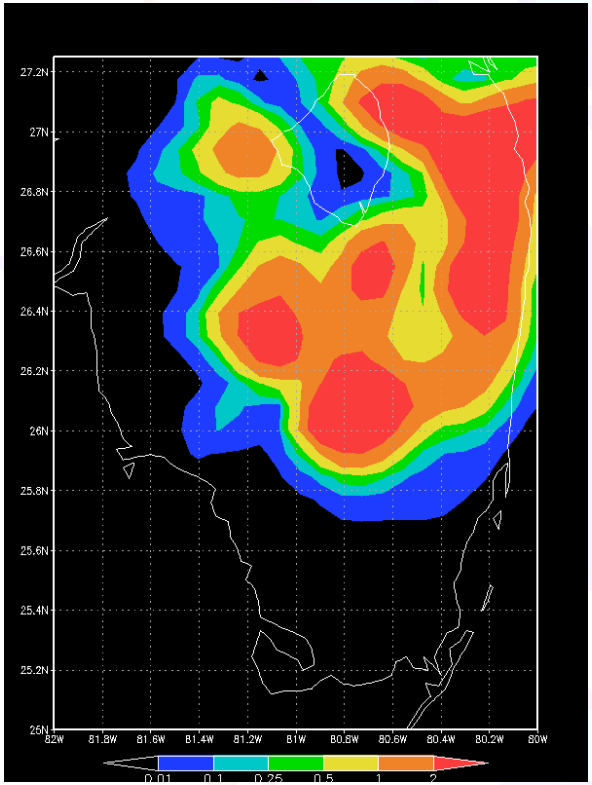
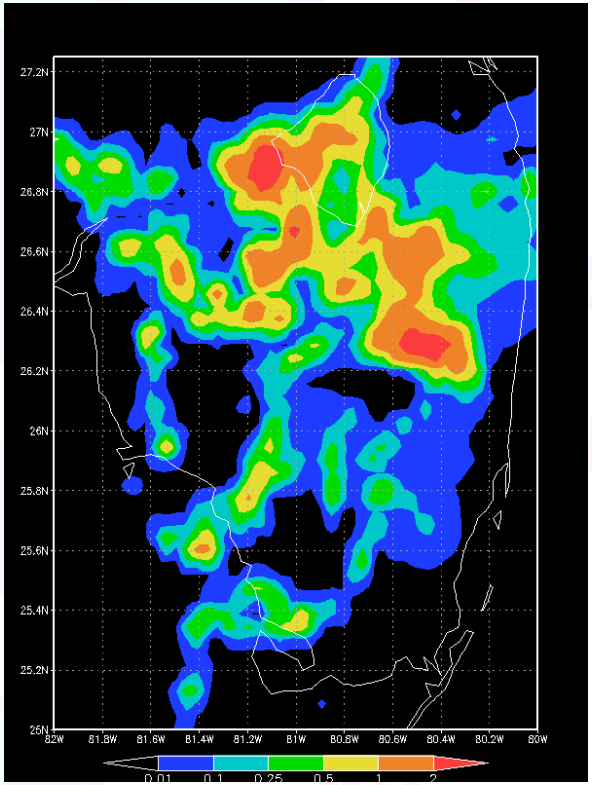
Validation of High Resolution Local Model at WFO Miami





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Outline

- Objectives
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- Data
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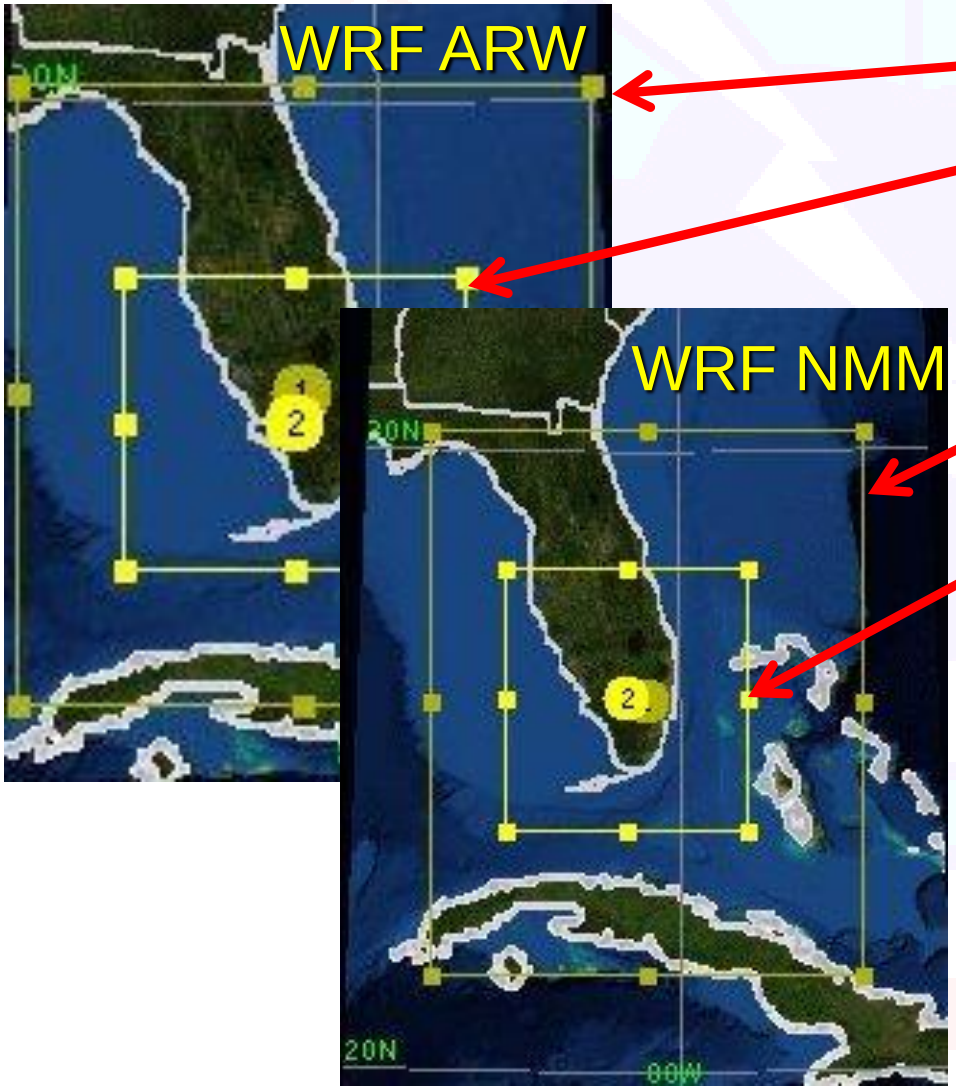
- Summary and Future

Objectives

- To assess the performance of WFO Miami high resolution local models in forecasting summer time precipitation.
- To compare the different model configurations against each other and the RUC13.
- To quantify the effect of using NASA's SPoRT SST and LIS datasets.

WFO Miami Local Models



- WRF-ARW
  - D01 – 9 km/D02 – 3km
  - Cycles: 00Z, 04Z, 08Z, 12Z, 16Z, and 20Z (out to 18 hours)
  - BC: 13 km RUC
- WRF-NMM
  - D01 – 6km/D02 – 2 km
  - Cycles: 00Z, 03Z, 06Z, 09Z, 12Z, 15Z, 18Z, 21Z (out to 36 hours)
  - BC: Global Forecast System
- Common all configurations:
  - No convective parameterization
  - Initial Conditions: 13km RUC
  - Surface Datasets: NASA's SPoRT high res SST and Land Information System (LIS)

Data

- Local WRF-ARW and WRF-NMM archives
- 13 km RUC Archives
- NASA's SPoRT SST and LIS Archives
- Stage IV Precipitation (5 km)

Methodology

- Gather forecast and observed precipitation amounts for 1, 3, and 6 hour periods for the 00Z and 12Z model cycles from May 15 to Aug 15, 2011.
- Compare forecasts against stage IV radar derived precipitation amounts by computing a variety of skill scores including: threat scores, equitable threat scores, areal bias, percent correct, POD, and FAR. The scores will be computed for the .01”, 0.10”, 0.25”, 0.50” thresholds.
- Our goal is to compare the different model configurations against each other and the RUC13 including comparison of model runs with and without the NASA SPoRT provided SSTs and LIS datasets

- So how do you compute these?

Skill Scores
Contingency Table

Forecast \ Observed	No	Yes
No	a	b
Yes	c	d

- Computed on lower resolution grid between model and Stage IV grid.

$$POD = d/(b+d);\ FAR = c/(c+d)$$

$$\%\ correct = (a+d)/(a+b+c+d)$$

$$Areal\ Bias = (c+d)/(b+d)$$

Threat Scores Conceptually

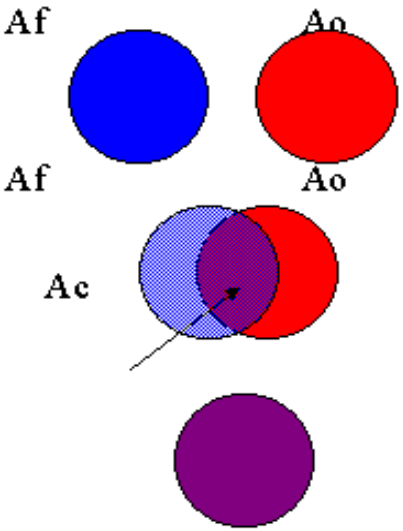
THREAT SCORE

$$TS = Ac / (Af + Ao - Ac)$$

Ac = Area correct

Af = Area forecast

Ao = Area observed



Af = Ao, Ac = 0

Threat score = 0.00

Af = Ao, Ac = 1/2 Af

Threat score = 0.33

Af = Ao = Ac

Threat score = 1.00

Threat Scores
In terms of how you compute it

Forecast \ Observed	No	Yes
No	a	b
Yes	c	d

- Range is from 0 (no Skill) to 1 (perfect)

$$TS = d/(b + c + d)$$

Equitable Threat Scores In terms of how you compute it

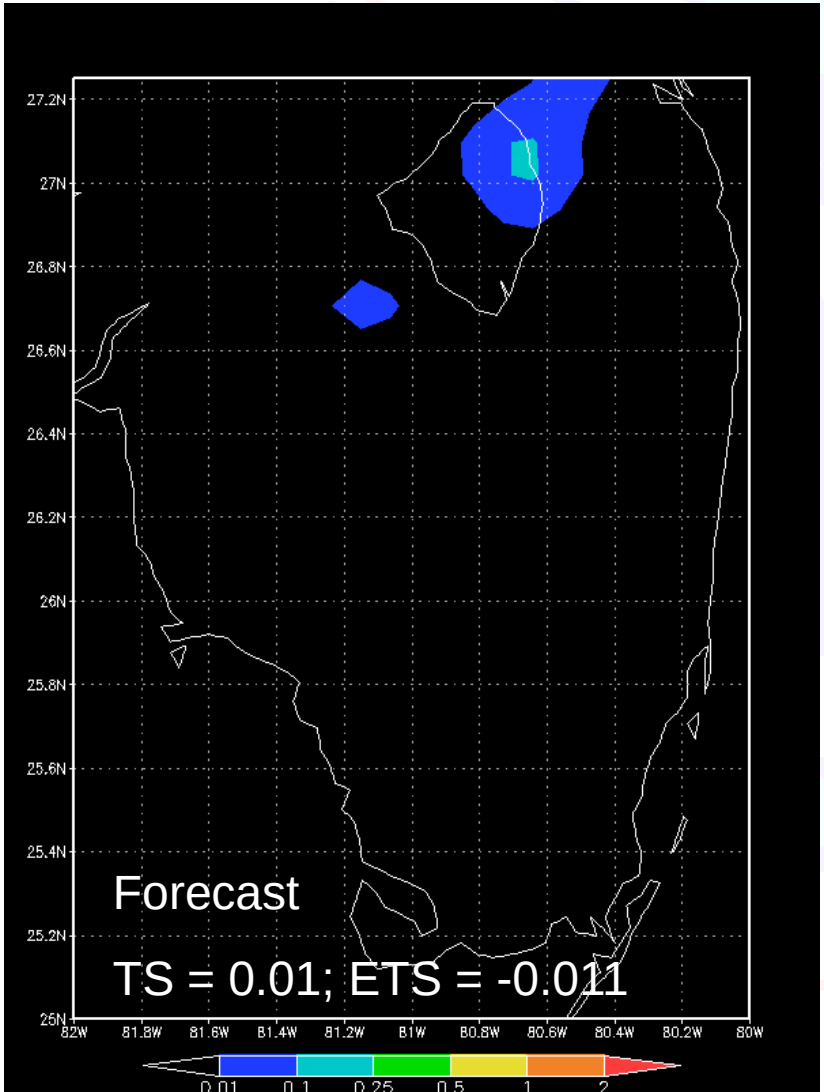
		Observed: No	Observed: Yes
Forecast	No	a	b
	Yes	c	d

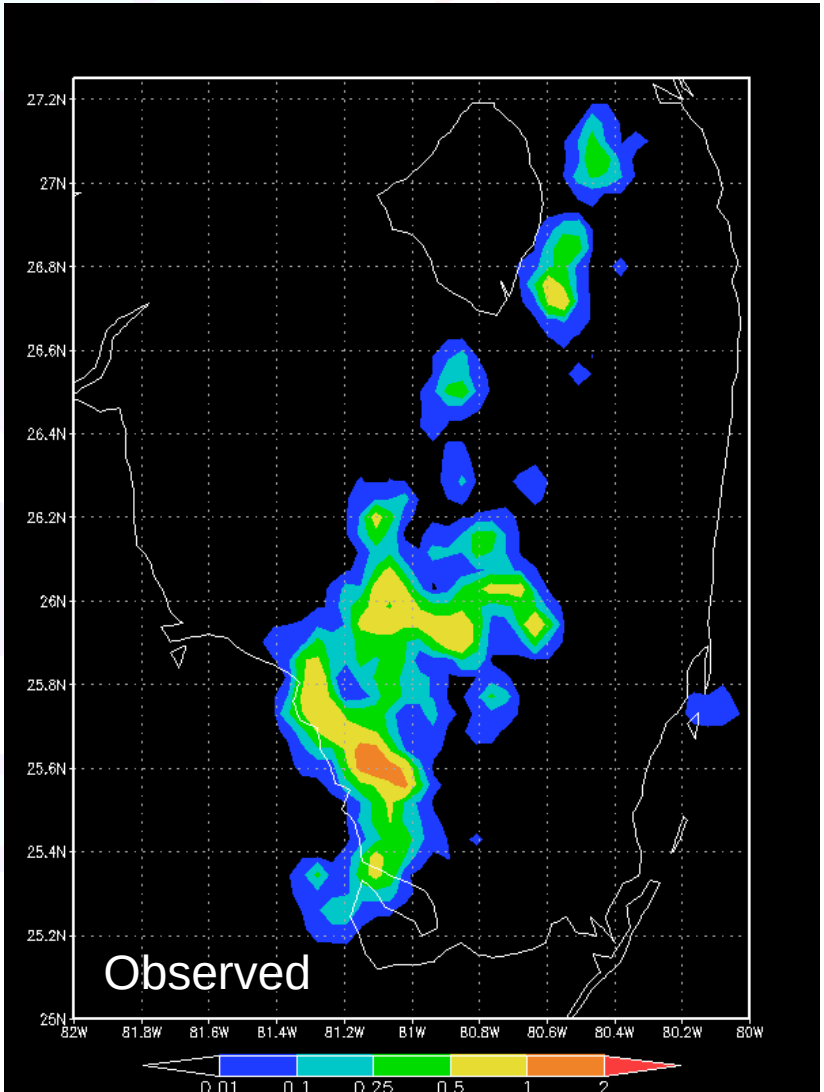
- Corrects for inflated TS from overforecasting areas of rain
- Assumes forecast and obs are independent
- ETS < 0 unskilled forecast

$$ETS = (d-dr)/(b + c + d-dr)$$

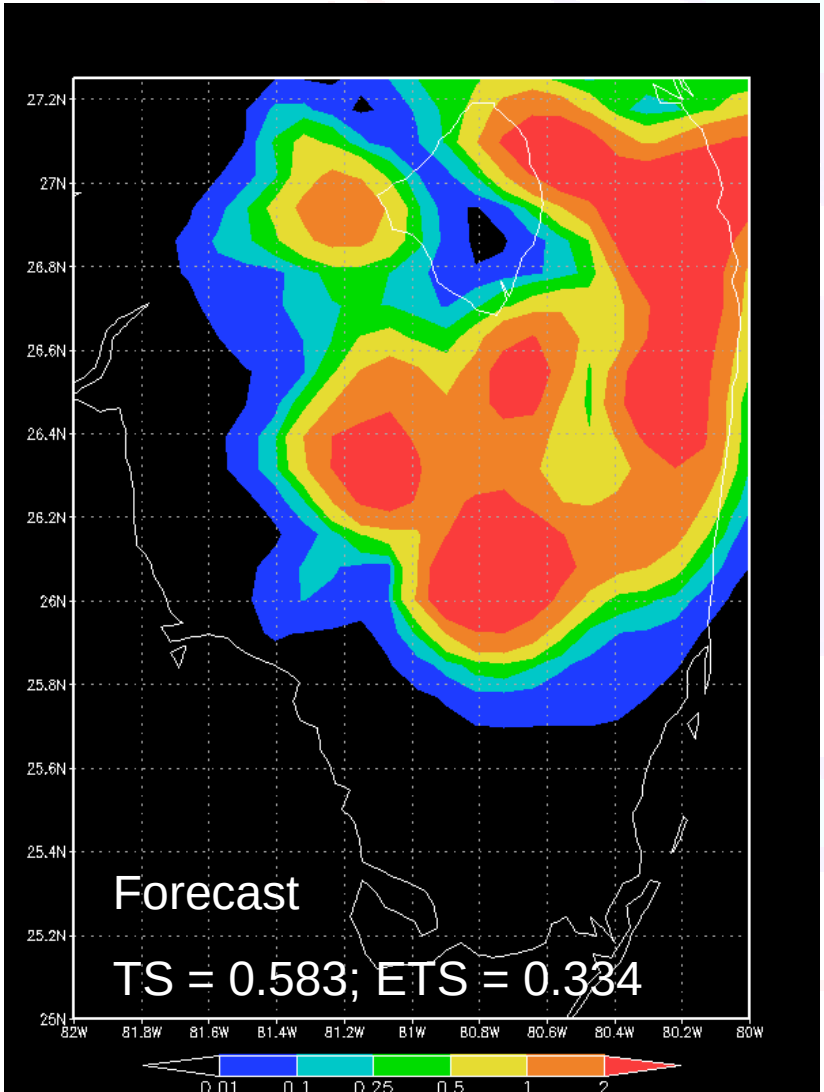
$$dr = (c+d)*(b+d)/(a+b+c+d) = \text{hits expected by chance: range } <0 \text{ to } 1$$

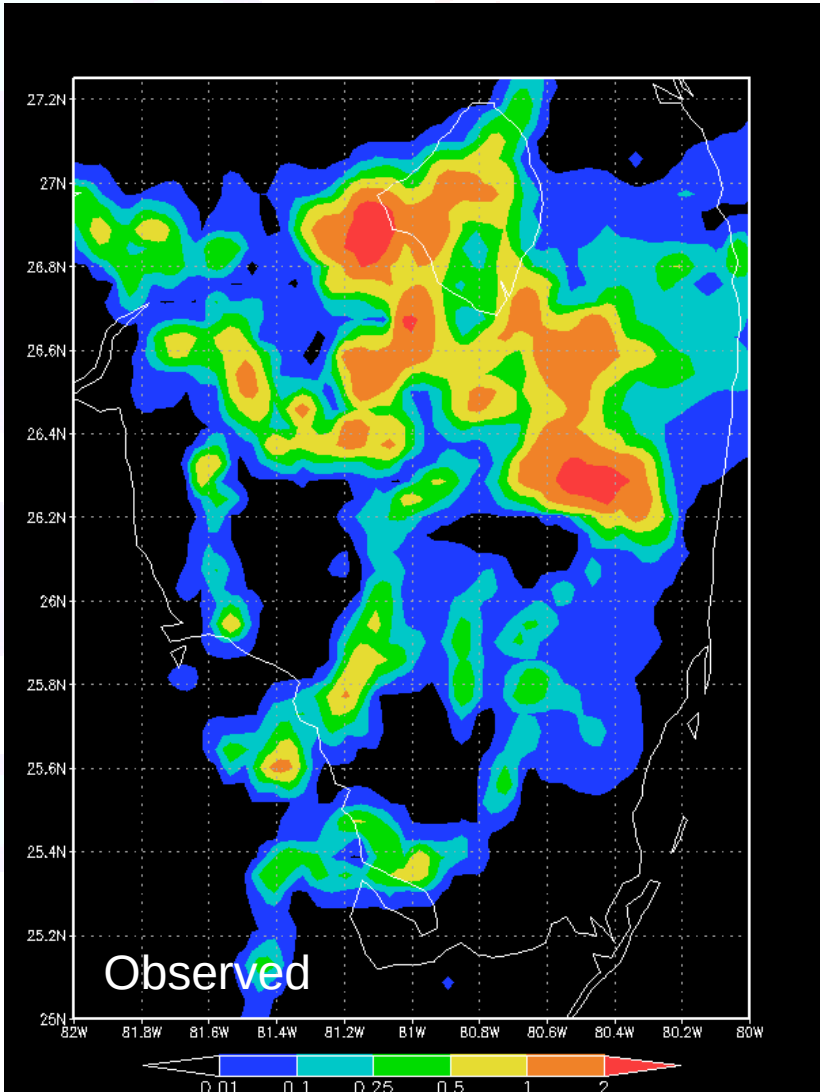
Threat Scores Illustration (Bad)





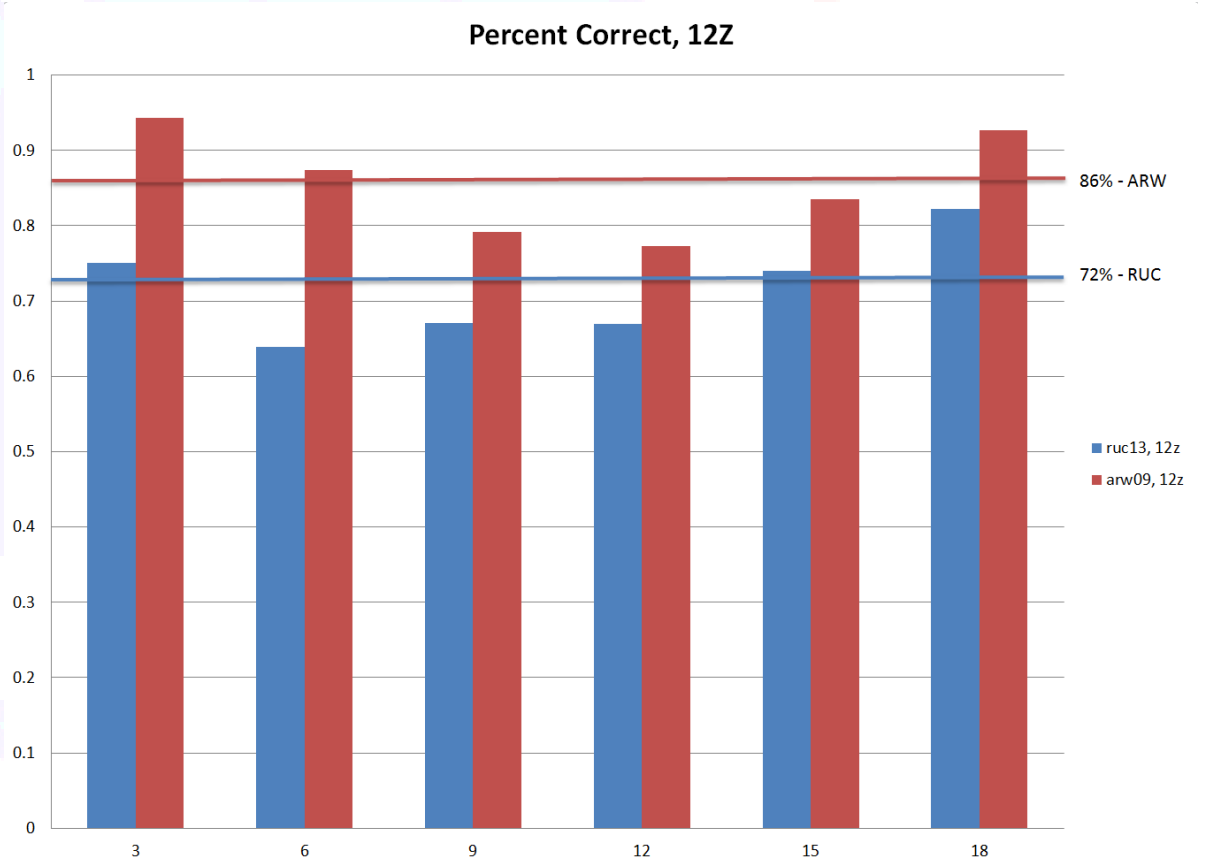
Threat Scores Illustration (Good)





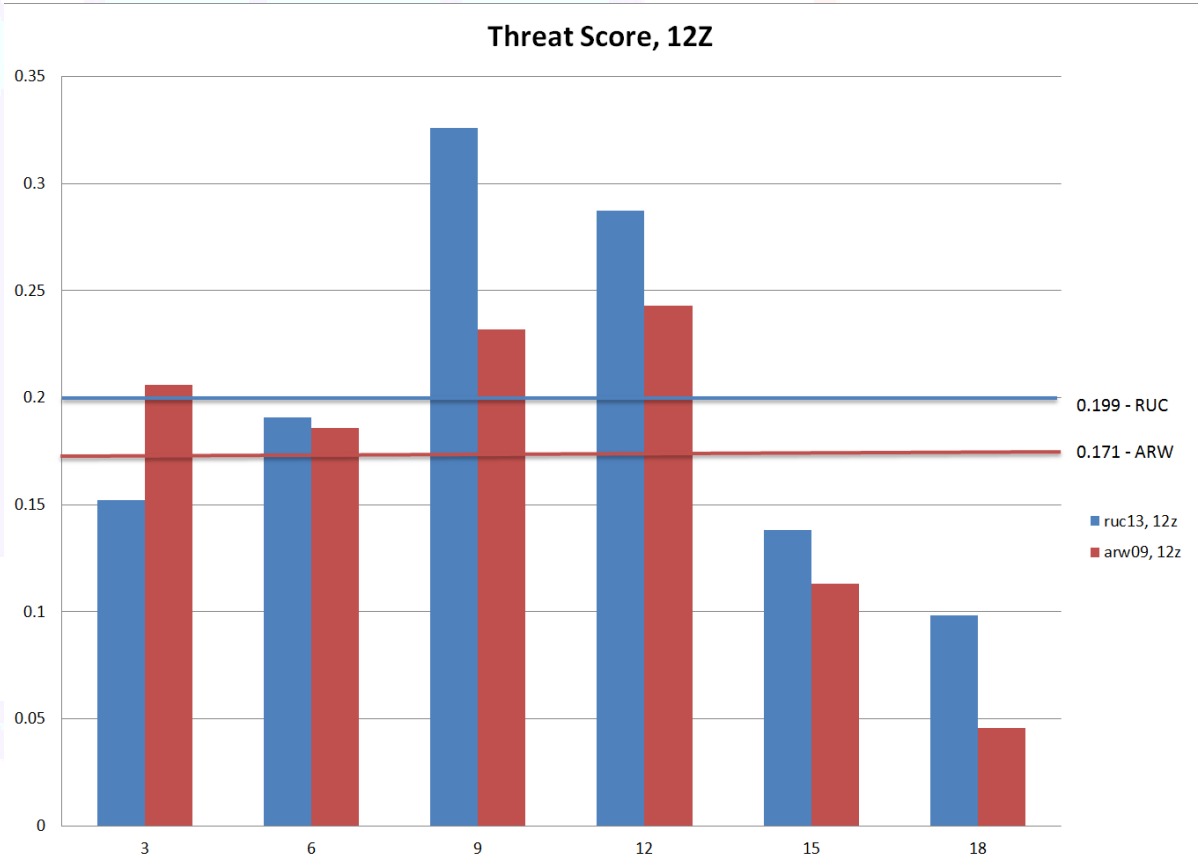
Preliminary Results

- In Average, ARW d01 or 9km domain shows 14% improvement over the RUC13 in detecting and distinguishing between areas of rain an no rain.



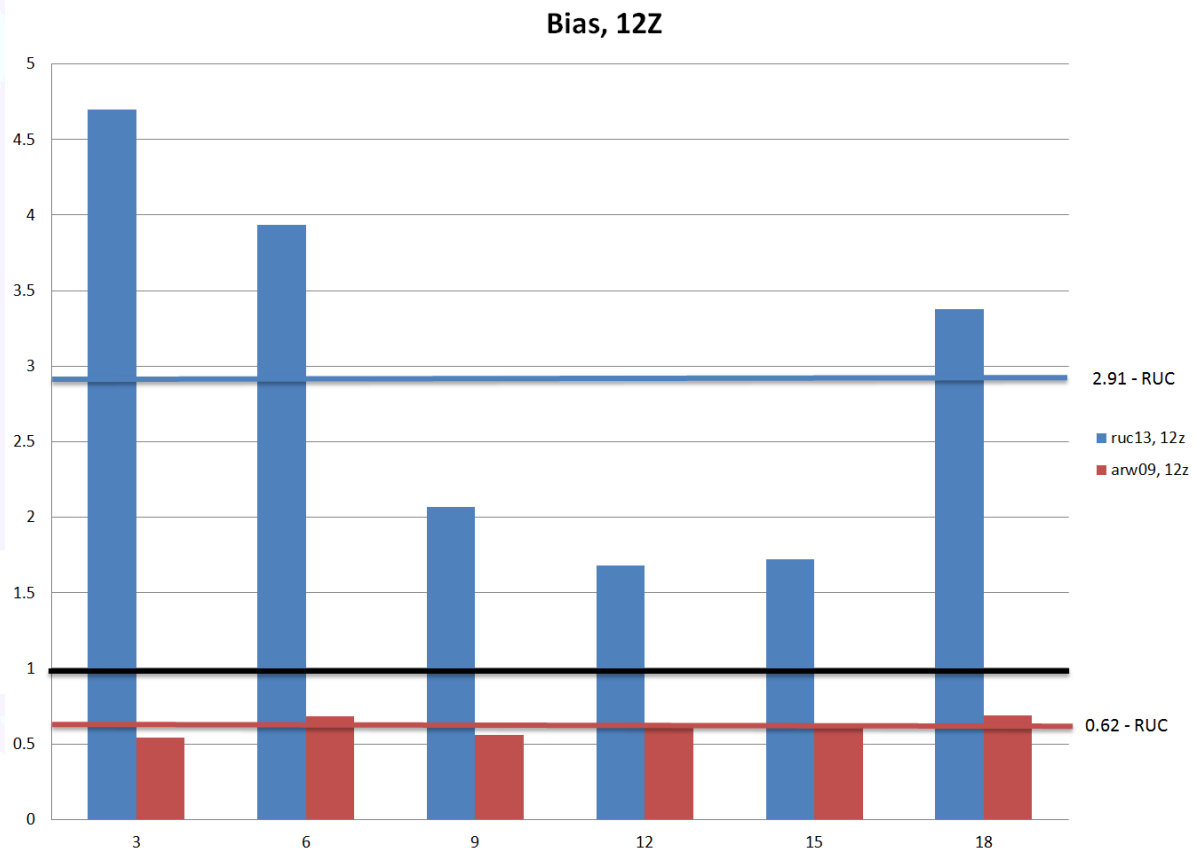
Preliminary Results

- These are scores composited over the entire study period for each forecast hour. From that perspective, threat scores close to .2 and higher are in general considered good.
- This result shows that through at least the first 12 hour of the forecast, both performed quite well with ruc13 edging arw09.



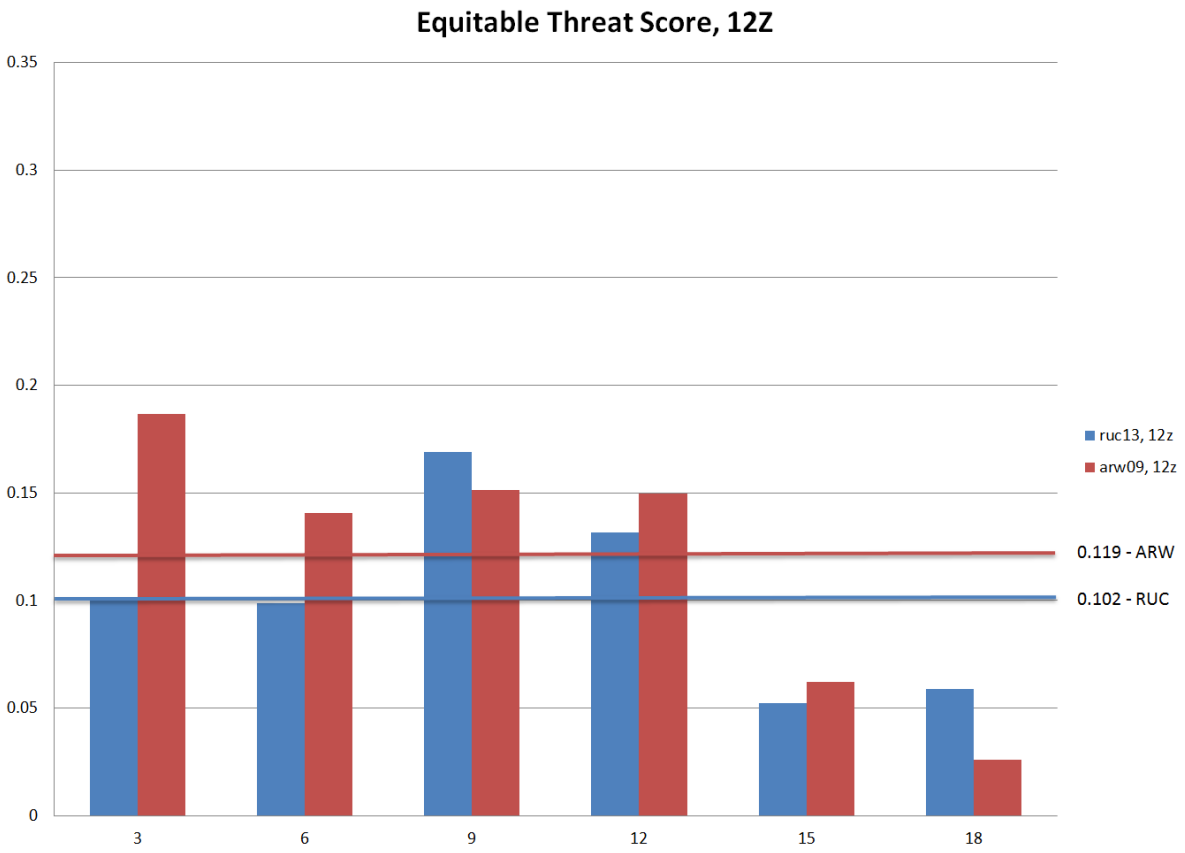
Preliminary Results

- However, RUC13 seems to suffer of a pronounce areal bias overestimating areas of rain by as much as a factor of 3 in the mean with individual forecast times as high as nearly 5.
- ARW09, on the other has a rather consistent dry bias but not as pronounced as the ruc wet bias.



Preliminary Results

- The ETS reflects this with ARW09 showing overall improvement over the RUC13 which appear to be substantial in the early part of the forecast.



Summary and Future Work

- Preliminary results compiled for May 15 to July 15
- Complete all calculations for all model configurations throughout the fall
- Study Period will be extended through Aug 15
- Collaboration ?