Customizing and Understanding Wavelet Stats

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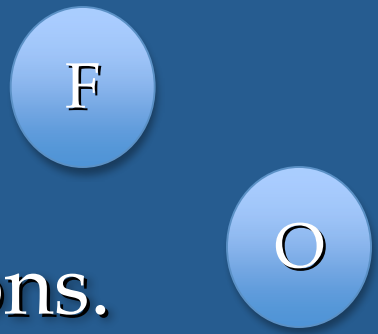
Options for Handling Missing data

- Points with valid forecasts.
- Points with valid observations.
- Points with both valid forecasts and observations. $F \cap O$
- All points. $F \cup O$



Thresholds

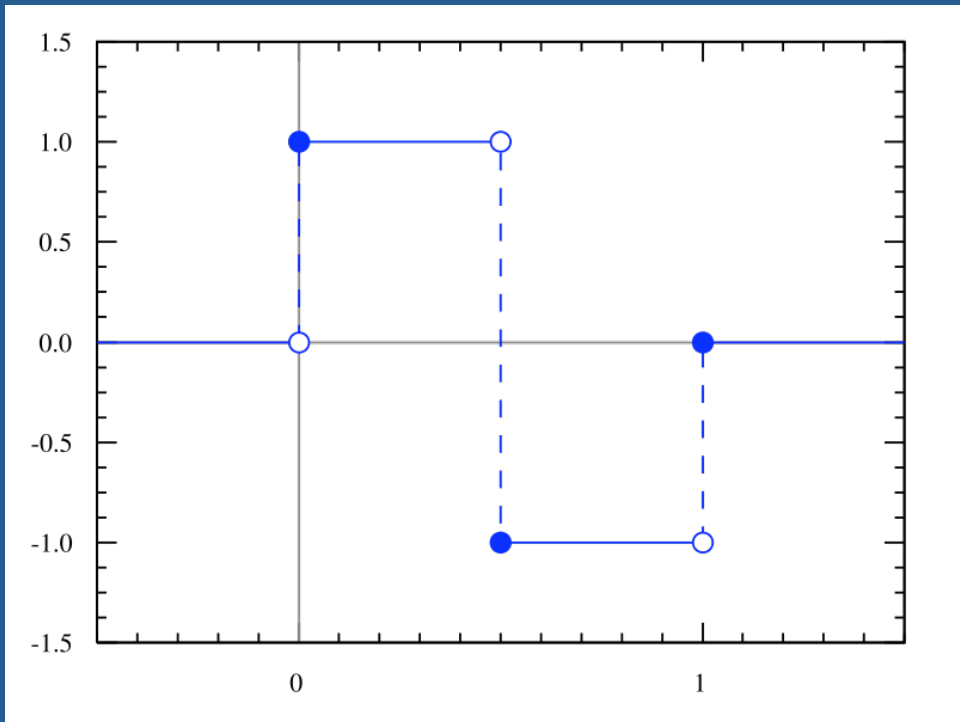
Forecast		Threshold	Event
0.05	<	0.2	0
0.17	<	0.2	0
0.45	>	0.2	1
2.15	>	0.2	1
0.05	<	1	0
0.17	<	1	0
0.45	<	1	0
2.15	>	1	1

Tiles – Grid must be 2^n x 2^n

- Cut down – user selected subset (square)
- Tiles – automated selection of subset(s)
- Pad with zeros – not recommended unless adds very small number of points.

Wavelets

- Haar
- Centered Haar
- Daubechies
- Centered Daubechies
- B spline
- Centered B spline

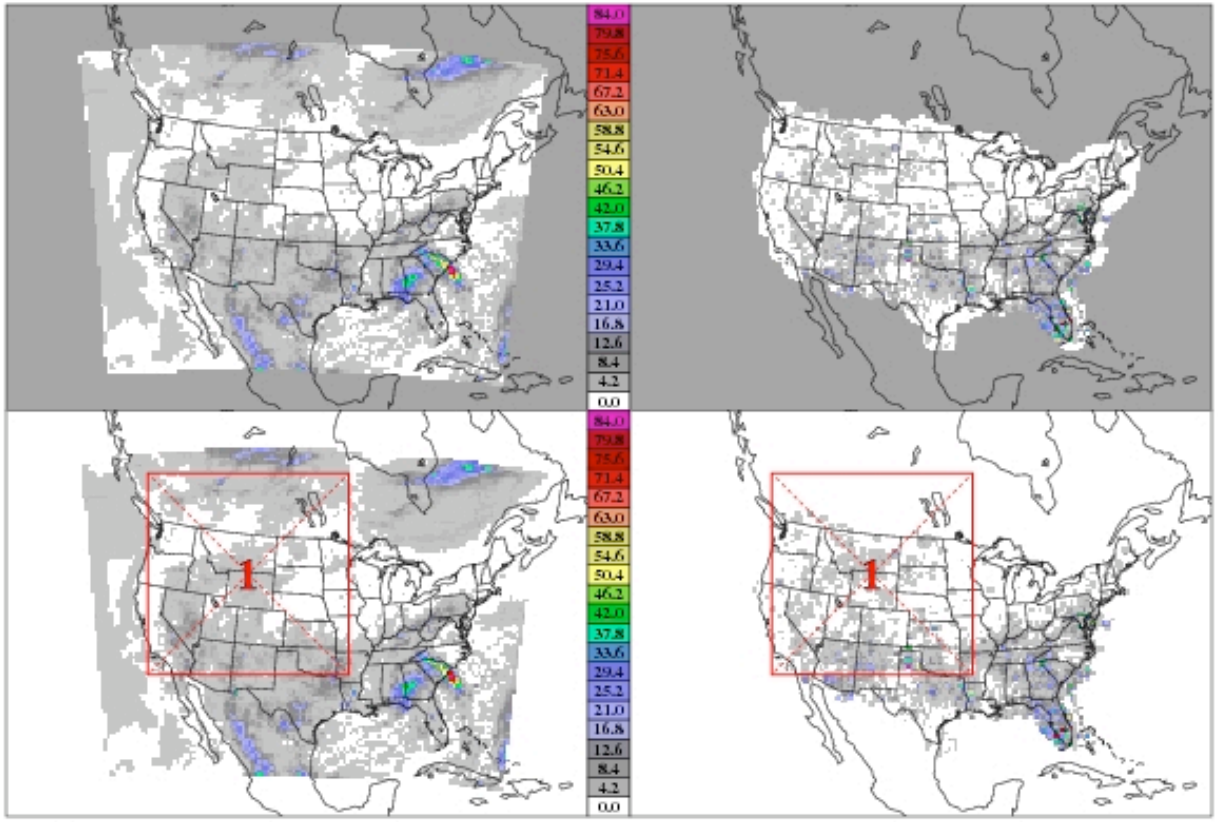


Output

- Text files
  - Options
  - Statistics
  - Can be read into stat analysis tool.
- Postscript files
  - Graphics
  - Options
  - Statistics

Wavelet-Stat: APCP/A24

Forecast | Observation



Model Name: WRF

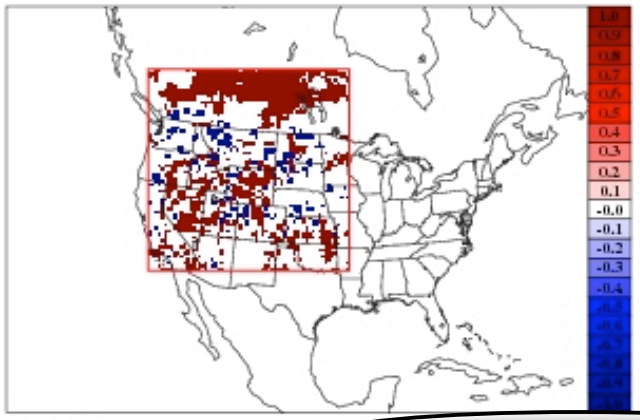
Init Time: Aug 7, 2005 00:00:00
Valid Time: Aug 8, 2005 00:00:00
Lead Time: 24:00:00
Accum Time: 24:00:00

Tile Method: User-Defined
Tile Count: 1
Tile Dim: 64 x 64
Tile Corner: (45, 45)

Mask Missing: Off
Wavelet(k): Haar (2)

Wavelet-Stat: APCP/A24, Tile 1, >0.100, Binary

Difference (F-0)

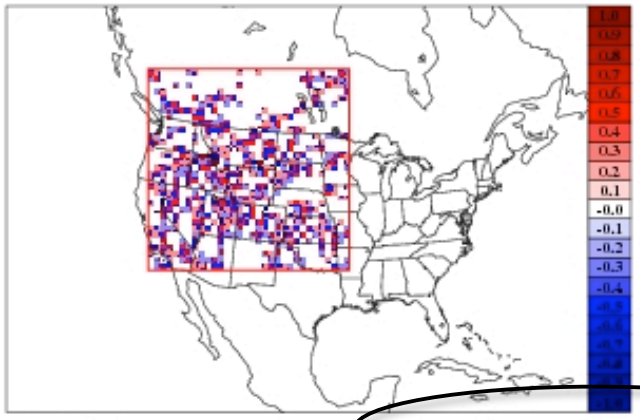


Frequency Bias:	1.82519	Intensity Skill Score:	0.25550
Base Rate:	0.28491	Fcst Energy Squared (%):	0.52002 (100.00)
Mean-Squared Error (%):	0.37866 (100.00)	Obs Energy Squared (%):	0.28491 (100.00)

Overall forecast has skill (ISS > 0)

Wavelet-Stat: APCP/A24, Tile 1, >0.100, Scale 1

Difference (F-0)



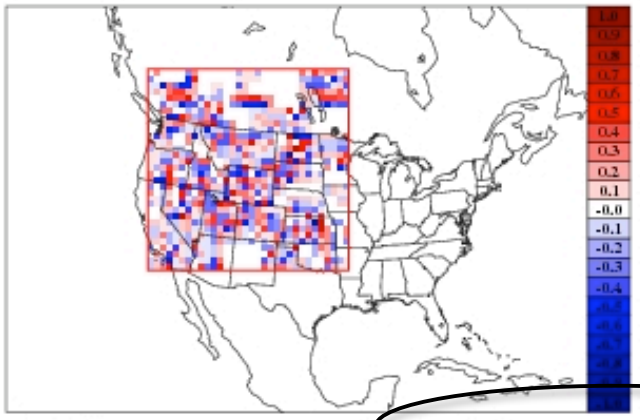
Frequency Bias:	1.82519	Intensity Skill Score:	-0.59185
Base Rate:	0.28491	Fcst Energy Squared (%):	0.05286 (10.16)
Mean-Squared Error (%):	0.11566 (30.54)	Obs Energy Squared (%):	0.06659 (23.37)

Errors at this scale account for about 1/3 of the MSE.

At this scale, forecast does not have skill (ISS < 0)

Wavelet-Stat: APCP/A24, Tile 1, >0.100, Scale 2

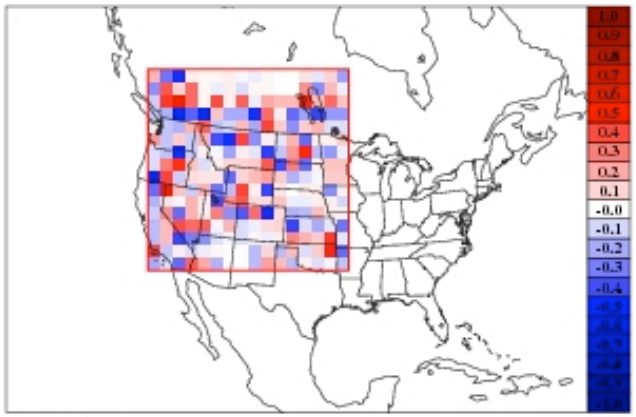
Difference (F-0)



Frequency Bias:	1.82519	Intensity Skill Score:	0.08794
Base Rate:	0.28491	Fcst Energy Squared (%):	0.04028 (7.75)
Mean-Squared Error (%):	0.06627 (17.50)	Obs Energy Squared (%):	0.03706 (13.01)

Wavelet-Stat: APCP/A24, Tile 1, >0.100, Scale 3

Difference (F-0)

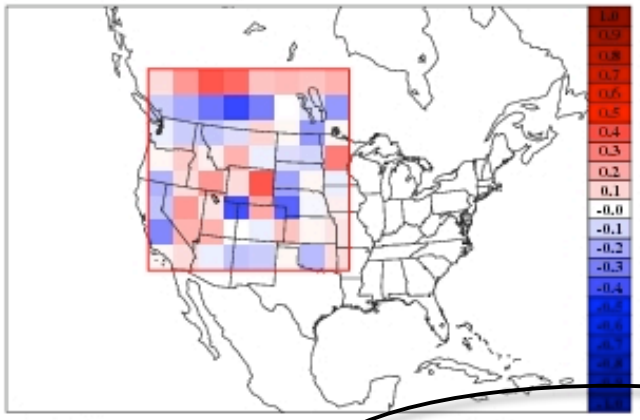


Frequency Bias:	1.82519	Intensity Skill Score:	0.28929
Base Rate:	0.28491	Fcst Energy Squared (%):	0.03940 (7.58)
Mean-Squared Error (%):	0.05164 (13.64)	Obs Energy Squared (%):	0.02658 (9.33)

Forecast transitions from no skill to skill at scale 2 (ISS > 0).

Wavelet-Stat: APCP/A24, Tile 1, >0.100, Scale 4

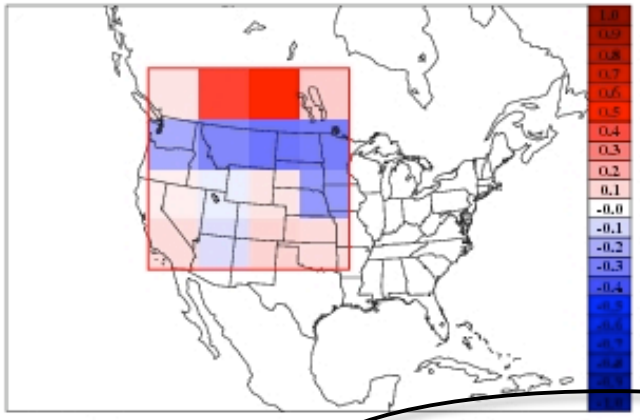
Difference (F-0)



Frequency Bias:	1.82519	Intensity Skill Score:	0.55139
Base Rate:	0.28491	Fcst Energy Squared (%):	0.04544 (8.74)
Mean-Squared Error (%):	0.03260 (8.61)	Obs Energy Squared (%):	0.02026 (7.11)

Wavelet-Stat: APCP/A24, Tile 1, >0.100, Scale 5

Difference (F-0)

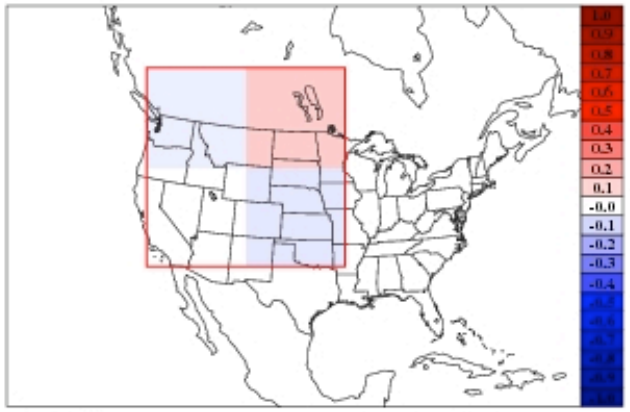


Frequency Bias:	1.82519	Intensity Skill Score:	0.28659
Base Rate:	0.28491	Fcst Energy Squared (%):	0.05612 (10.79)
Mean-Squared Error (%):	0.05184 (13.69)	Obs Energy Squared (%):	0.03091 (10.85)

At these scales, the forecast and observed energy percentages are very similar.

Wavelet-Stat: APCP/A24, Tile 1, >0.100, Scale 6

Difference (F-0)



Frequency Bias:	1.82519	Intensity Skill Score:	0.92589
Base Rate:	0.28491	Fcst Energy Squared (%):	0.01550 (2.98)
Mean-Squared Error (%):	0.00539 (1.42)	Obs Energy Squared (%):	0.02233 (7.84)

Wavelet-Stat: APCP/A24, Tile 1, >0.100, Scale 7

Difference (F-0)

Frequency Bias:	1.82519	Intensity Skill Score:	0.23925
Base Rate:	0.28491	Fcst Energy Squared (%):	0.27042 (52.00)
Mean-Squared Error (%):	0.05528 (14.60)	Obs Energy Squared (%):	0.08117 (28.49)

Summary

- Wavelet tool provides a flexible method for decomposing spatial fields into different scales.
- Once decomposed, verification measures at each *physical* scale can be examined and compared.