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Evaluating the use of RAP analyses for model validation as compared to PECAN observations for Great Plains LLJ events

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Introduction

In general, because of the general paucity of upper-air observations available, model analyses, such as the Rapid Refresh (RAP) model, are often used as ground truth for forecast validation. The PECAN program, however, offers a rich set of surface and upper-air observations that can be used to analyze the initiation and development of LLJs as well as a means of validating model forecasts. Also of value is the use of PECAN observations to evaluate the appropriateness of using RAP analyses as representative ground truth for model validation. This study provides a comparison of RAP analyses and PECAN radiosonde data for several LLJ cases.

Objective

To evaluate the use of RAP analyses as "ground truth" for forecast validation as compared to PECAN sounding data for LLJ cases.

Methodology

PECAN soundings for 5 locations are compared with soundings extracted from RAP analyses over the same locations

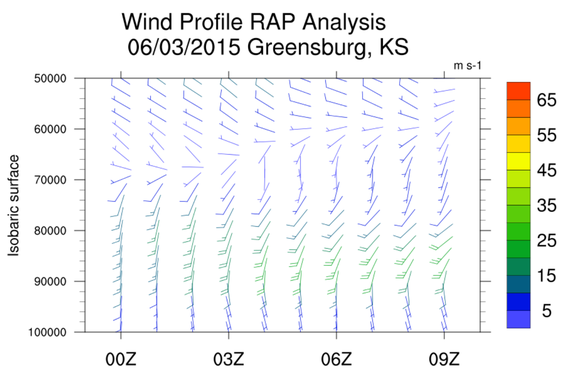
Fixed-point (FP) locations:

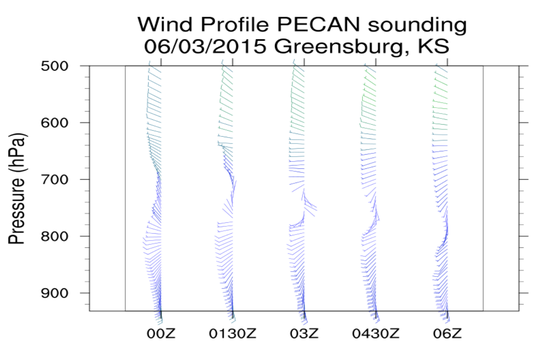
Greensburg, KS Ellis, KS Minden, NE
Brewster, KS Hesston, KS

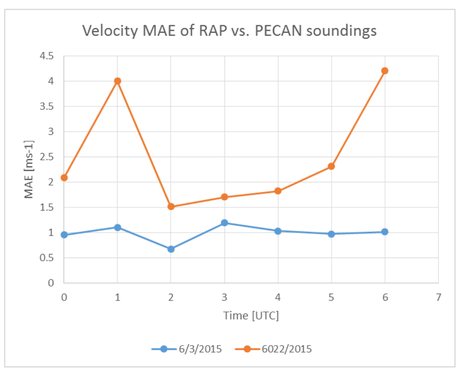
PECAN soundings interpolated spatially to RAP vertical grid (25m vertical spacing) and interpolated temporally to the top of each hour (0-6 UTC).

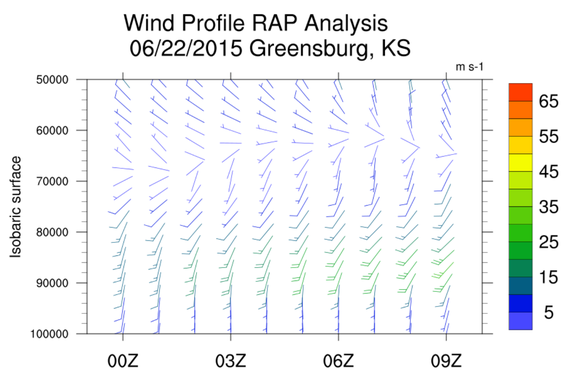
Bias calculated based on differences between RAP variable and PECAN observation for a specific location. Differences are averaged over the vertical layer from surface to 850 mb for a given hour, and then averaged among all 5 FP locations.

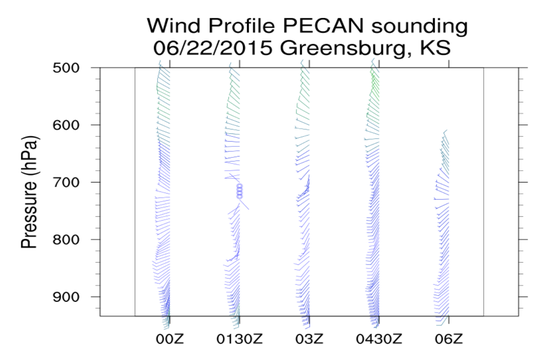
Specific Cases





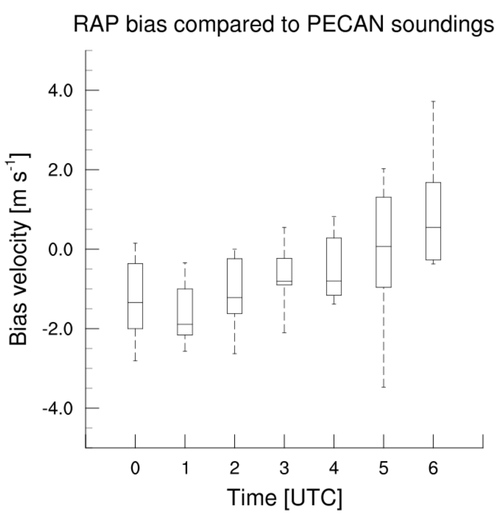


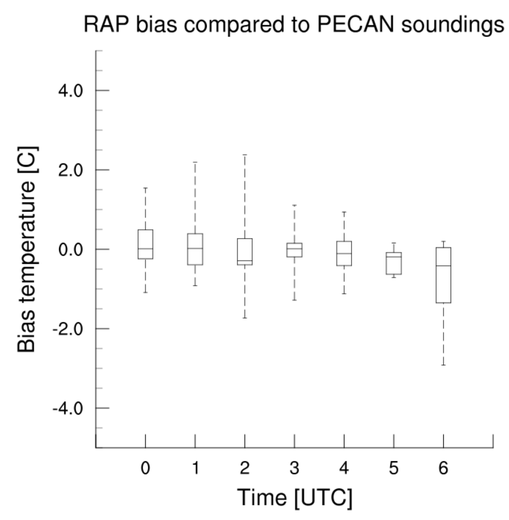




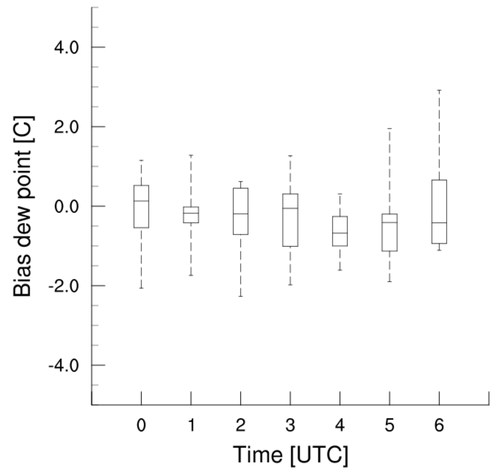
Results

The boxes represent the 25-75 percentile spread in bias values across **10 PECAN** cases.





RAP bias compared to PECAN soundings



Summary

- There is a distinct negative velocity bias for RAP from 0-5 UTC.
- Median velocity bias is nearly zero for 5 and 6 UTC, but the spread of the 25-75th percentile box is larger and there are significant outliers;
- Temperature bias median is close to zero throughout the period and the 25-75th percentile box is also rather tight (small), suggesting that temperature bias overall is not so much an issue, although some outliers do exist;
- Moisture bias median is not too strong overall, but outliers exist here as well.

References

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Acknowledgements

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