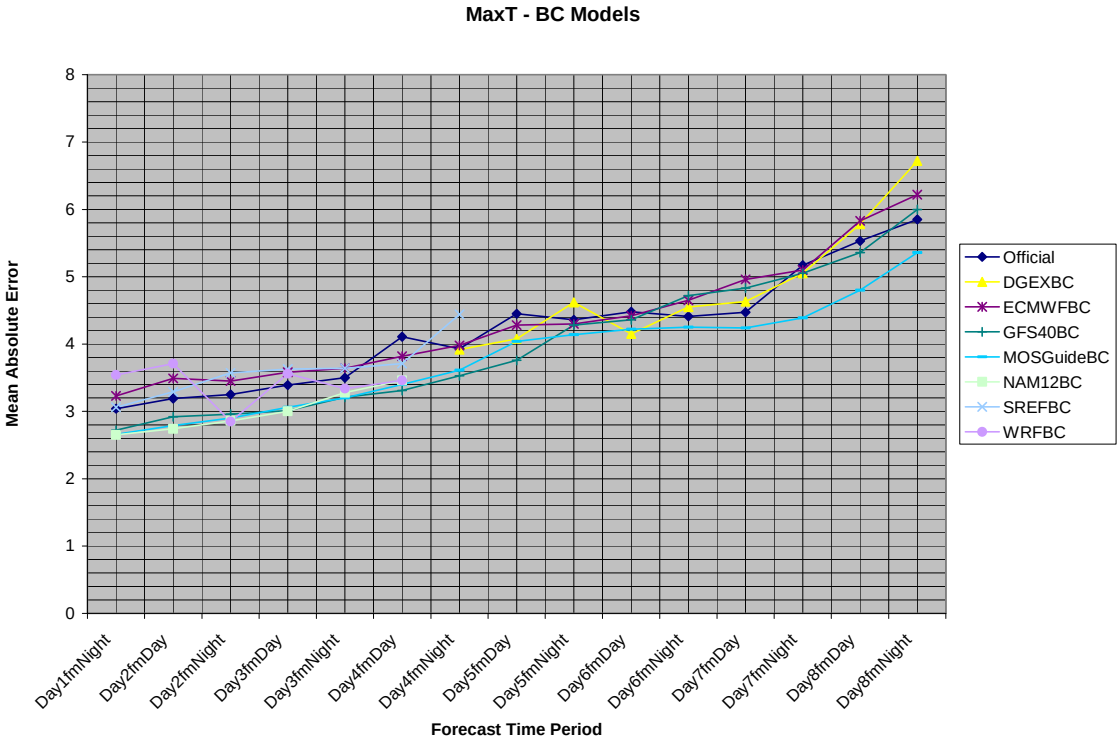

Figure 3 – MaxT - BC Models

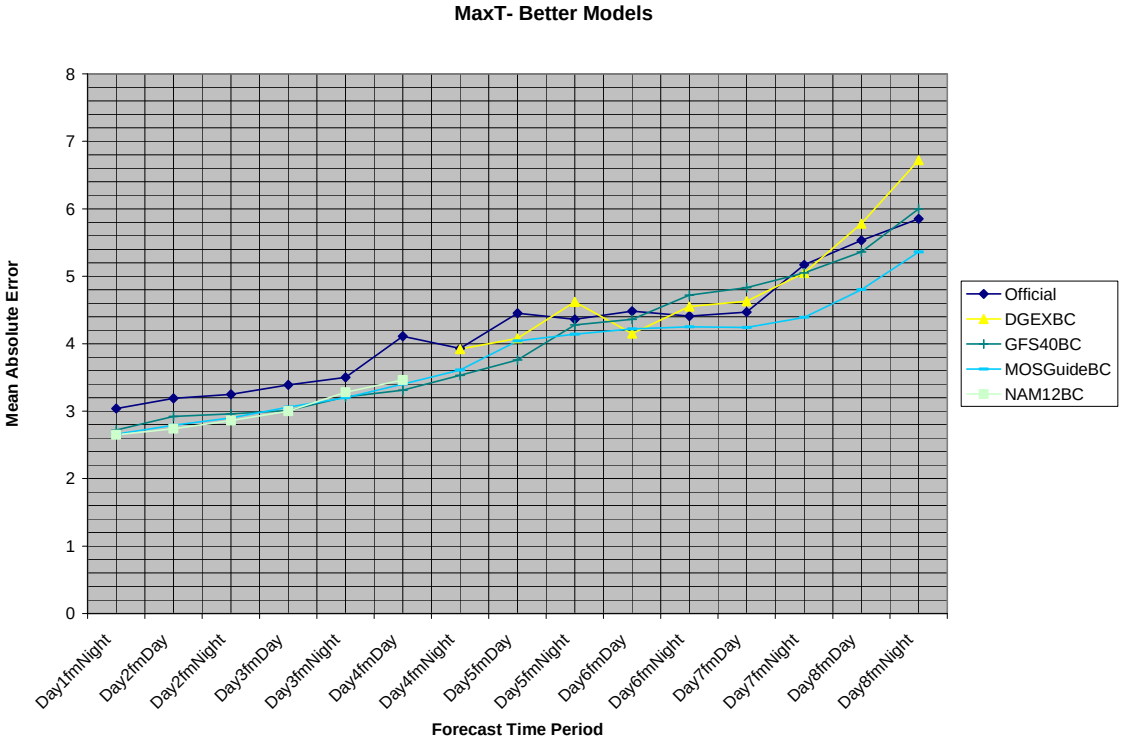

Figure 4 – MaxT - Better Models

Performance for MinT

In evaluating performance for MinT (Figures 5-7), a number of items of interest were noted:

- Bias- correction provided improvement for each model at all time periods except for MOSGuide near the end of the extended where MOSGuide and MOSGuideBC were similar
- The best guidance was better than the official forecast at most time periods, but by a very small margin, no more than three tenths of a degree.
- MOSGuideBC was better than the official forecast at all time periods except the end of the extended
- SREFBC also provided very good guidance in the shorter term, but was not as good as MOSGuideBC
- For all of the better guidance, performance was similar for each of the smaller geographic areas

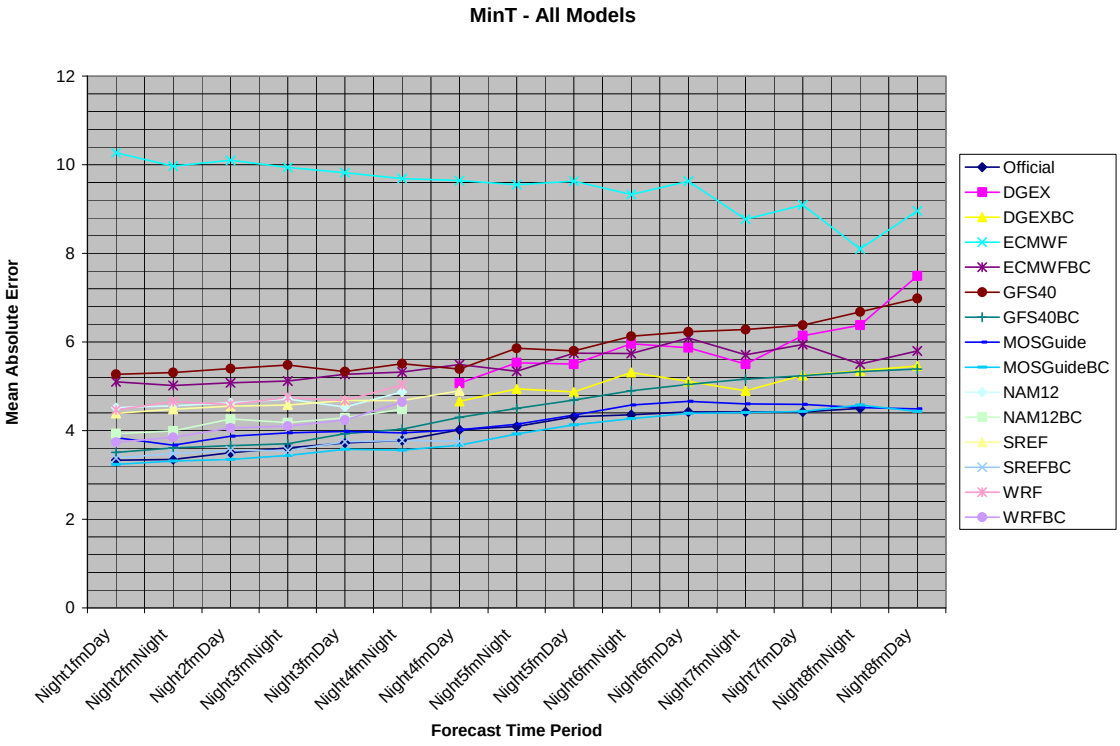

Figure 5 – MinT - All Models

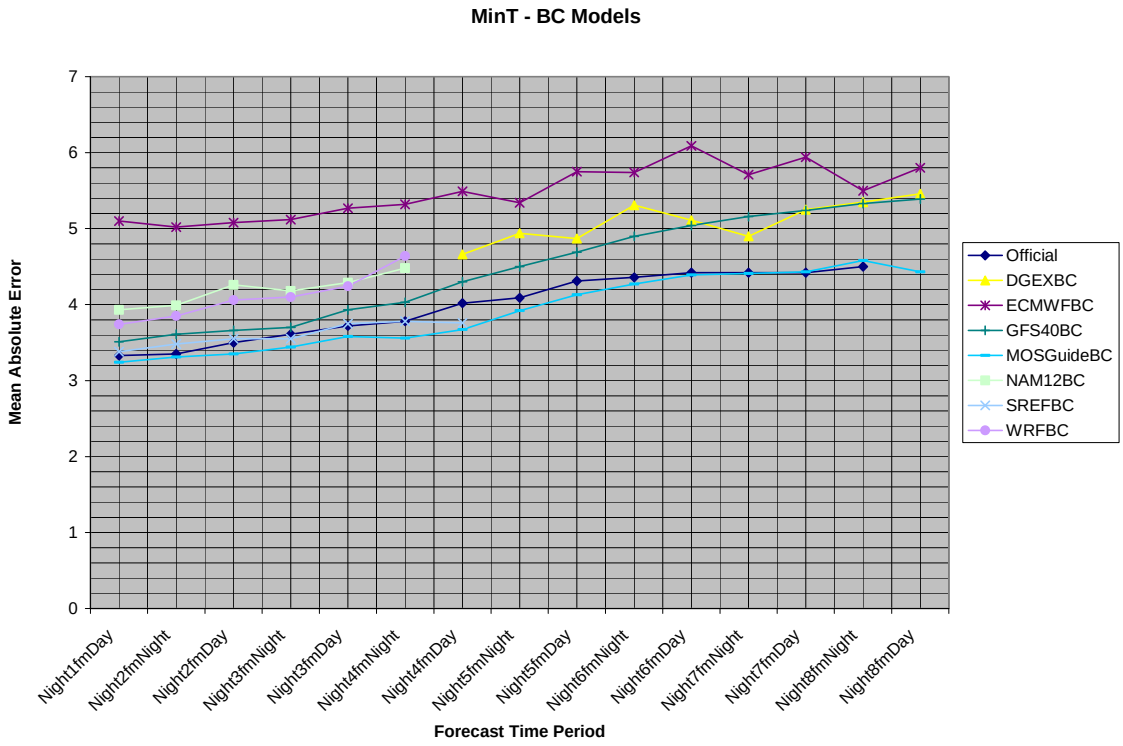

Figure 6 – MinT - BC Models

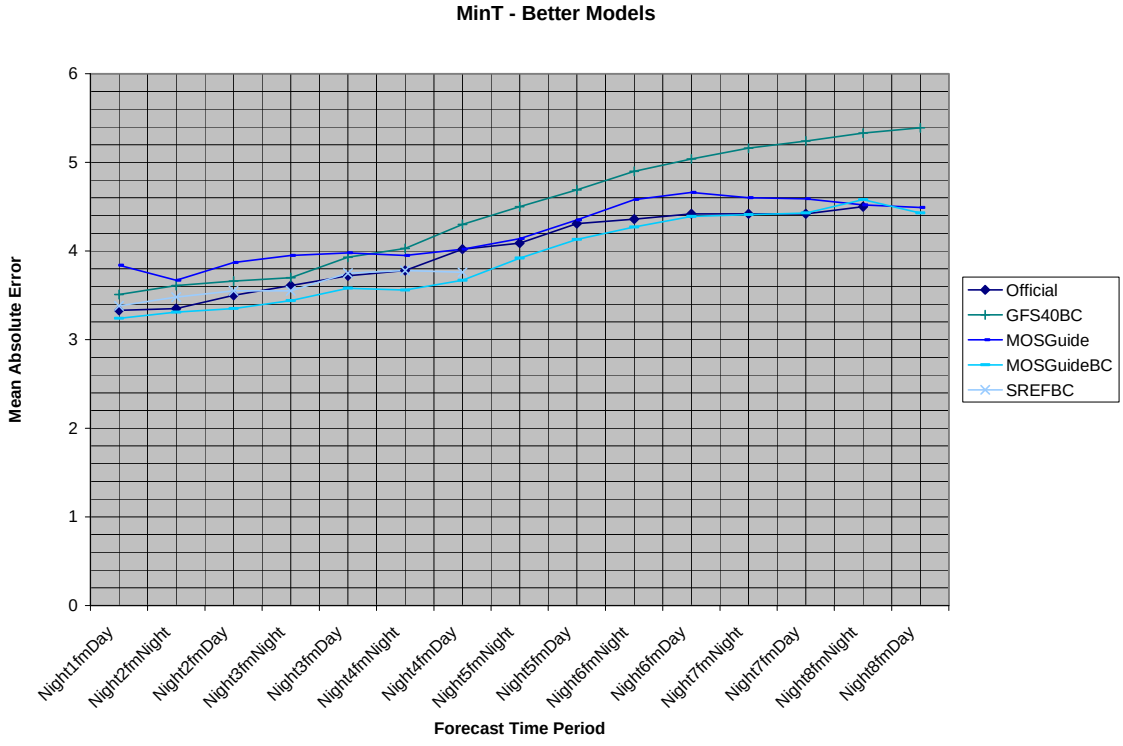

Figure 7 – MinT - Better Models

Performance for Td

Performance for Td, whether for official forecasts or model guidance, was not as good as for either MaxT or MinT.

In evaluating performance for Td (Figures 8-9), a number of items of interest were noted:

- Bias correction did not consistently improve on the initial model forecast
- MOSGuide was the only model of the better models for which bias correction provided improvement at all time periods
- In the shorter term, MOSGuideBC and NAM12 were best followed by SREFBC and WRF
- In the extended, MOSGuideBC was best
- Official forecasts were only comparable to the best guidance in the very short term, no more than the first 24 hours
- Official forecast steadily degraded over time relative to the better guidance
- For the best guidance, performance was consistent across smaller geographic areas

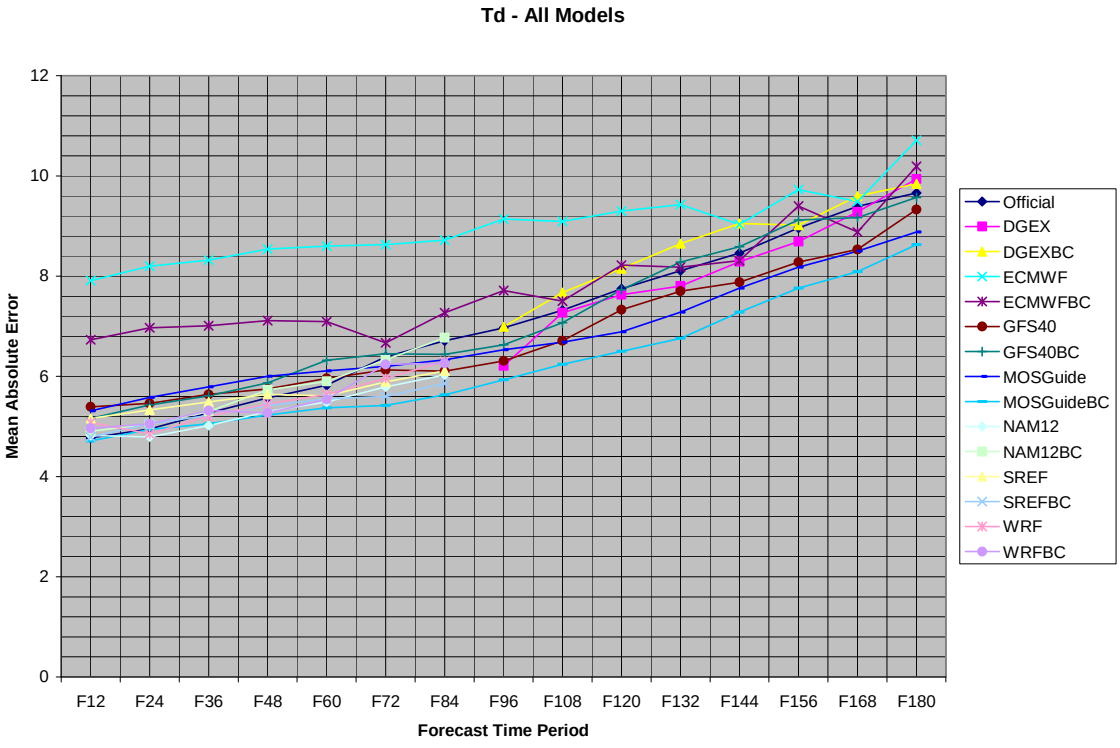

Figure 8 – Td - All Models

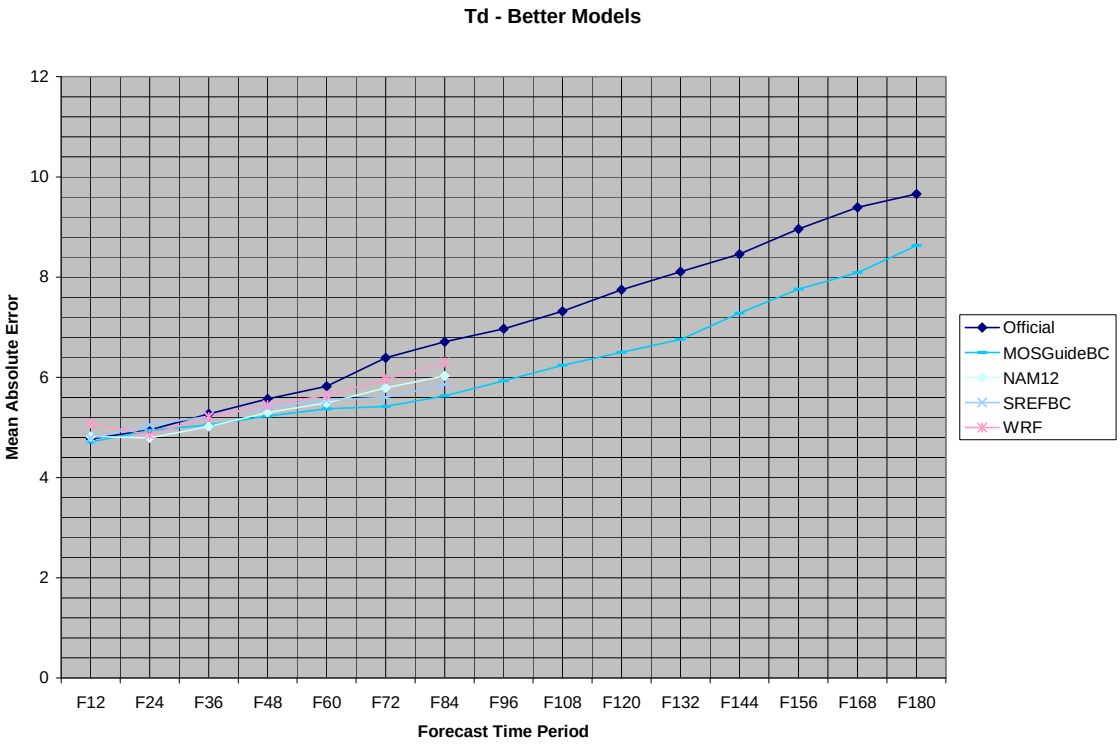

Figure 9 – Td - Better Models

Conclusions

In spite of the limitations of bias correction during patterns that are less persistent, bias correction provided consistent improvement over initial model forecasts for MaxT and MinT.

For MaxT, official forecasts could be improved by more consistently using the better guidance, mainly MOSGuideBC, but also NAM12BC and GFS40BC at some time periods.

Opportunities for improvement over guidance were more limited for MinT with MOSGuideBC and SREFBC the best input options.

For Td, bias correction did not consistently result in improvement over the initial model forecast except for MOSGuide. None of the model guidance was particularly good, but simply using MOSGuideBC for much of the forecast (especially in the extended), would have improved the official forecast by 1 to 1.5 degrees. In the shorter term, NAM12 and MOSGuideBC were the better options.

For Td in particular, it would be useful to examine performance during particular patterns (offshore, winter storm, etc.) to see which models may have performed better in particular patterns.

For MaxT and MinT, bias correction mostly resulted in improvement over the initial model forecast. Those models with smaller initial errors typically then had the lower BC errors as well. The ECMWF, in particular, seems to suffer from a particularly poor SmartInit for MaxT and MinT. In its current form, the ECMWF is among the poorest of input options. Considering that the ECMWF is believed to be generally outperforming the other models, one wonders how much better it's forecast of surface fields might be with a better SmartInit and the fields needed for that better SmartInit.

Reference

Barker, T., 2007: BOIVerify Ver. 2.0 Documentation. [Available online at http://ww2.wrh.noaa.gov/ssd/digital_services/training/BOIVerify2/]