

## MC3E April 22 – June 6

### ARM Southern Great Plains Central Facility

Represents a collaborative effort between the DOE ASR Program and the NASA Global Precipitation Measurement (GPM) mission

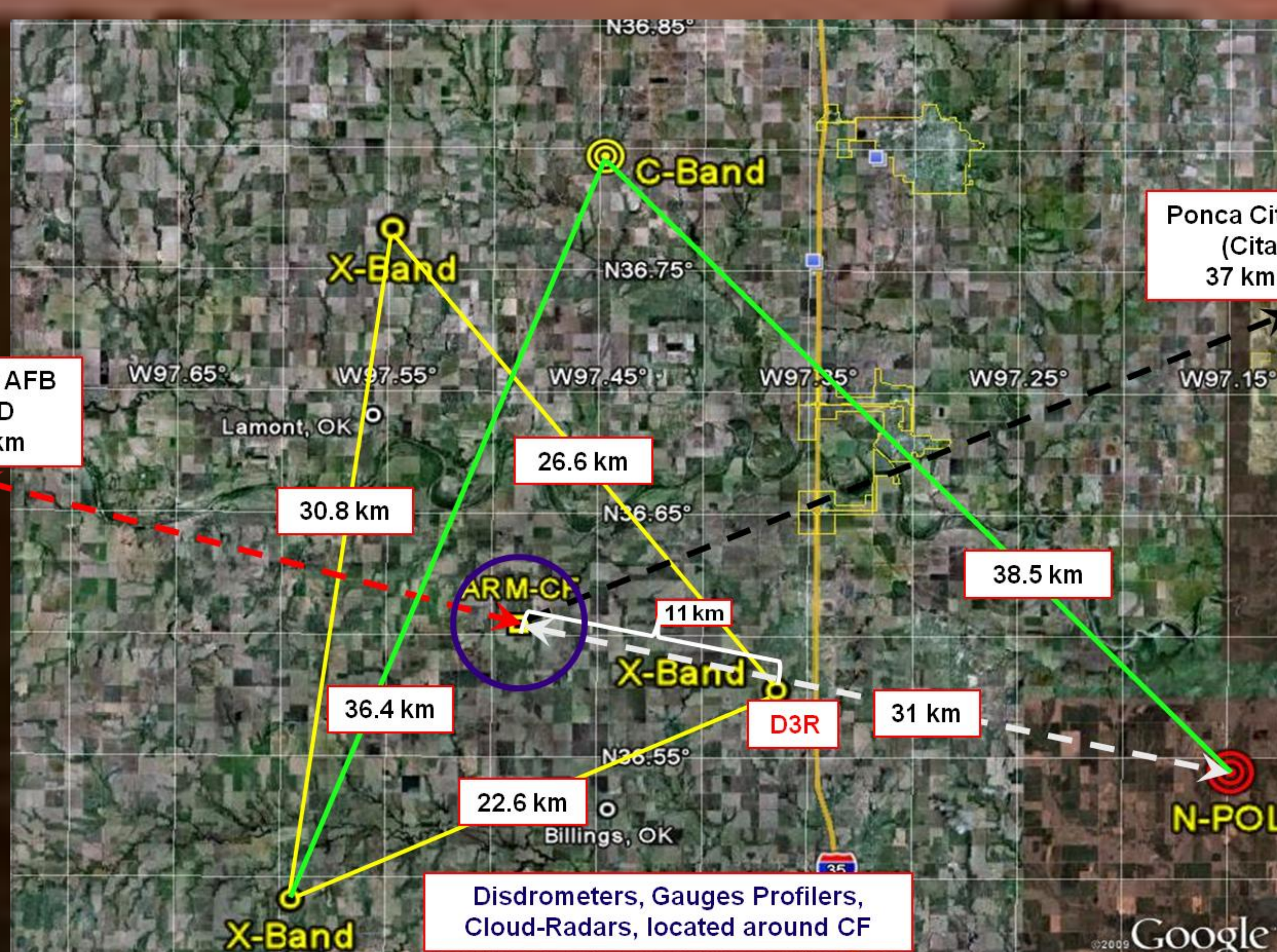
#### Overarching Science:

A complete characterization of convective cloud systems in order to:

- 1) Advance the understanding of the different components of convective parameterization
  - Focus: Convective initiation and up/downdraft coupling to precipitation and cloud microphysics.
- 2) Improve the fidelity of satellite estimates of precipitation over land.
  - Focus: Observation and quantification of dominant column microphysical processes impacting satellite-based passive/active microwave retrievals

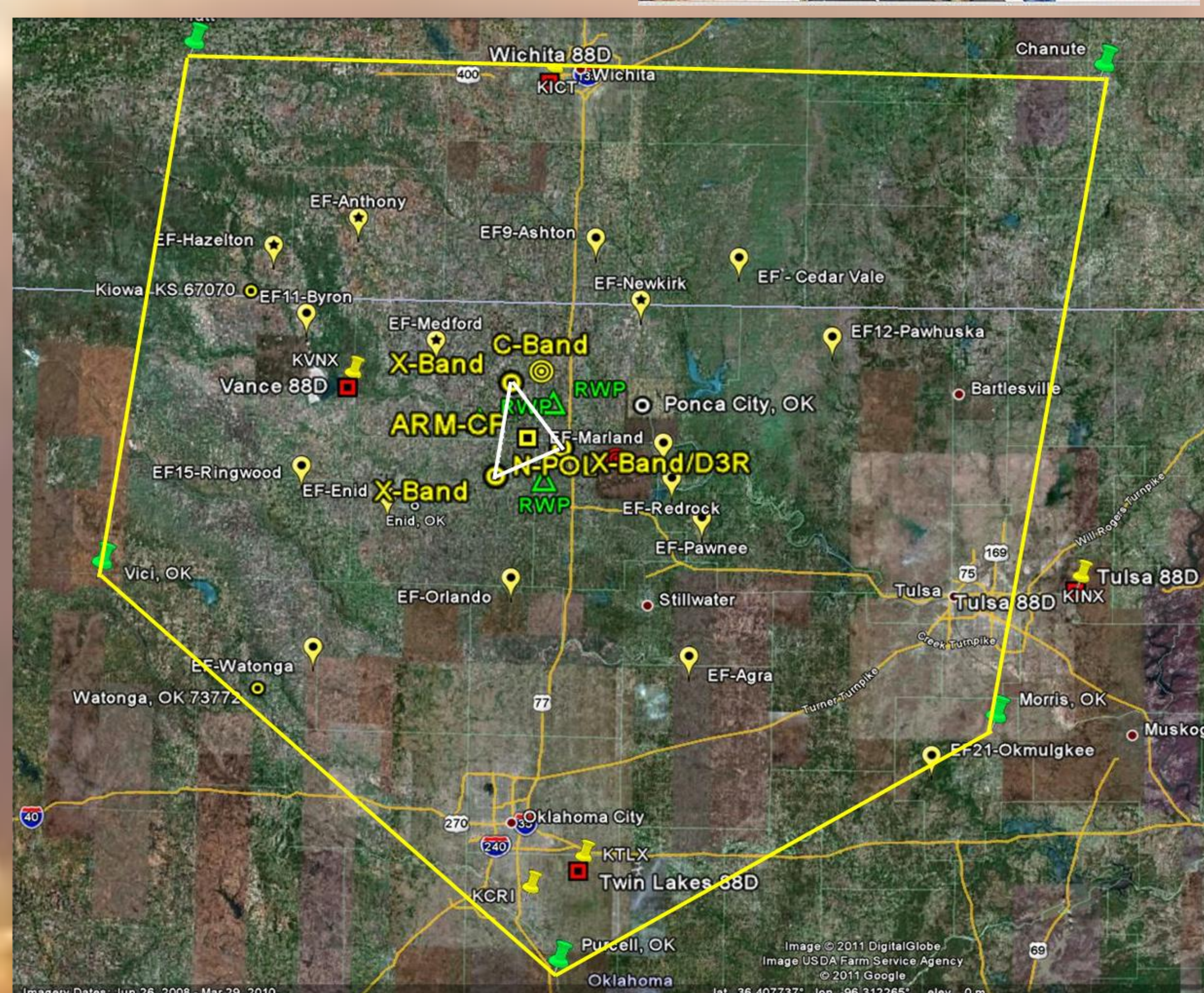
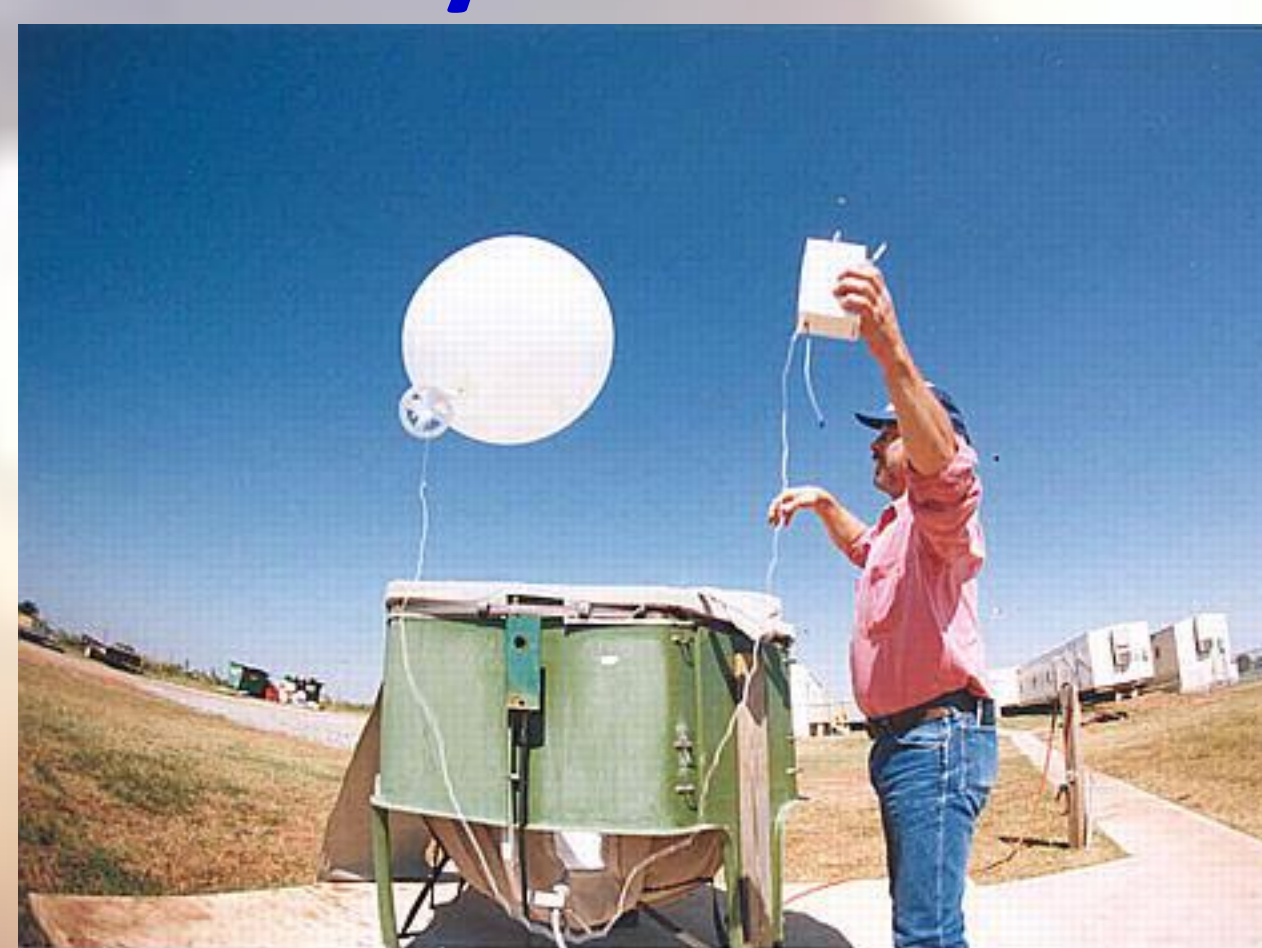
### Multi-frequency, Multi-scale Radar-based

- X-band radar network (X-SAPR)
- NASA S-Band Transportable Dual-Polarimetric Radar (NPOL)
- C-band (Dual Polarization) Scanning ARM Precipitation Radar (C-SAPR)
- NASA Ka/Ku band Deployable Dual-Polarimetric Doppler Scanning Radar (D3R)
- ARM Dual-Wavelength (Ka/W) Scanning Cloud Radar (Ka-SACR/W-SACR)
- NOAA-ESRL S-Band and 449 MHz Profiler Pair
- ARM 915 MHz Wind Profilers
- National Weather Service WSR-88Ds
- NOAA Profiler Network 404 MHz Wind Profilers



## Radiosonde Array

- Six launch sites
  - Pratt, KS
  - Chanutte, KS
  - Vici, OK
  - Morris, OK
  - Purcell, OK
  - Lamont, OK
- Launch Frequency 4-8x per day



## NASA Disdrometer Facility

- 16 Parsivel disdrometers
- 5 3<sup>rd</sup>-generation 2D Video Disdrometers
- 20 Rain gauges



## Contacts

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## MC3E Airborne Instrumentation



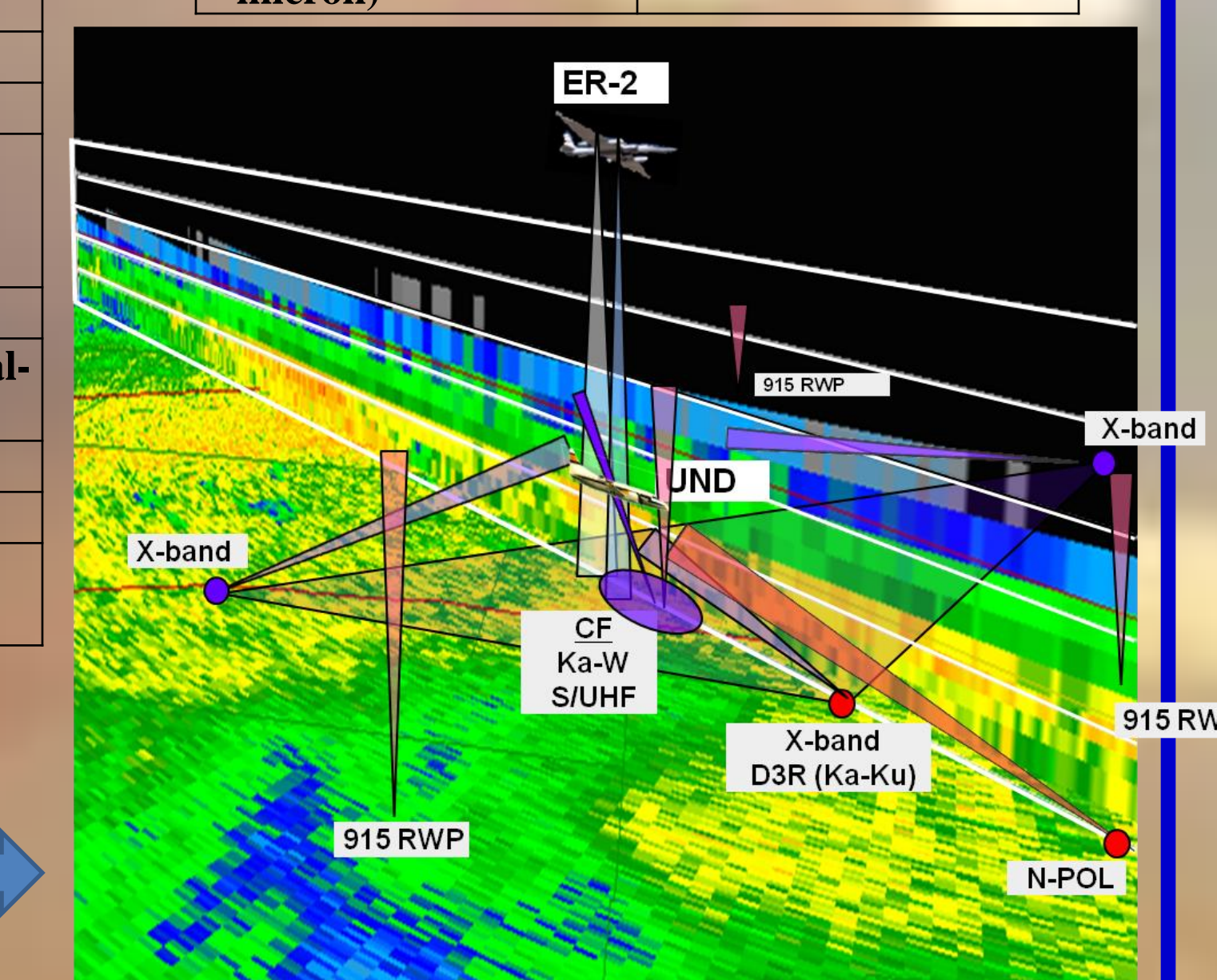
NASA ER-2 Radiometer and Radars

AMPR (Passive) polarizations	H+V	Characteristics
Frequencies		10.7, 19.35, 37.1, 85.5 GHz
Resolution @ 20 km range		0.6 km (85.5 GHz), 1.5 km (37.1 GHz), 2.8 km (10.7-19.35 GHz)
CoSMIR (Passive) polarizations	H+V	
Frequencies		37, 89, 165.5, 183.3+/-1, 183.3+/-3, 183.3+/-8 GHz
Resolution @ 20 km range		1.4 km footprint at nadir
HIWRAP (Active)	Ka-Ku band	
Frequency (inner/outer beam)		13.91/13.35 GHz, 35.56/33.72 GHz
Transmit peak power		30 W (Ku), 10 W (Ka)
3 dB beamwidth		2.9° Ku, 1.2° Ka
MDS (dBZ <sub>e</sub> , 60 m res., 3.3 μs chirp pulse, 10 km range)		0.0, -5.0 dBZ <sub>e</sub>
CRS W-band (Active)		
Frequency		94.15 GHz (dual-polarized)
Transmit peak power		1700 W
3 dB beamwidth		0.6° x 0.8°
MDS (dBZ <sub>e</sub> , 0.5 μs pulse; 1 km range)		-35 dBZ <sub>e</sub>



UND Citation

Instruments	Measurement
FSSP/King	Cloud liquid water
PMS or DMT (TBD: 2D-C/P, CIP/PIP etc.)	Cloud and precipitation particle spectra
SPEC Inc. HVPS	Large hydrometeor spectra
SPEC Inc. 2D-S	Cloud particle spectra
CDP and/or SID	Cloud particle spectra
CVI	Total water content
Rosemount icing probe	Supercooled liquid water
CN counter (10 nm cut), UHSAS (100 channels, 60 nm – 1 micron)	CN/CCN



MC3E "dream" scenario

## Campaign Measurement Objectives

### DOE ASR

- 1) Determine Pre-convective environment, large-scale fording and feedbacks
- 2) Observations of convective initiation,
- 3) Quantify updraft / downdraft dynamics,
- 4) Diagnose Condensate transport / detrainment / entrainment
- 5) Characterize precipitation and cloud microphysics,
- 6) Assess influences on radiation

### NASA GPM

- 1) Coordinated airborne "satellite simulator" and in-situ platform
  - a. High-altitude Ka/Ku-band radar + multi-frequency radiometer overflying in-situ ice microphysics aircraft
- 2) Unified 3-D Mapping of hydrometeor distribution/type
  - a. Sub pixel-scale DSD and rain rate variability (0.5 – 5 km)
- 3) Data to support satellite simulator model testing (CRM/LSM/RT)
  - a. Collection of high quality sounding-based forcing data sets
  - b. Microphysical and kinematic validation datasets.
  - c. Land surface states affecting variability in emission.