Analysis of TAMDAR Wind Observations from TAVE-II

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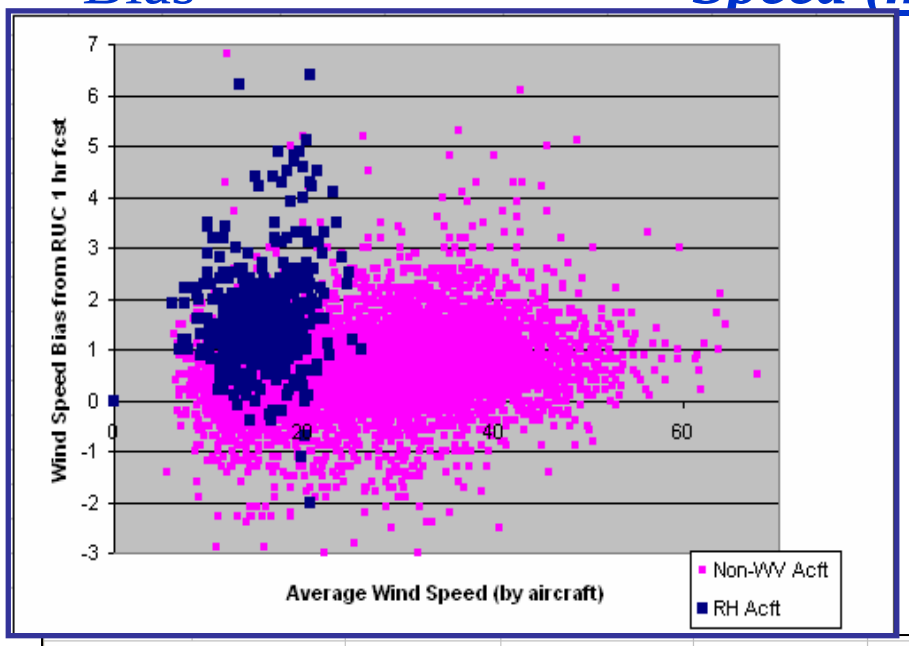
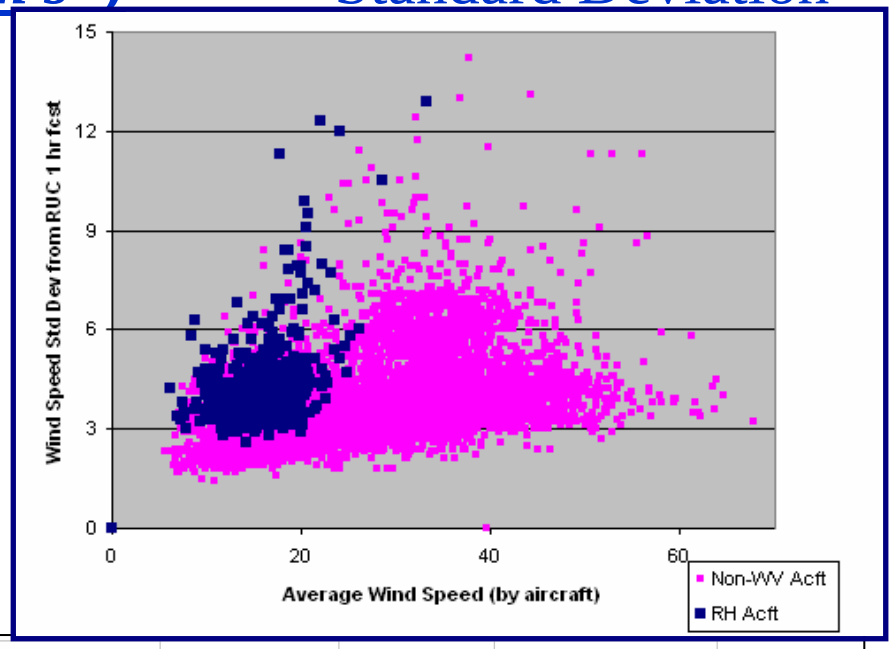
From last workshop

Comparison of TAMDAR and non-TAMDAR with RUC 1 hr forecast showed different character than other aircraft

Bias **Speed ($m\ s^{-1}$)** Standard Deviation





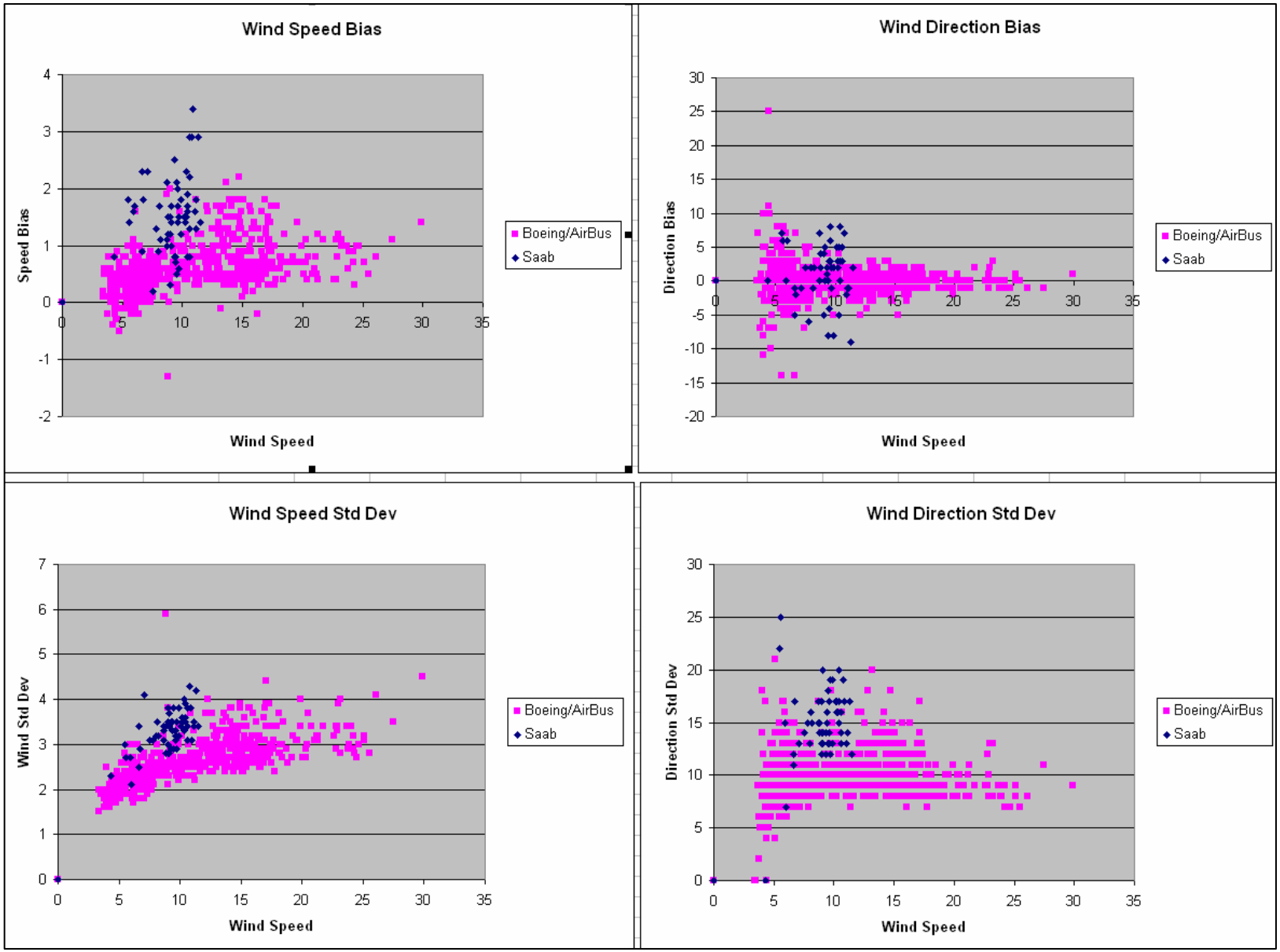
Non RH Aircraft						
Data set stats for obs meeting WMO Mins				***Spd Bias =***	***0.57***	***Spd Std Dev=*** ***3.27***
	% Meet WMO Mins			99.95%		94.10%
		% Exceed WMO Mins		0.05%		5.90%
RH Aircraft						
Data set stats for obs meeting WMO Mins				***Spd Bias =***	***1.752549***	***Spd Std Dev=*** ***3.894472***
	% Meet WMO Mins			98.74%		87.00%
		% Exceed WMO Mins		1.26%		13.00%

WMO Wind Requirements for Regional NWP (RMS) - 1 m s^{-1}, Minimum Acceptable 5 m s^{-1}

Data from Mid-January - Mid-March 2005

Source statistical data provided by Bill Moninger - FSL

Differing Characteristics in Wind Speed and Direction fits to RUC between Small and Large Aircraft
Continue into Recent FSL Weekly Statistics



Efforts underway at CIMSS to Assess Wind Errors in TAMDAR data

- Assessing the Radiosonde “Standard” against Wind Profiler data
- Assessment of Wind Speed Statistics from TAVE-II
- Comparison with NWS-GRB TAMDAR-Radiosonde “Matches of opportunity”
- Impact of Wind Direction Differences
- Combined impact of Wind Speed and Direction differences
  - Calculate Vector Differences

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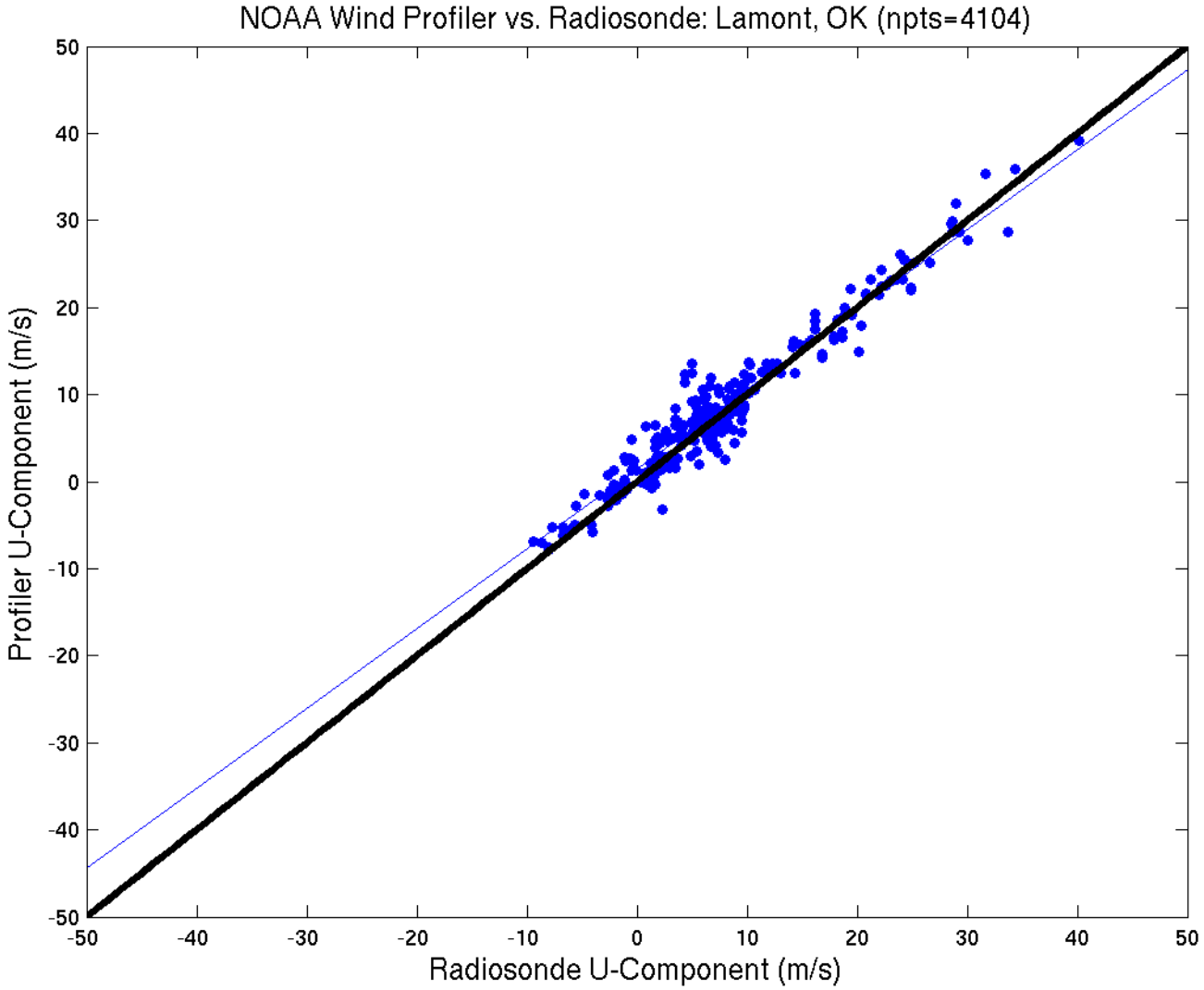
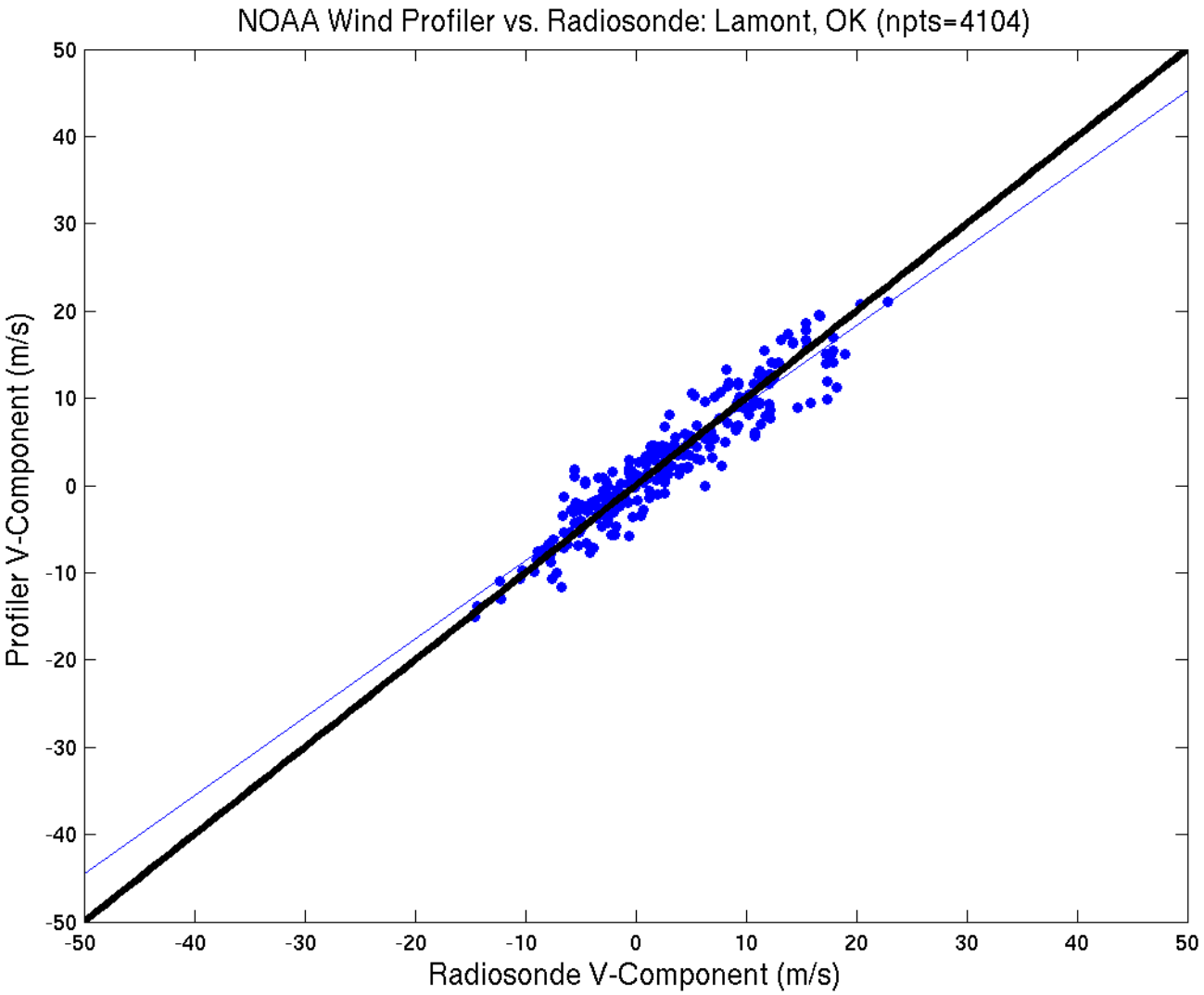
Comparison of Time and Space Co-Located Rawinsonde and Wind Profiler U Wind Components from ARM-CART Site



Comparison of Time and Space Co-Located Rawinsonde and Wind Profiler V Wind Components

from ARM-CART Site



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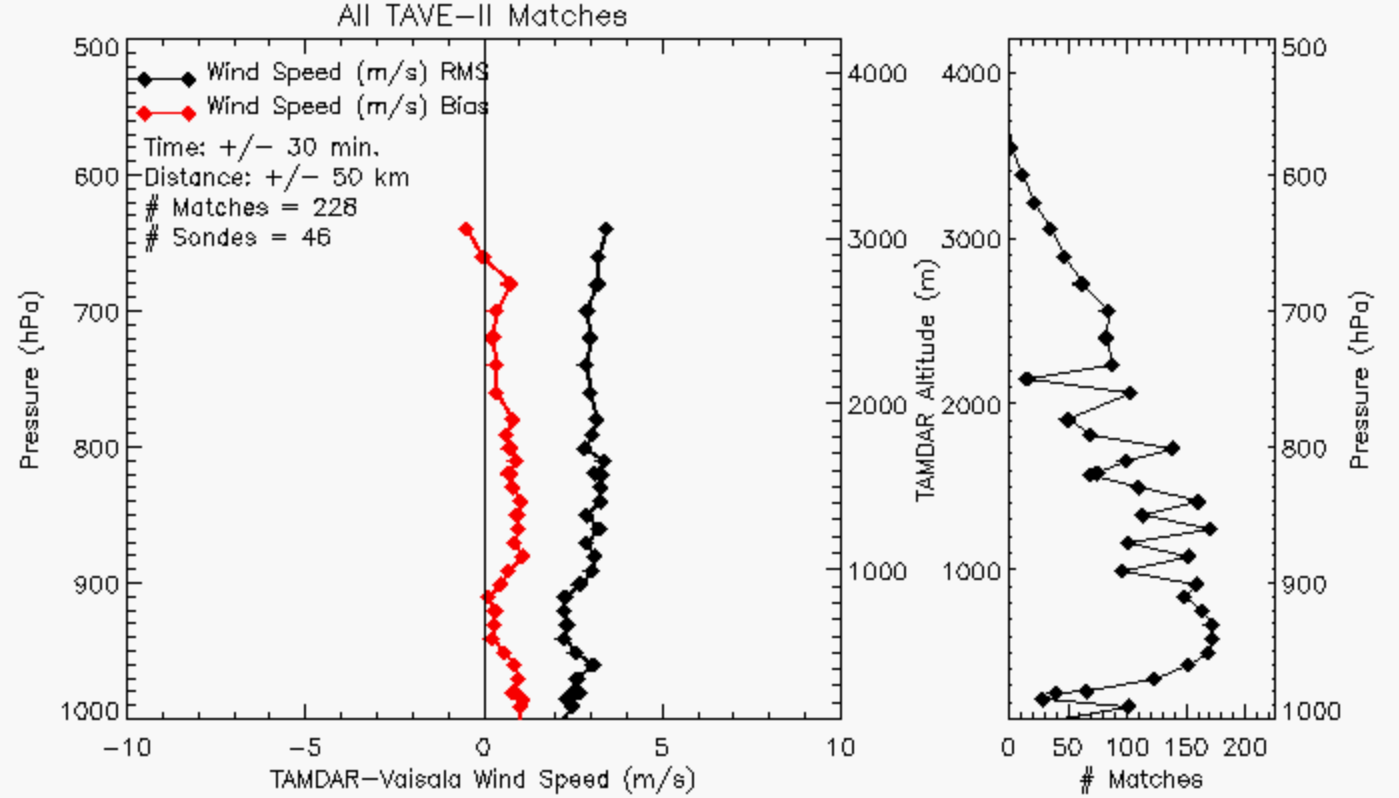
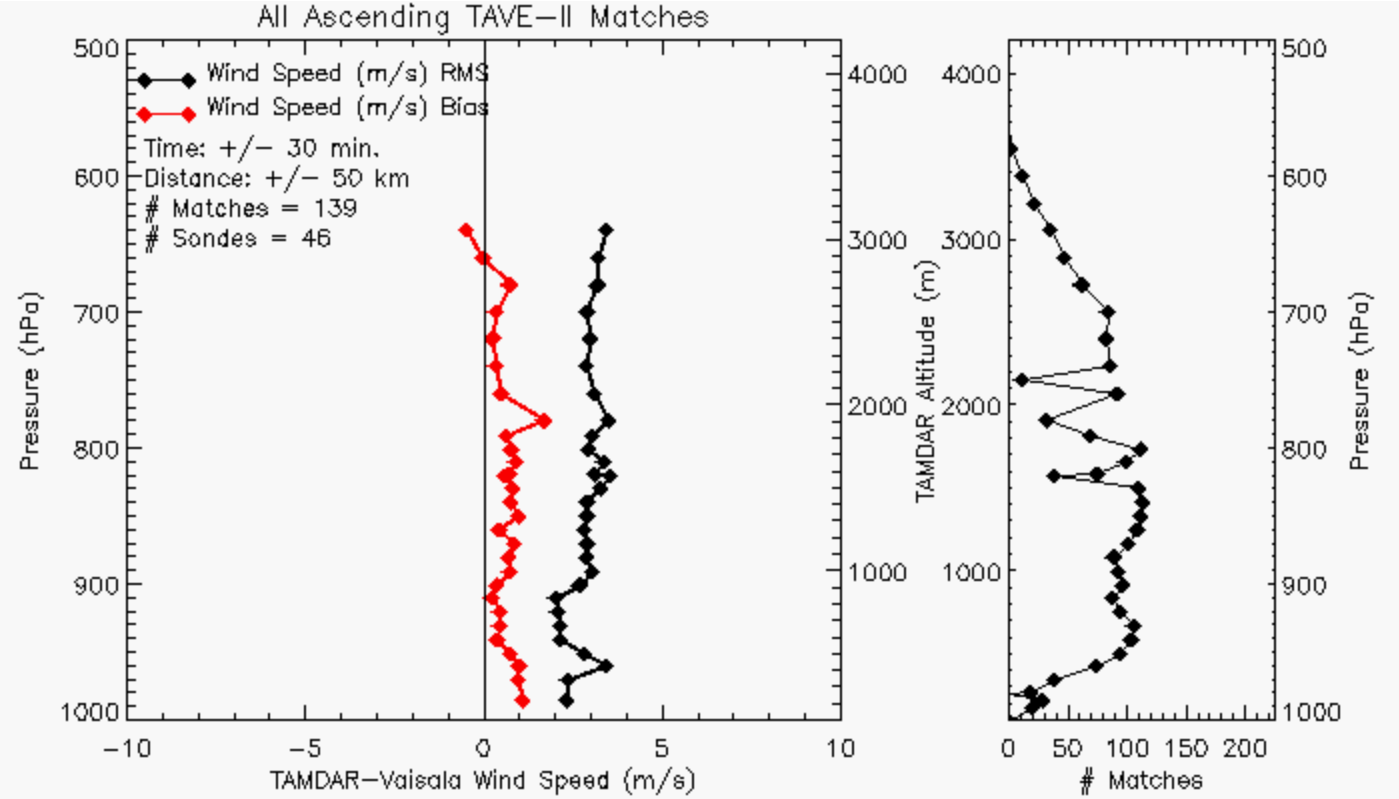
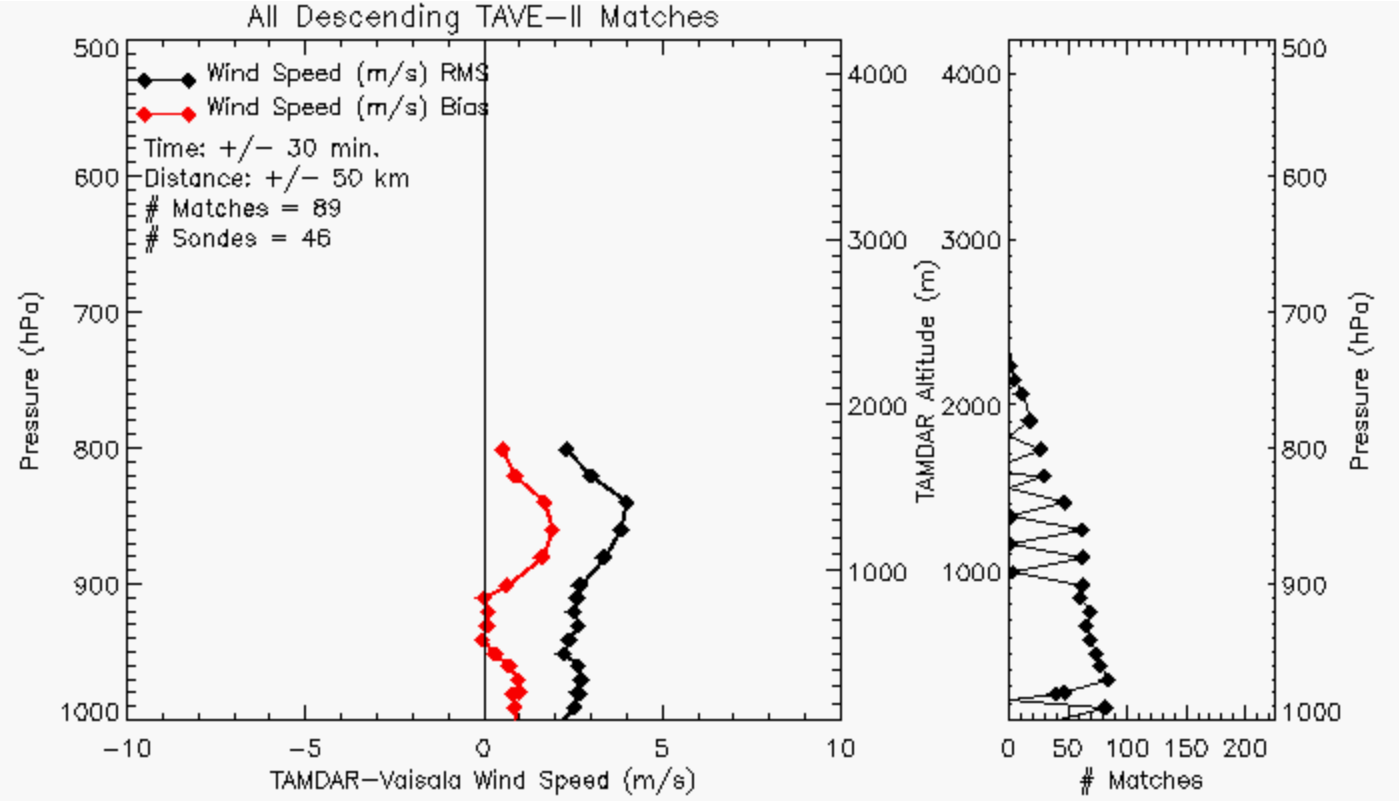
Comparison of TAMDAR and Rawinsonde Wind Speed during TAVE-II
- All Matches -



Comparison of TAMDAR and Rawinsonde Wind Speed during TAVE-II
- Ascent Matches only -



Comparison of TAMDAR and Rawinsonde Wind Speed during TAVE-II
- Descent Matches only -



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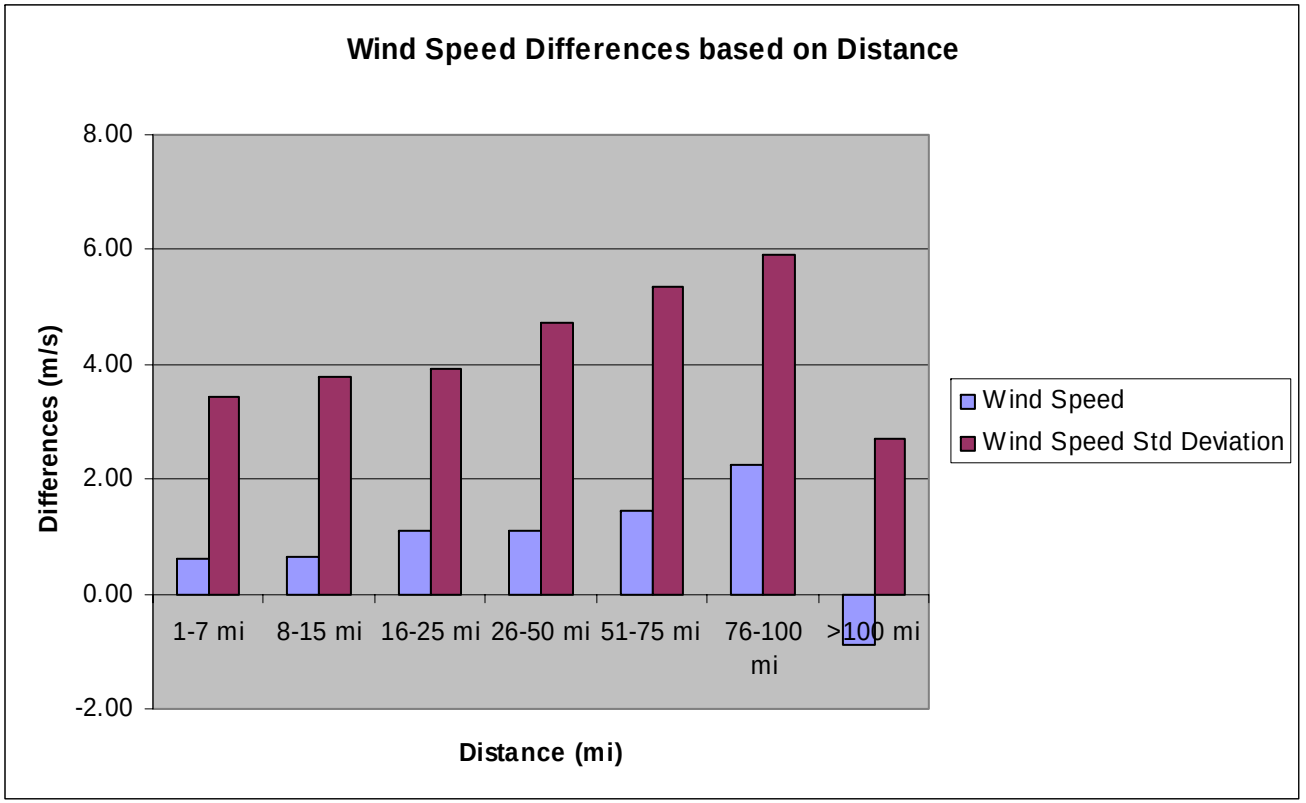
Independent Comparison of TAMDAR and Rawinsonde Wind Speed from "data sets of opportunity" made by NWS-GRB - sorted by distance between data sources -



Shows similar Speed Differences (3-4 m/s) in "closest" 25 miles and "+/- 1 hr"

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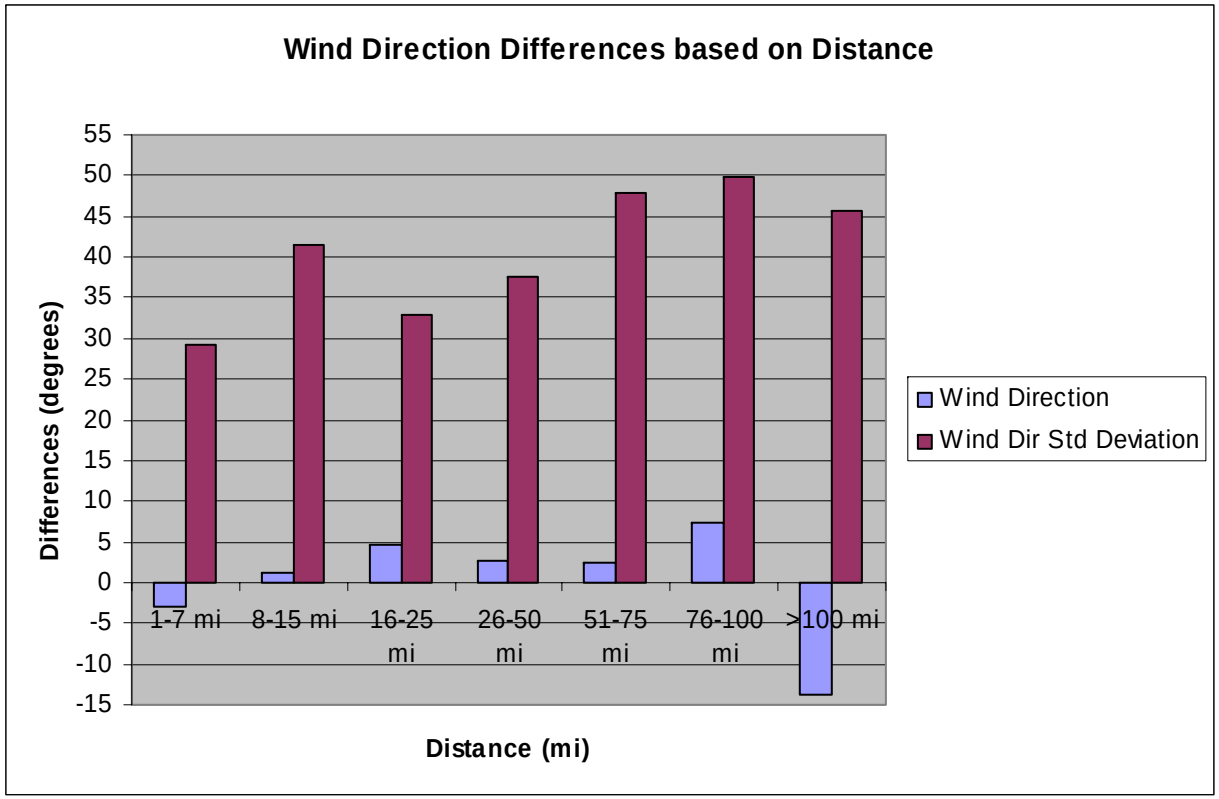
WMO Wind Requirements for Regional NWP (RMS) - 1 m s^{-1}, Minimum Acceptable 5 m s^{-1}

Independent Comparison of TAMDAR and Rawinsonde Wind Direction from "data sets of opportunity" made by NWS-GRB - sorted by distance between data sources -



Direction Differences Standard Deviation consistently 30^{o} or more

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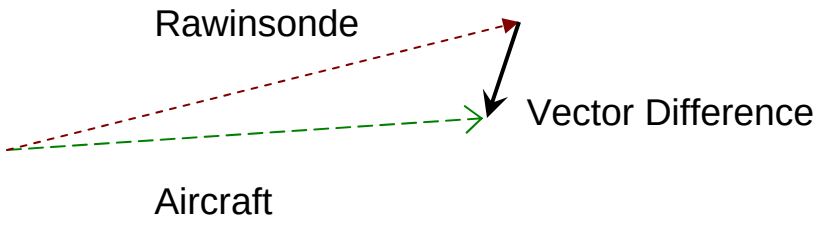

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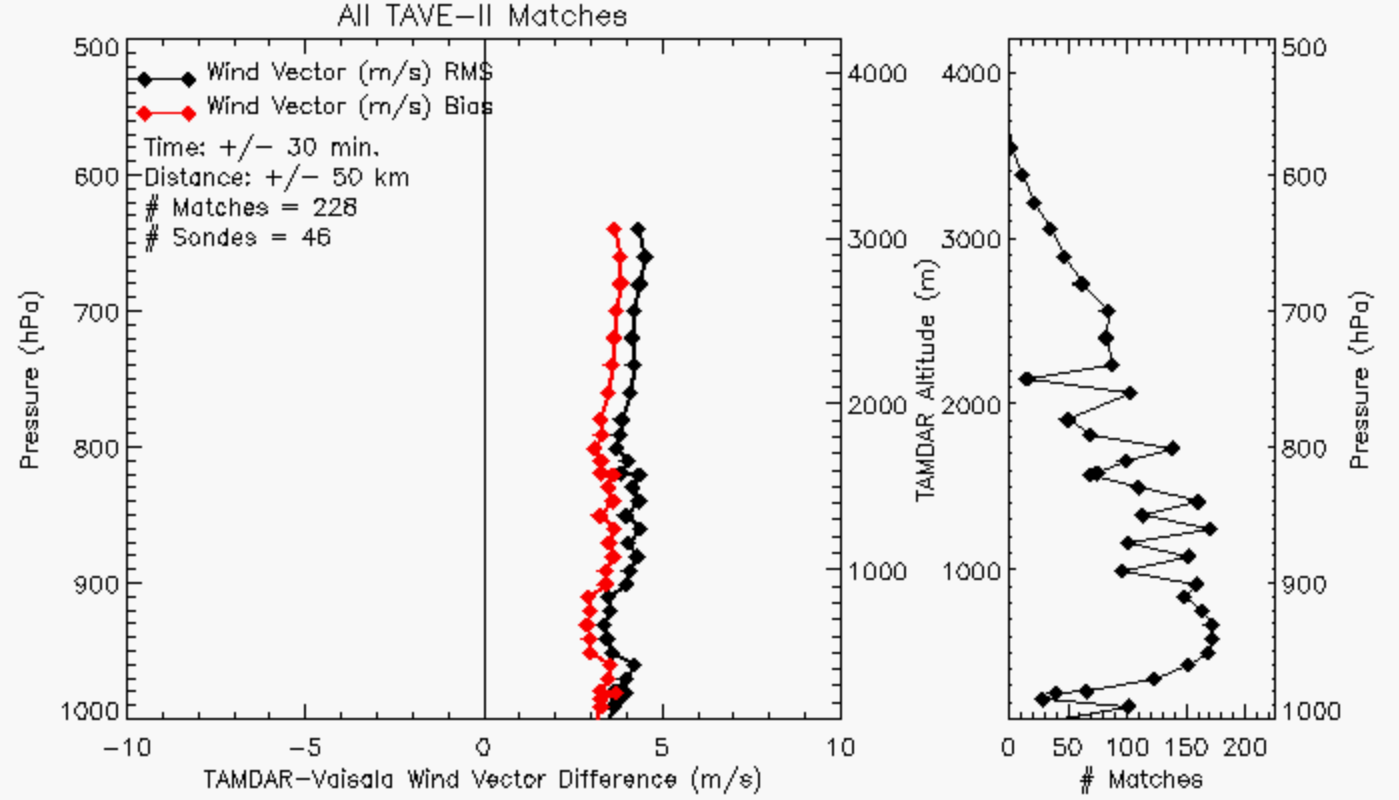
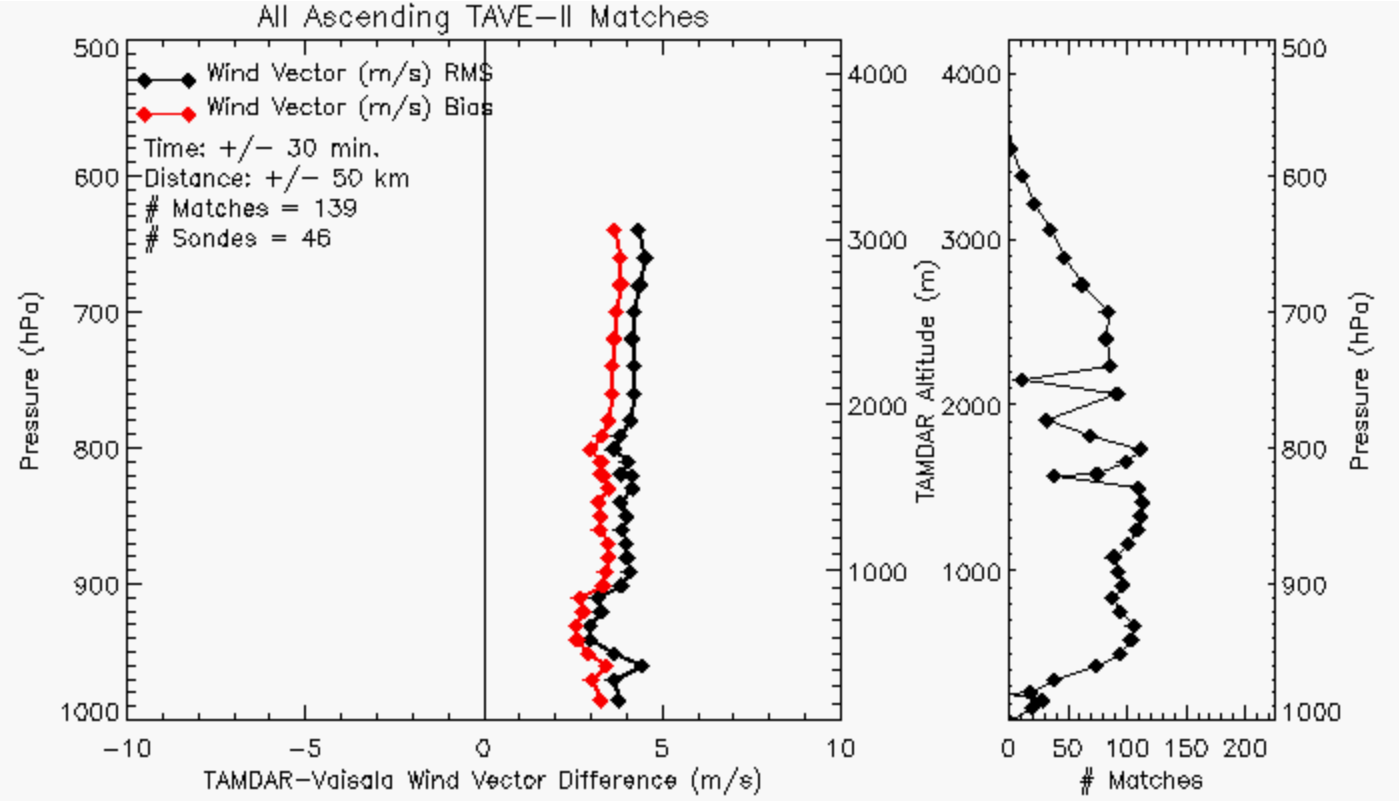
Vector Difference Comparisons of TAMDAR and Rawinsonde Wind data during TAVE-II
- All Matches -



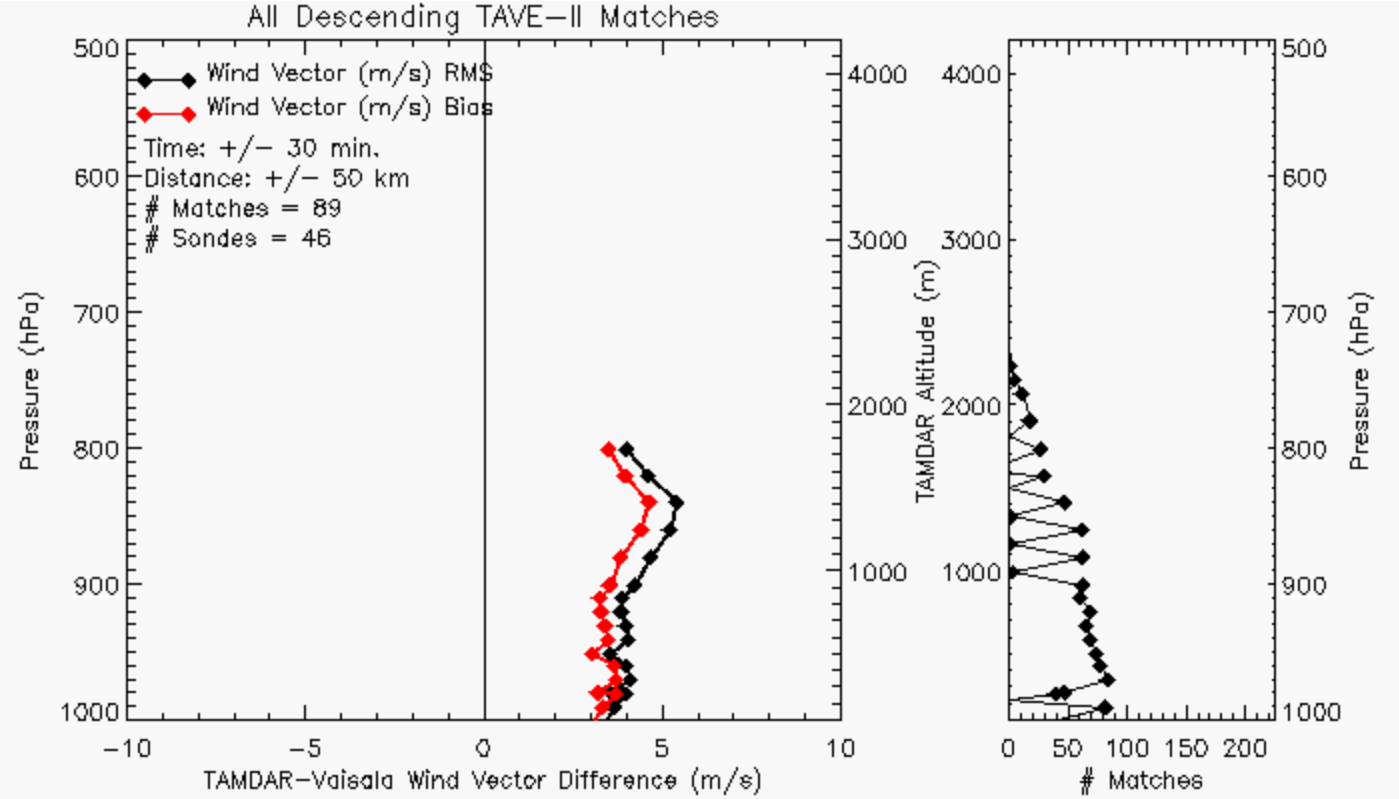
Little level-to-level variability

Vector Difference Comparisons of TAMDAR and Rawinsonde Wind data during TAVE-II
- Ascent Matches only -



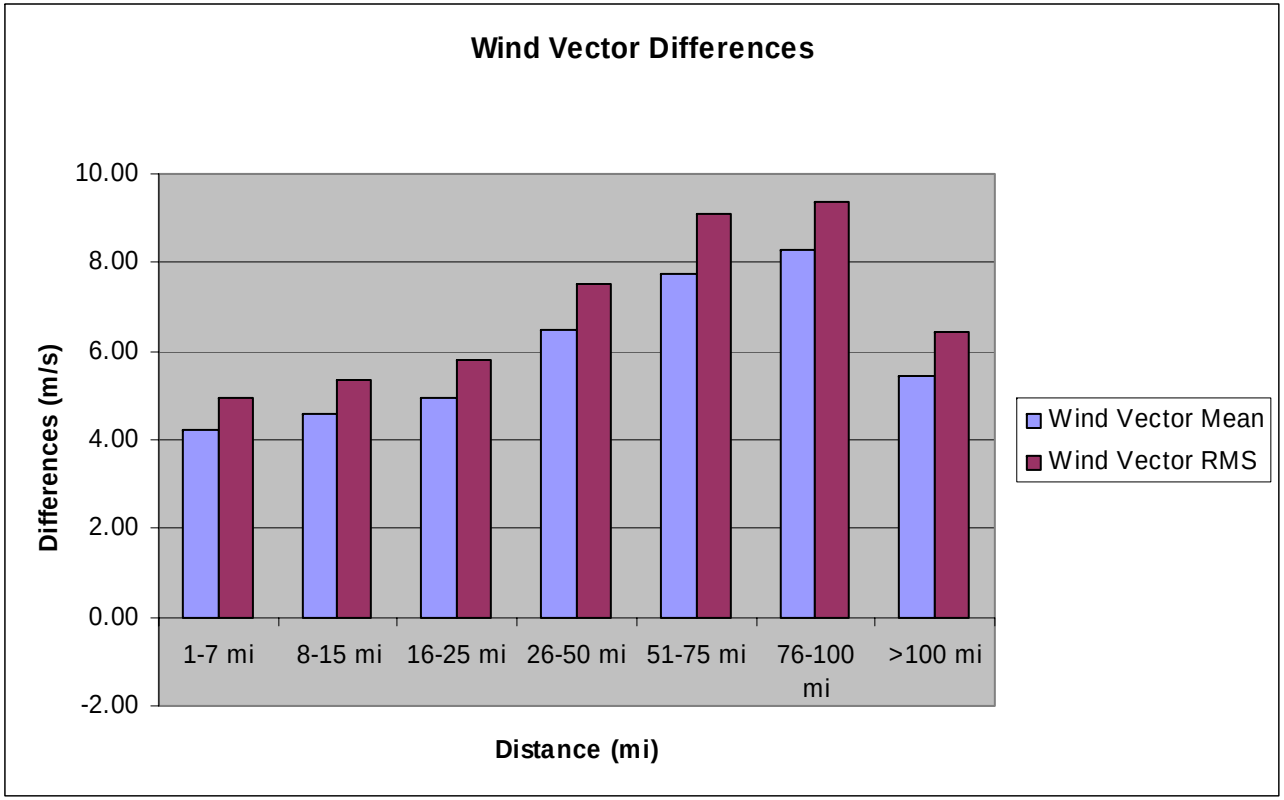
Better fits from 950-900 hPa, with little level-to-level variability above

Vector Difference Comparisons of TAMDAR and Rawinsonde Wind data during TAVE-II
- Descent Matches only -



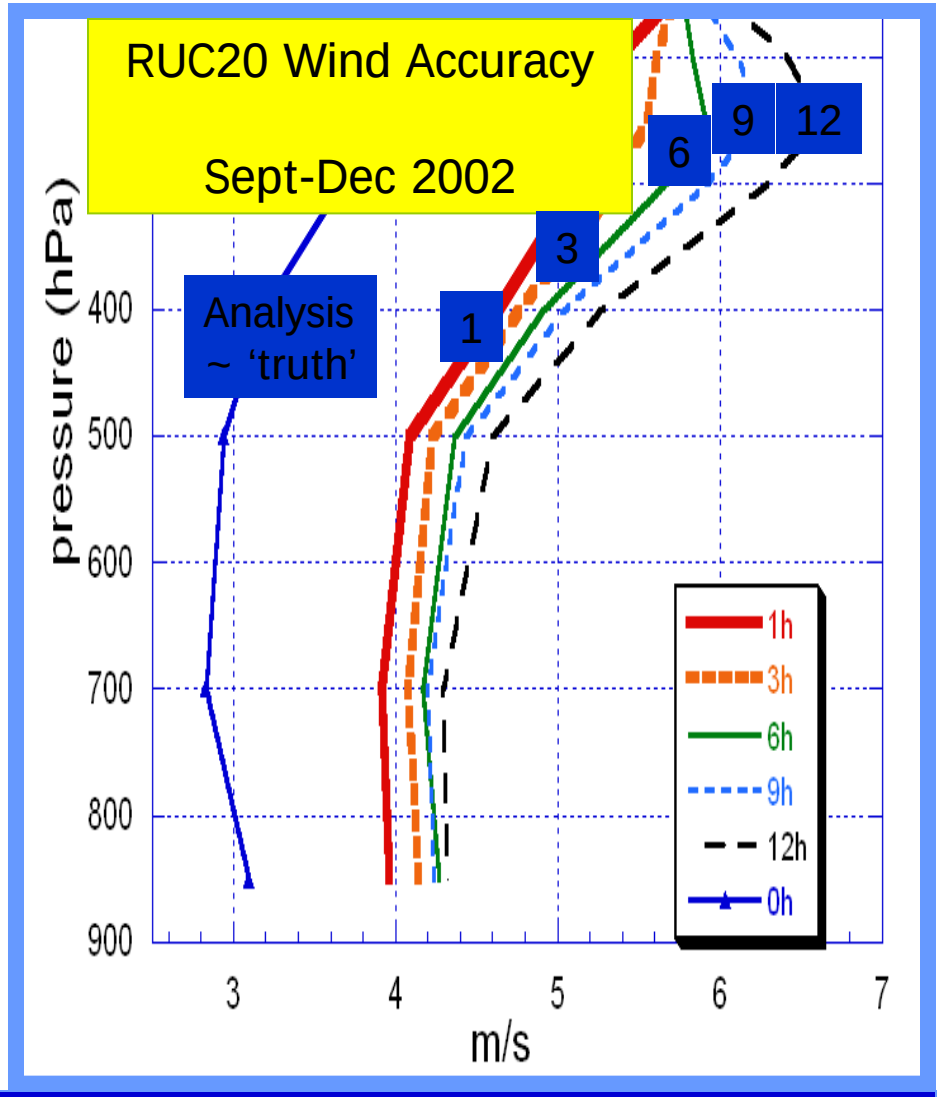
Worse fits at all levels, greatest errors between 800-900 hPa

Independent Comparison of TAMDAR and Rawinsonde Wind Speed
from "data sets of opportunity" made by NWS-GRB
- sorted by distance between data sources -



Combining of Speed and Direction data produces
RMS Vector Differences of 5-6 m/s in "closest" 25 miles and "+/- 1 hr"

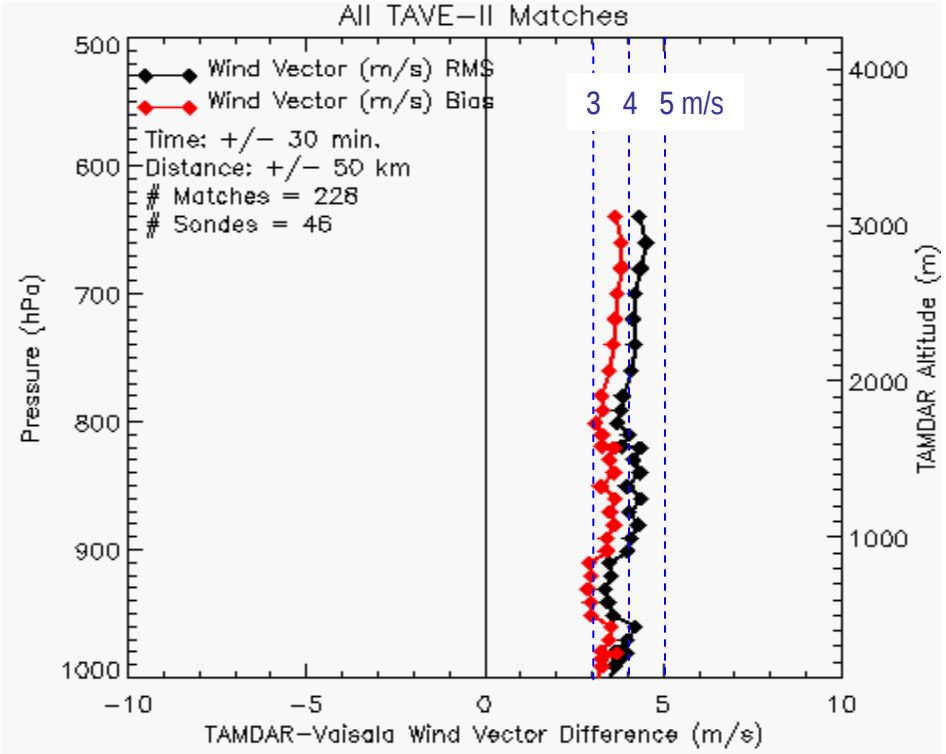
WMO Wind Requirements for Regional NWP (RMS) - 1 m s^{-1}, Minimum Acceptable 5 m s^{-1}



Verification against rawinsonde data over RUC domain RMS vector difference (forecast vs. obs)

RUC is able to use recent obs *(ACARS and Wind Profiler)* to improve forecast skill down to 1-h projection for winds

TAMDAR-Rawinsonde
Wind Observation Differences
similar to RUC analysis guess error



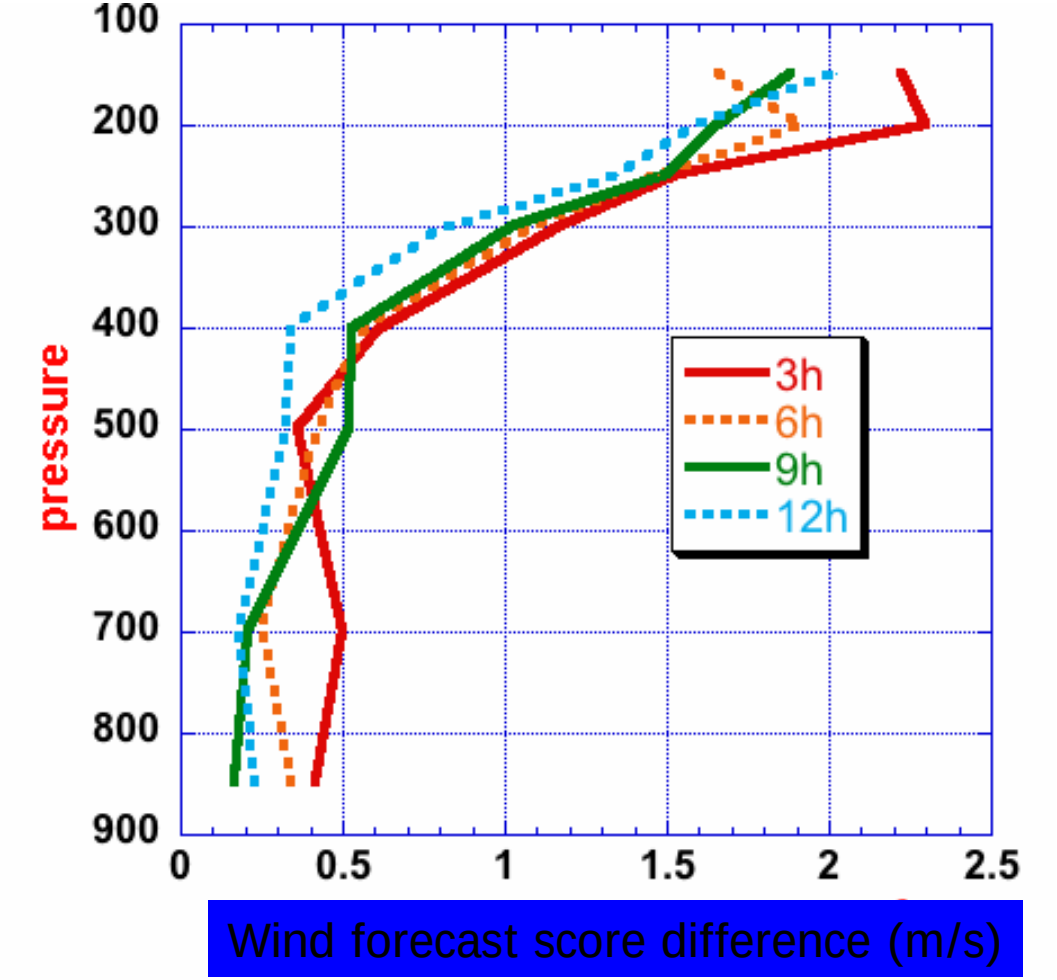
Should expect little analysis impact

Strong competition for providing high-quality asynoptic wind data

For Reference: Profiler Winds fit RUC forecasts better than Rawinsonde Winds

Wind forecast score difference - Rawinsonde verification minus profiler verification (m s^{-1})

Using *same* set of RUC wind forecasts -- Midwest domain - winter (4-16 Feb 2001) OSE.



✓Positive values imply raob wind obs errors > profiler obs errors

✓Raob errors increase with height because of balloon drift and decreasing elevation angle

✓Upper-level wind forecast errors are considerably exaggerated using raob data for verification

Conclusions regarding CIMSS' efforts to Assess Wind Errors in TAMDAR data

- Assessing the Radiosonde "Standard" against Wind Profiler data
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- Impact of Wind Direction Differences
- Combined impact of wind Speed and Direction differences
  - Vector Errors
- Conclusions
  - Differences in both Wind Speed and Direction
    - Use RMS Vector Difference
  - Similar results at all levels
    - Worse in Descent
  - Exceeds WMO requirements
  - Similar magnitude to RUC analysis guess and fcst error
    - *Expect small analysis impact*
  - *Any ideas why?*

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