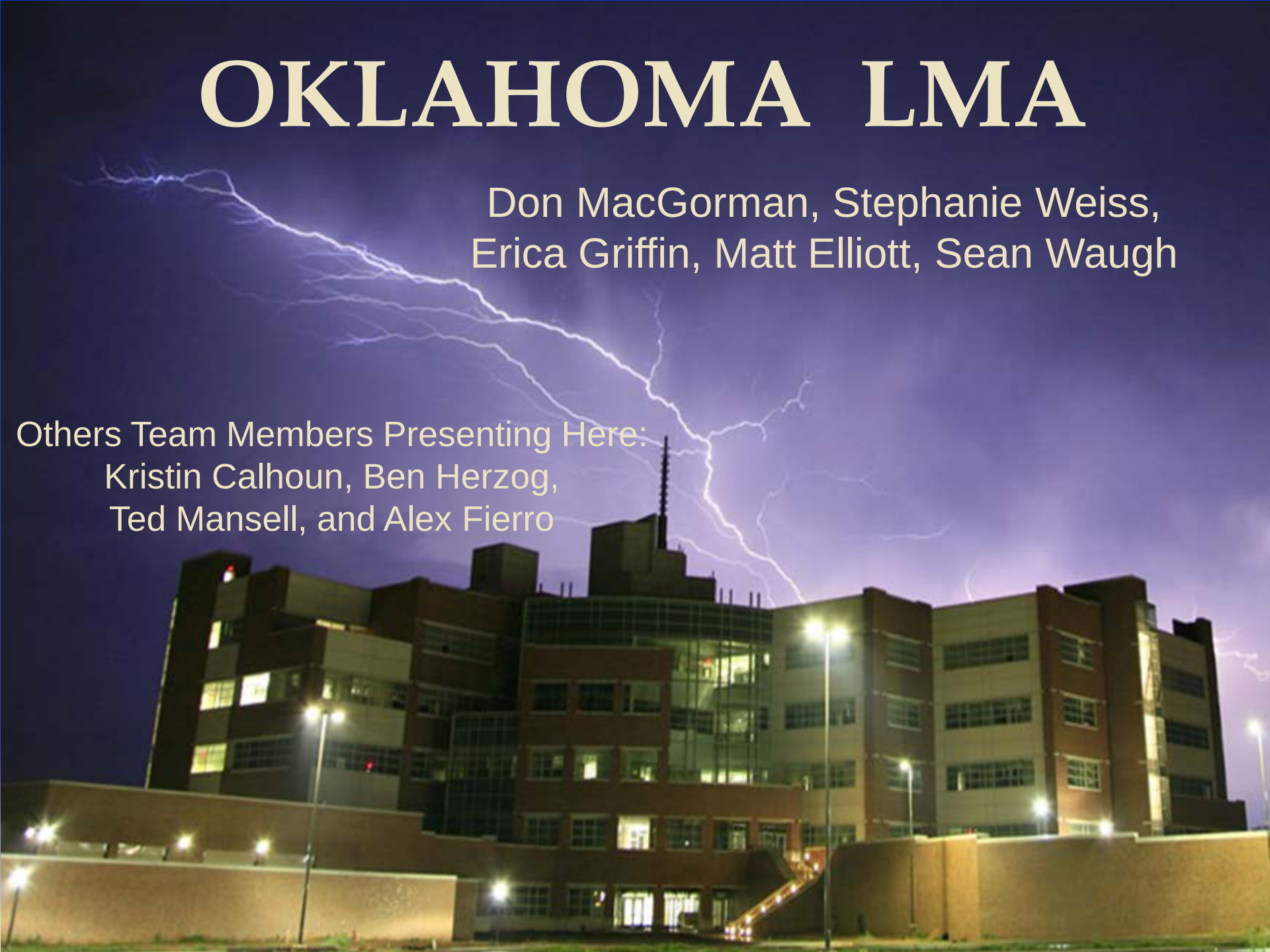
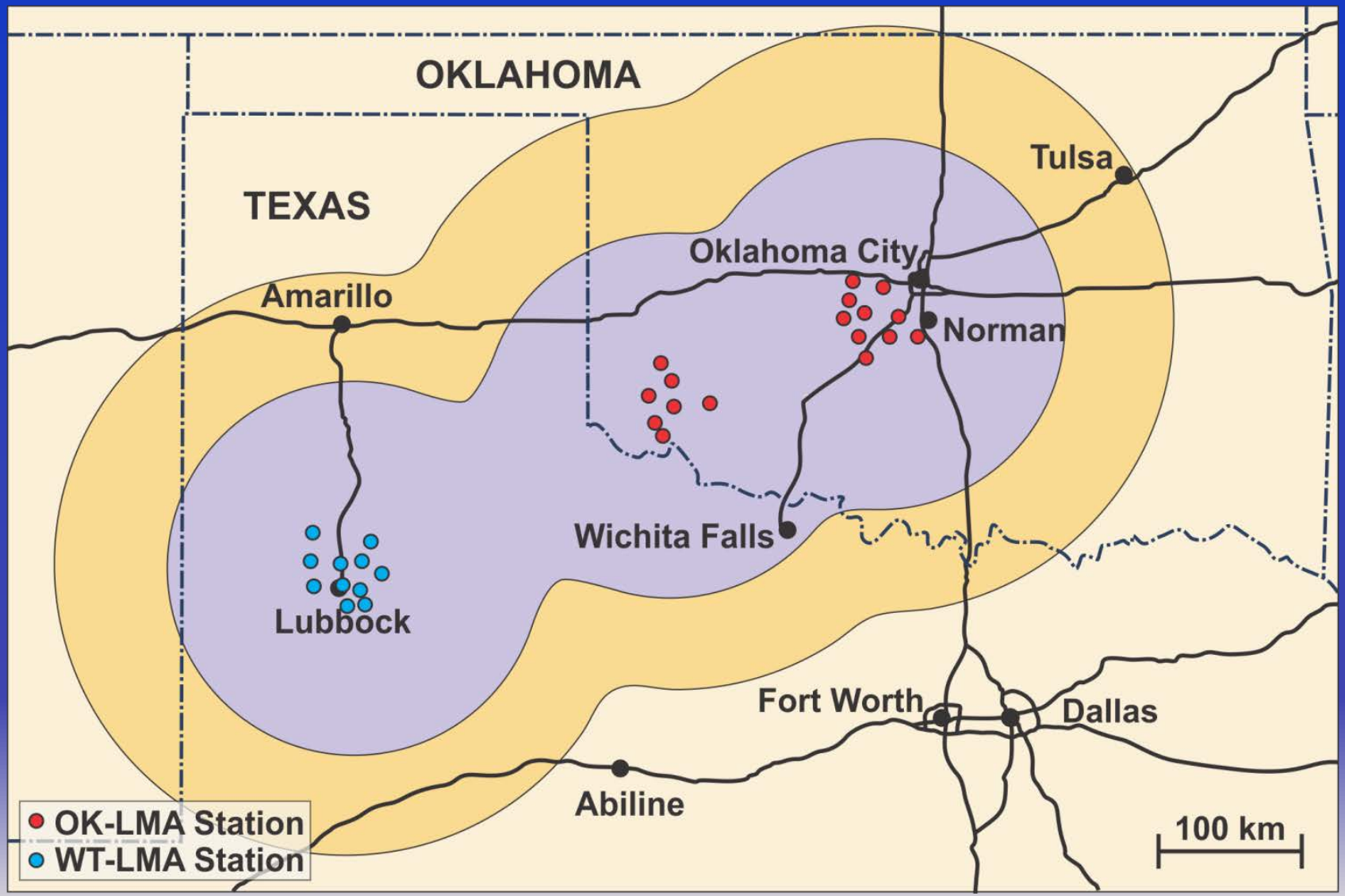
OKLAHOMA LMA

Don MacGorman, Stephanie Weiss,
Erica Griffin, Matt Elliott, Sean Waugh

Others Team Members Presenting Here:
Kristin Calhoun, Ben Herzog,
Ted Mansell, and Alex Fierro



OKLMA-WTLMA COVERAGE

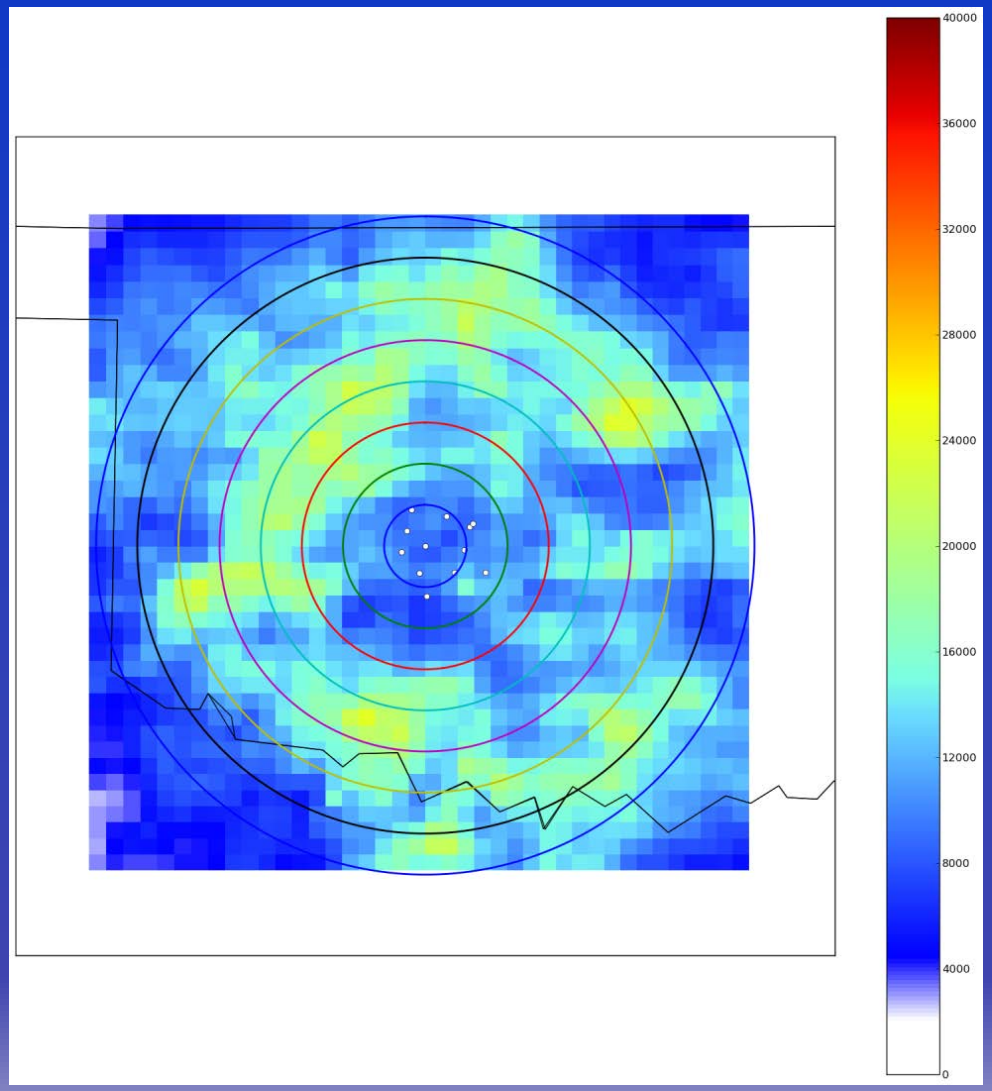


OKLMA Lightning Climatology 2004

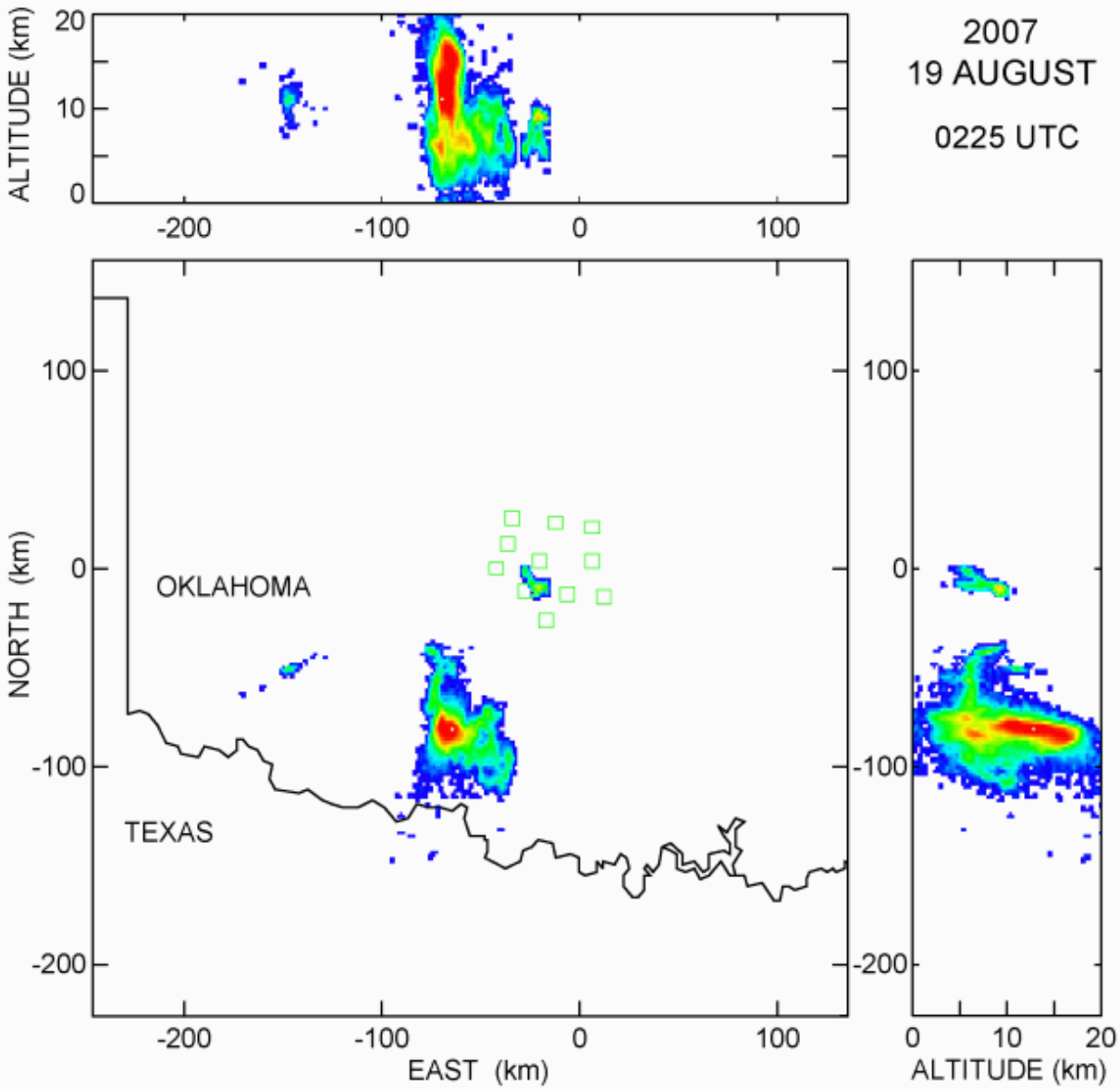
Annual Number of Seconds with ≥2 VHF Sources

10 km X 10 km Grid Box

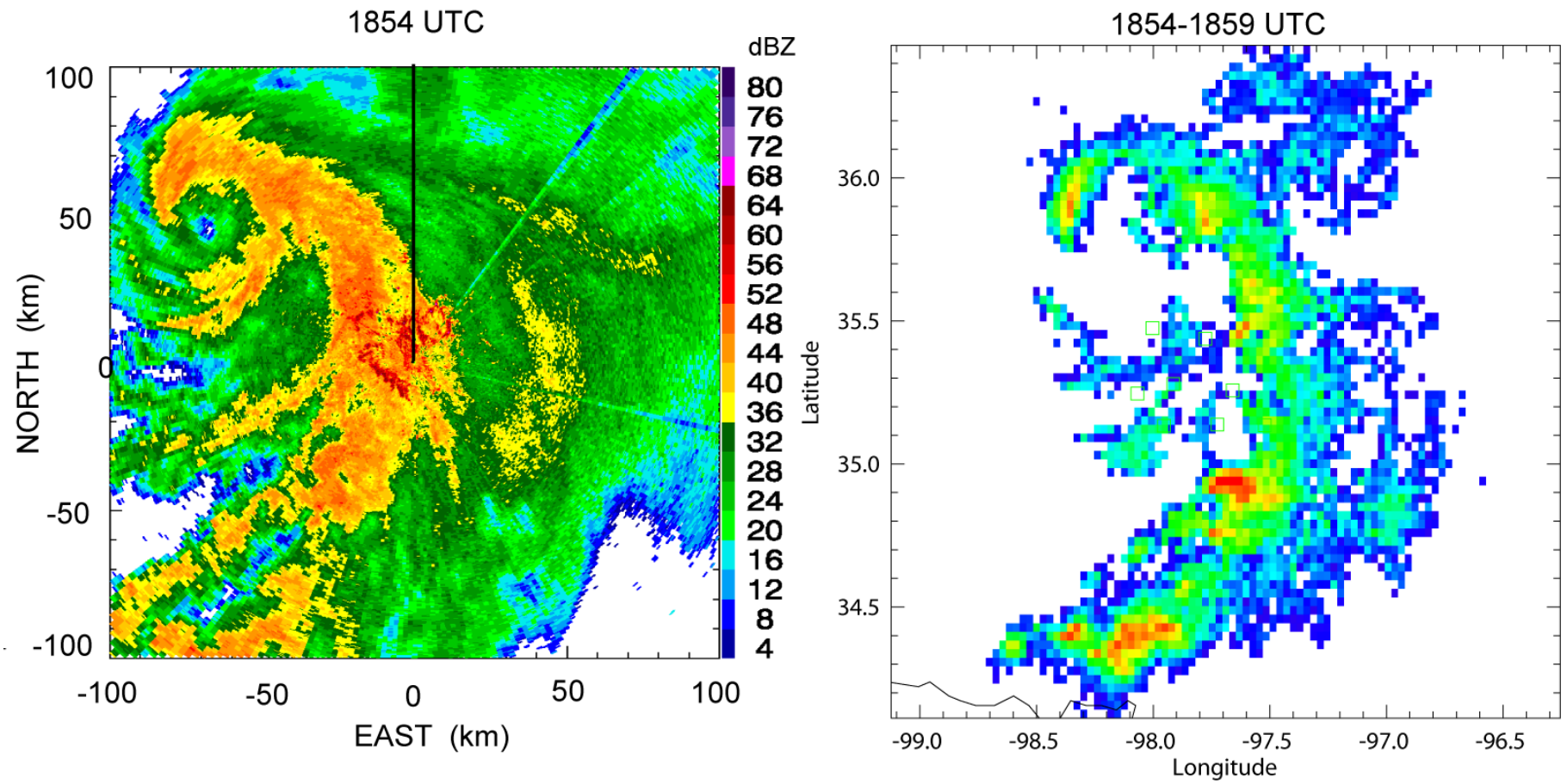
Uniform Amplitude Distribution with Range



Remnants of Tropical Storm Erin



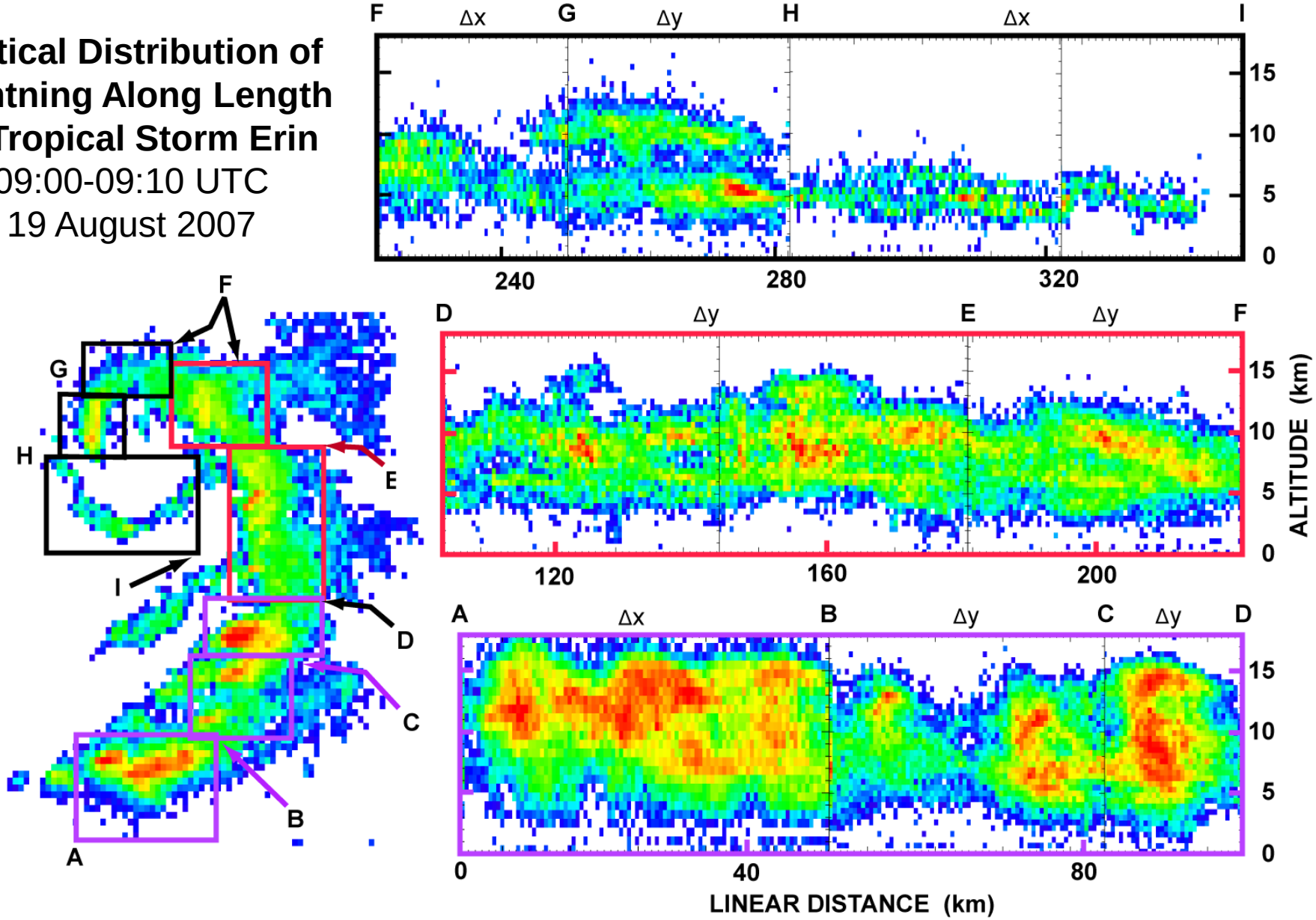
Reflectivity Compared with Density of VHF Sources
19 August 2007



Vertical Distribution of Lightning Along Length of Tropical Storm Erin

09:00-09:10 UTC

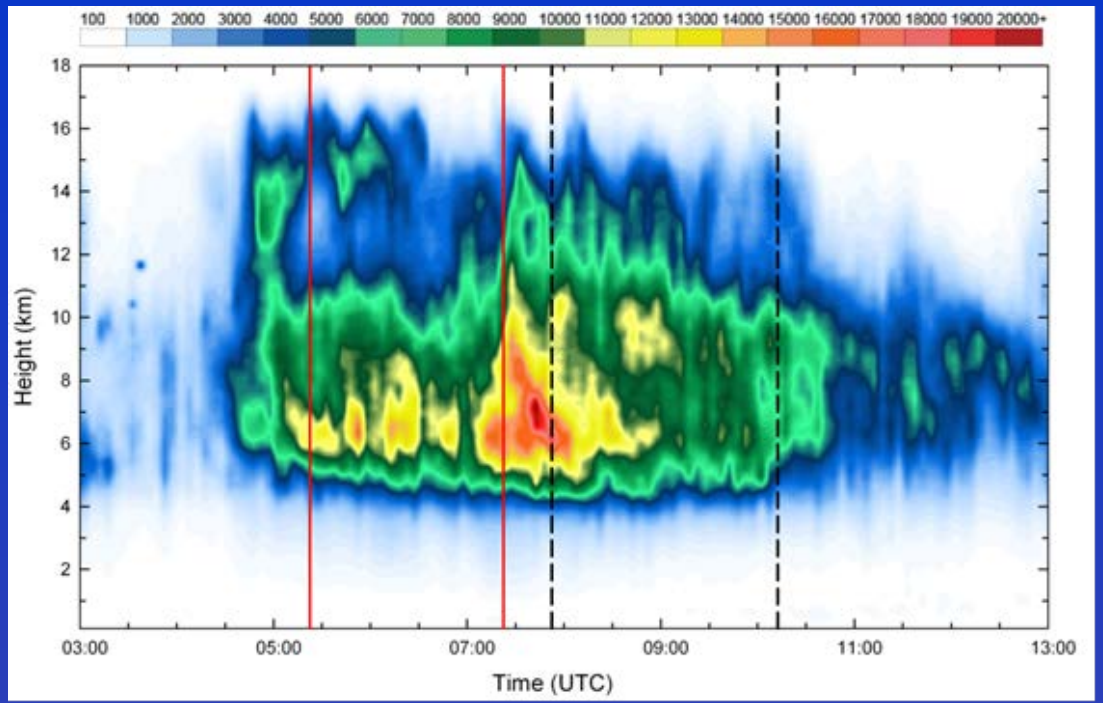
19 August 2007



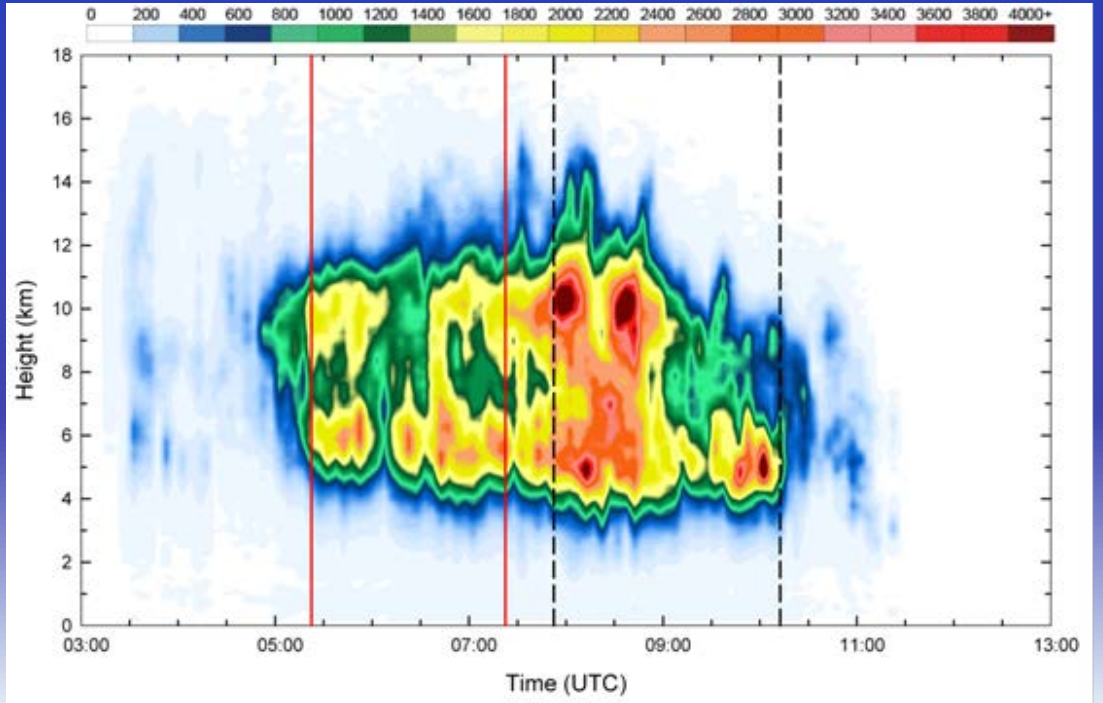
Tropical Storm Erin Remnants

19 August 2007

Whole system



Within 50 km of center

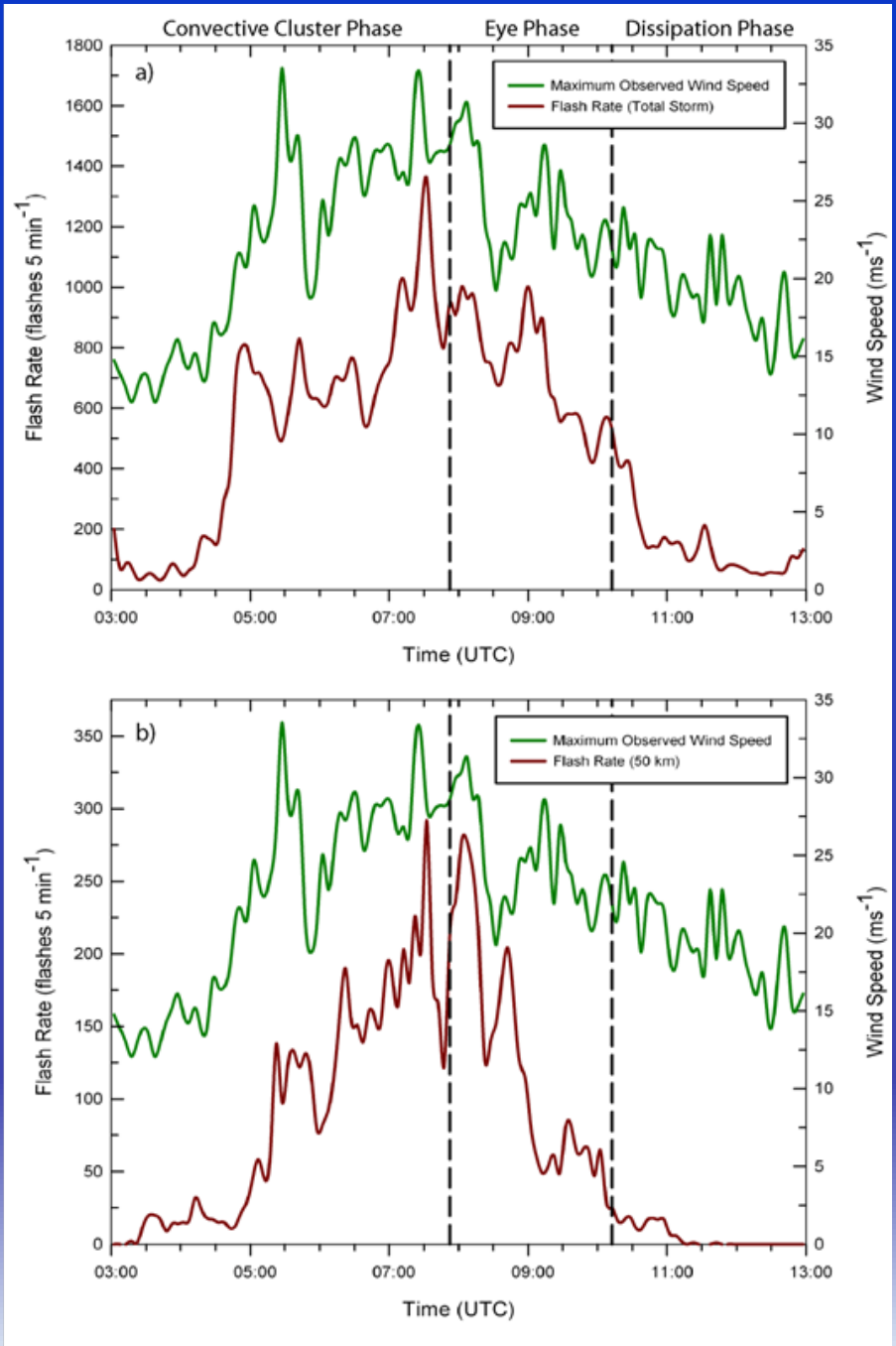


Flash Rate vs Max Wind Speed

19 August 2007

Whole system

Within 50 km of center

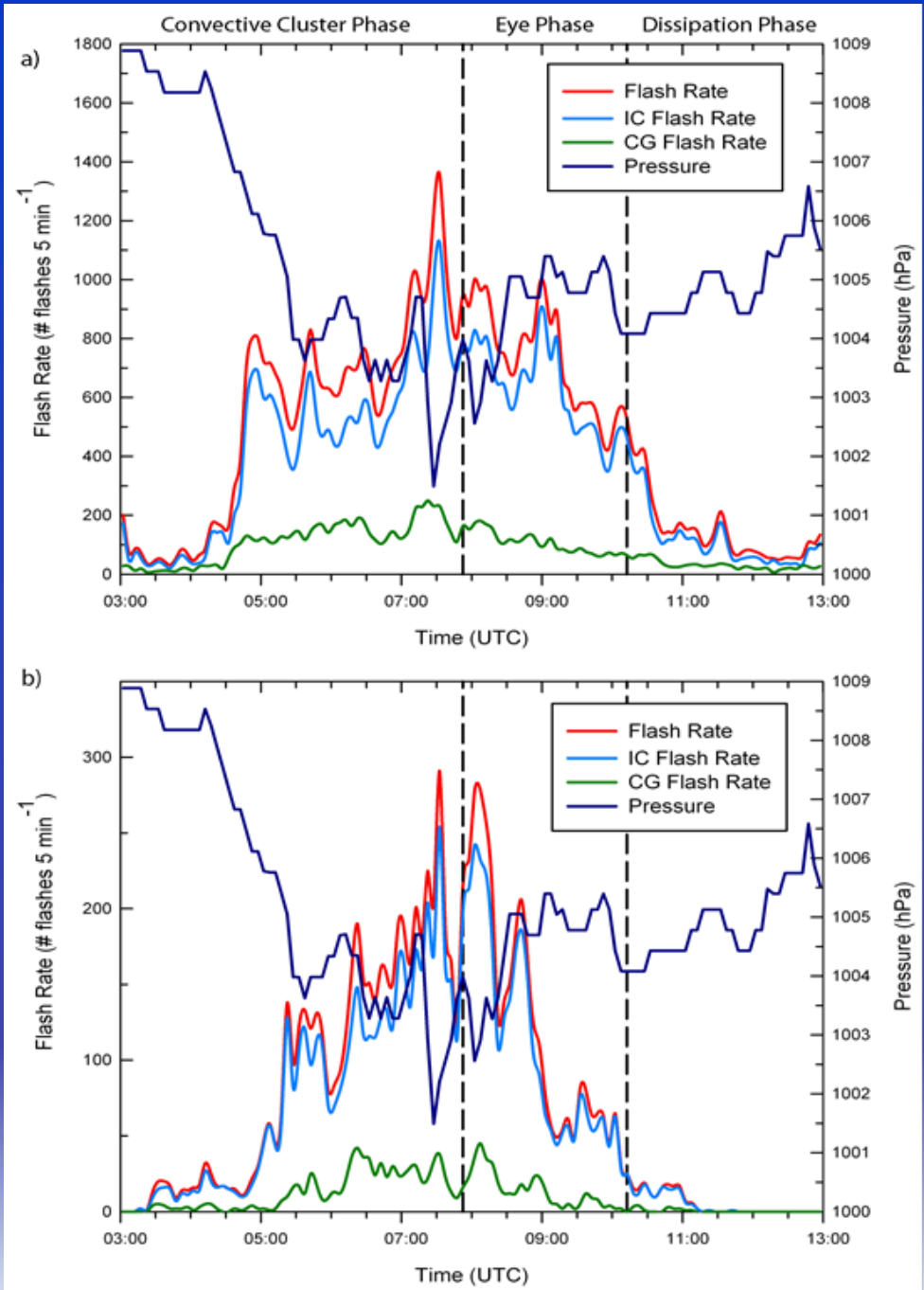


Flash Rate vs Minimum Pressure

19 August 2007

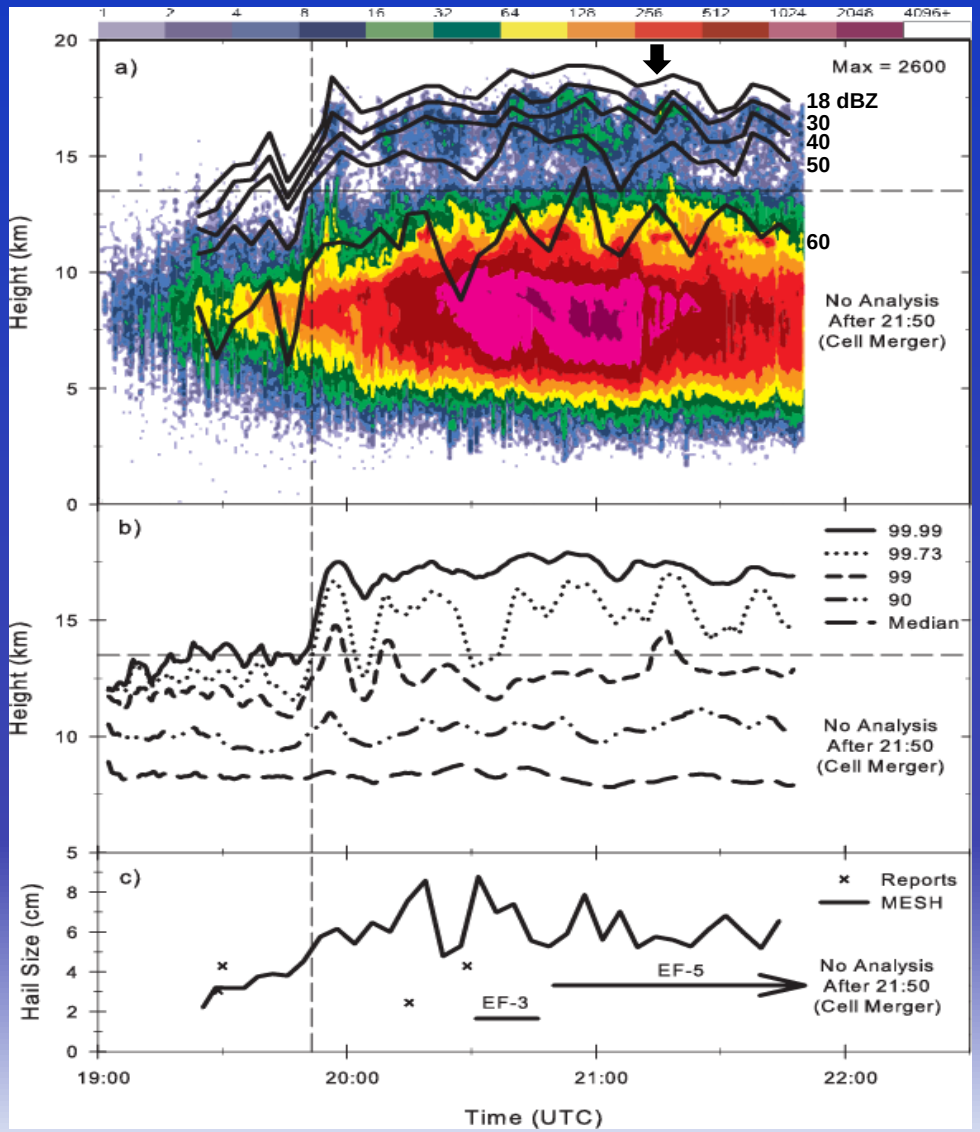
Whole system

Within 50 km of center



Vertical Distribution of Sources 24 May 2011

- Quasi-steady LMA OT signature (≥ 2 hrs)
  - Densities
    - Max ~ 15-18 km
    - Min ~ 13.5-15 km
  - Similar oscillations between $LMA_{99.99}$ & $ET_{18\text{-}40}$
- Onset of LMA OT signature
  - 14 min before tornado warning
  - 37 min before tornado report
  - 20 min after 1st severe hail report
  - But MESH greatest while signature was present

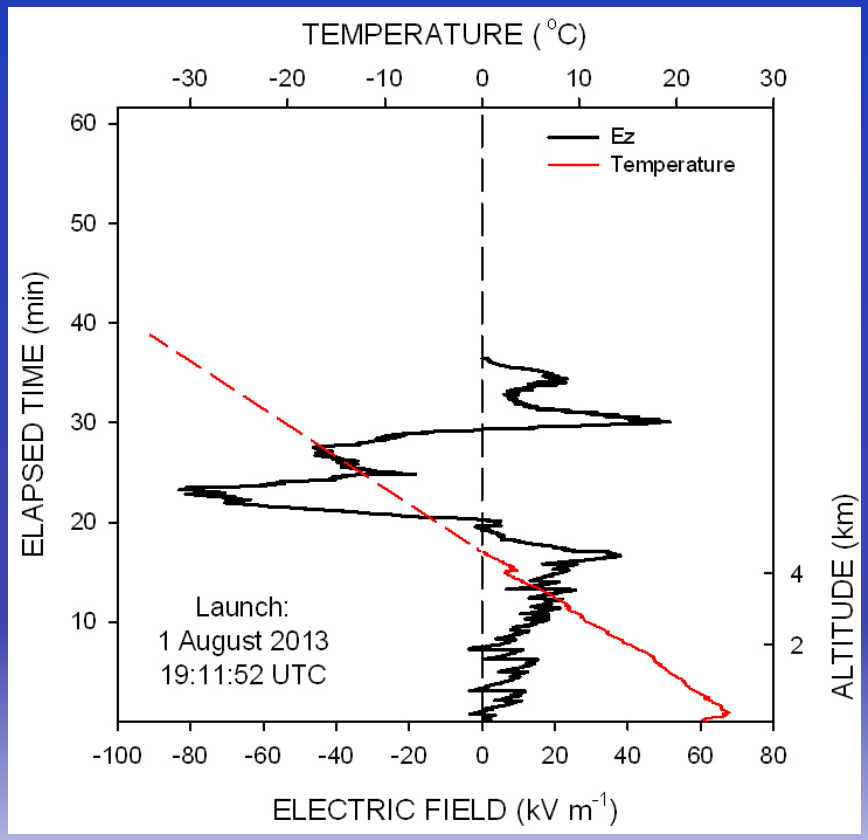


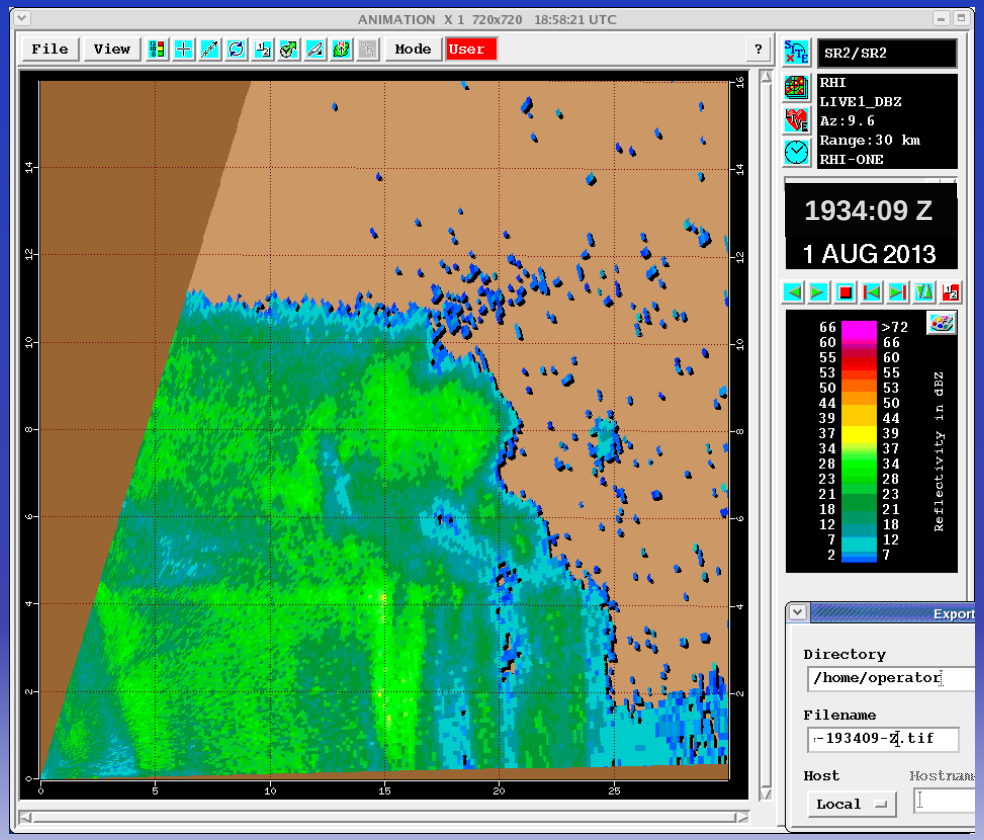
Electric Field Meter & SR2 Reflectivity

Camp Blanding, Florida

1 August 2013

1934:14 UTC

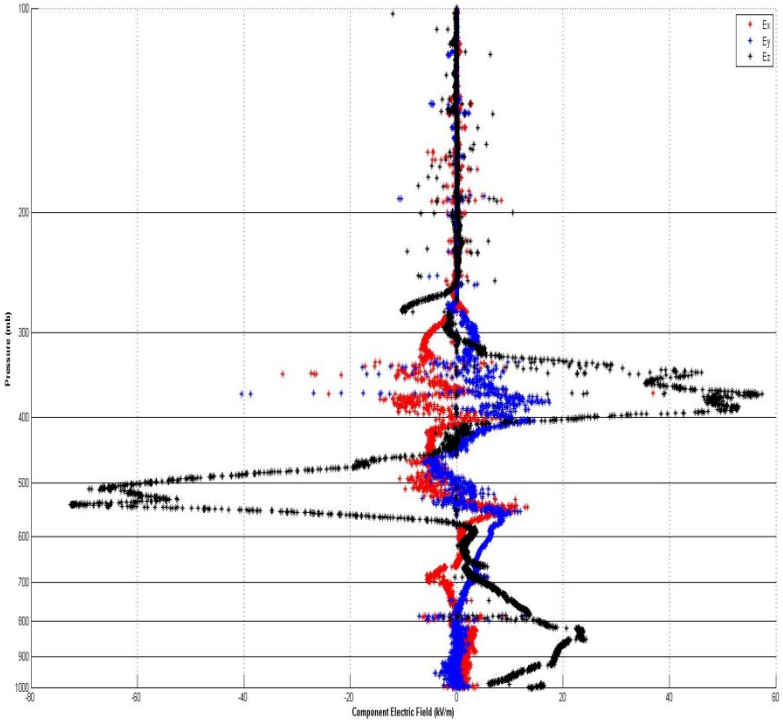


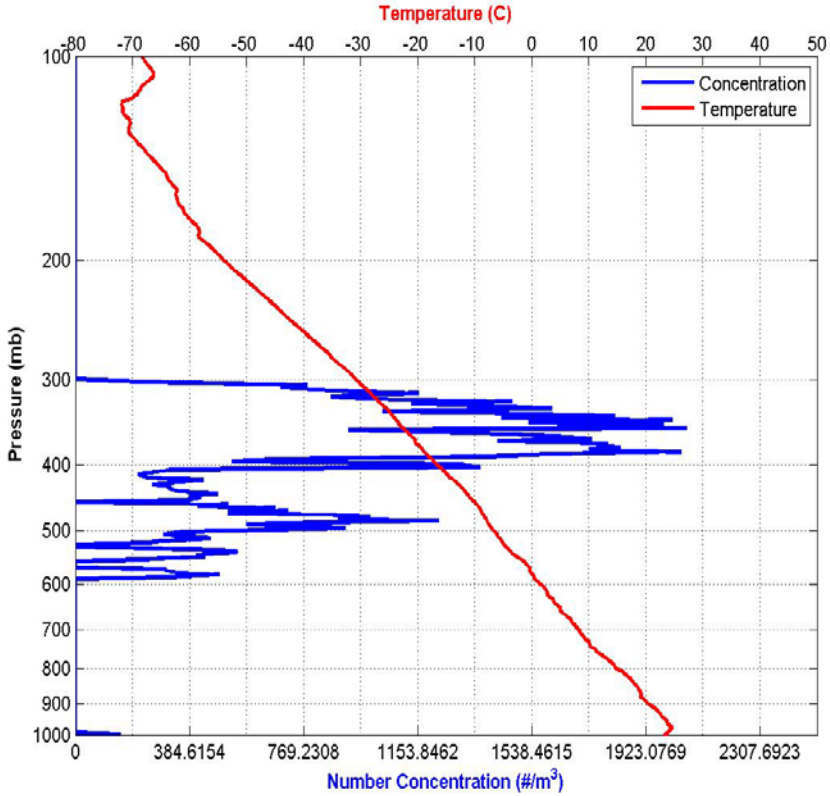


Electric Field and Imager Data

Florida

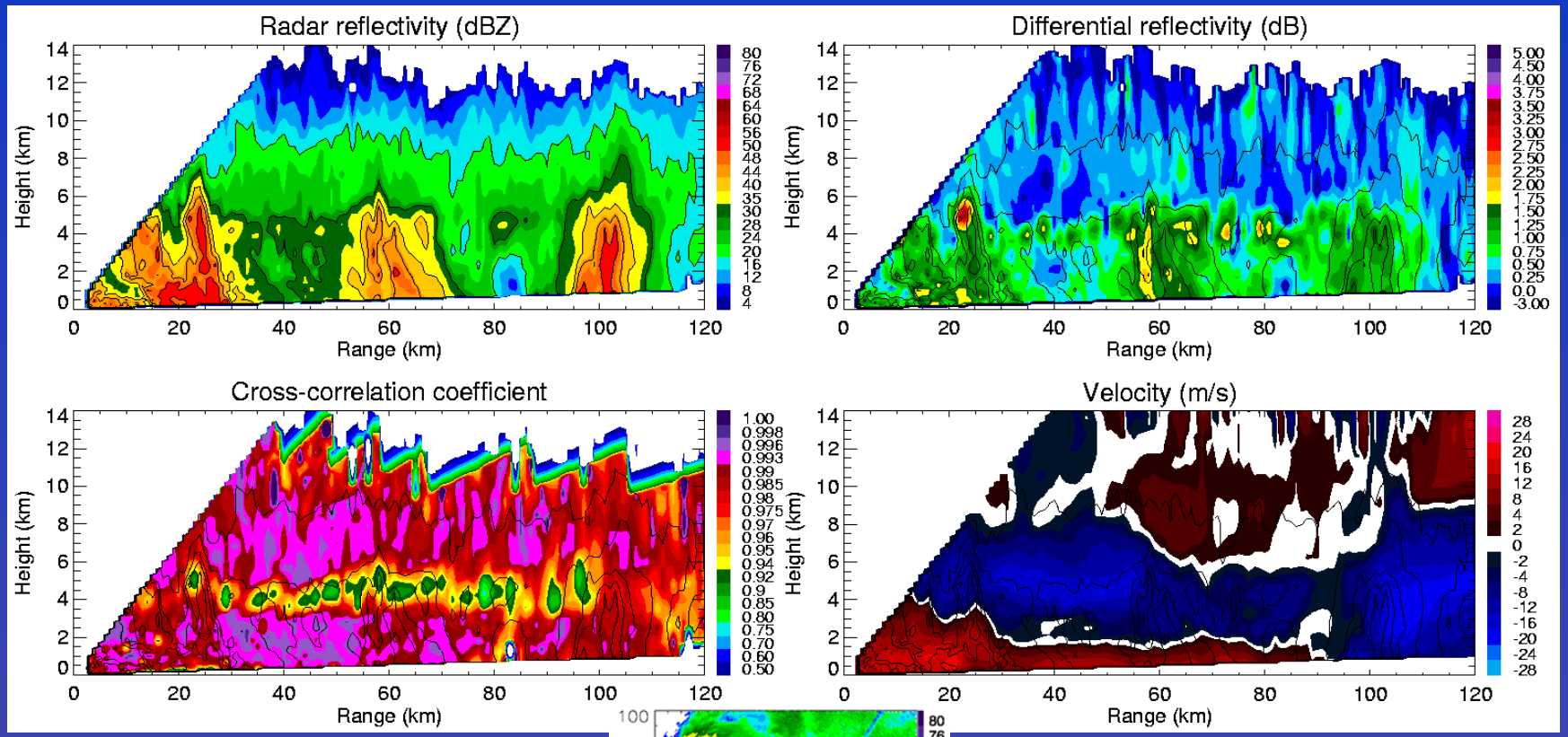
15 August 2013

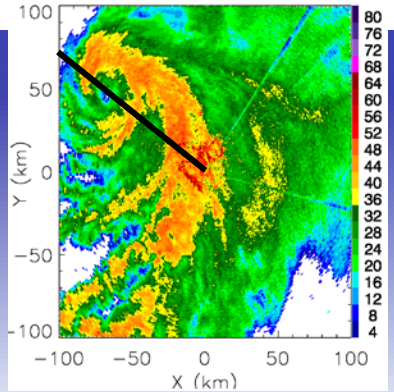




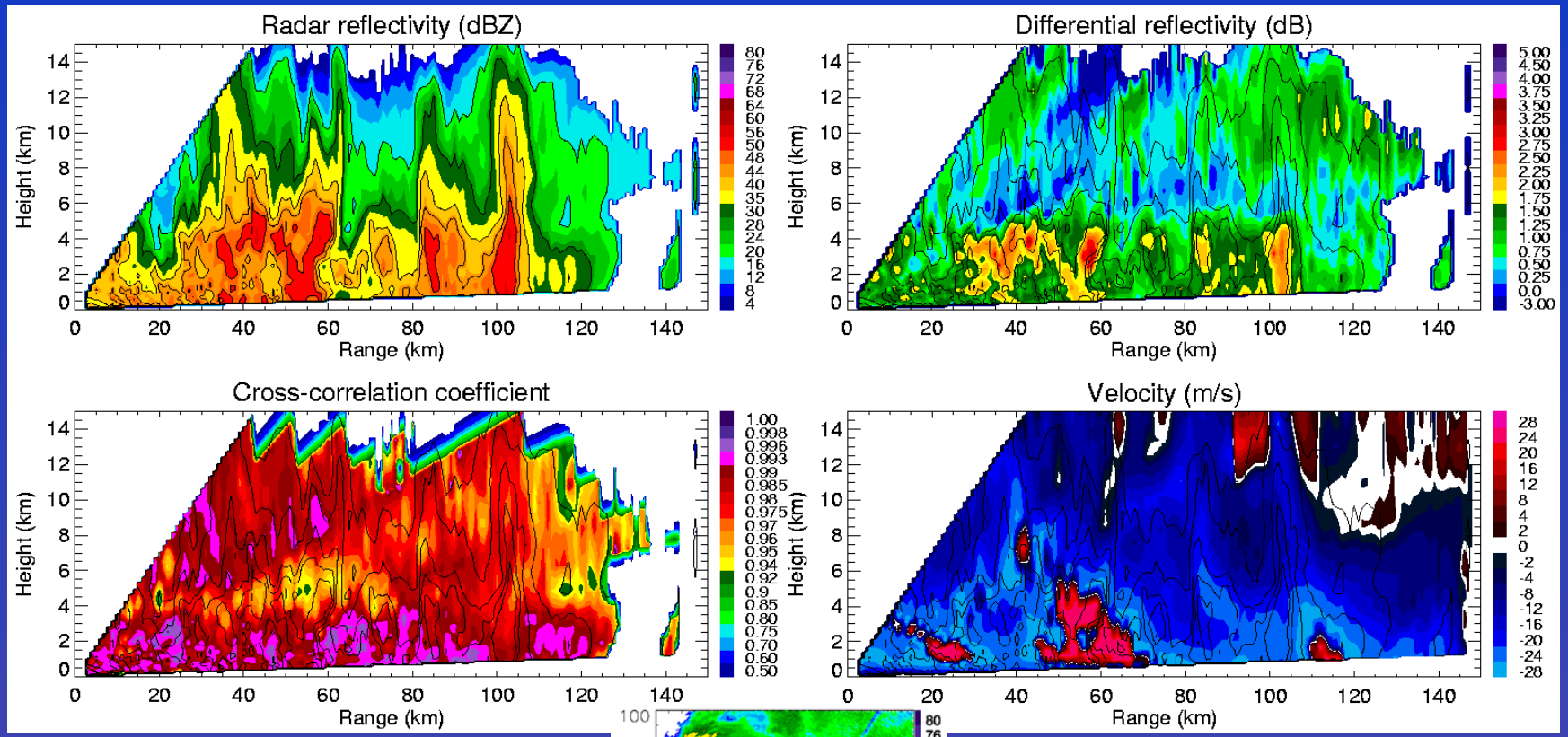
Thank you

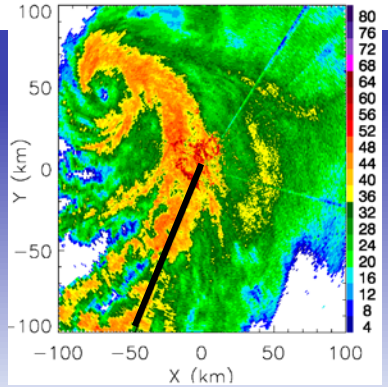
Polarimetric Variables Across the Eye
0854 UTC, 8/19/07





Polarimetric Variables along SE Tail
0854 UTC, 8/19/07

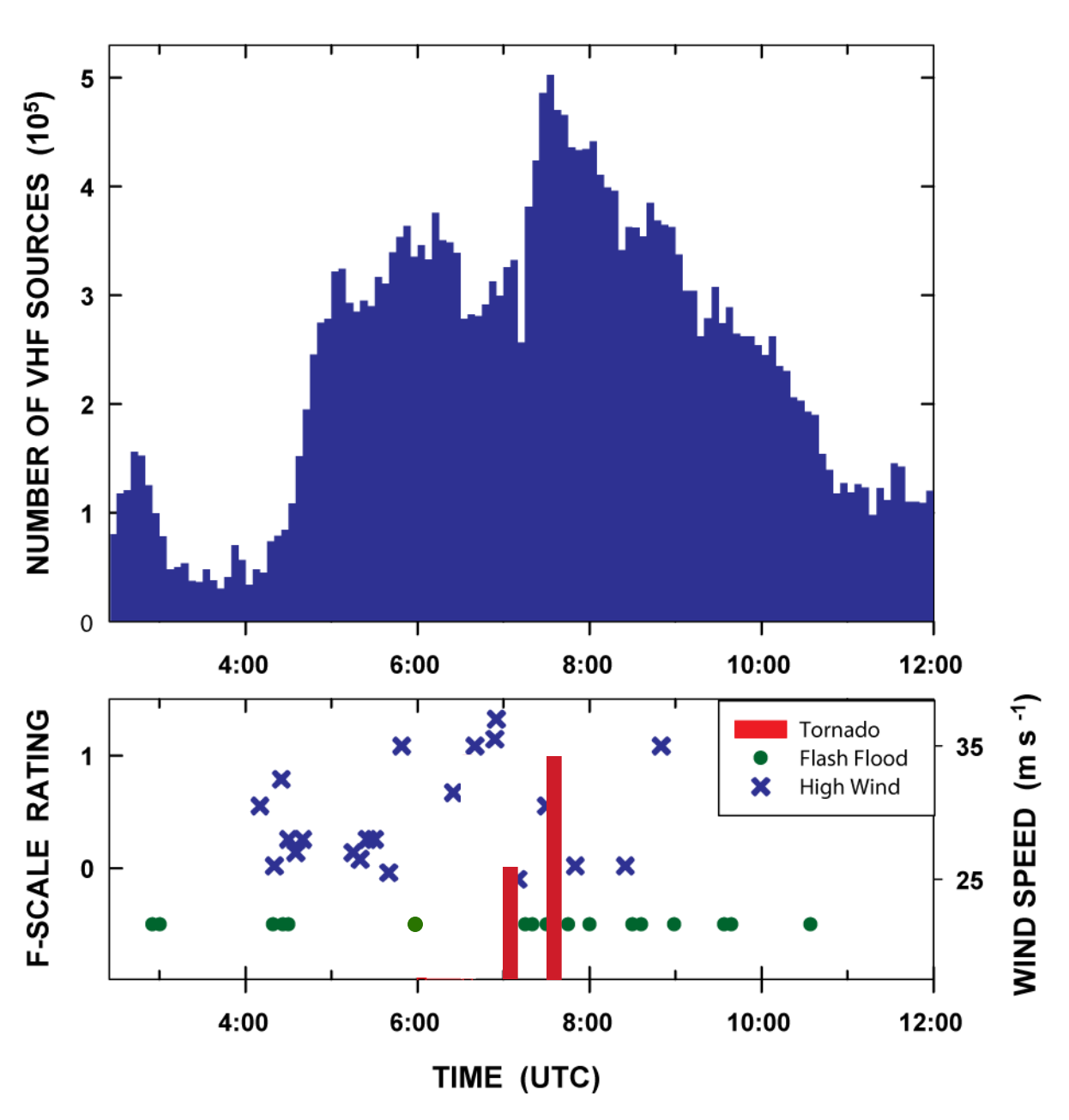




VHF Source Counts & Severe Weather

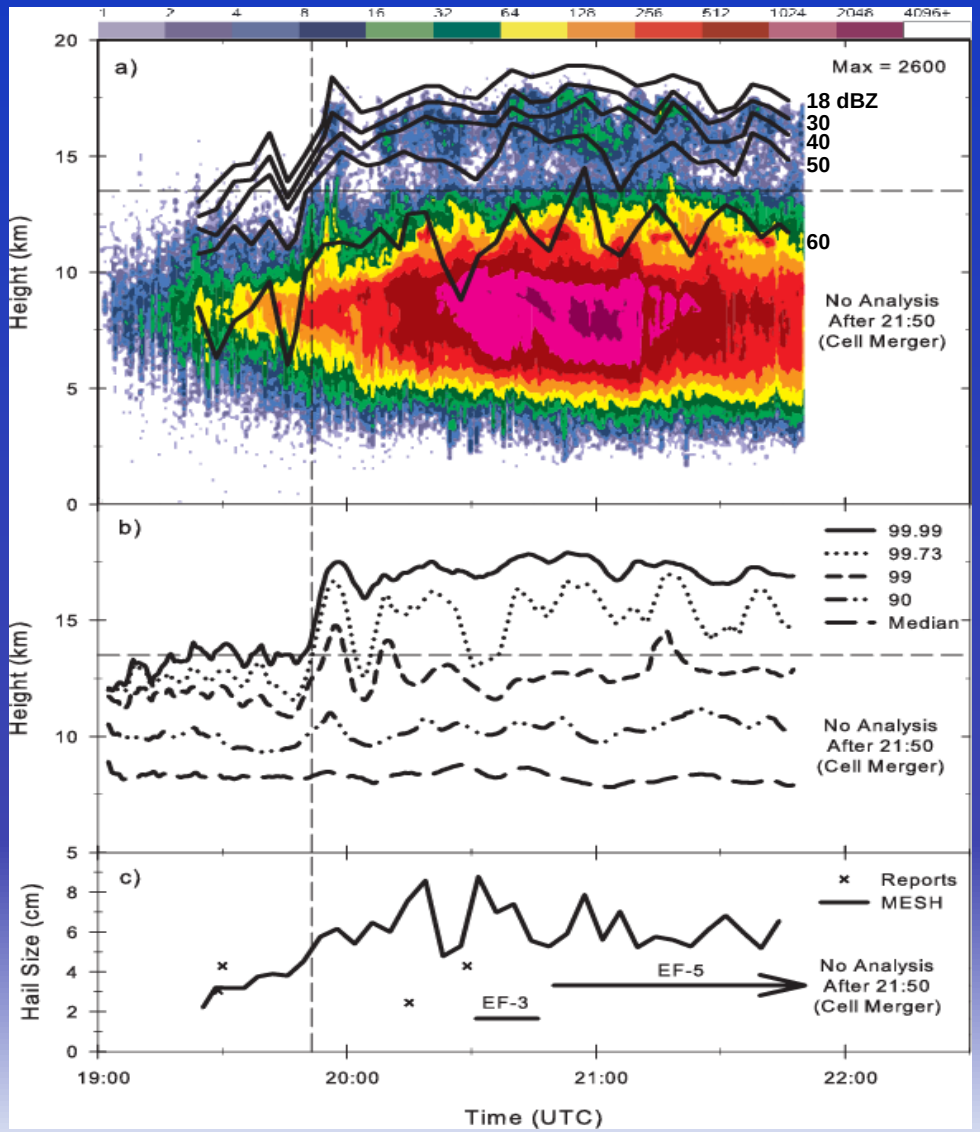
19 August 2007

VHF Counts in
5-min increments



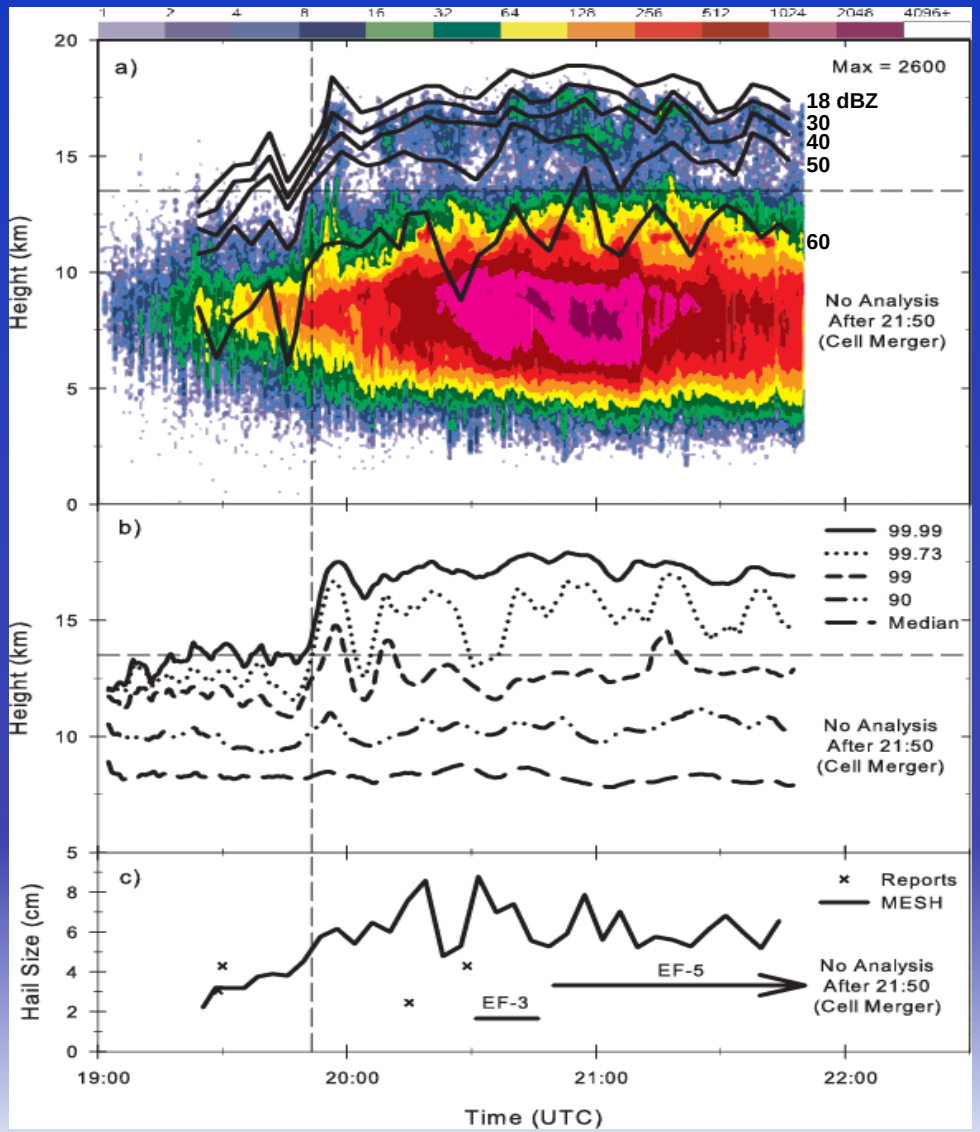
Vertical Distribution of Sources
Case 1: 24 May 2011

- Onset of LMA OT signature
  - Extension of initial lightning bubble
    - Peak ~ 17.4 km
    - Rise rate ~ 20 m s^{-1}
    - Low source density
  - Simultaneous increase in ETs
    - $ET_{18\text{-}40}$ above LNB
    - ET_{50} near LNB
- Sudden, but brief, lull after initial penetration



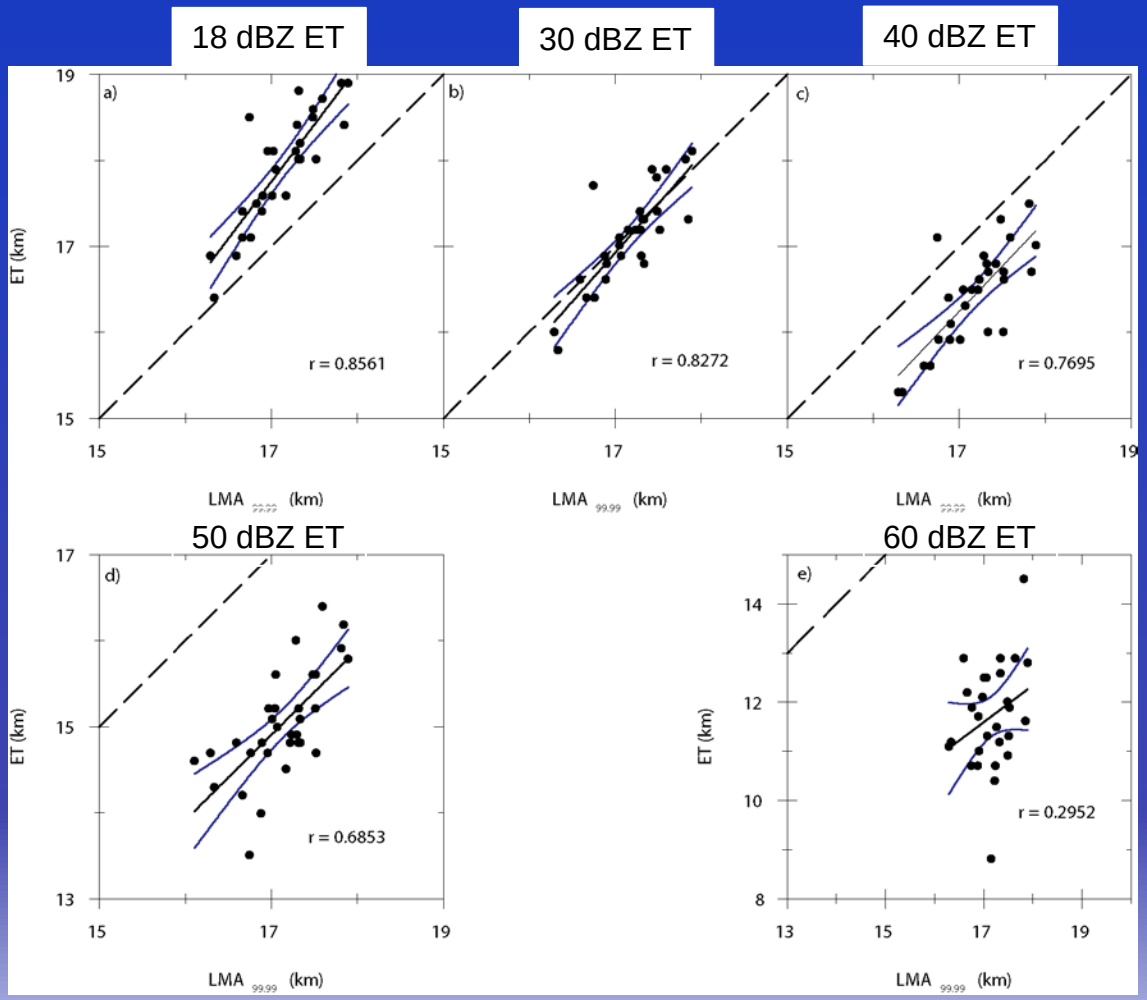
Vertical Distribution of Sources
Case 1: 24 May 2011

- Relationship to storm severity
  - Onset of LMA OT signature
    - 14 min prior to 1st tornado warning
    - 37 min prior to 1st tornado report
    - 20 min after 1st severe hail report
  - MESH greatest while signature was present

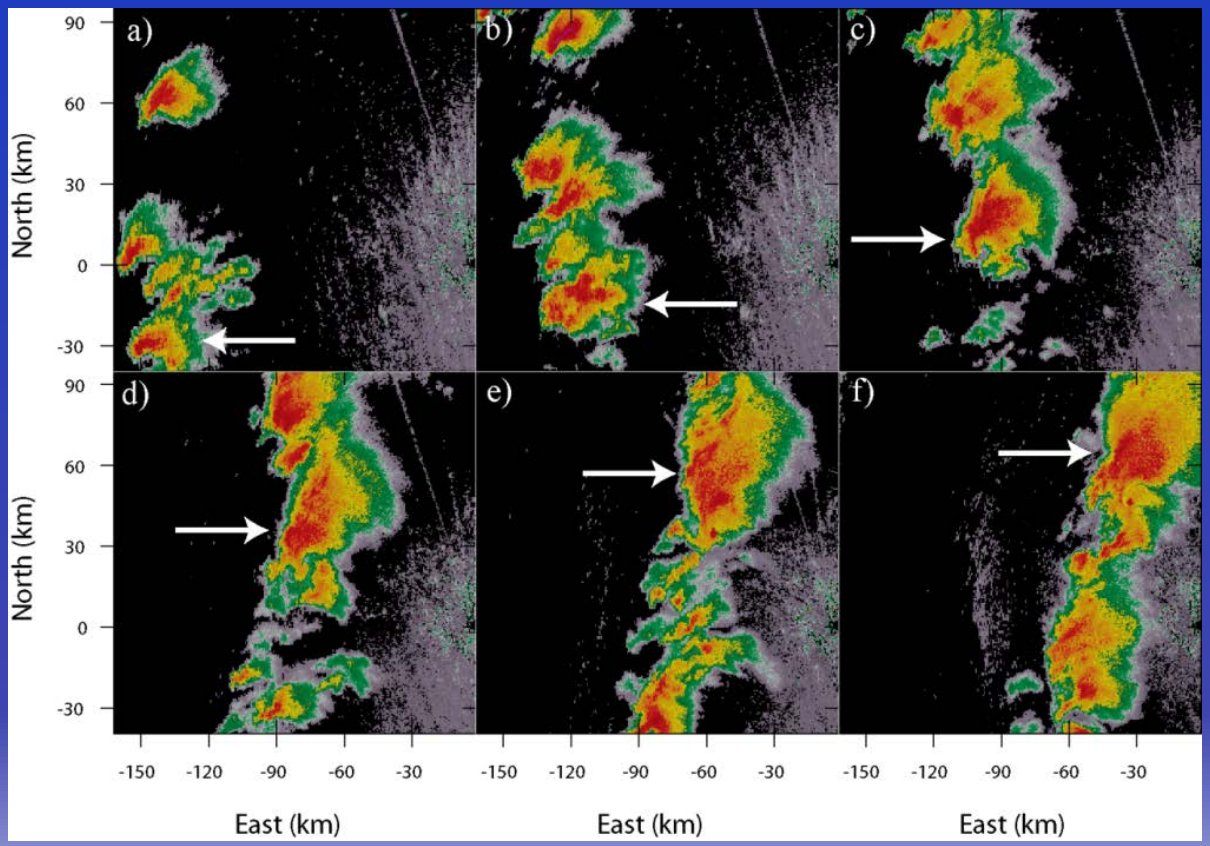


Correlations
Case 1: 24 May 2011

- $ET_{18,30,40,50}$
  - Strong positive
  - ET_{30} & $LMA_{99.99}$ at same altitude
  - $LMA_{99.99} < ET_{18}$
- ET_{60}
  - Weak positive



Meteorological Overview
Case 1: 24 May 2011

	Case 1 24 May 2011 1900-2230
Storm Type	Supercell
CAPE (J kg^{-1})	4287
LNB (km)	13.5
MPL (km)	18
Max Overshoot (km)	4.5

0.5° Reflectivity PPIs (KOUN)