

DOE - ARM / NASA- GPM

Midlatitude Continental Convective Cloud Experiment (MC³E)

- SGP
- May - June 2011



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Partnering with NASA GPM, CASA, NSF DC-3, Oklahoma University,
NSSL, OK Climate Survey, NASA CloudSat

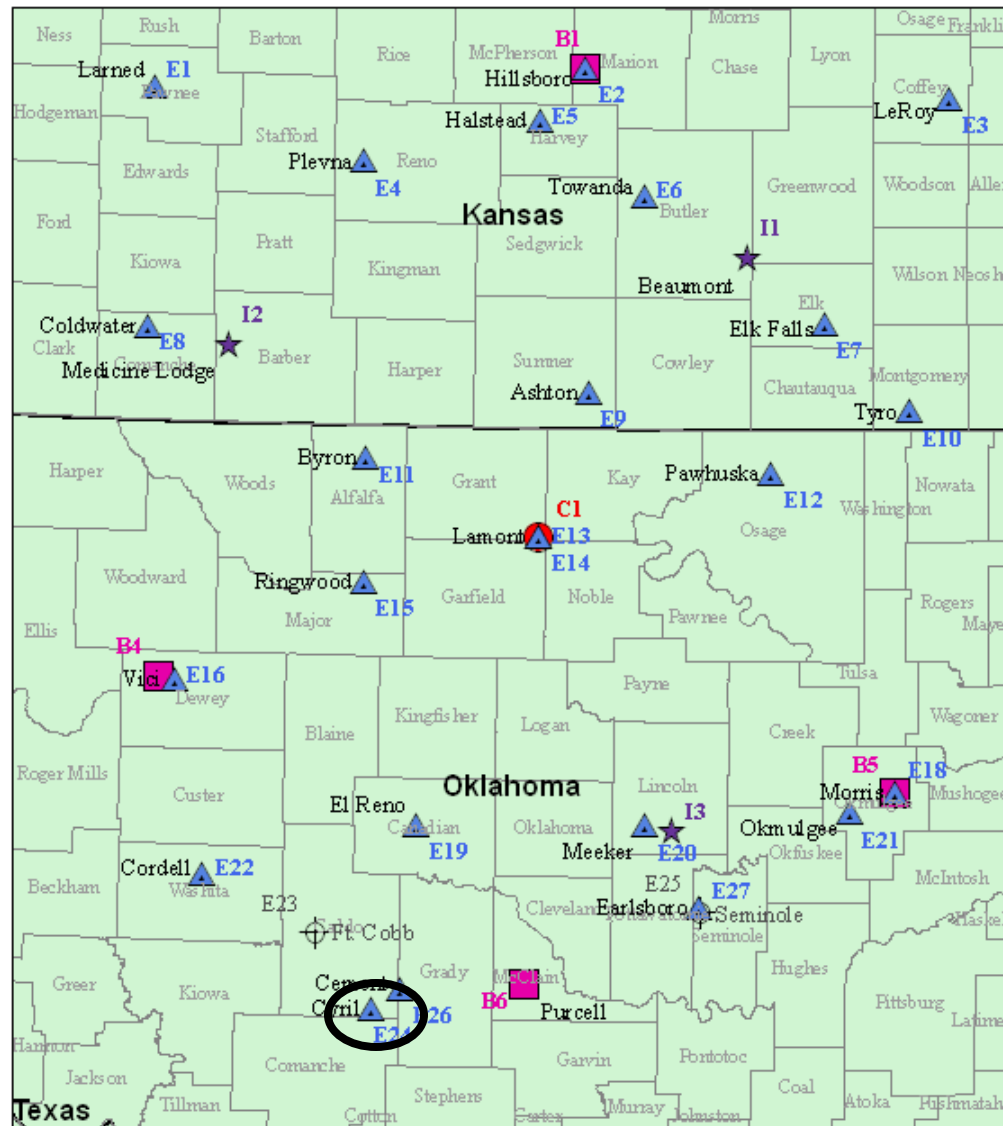
ARM Key Science question #4: How do radiative processes interact with dynamical and hydrological processes to produce cloud feedbacks that regulate climate change?

Goal: Improve climate models!!

Elements Convective Parameterization

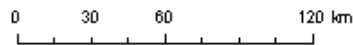
- 1) Pre-convective environment
- 2) Convective Initiation
- 3) Updraft/Downdraft Dynamics
- 4) Condensate Transport/Detrainment
- 5) Precipitation/Cloud microphysics
- 6) Influence on environment
- 7) Influence on Radiation
- 8) Large-scale forcing

Big Question: Given PBL (T, q) and vertical profiles, can the precipitation at the ground be predicted? (A. D. Del Genio)

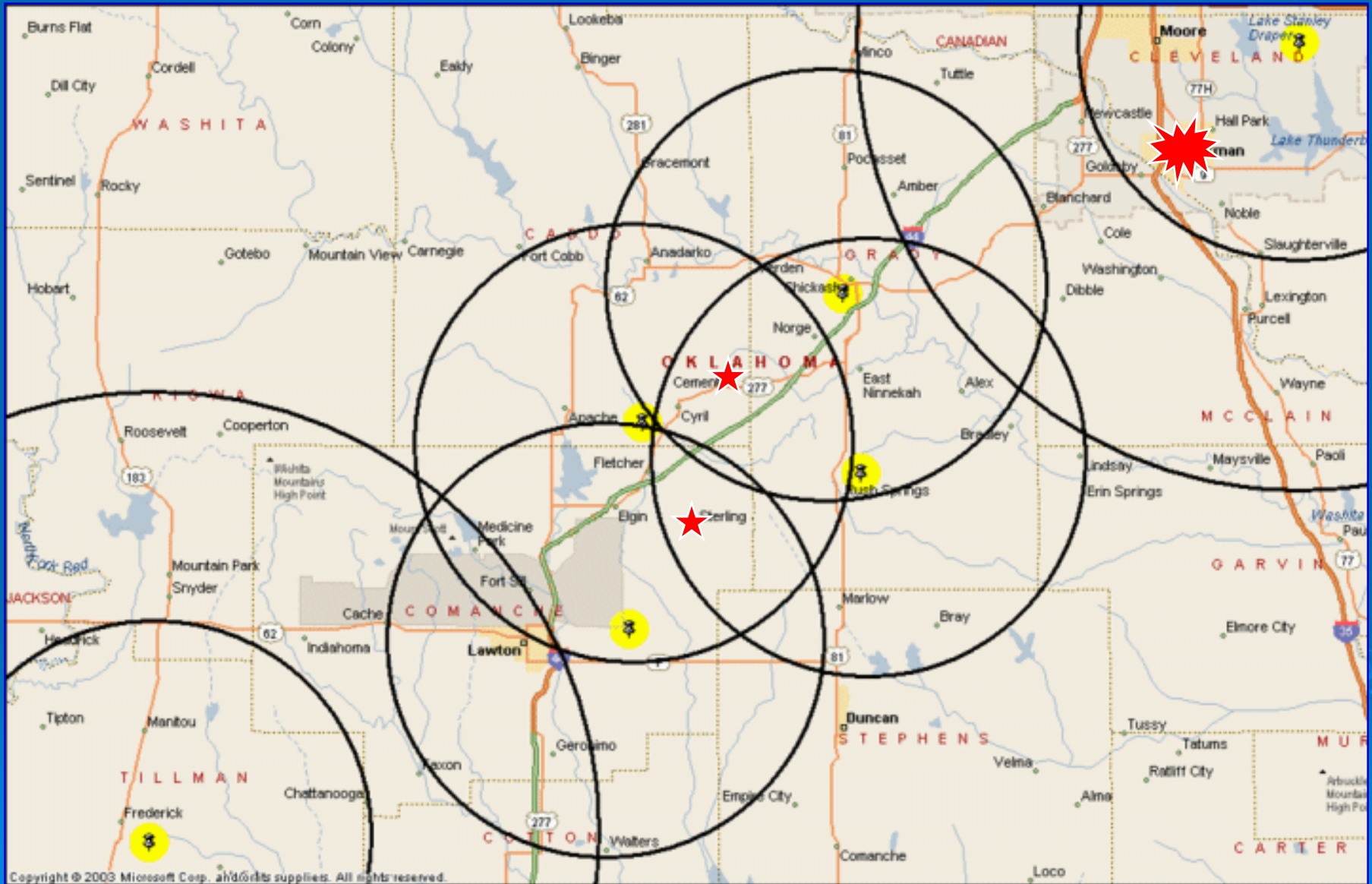


Legend

- Boundary Facility
- Central Facility
- Extended Facility
- Intermediate Facility
- Retired



CASA IP1 Radar array and ARM RWP locations



ARM-funded IOP Measurement Priorities

- Model Forcing Dataset

 - Sounding network

 - Appropriate for determining continuous forcing dataset

- 4D Atmospheric state description

 - Soundings (Array and soundings of opportunity)

 - Radar Refractivity

 - Surface Observations

- 4D Cloud and Precipitation characteristics

 - CASA, CIRPAS 9.4 Ghz Phased-Array, McGill scanning 94-GHz, ARM SBIR scanning 35-GHz

- Updraft/Downdraft dynamics

 - CASA, 915 MHz wind profilers, cloud radars

Calibrated measurement continuity across full spectrum of precip. rates/types

Ka-Ku Scanning Transportable Dual-Polarimetric Radar (dual-aperture)

- Match DPR frequencies, direct link to PIA and dual-wavelength vs. dual-pol methods
- Extension to clouds, light precipitation, and improved sampling of ice, snow, mixed phase
- Mobility enables placement in variety of network configurations/regimes with relative ease

NASA PMM N-POL S-band Scanning Dual-Polarimetric Radar

- Transmitter, receiver, and antenna upgrades completed by fall 2010.
- Transportable platform for study of heavy/moderate precipitation regimes
- Dual-pol retrieval of 3-D DSD information and qualitative ice microphysics information

2D Video Disdrometer (or other TBD) Dense Array, supplemented by rain gauges

- Validation/extension of GV satellite simulator and ground radar DSD retrievals/precipitation rates (liquid/frozen)
- Spatial/temporal covariance of particle size distributions and precipitation rates

Wind Profiler

- Vertical profiles of Z, DSD collocated with disdrometers under coverage umbrella of radar

Aircraft

- High altitude (ER-2 w/ GMI and DPR simulators) Aircraft already reserved
- In-situ AC (e.g., UND Citation) for microphysics Cost estimate obtained

Other Known (CloudSat): W-band radar w/RHI-scanning/V-pointing

An Opportunity for the ARM program

- Unprecedented 4-D observations of convective clouds and environment
- State-of-the art 3D scanning observations
- Foster collaborations with NASA-GPM, CASA, OU, NSSL
- Leverage existing climatological observations