



# Precipitation Estimation from the ARM Distributed Radar Network During the MC3E Campaign

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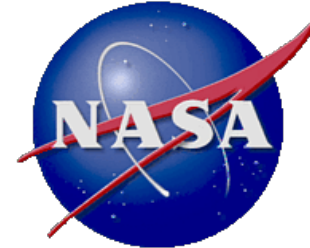


# “Implementation plan for Quantitative Precipitation Estimates (QPE) from Scanning ARM Precipitation Radars”

- Rainfall products (QPE) are in high demand for the verification of cloud and climate models, construction of forcing data for the driving of models.
- Increasing demand for detailed direct or radar-based insights into precipitation and deep convective clouds.
  - Raindrop Size Distribution (DSD)
  - Echo classification – Convective / Stratiform fractions.
- “What is the uncertainty?”

- July, 2011 (soon after MC3E)

# The Mid-latitude Continental Convective Clouds Experiment (MC3E) – Jensen et al.



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***A collaborative effort between the DOE ARM  
and NASA GPM mission***

April 22 – June 6<sup>th</sup>, 2011  
ARM Central Facility, Lamont Oklahoma

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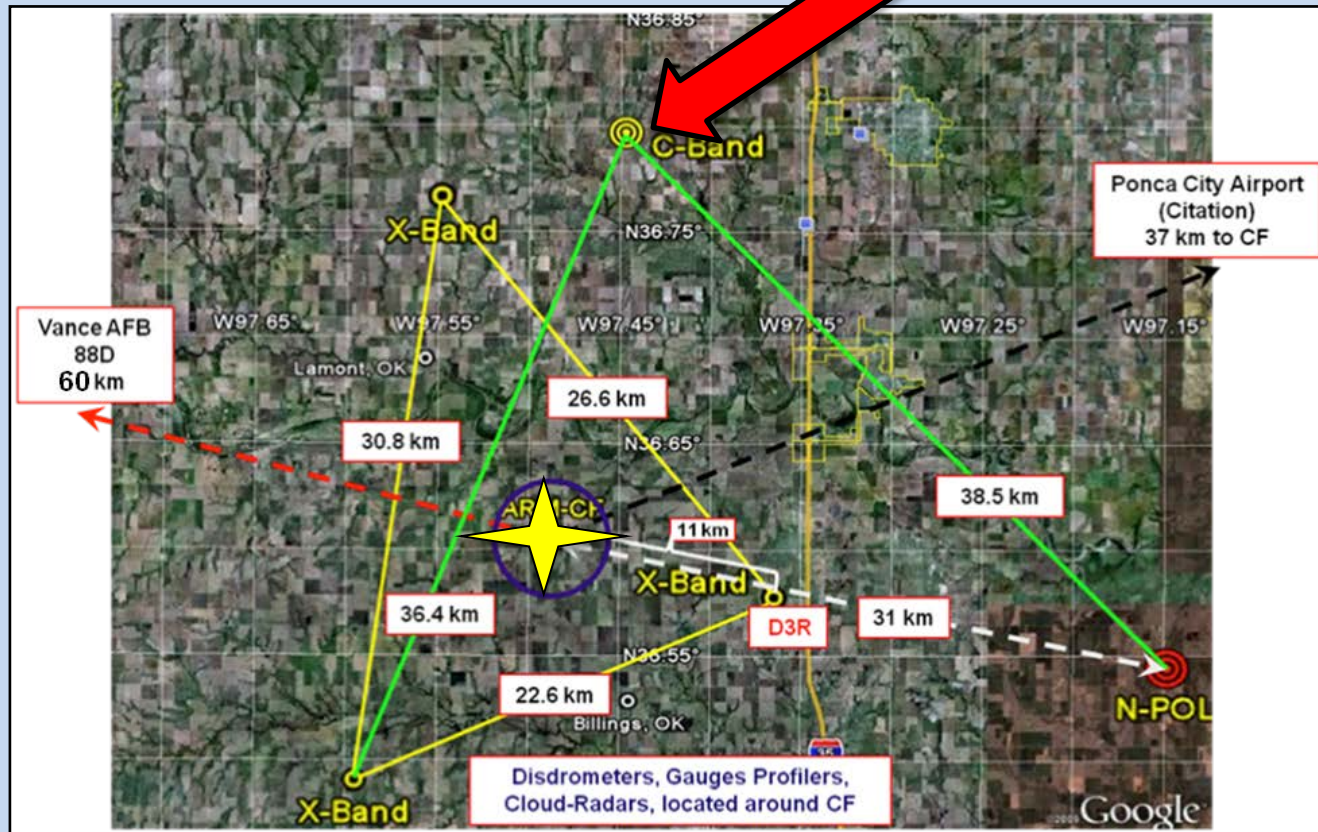


MC3E was the first demonstration of the ARM Climate Research Facility scanning precipitation radar platforms. A goal was to demonstrate the capabilities of ARM polarimetric radar systems for providing unique insights into deep convective storm evolution and microphysics.

Tackle the umbrella observations from the C-band scanning ARM precipitation radar (C-SAPR) first.

Wealth of collocated ARM / NASA resources.

“Radars? In Oklahoma?”



“What is the uncertainty?”

“It depends.”

Error ~ (System Bias) + (Physical Process Noise)

(System) – Radar Calibration, Processing, System  
(wavelength) limitations & strengths.

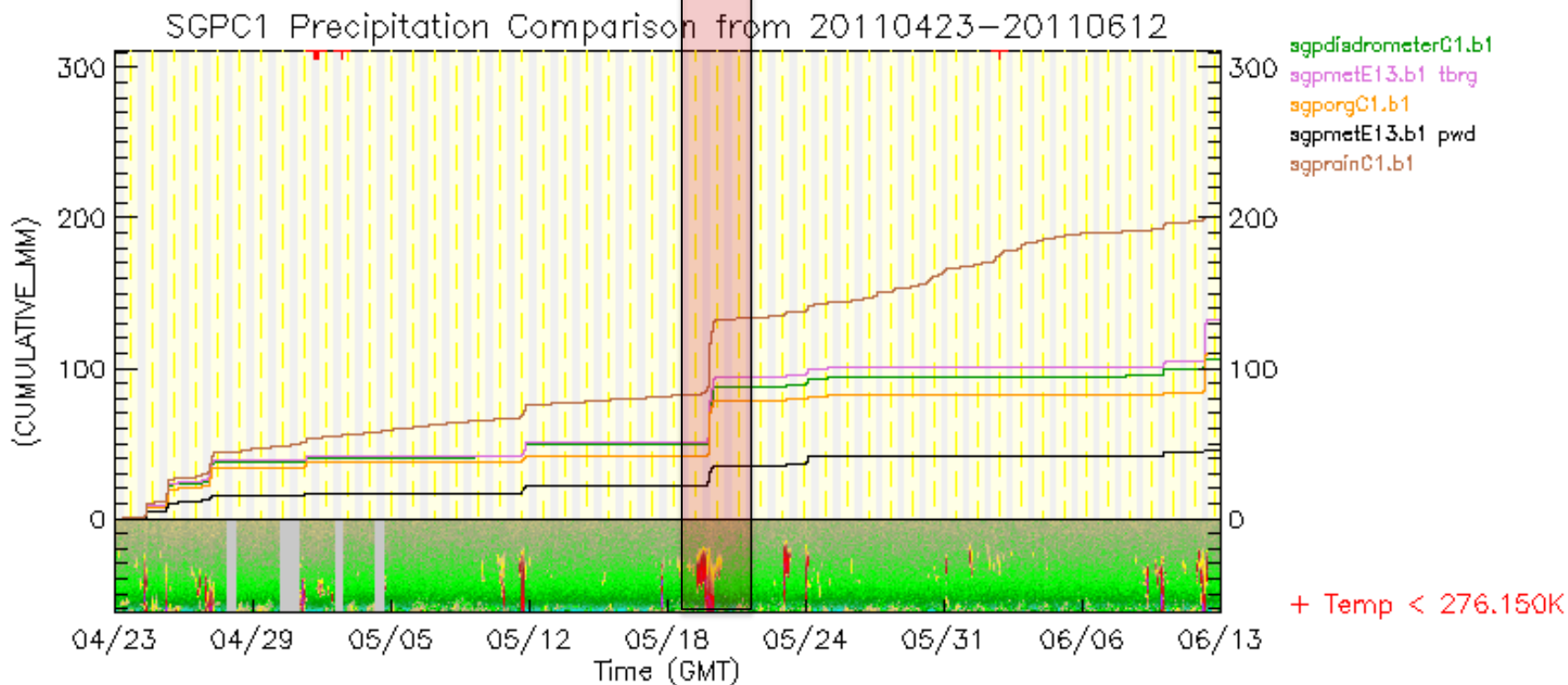
(Physical Process) – DSD Variability, Known Contaminants  
(hail, mixed phase).

# Standing Out: Adding Value in a Crowd.

## Measure Twice, Cut Once

- Important for rainfall is important for everything Radar.
- Establish 'Best Practices' with the DQ Office.
  - "Facility" (calibration) approach; Database;
- 'Open' codes: Flexible to new 'research' methods.
- Respond to users; "Easy" gridded products (MMCG).  
Uncertainty 'fields'.

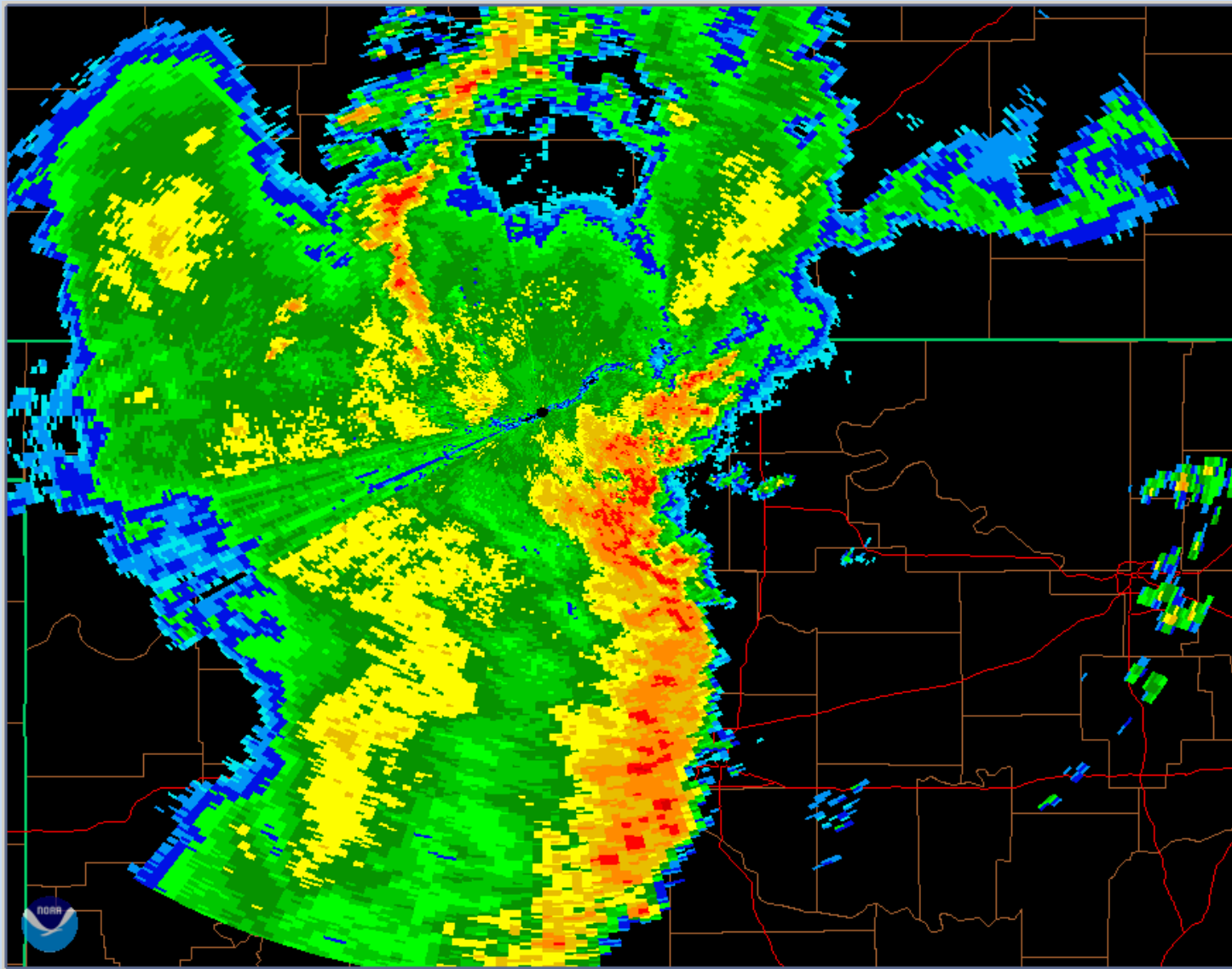
# MC3E: Overview & DQ (Poster: Theisen)



Datastream	Period Total (mm)	Percent of MET Value	mm Removed by Threshold	Max Rate (mm/hr)
sgpdisdrometerC1.b1	105.729	80.0493	0 (0.00000 mm/hr)	145.441
sgpmetE13.b1 tbrg	132.080	100.000	0 (0.00000 mm)	198.120
sgporgC1.b1	110.175	83.4153	0 (0.00000 mm/hr)	204.000
sgpmetE13.b1 pwd	46.0045	34.8308	0 (0.00000 mm/hr)	27.6200
sgprainC1.b1	200.512	151.812	0.00151570 (0.100000 mm/hr)	91.9267

Rain datastream was smoothed using a Moving Average of 15 Minutes

# MC3E: May 20<sup>th</sup> 2011; “Golden” Event



NEXRAD LEVEL-III  
BASE REFLECTIVITY  
KVNX - VANCE AFB, OK  
05/20/2011 09:53:08 GMT  
LAT: 36/44/27 N  
LON: 98/07/40 W  
ELEV: 1258 FT  
MODE/VCP: A / 12  
  
ELEV ANGLE: 0.50 °  
MAX: 58 dBZ

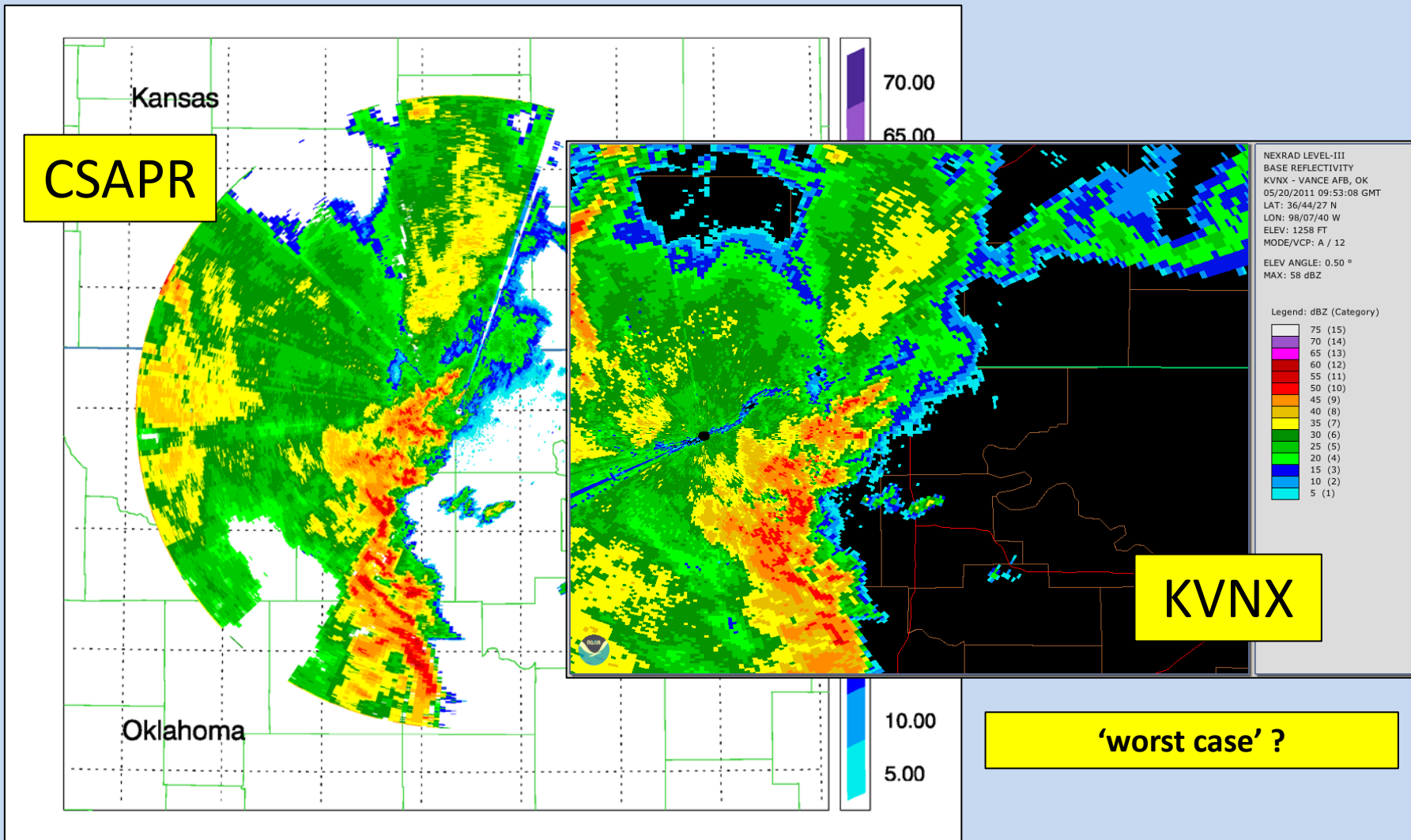
Legend: dBZ (Category)

75 (15)
70 (14)
65 (13)
60 (12)
55 (11)
50 (10)
45 (9)
40 (8)
35 (7)
30 (6)
25 (5)
20 (4)
15 (3)
10 (2)
5 (1)



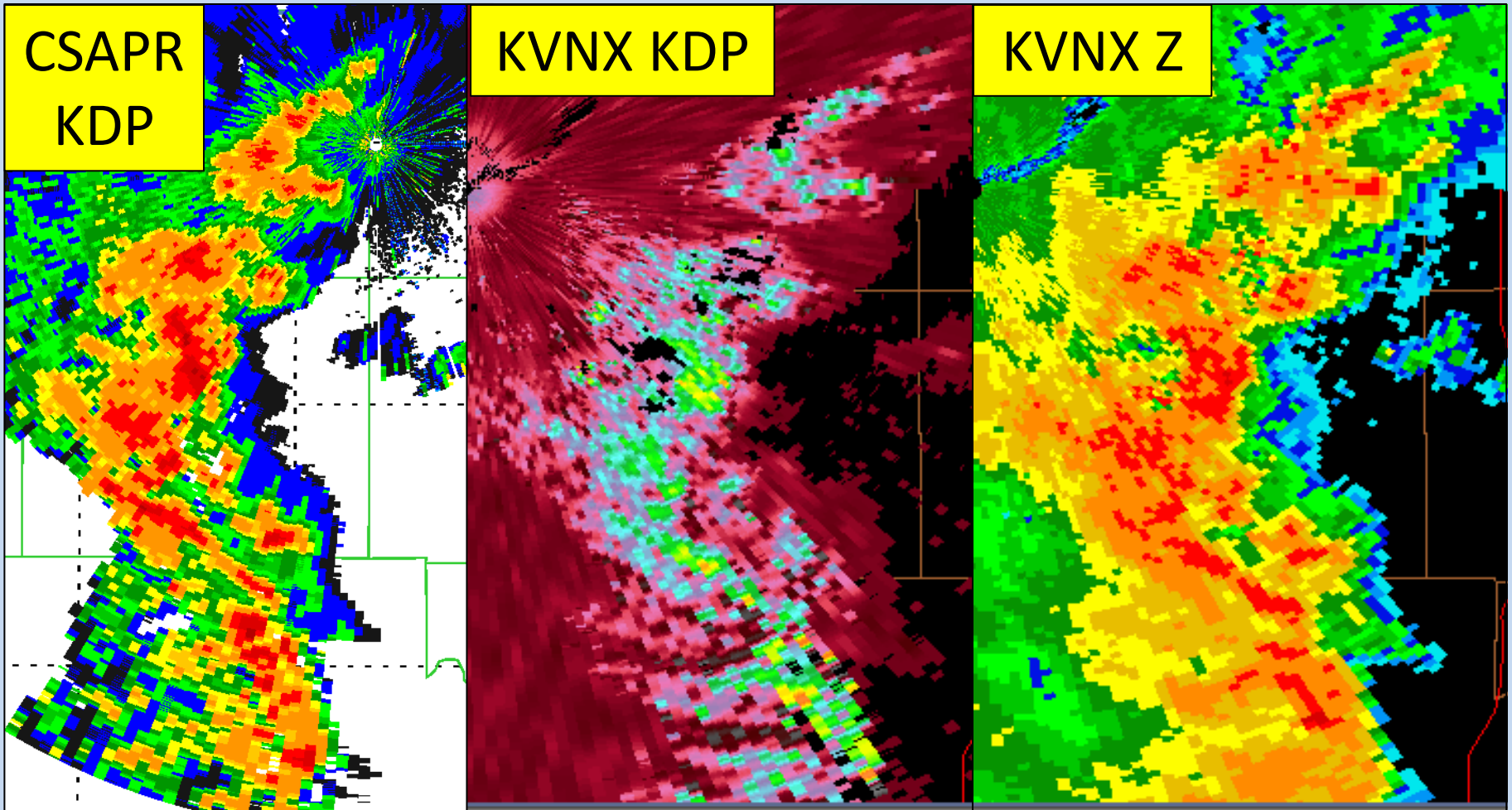


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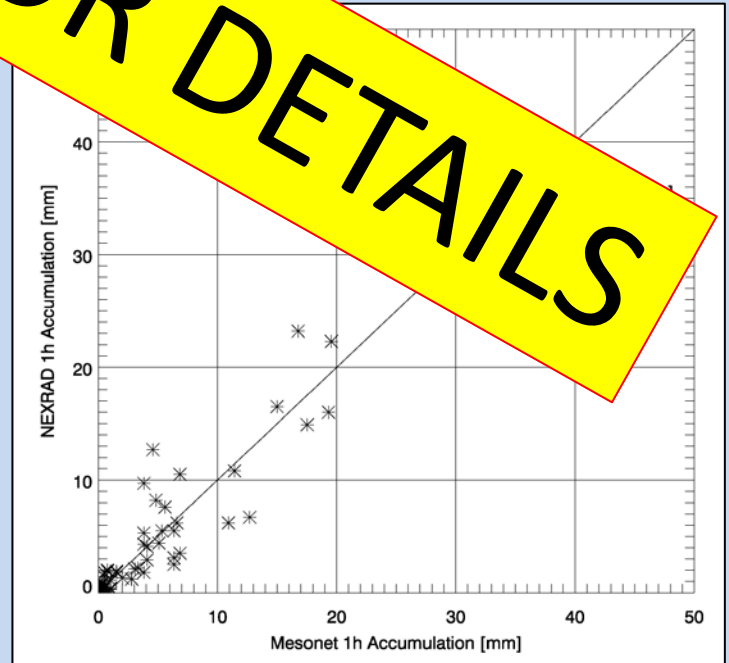
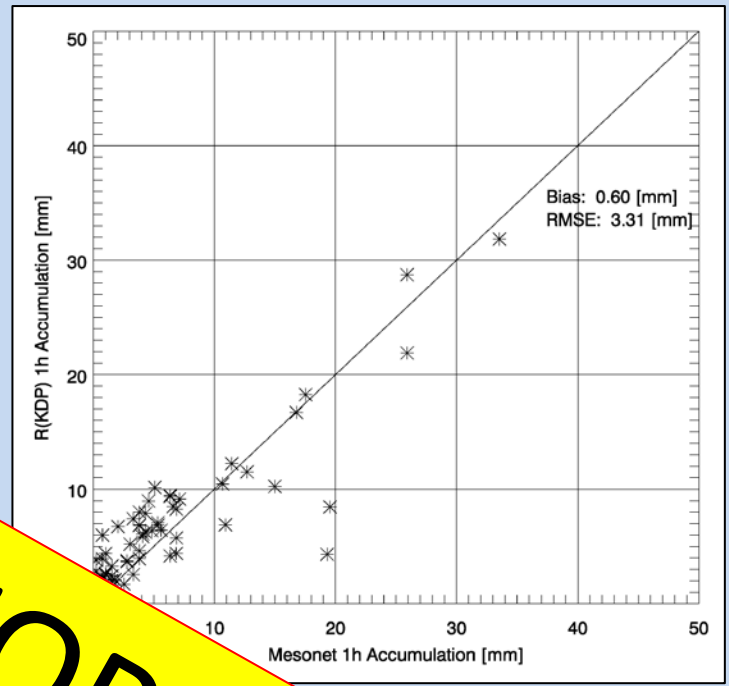
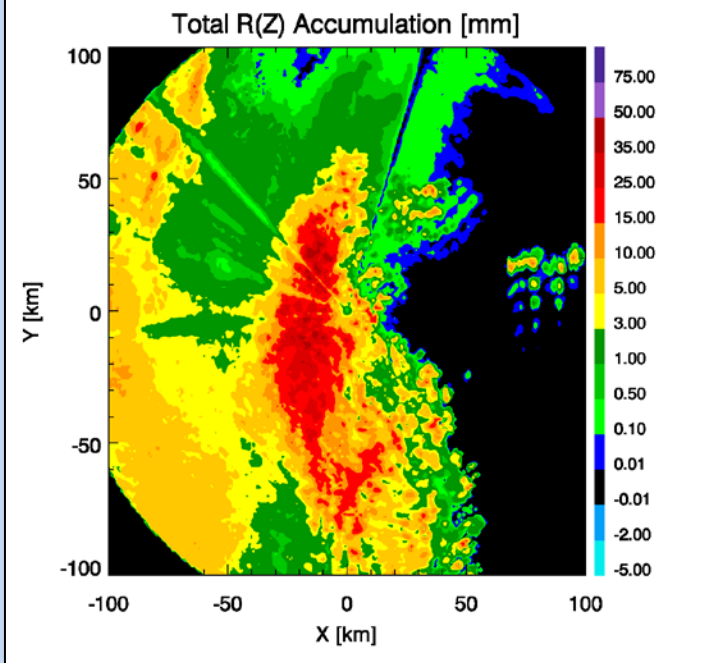
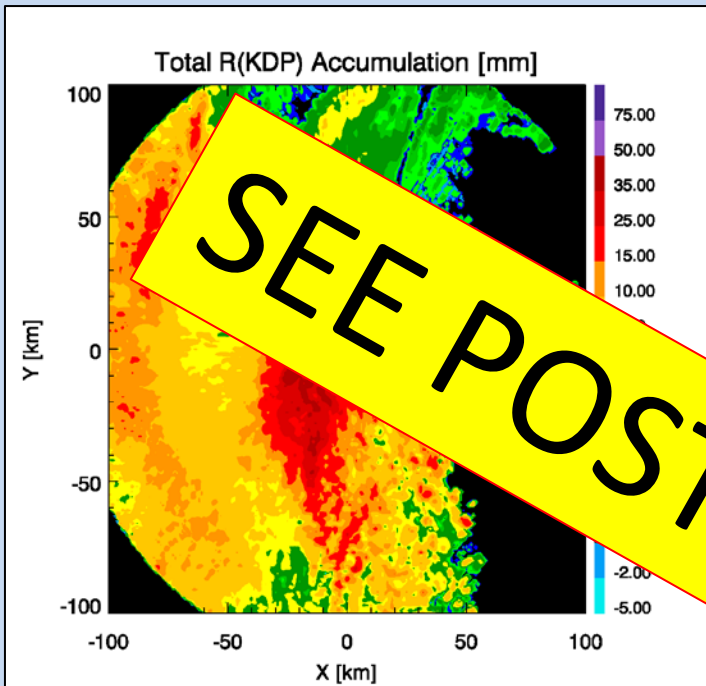
**Blockage, Attenuation in rain, Calibration still an issue at C-band.  
Just a 2 dBz error in Oklahoma could be 30 mm/hr!**

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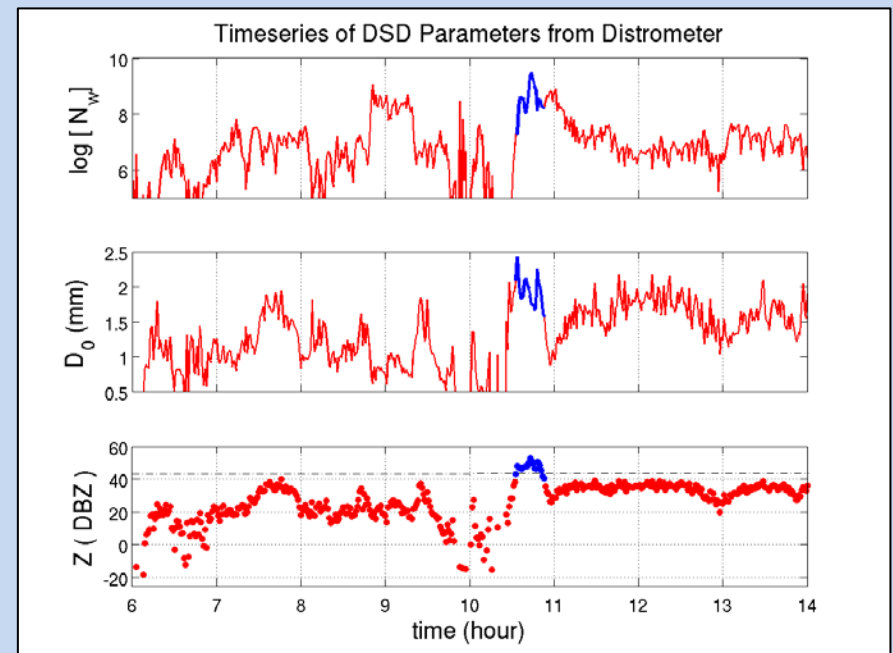
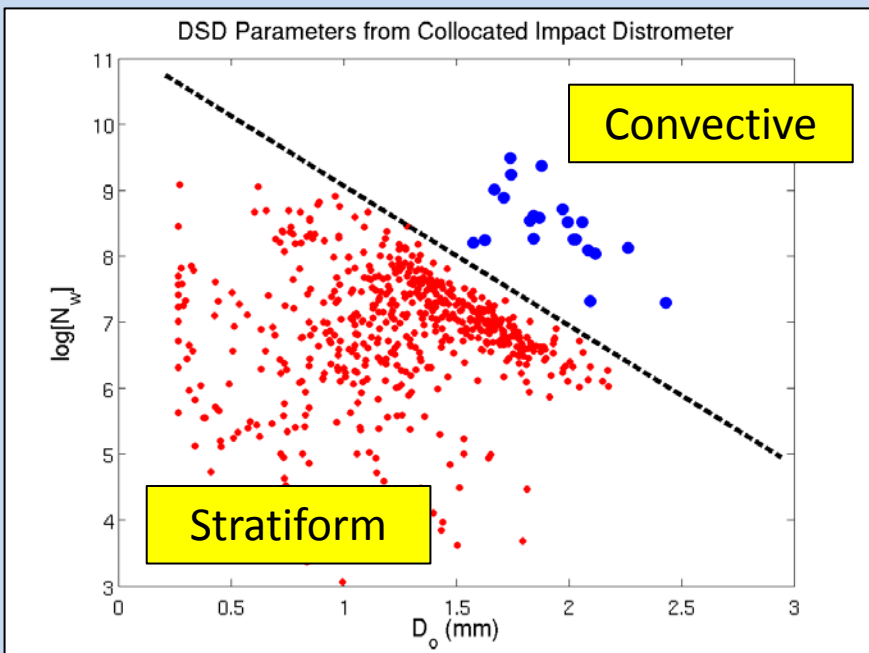
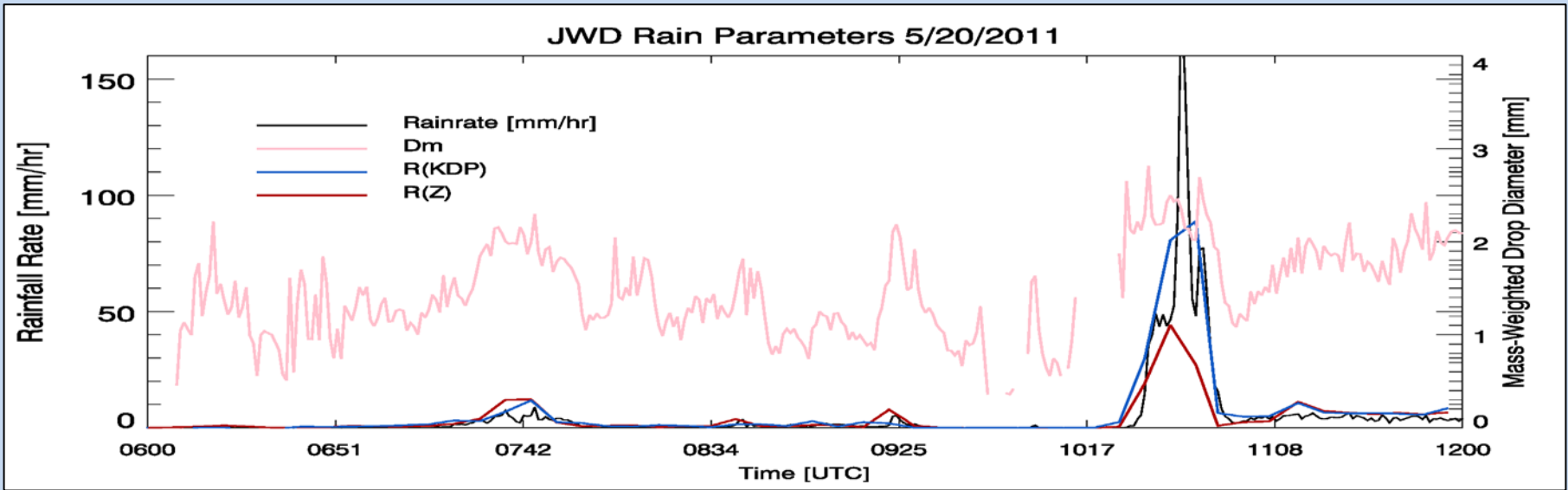


‘Value’ with C-band polarimetric measurements (e.g., KDP) - Ways to improve processing methods, esp. near deep convective cores.

SEE POSTER FOR DETAILS



# “Facility” Approach (See posters: Dunn, Giangrande)



# Summary:

- Evaluation Products (MMCG) available - Working towards MMCGv2.
- Solid performance against “tough” regional standards. Progress toward DSD, convective – stratiform masking.
- Manus development underway: 2DVD record; Challenges?

