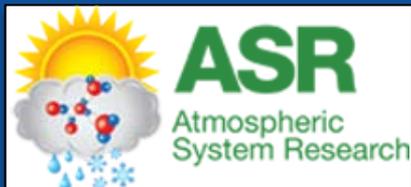


# MC3E Ensemble Forcing

November 4<sup>th</sup> 2013, ASR Fall meeting

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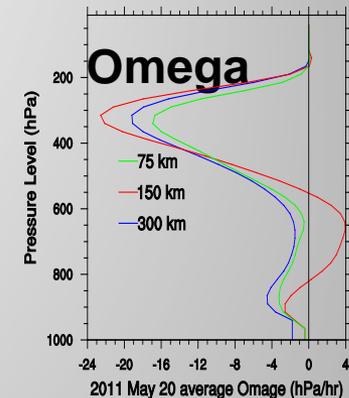
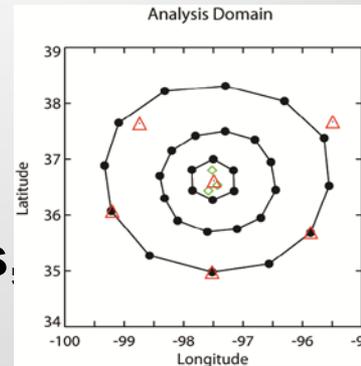


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# What we have now?

- 3-hourly, 25 mb, 04/22/2011 to 06/06/2011 for 300km, 150km and 75km diameter domains
- Constrained by surface heat fluxes, surface and TOA radiative fluxes and surface precipitation



# What we are planning?

- Perturbed precipitation rates of 300km domain as constrain into variational analysis to derive an Ensemble forcing

# How to perturb precipitation?

- **Simplest** way is to add a range in addition to 300km domain mean, and perturb between the upper and lower bound randomly
  - What is the perturbation range (**physically based**)?
  - What is the assumption for temporal and spatial correlation of such perturbations?

# Precipitation measurement

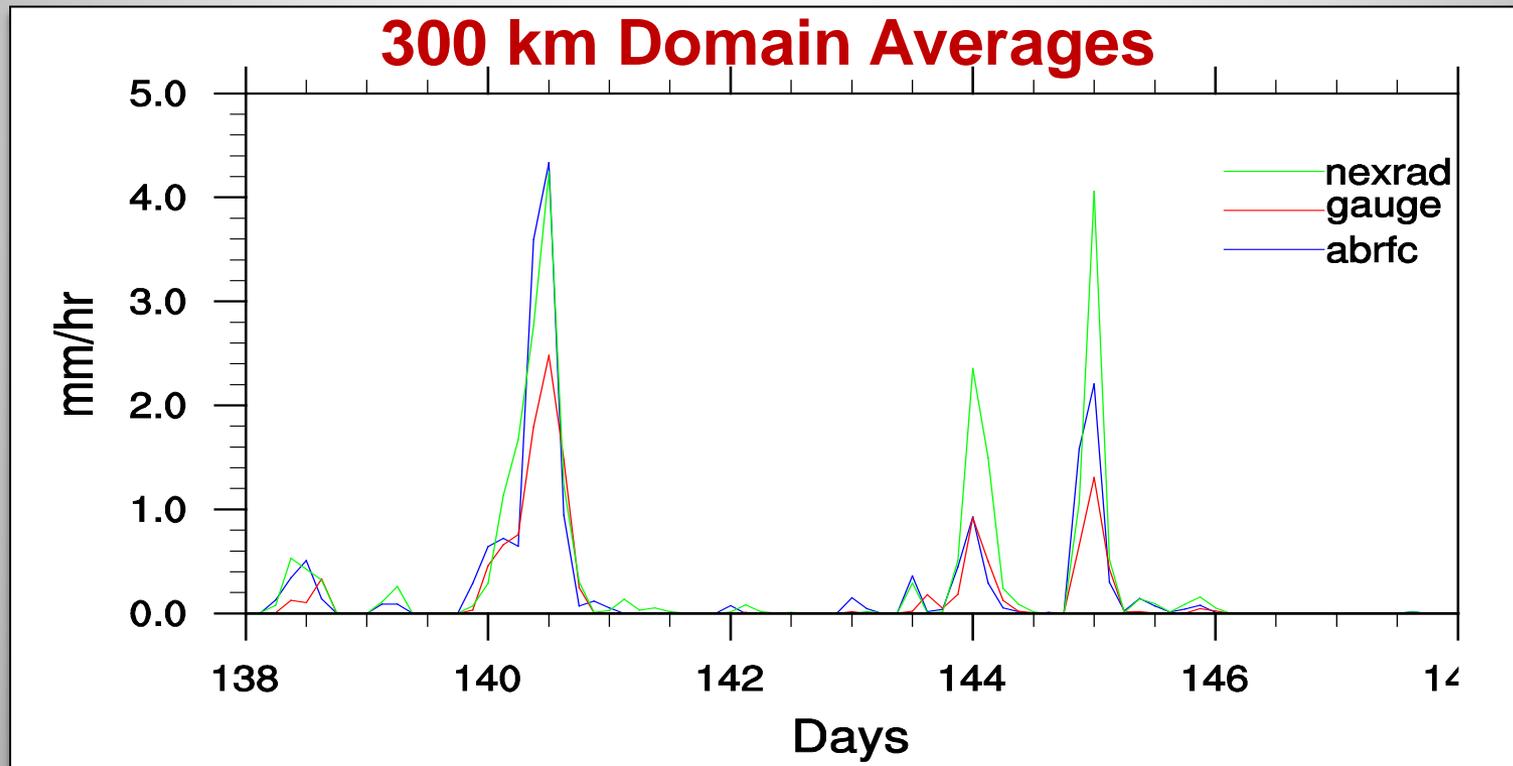
- **ABRFC** (Merges NEXRAD radar with rain gauge obs including Oklahoma Mesonet - Uses radar to spatially interpolate gauges)
- **Rain Gauge** data from ARM smos, OK mesonet and KSU mesonet
- **NEXRAD NMQ Q2** retrieved precipitation (Radar product adjustment relative to rain gauge data)

Scott's CSSEF efforts → provide an uncertainty estimate at the 1 km scale to 10 km scales.

- Need to translate these to larger scales (100-300 km).
- Oklahoma precipitation has challenges including hail, additional regime related uncertainty

NEXRAD NMQ Reference: Zhang, Jian, and Coauthors, 2011: National Mosaic and Multi-Sensor QPE (NMQ) System: Description, Results, and Future Plans. *Bull. Amer. Meteor. Soc.*, **92**, 1321–1338.

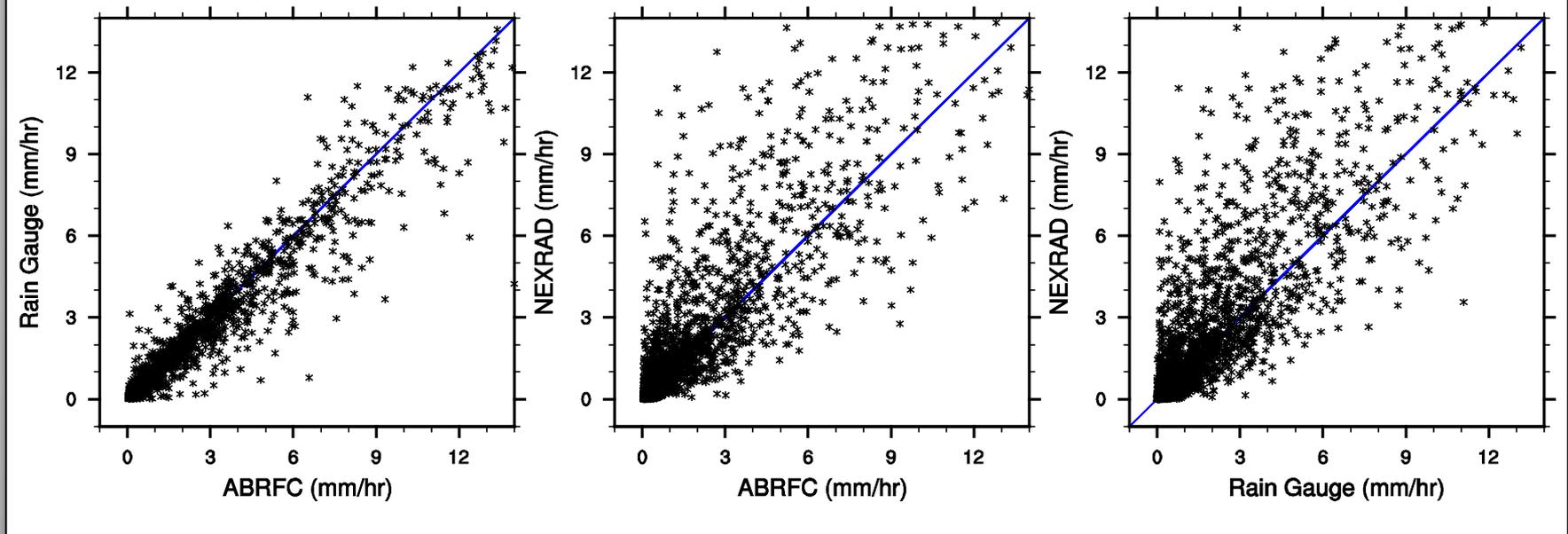
# Comparison for the domain average



- NEXRAD NMQ Q2 data (Radar, data is biased corrected according to Rain Gauge Data)
- Rain Gauge Data (From SMOS, OK Mesonet, and KSU Mesonet)
- ABRFC data (Radar, used to spatially interpolate Rain Gauge estimates)
- **Some Clear Differences:** Some are expected (1<sup>st</sup> peak) for Squall Lines; Some due to isolated convection, hail- related uncertainties (2<sup>nd</sup> and 3<sup>rd</sup> peaks)

# Comparison at individual sites

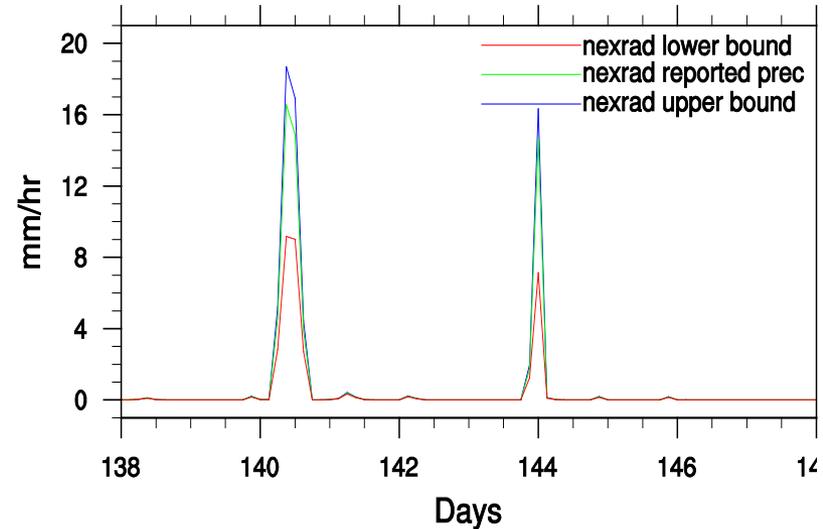
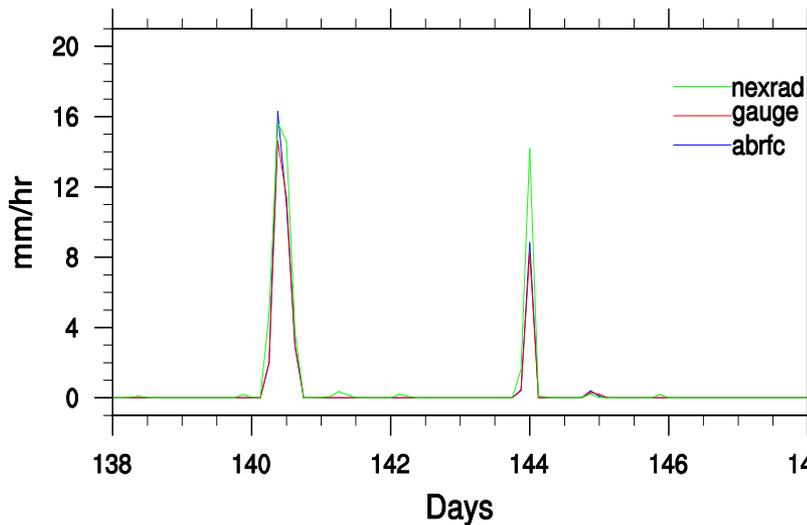
## Scatterplot – OK Mesonet Stations Comparisons (All MC3E)



- Both ABRFC and NEXRAD NMQ data extracted over OK Mesonet locations.
- ABRFC data adjusted to be consistent with OK Mesonet gauge data.
- The major difference: NEXRAD NMQ Q2 less 'steered' to Mesonet gauge data.
  - Still, not 'independent' of gauge data.

# Perturbation Range?

Comparison at OK Mesonet #17, a site close to CF



- The NEXRAD NMQ uncertainty range (e.g., Scott's CESSF work) designed to typically encompass the differences between these data streams.
- Thus, this may allow us to perturb precipitation rates based on this NEXRAD NMQ and associated uncertainty range.

# Temporal and Spatial correlation to construct 300 km domain mean precip?

1. Sample between upper and lower bound at each 10 km grid points of NEXRAD data **totally randomly** and then make the time series of domain mean
2. Assume **maximum temporal and spatial correlation** and sample at 10%, 20% ... to 90% of the range between upper and lower bound at each 10 km grid points of NEXRAD data and then make the time series of domain mean

# Time line

- By **the end of November**, Scott will deliver the final updates on precipitation uncertainty upper and lower bound based on NEXRAD NMQ for MC3E events
- We will deliver the ensemble forcing by **the end of 2013**.