Medium-Range Temperature Forecasting for South Pole Station

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Overview

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- Forecast Process
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Photo Credit: Ta-Lee Shue & NSF

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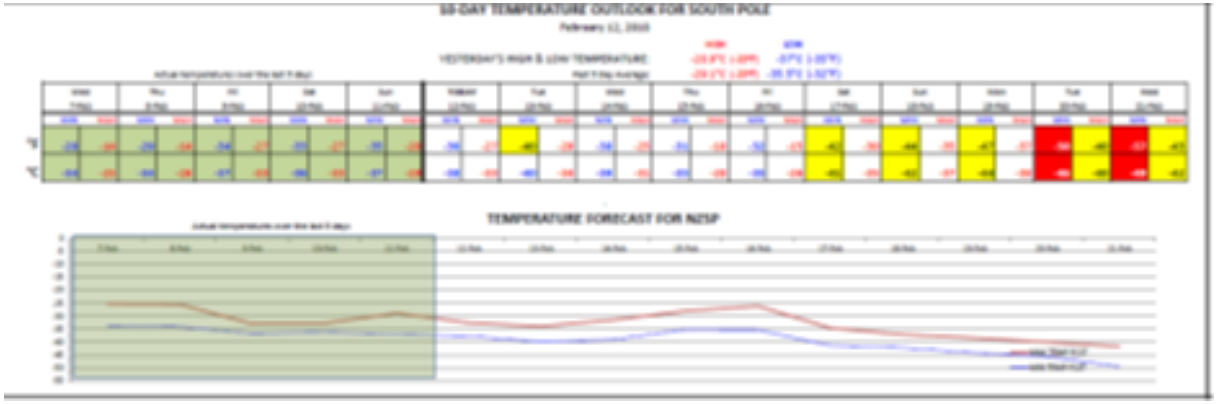
Background

- LC-130 missions to South Pole Station can be limited by temperatures colder than -40 ° C.
- SOPP meteorology provides a 10-day temperature forecast indicating maximum and minimum temperatures at the beginning and end of the operating season.
- This product is intended to guide mission planning through situational awareness.



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Forecast Process

- Forecasts incorporate a blend of model guidance from AMPS and GFS.
- A Microsoft Excel spreadsheet is used to parse and blend tabular data into a graphical format.
- 12Z GFS data is acquired from the NOAA/ARL READY website, while 00Z AMPS data comes from the UCAR site.
- A rough correction is applied to each input taking into account past performance and recent observations.

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Forecast Results

- For OPSEA 2017-18, 102 forecasts were produced over the 177-day period.
- Model guidance input along with final forecast data was recorded daily, along with observed maximum and minimum temperatures.
- Performance was analyzed by calculating forecast error for each forecast, along with model guidance for each day, and then determining seasonal average of bias, absolute error, and variance.

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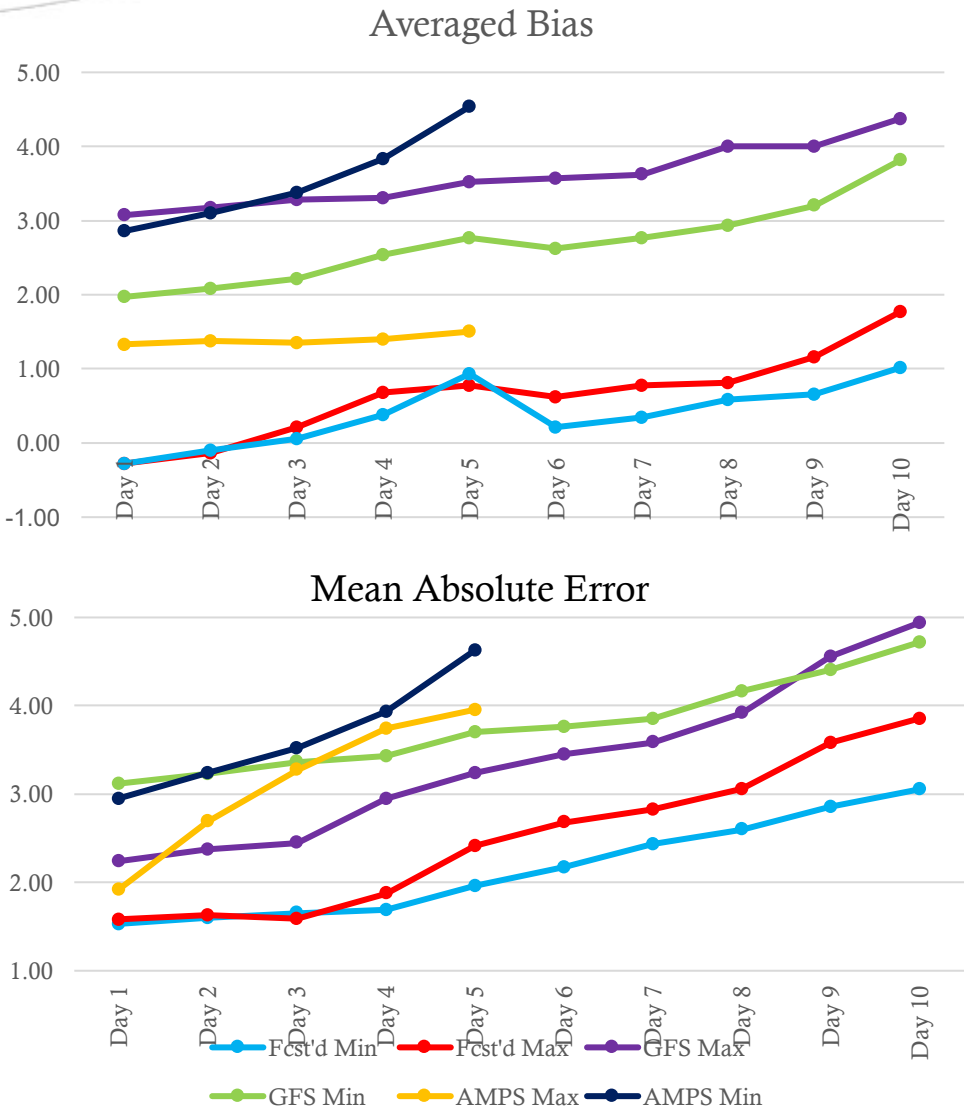
Forecast Results

- For the produced forecast, average bias was 0.5° C (warm), with a decent amount of skill noted over the model guidance.
- GFS forecasts were consistently too warm, while AMPS showed a bit more variability in forecasted maximum temperatures.



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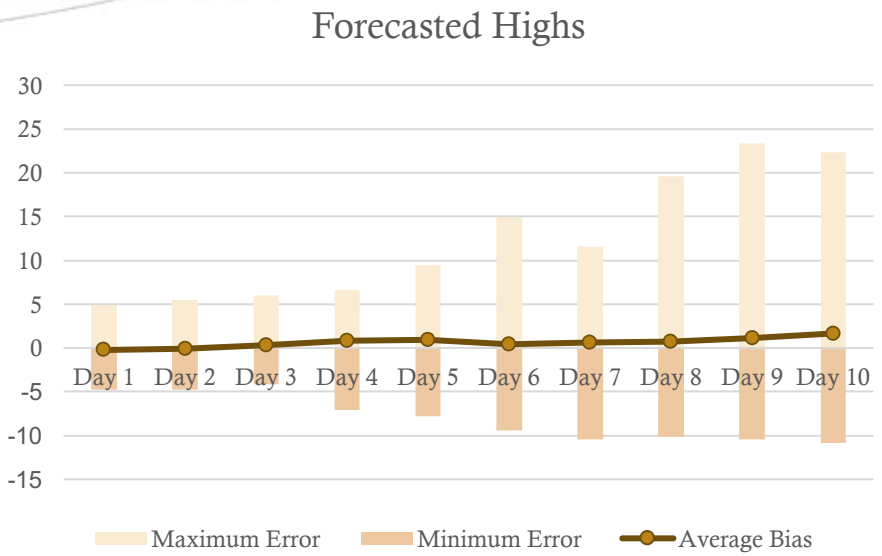
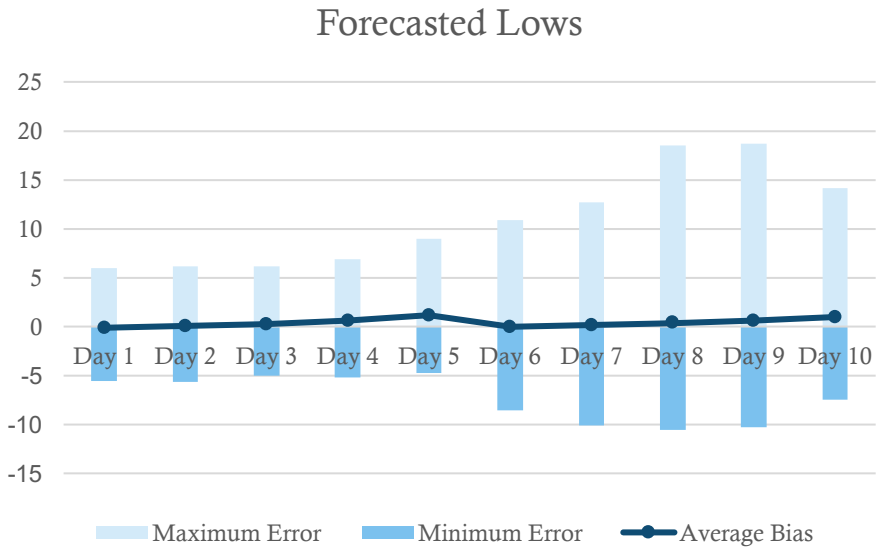
Forecast Results

- In terms of forecast performance, temperatures still maintained a warm bias, and showed an increasing variance toward the warm at the end of the forecast period.





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Discussion

- This product has evolved from manual scraping of commercially available weather websites (e.g., Wunderground or Accuweather) to incorporating tabular forecast data with hopes of automated forecast collection.
- The warm bias has been noted before: Monaghan et al. (2003) proposed that the overprediction of cloud coverage would be a factor in a warm bias.
- The tabular data presented in a 3 – 6-hour time interval may "hide" the true maximum or minimum forecasted temperature in the tabular guidance (Frodge and Henning 2006).

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Future plans

- This template may serve as a base for incorporating either deterministic or probabilistic prediction of additional weather elements.
- For the upcoming season, incorporation of climatological averages and better bias estimation using seasonal averages is planned.
- This product is also adapted for Phoenix Airfield to assist in mission planning before, during, and after the "gap" in heavy airlift scheduling, and will continued to be refined for this purpose.

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References

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Frodge, J. E., and R. Henning, 2006: South Pole Temperature Forecasting: Issues and Impacts. *1st Antarctic Meteor. Observations, Modeling, and Forecasting Workshop*, Boulder, CO. National Center for Atmospheric Research.

Monaghan, A.J., D.H. Bromwich, H. Wei, A.M. Cayette, J.G. Powers, Y. Kuo, and M.A. Lazzara, 2003: Performance of Weather Forecast Models in the Rescue of Dr. Ronald Shemenski from the South Pole in April 2001, *Wea. Forecasting*, **18**, 142-160.

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Questions?

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