Cold Season Usage of Total Lightning Observations

Improving Total Lightning Use

Geoffrey Stano — NASA SPoRT / ENSCO, Inc.

Brian Carcione — NWS Huntsville, AL / NASA SPoRT

Southern Thunder Workshop, Norman, OK 11-14 July 2011

Outline

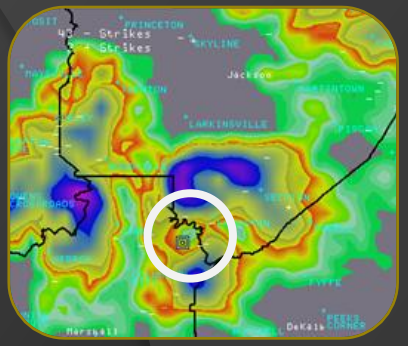
Why should there be interest?

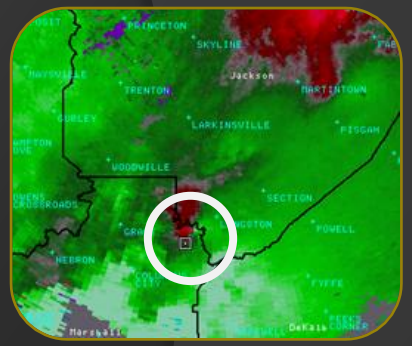
- Traditionally work with warm season
  - Climatological lightning max
  - Best way to show need in order to submit funding proposals
- What about the cold season?
  - Still see severe weather
  - Still have lightning threat
  - Same benefits from total lightning
  - Other scenarios?

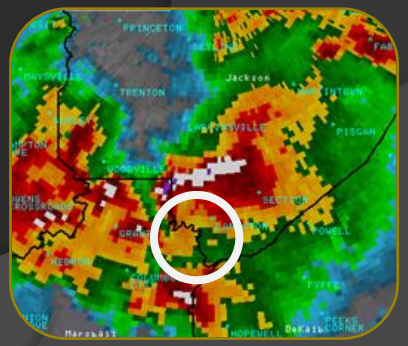
Current Use of Total Lightning

- Lightning jumps and severe weather
  - Working to expand this
- Positive end user feedback
  - SPoRT partners
  - Spring Program participants
- Training has been effective
  - Total lightning is now requested
  - Key tool for forecasters

Photo by Martha Tellefsen

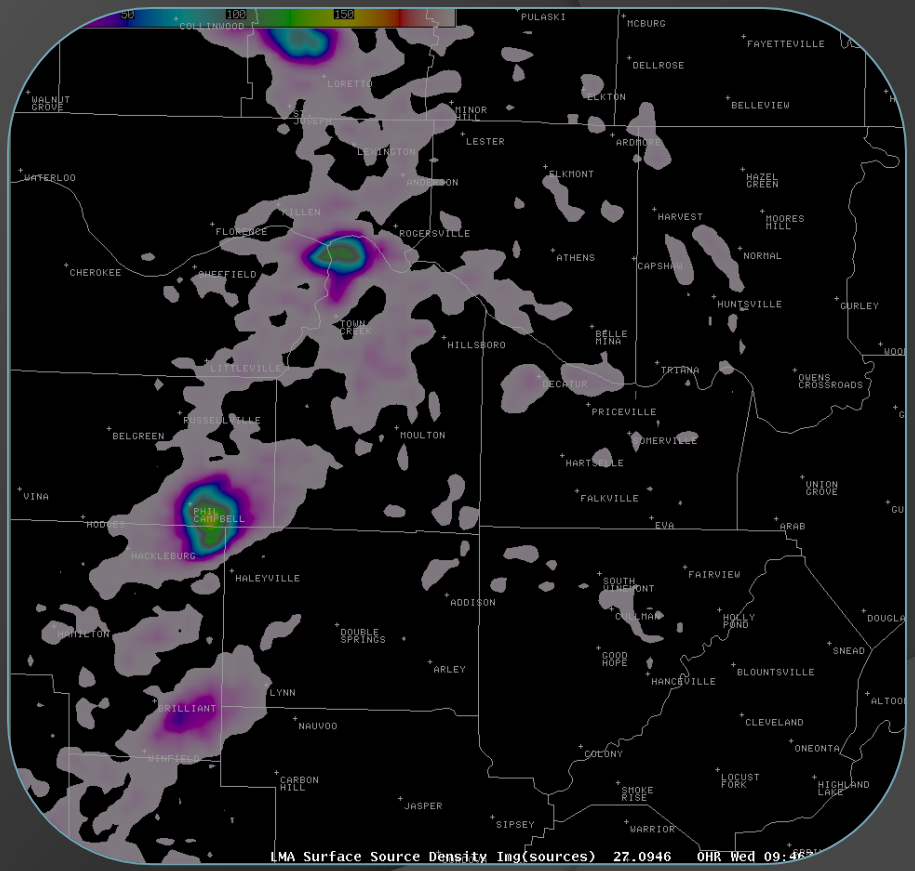






Outstanding Evaluation Questions

- What is the false alarm rate
  - Jumps without severe weather?
  - Severe weather without jumps?
- Does this work for most cases?
  - Currently “one size fits all” approach



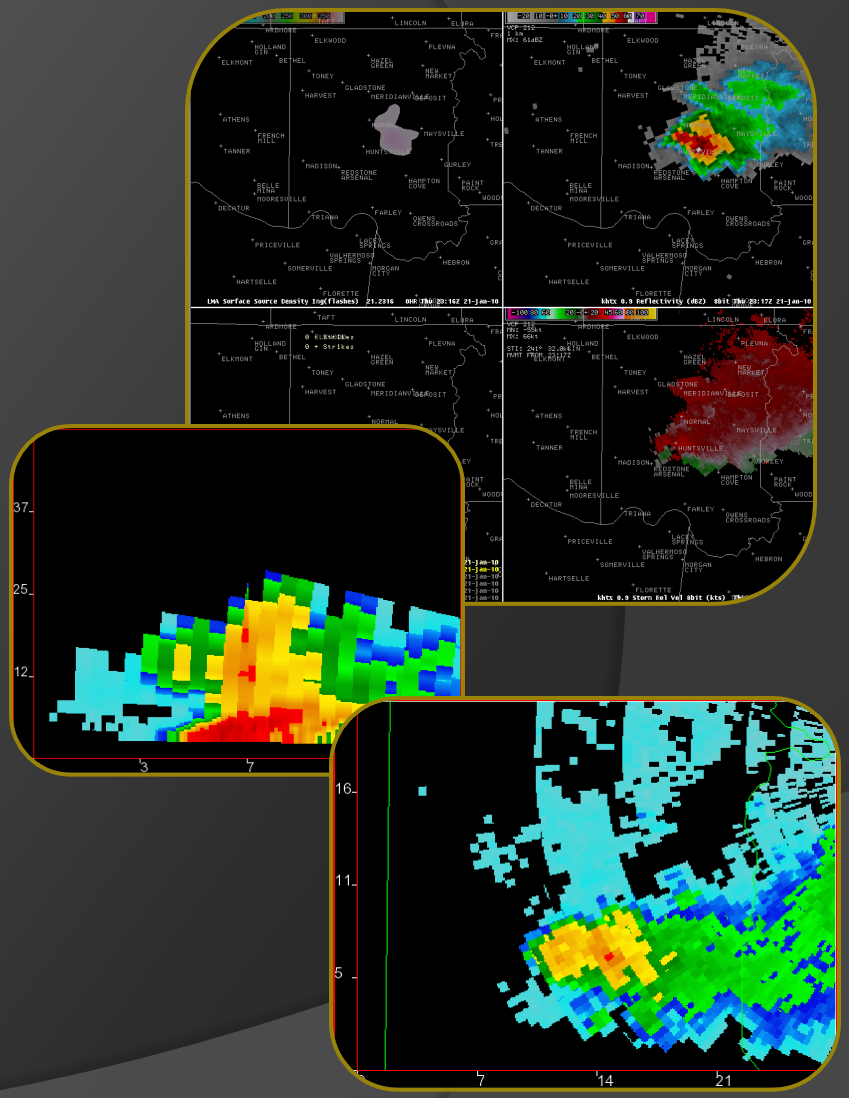
Cold Season Event

Event

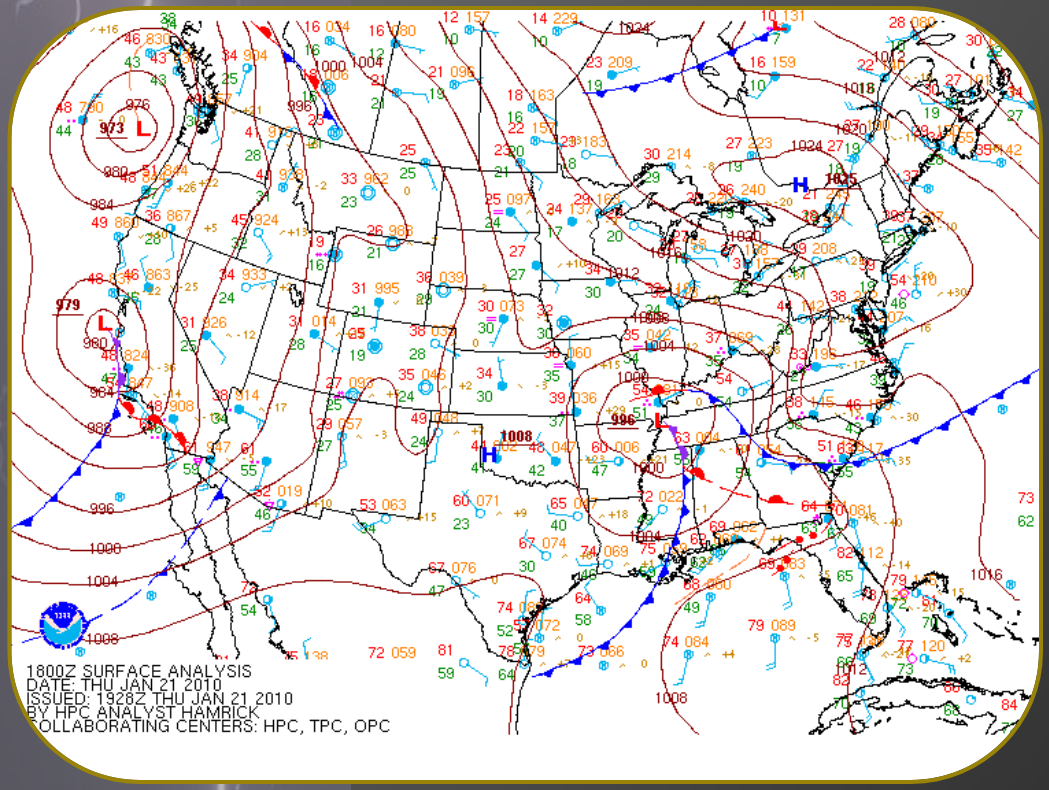
- 21 January 2010
- Evening
- Downtown Huntsville
- Heart of NALMA network

Question

- Was this different from warm season?



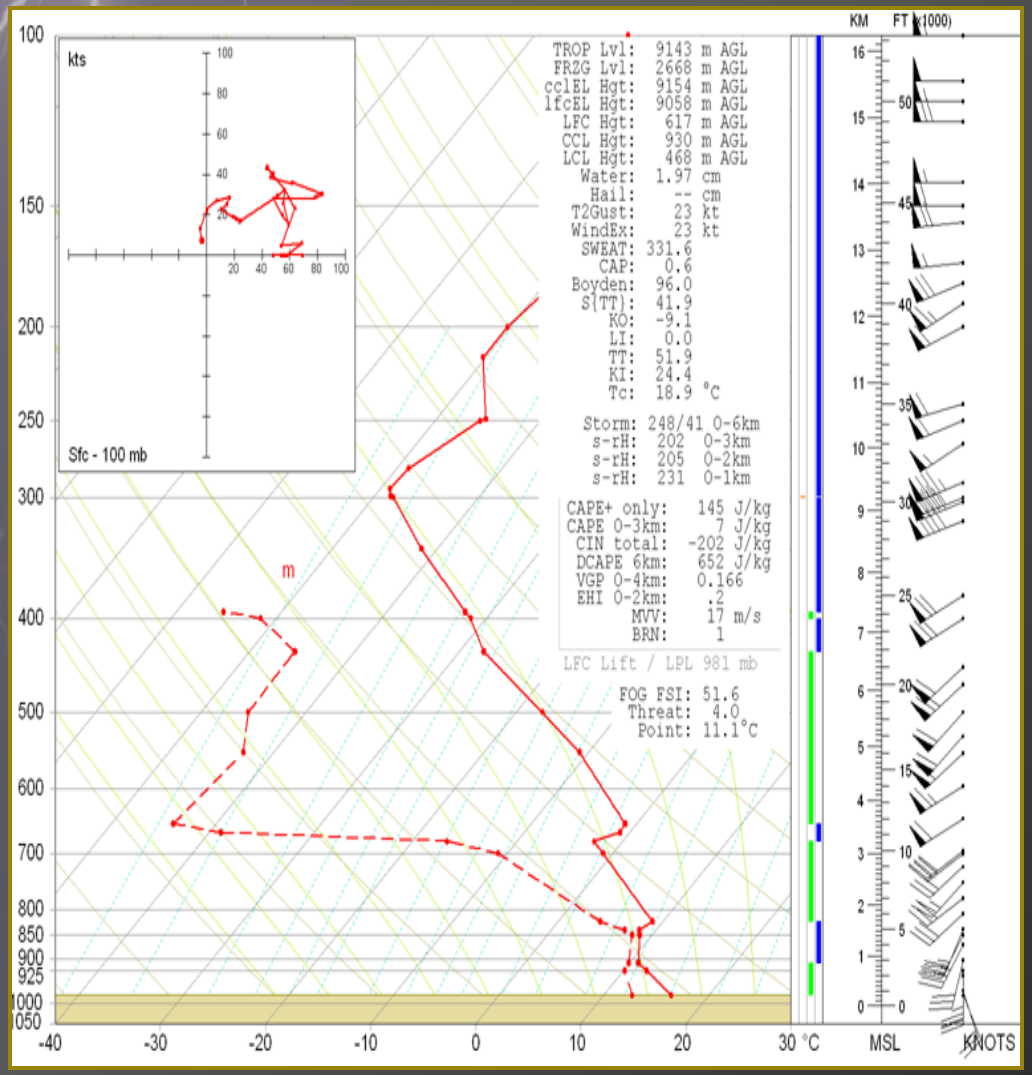
Scenario Set-up



Surface Conditions

- SPC Slight risk (1600 UTC)
- 5% tornado probability
- No watches for Alabama
- Warm surface conditions
  - Upper 60s for temps
  - Upper 50s for dew points
- Surface Low at Missouri boot heel
- Approaching occluded front

Sounding Parameters

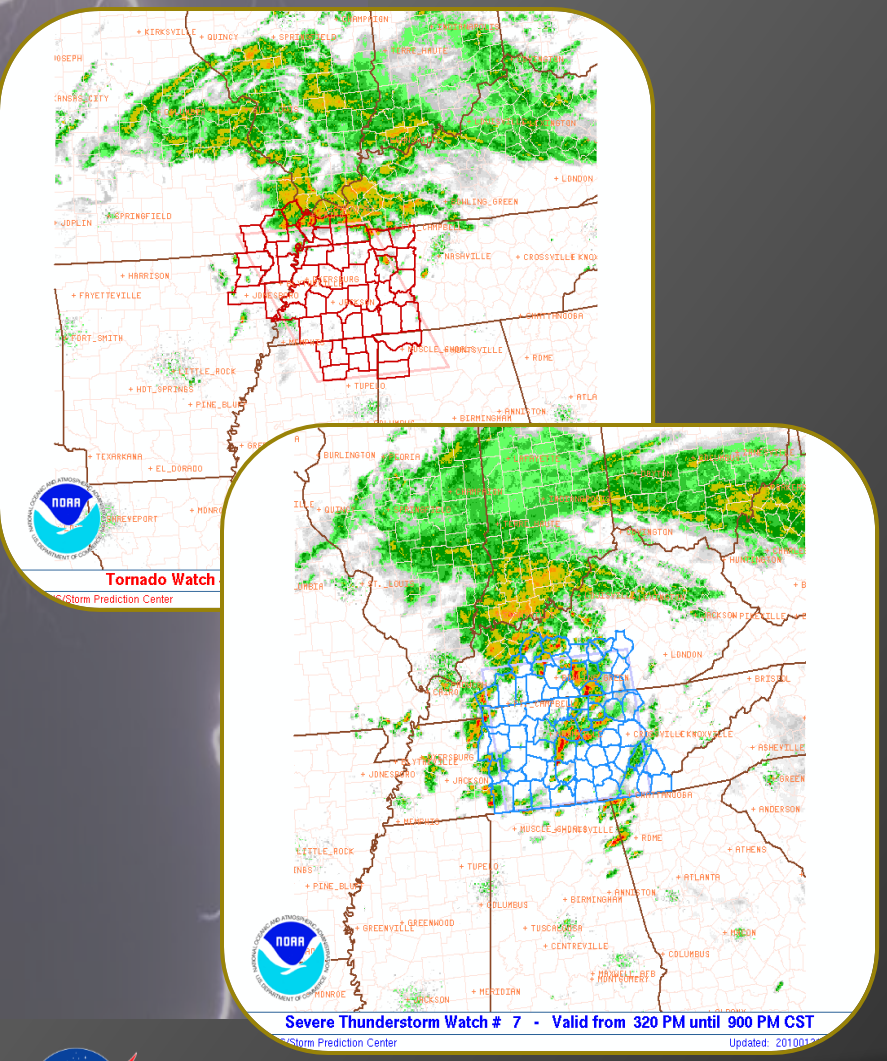


Sounding Parameters

- Strong deep layer shear
- Helicity and CAPE sufficient for mesocyclones
- Dry slot and cold pool aloft
- Steep mid-level lapse rate
  - 6.9 C / km
  - Heating available to steepen low-level lapse rate

Redstone Arsenal Sounding – 1700 UTC

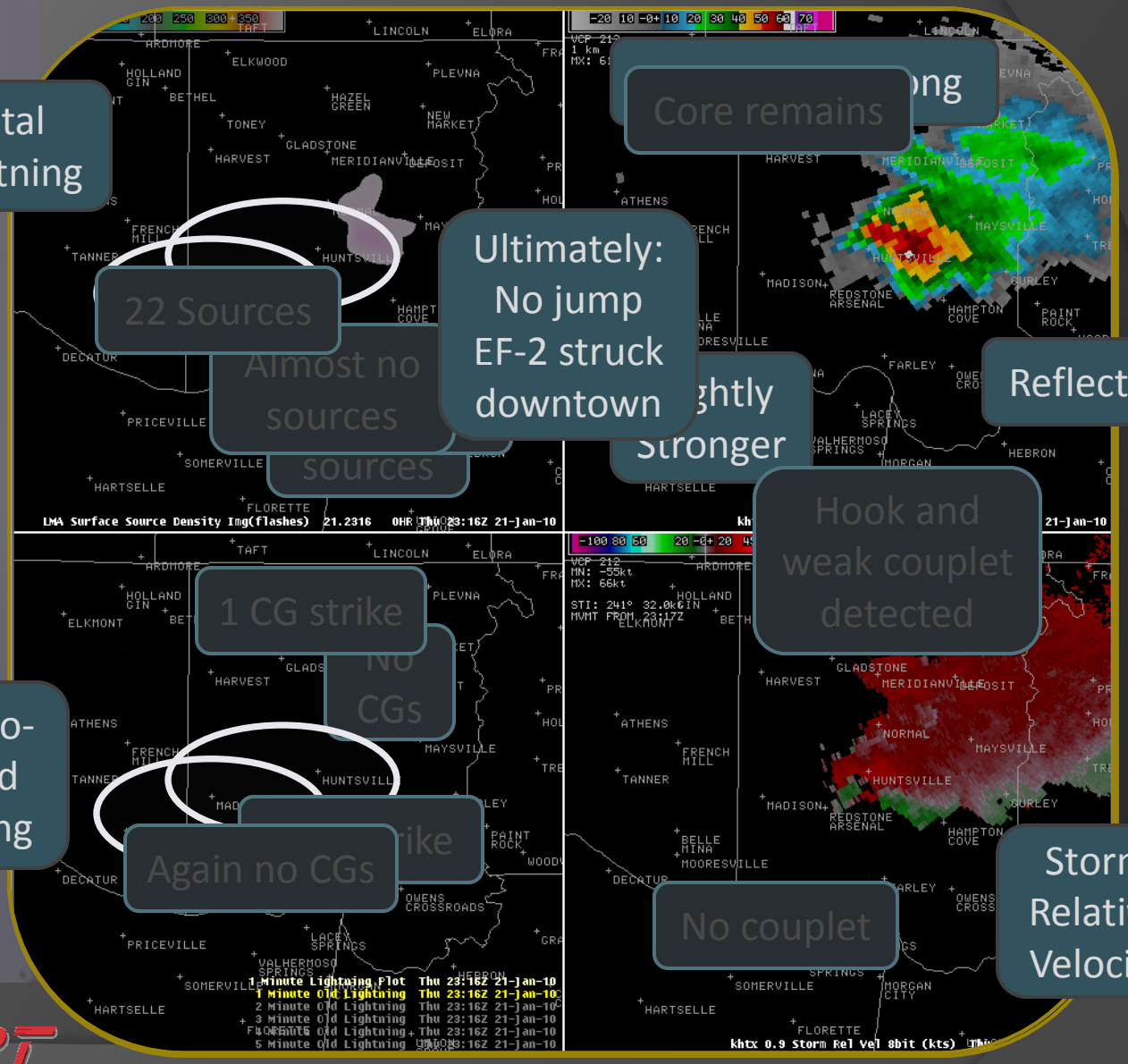
Scenario Evaluation



Scenario Evaluation

- Low topped convection
  - Including supercells
- Destabilization expected with heating
- Tornadoes possible
- Good forecast / analysis
- What did total lightning show?

The Event



Total Lightning

22 Sources

Almost no sources

sources

Ultimately: No jump EF-2 struck downtown

Core remains

ng

ghtly Stronger

Reflectivity

Hook and weak couplet detected

2316 UTC

1 CG strike

No CGs

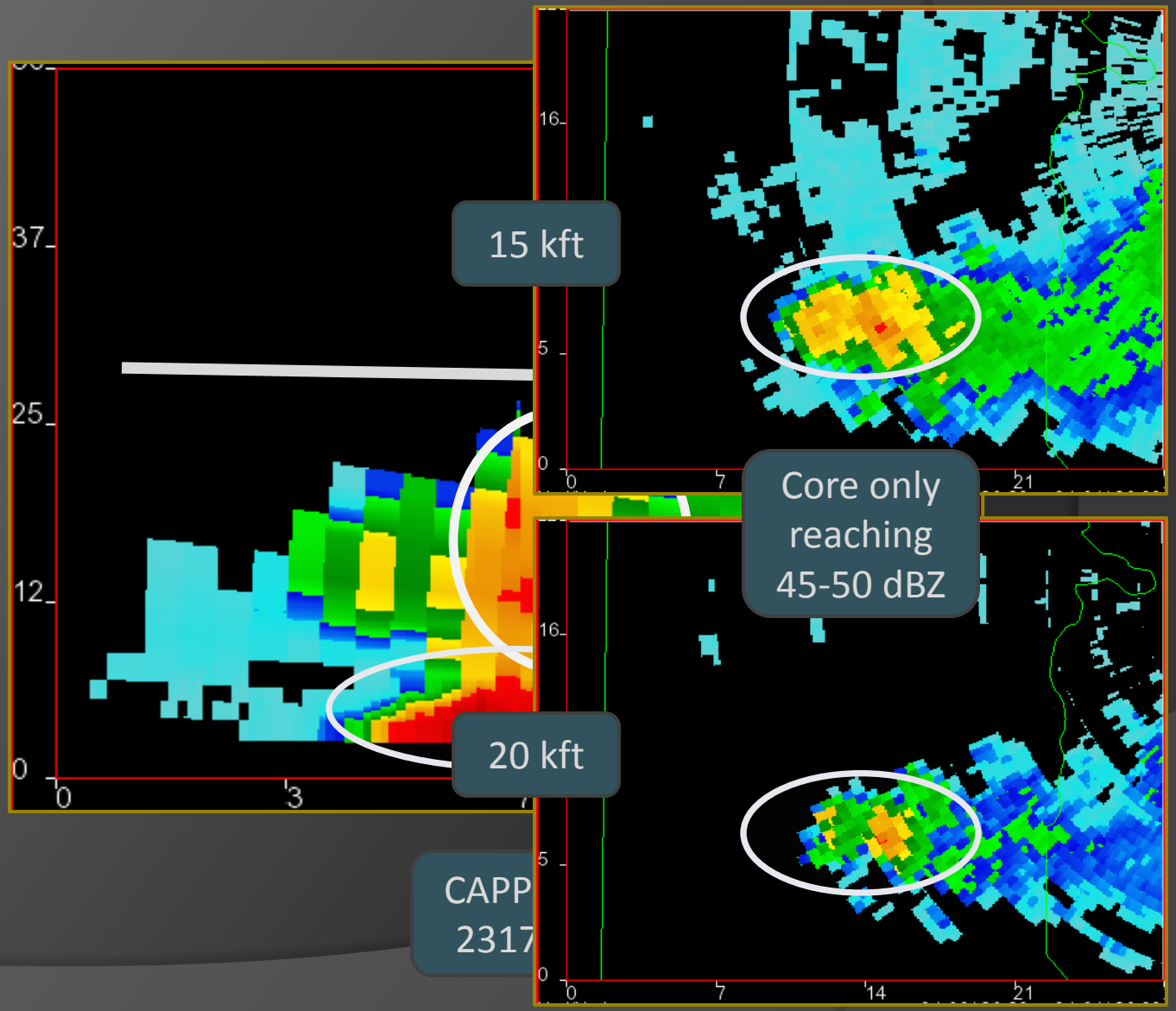
Cloud-to-Ground Lightning

Again no CGs

No couplet

Storm Relative Velocity

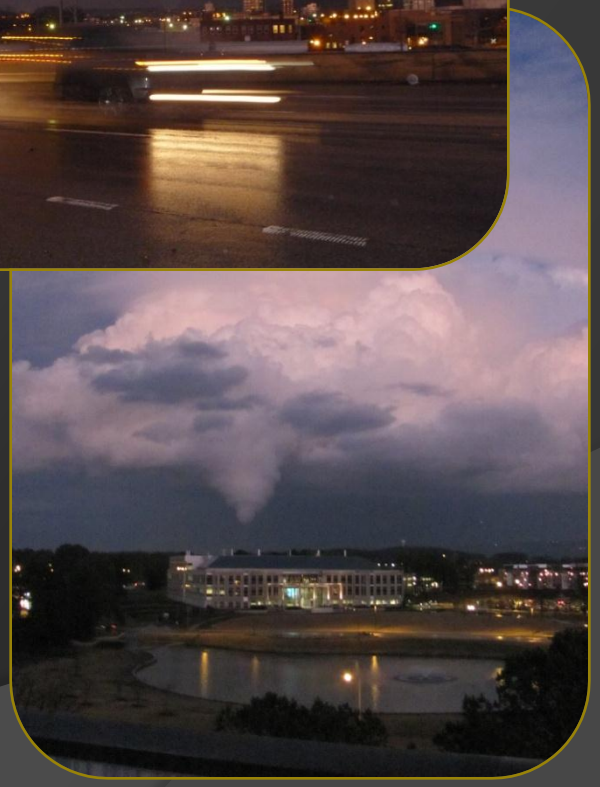
What Happened?



Event Summary

Event Summary

- Well forecast event
- EF-2 in heart of network
  - No detection efficiency issues
- Conditions not favorable for lightning
  - Shallow convection
  - Weak charging mechanisms
  - No observed jump
- Scenario where total lightning is *NOT* useful
- Had similar case in May 2009



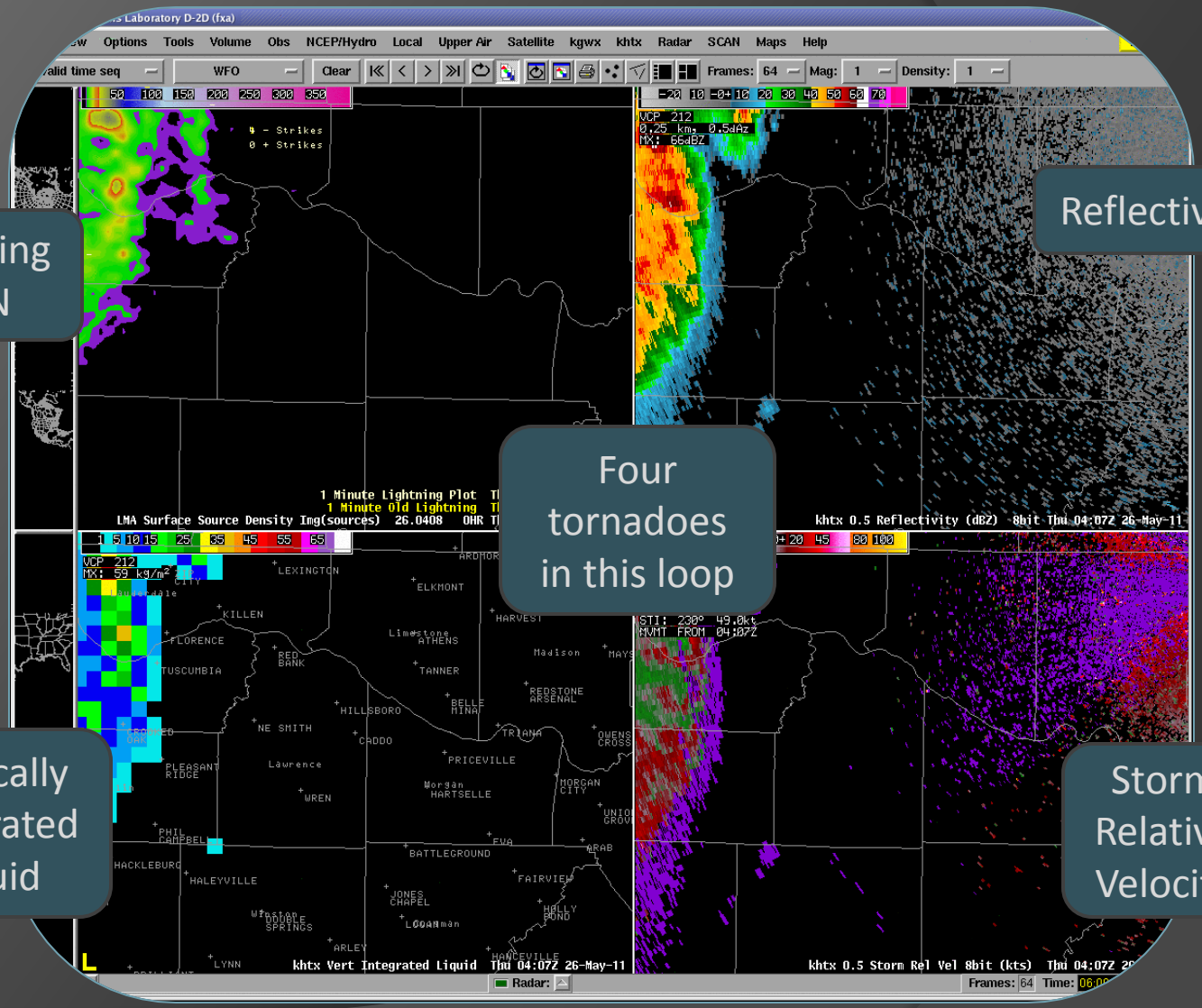
Photos by Christopher Schultz

Another Case

May 25-26, 2011

- Yes, this is not the cold season
  - Illustrates similar point though
- Situation
  - Line of storms approaching
  - Good total lightning data
  - Marginal case
  - Should play to total lightning's strengths

Loop of Event



Total Lightning and NLDN

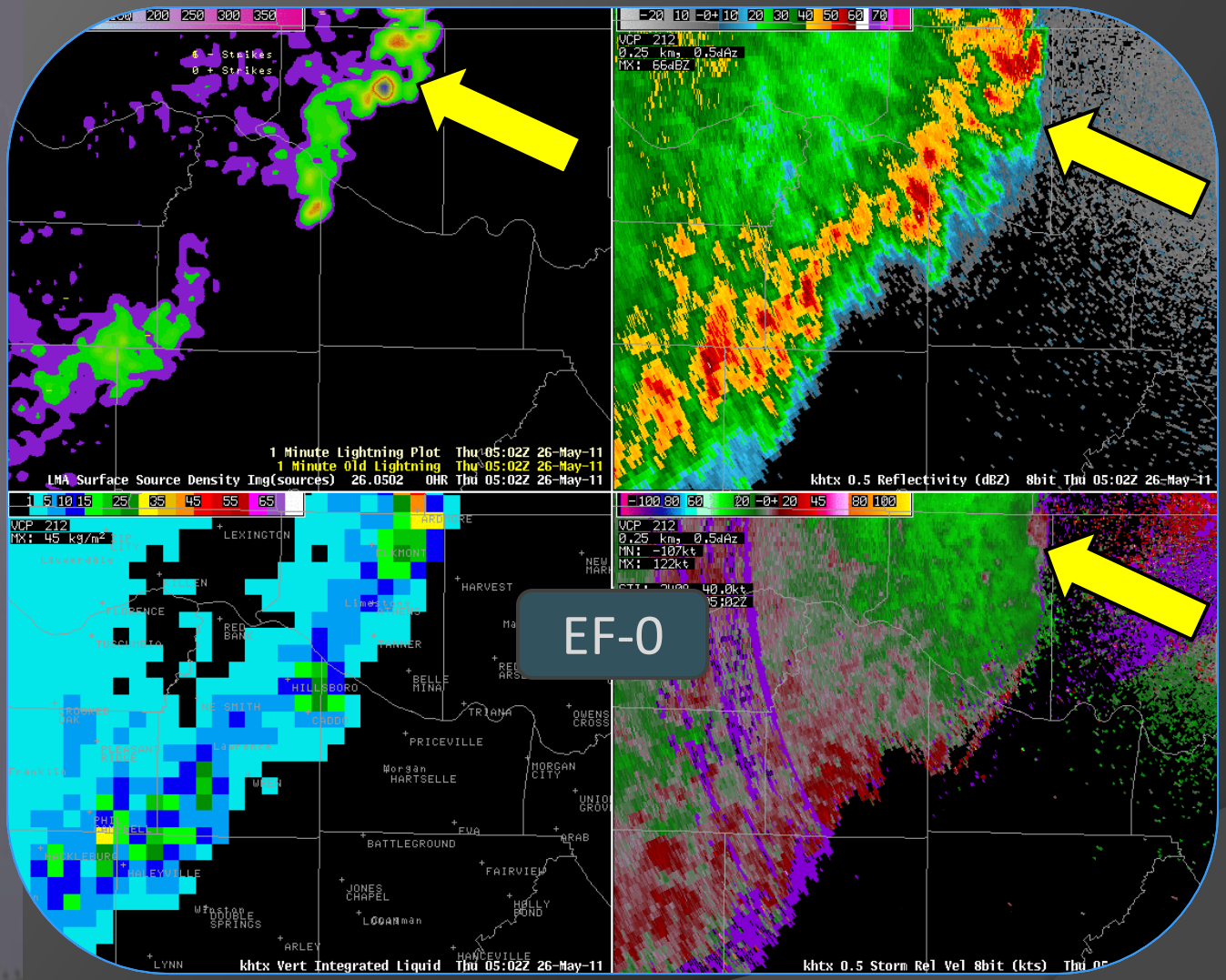
Reflectivity

Four tornadoes in this loop

Vertically Integrated Liquid

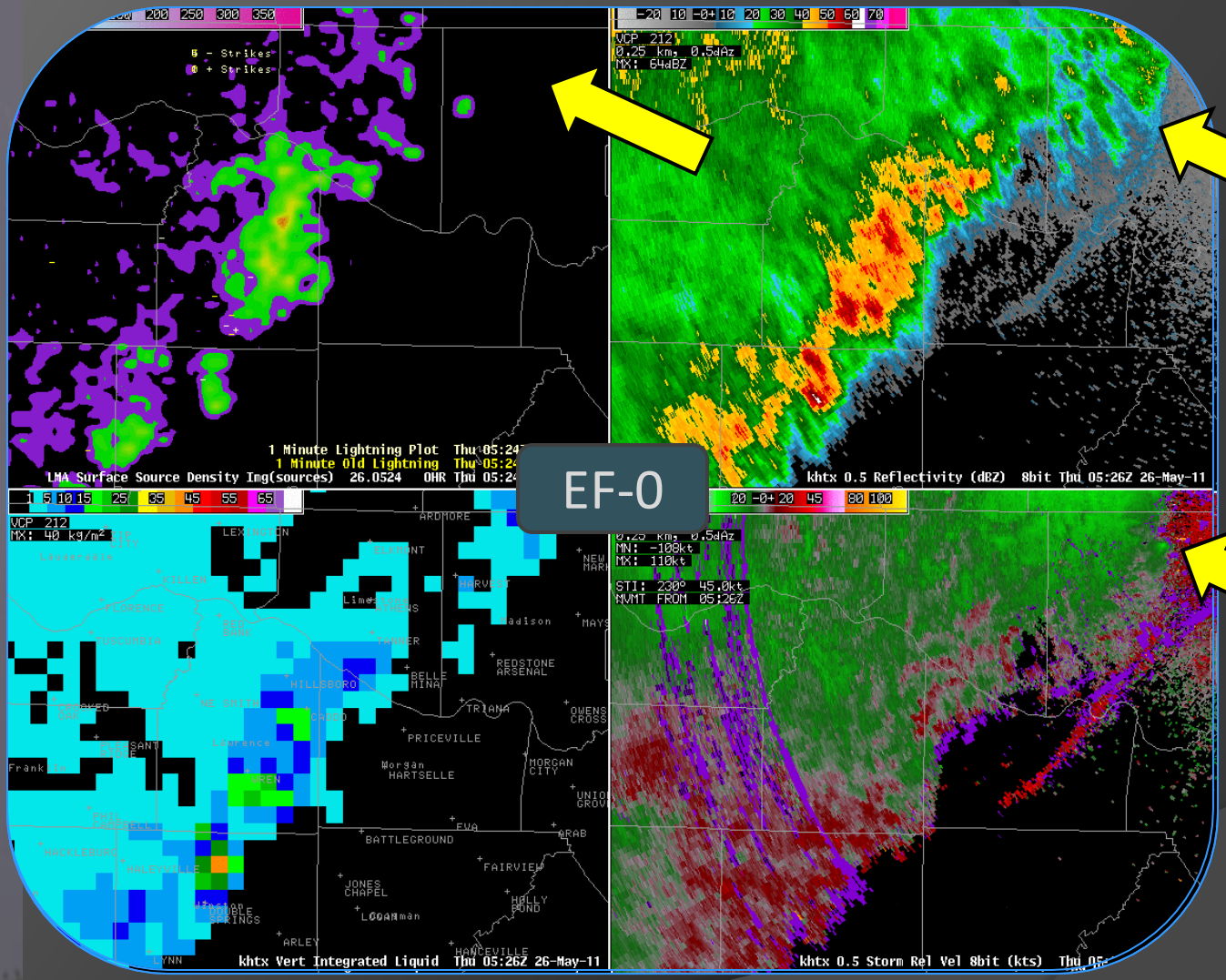
Storm Relative Velocity

0450-0502 UTC



0502 UTC

0518-0524 UTC



0522 UTC

Summary

- Purpose is not to dismiss utility of total lightning
  - Wish to promote greater use, particularly with GLM
- End users are relying on total lightning more
  - Including observations in procedures
  - Total lightning not a one size fits all system
- Need to educate end users
  - Using these examples in upcoming training
  - Convey physical reasons for these cases
- End result is a more robust product
  - Understand situations where total lightning is less effective
  - End users will not dismiss product when it “fails”

Questions?

Geoffrey Stano
geoffrey.stano@nasa.gov