

Generic Material for Demonstrating GLM Uses with International Partners

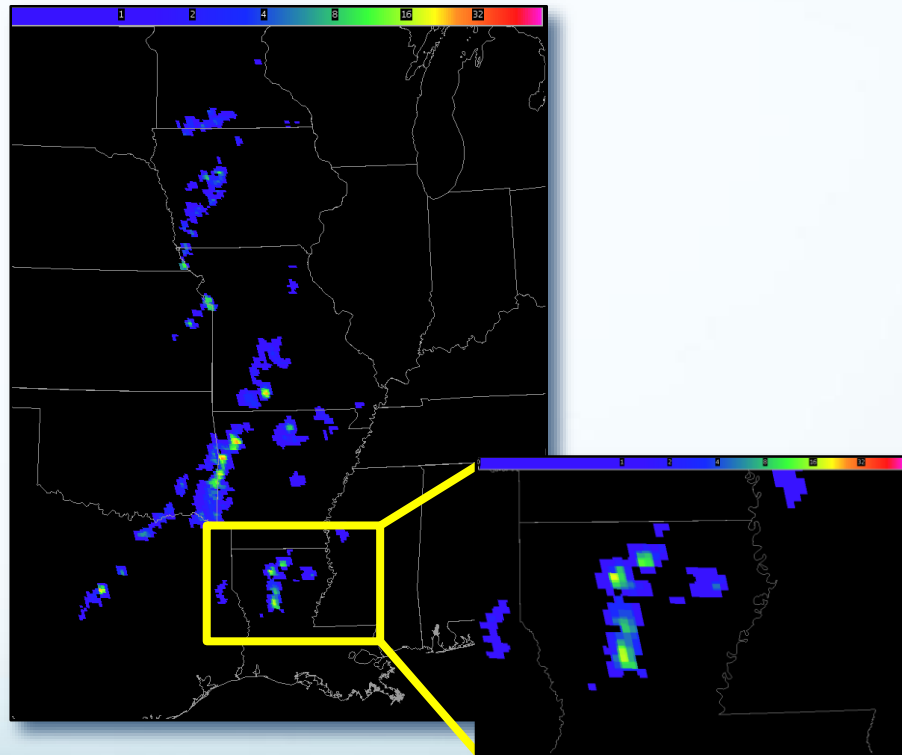
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²ENSCO, Inc.

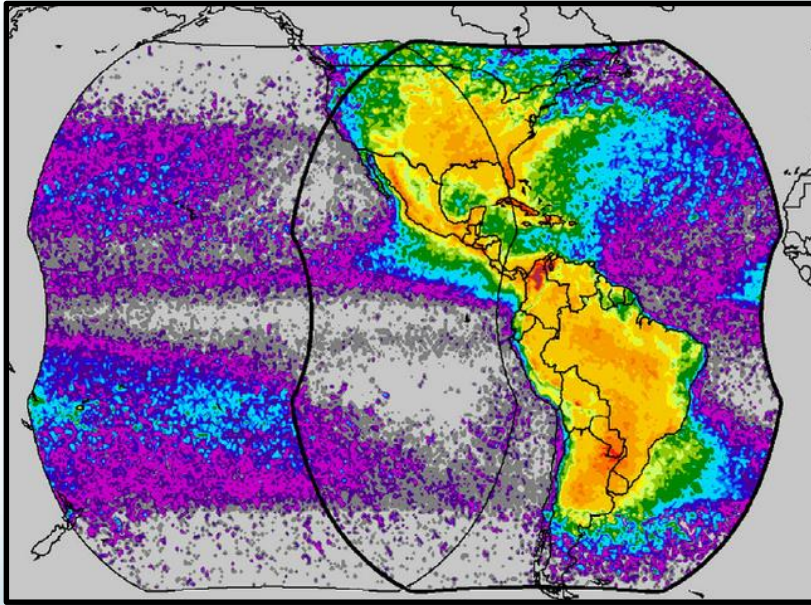
Objectives and Outline

- What is the Geostationary Lightning Mapper (GLM)?
- Creating the flash extent density product
- Initial example uses
- Advantages of GLM
- Limitations of GLM
- Objective: Basic overview of GLM with emphasis on operational applications



One minute of GLM flash extent density observations across the central U.S. and northern Louisiana (inset)

The Geostationary Lightning Mapper

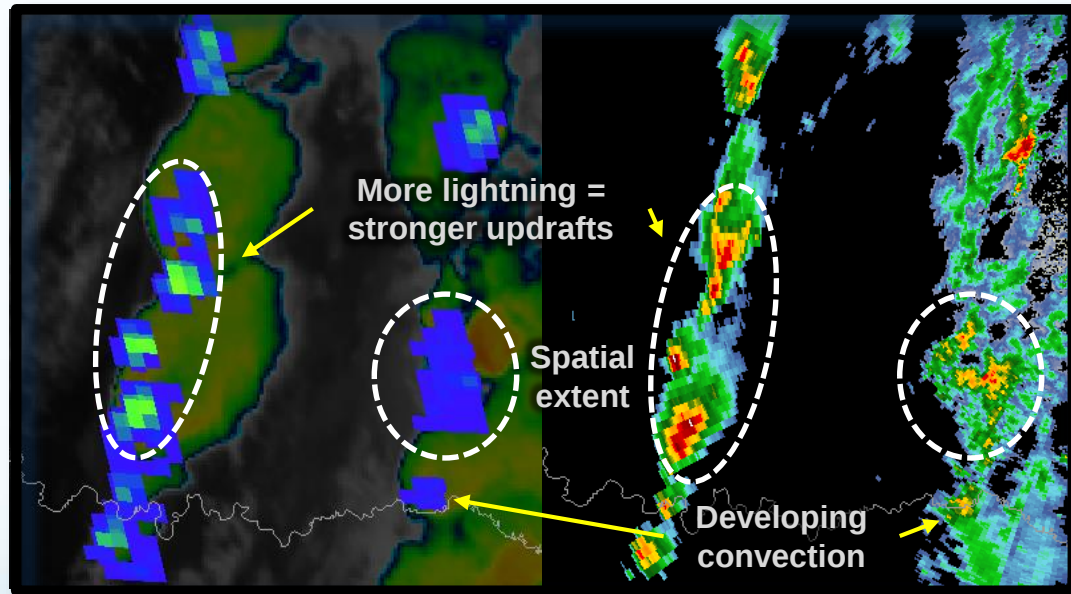


GLM field of view for GOES-16 and -17. (Using lightning climatology from OTD and TRMM-LIS (1995-2005))

- Essentially, large digital camera to detect cloud top brightness differences
- Covers 54° N/S
- Observes both intra-cloud and cloud-to-ground, but does not distinguish difference
- Specifications: >70% detection over the full disk over 24 hours (Closer to 90% at night)

Key GLM Features

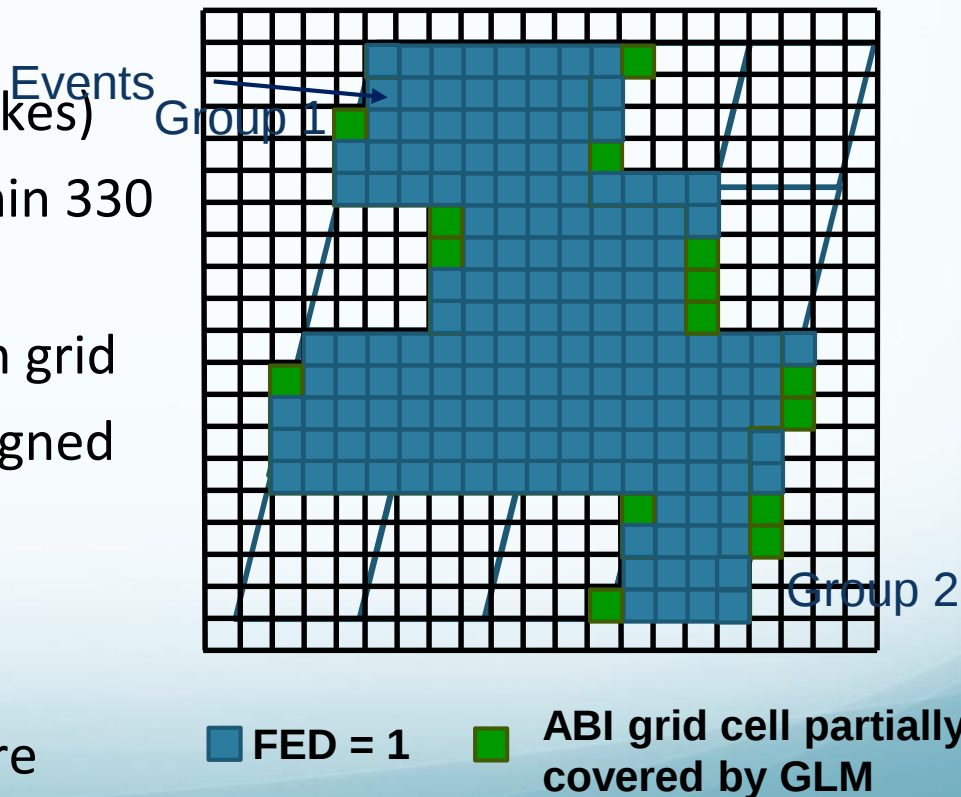
- Identifies spatial extent of lightning
- Lightning driven by strength / volume of updraft in mixed phase region
 - Bigger updraft = more lightning
- GLM observations can serve as proxy for convective activity



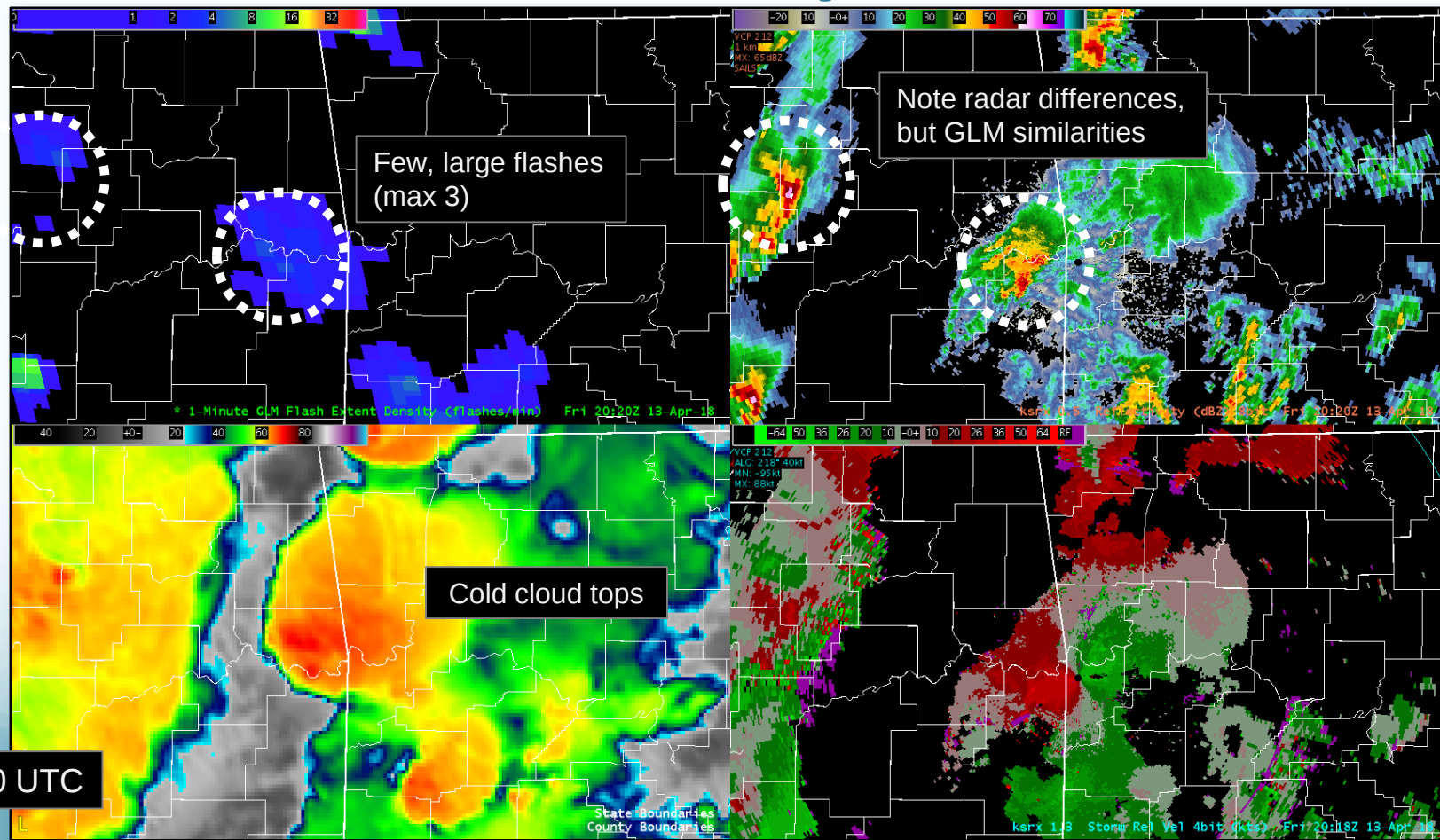
Example of GLM flash extent density overlaid on 10.3 micron ABI (left) compared to radar reflectivity (right)

Creating the GLM Flash Extent Density

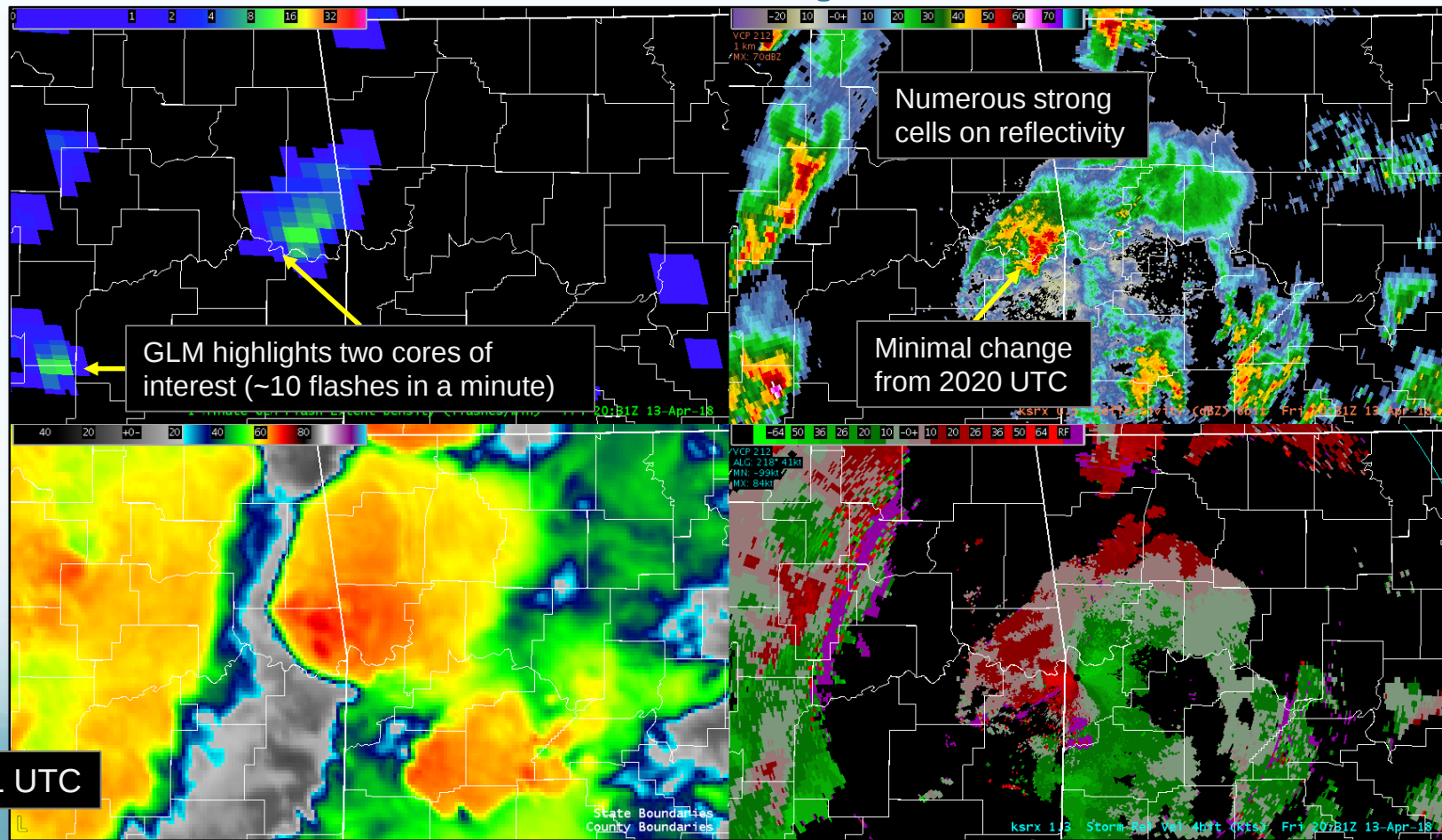
- Events (any detections per pixel in 2 ms) assigned to GLM polygon
- Events into groups (like return strokes)
- Groups combined into a flash (within 330 ms and 16.5 km)
- GLM polygons sliced by ABI 2×2 km grid
- ABI grids fully covered by GLM assigned value (1 for 1 flash)
- Partially covered grids rounded to nearest integer
- Grids necessary – Raw GLM data are points and lack spatial information



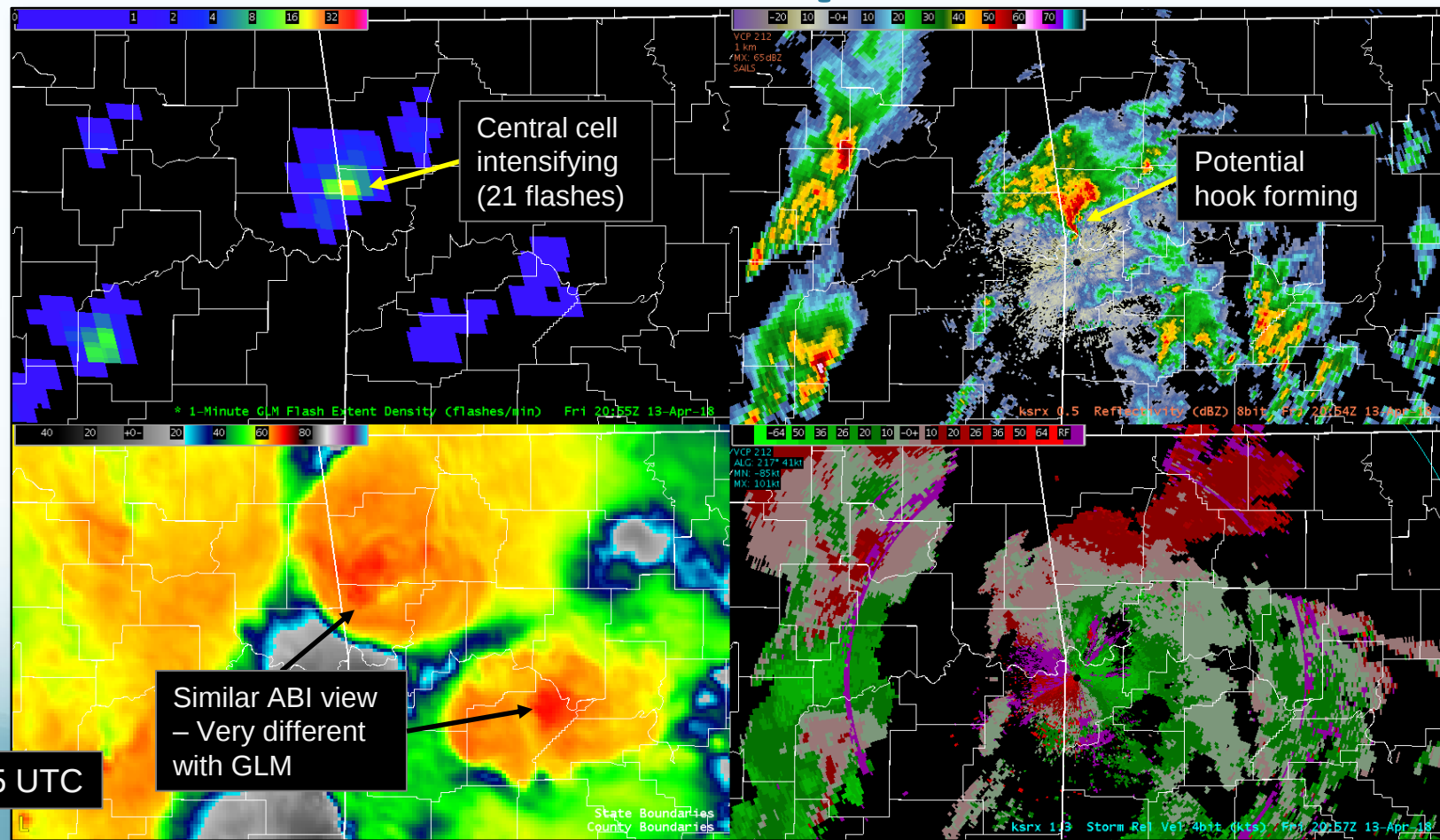
Severe Weather Interpretation Case (1)



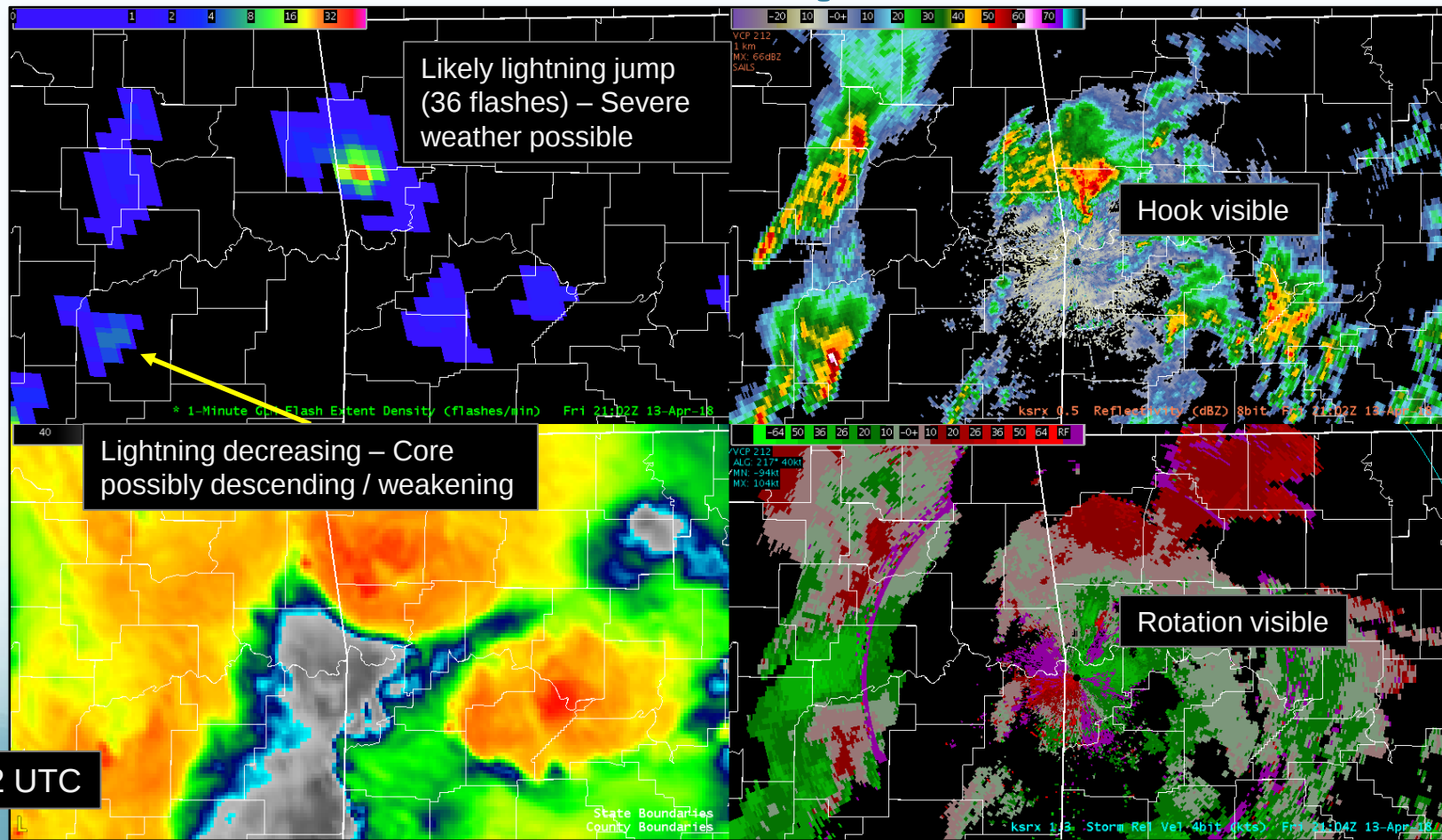
Severe Weather Interpretation Case (2)



Severe Weather Interpretation Case (3)

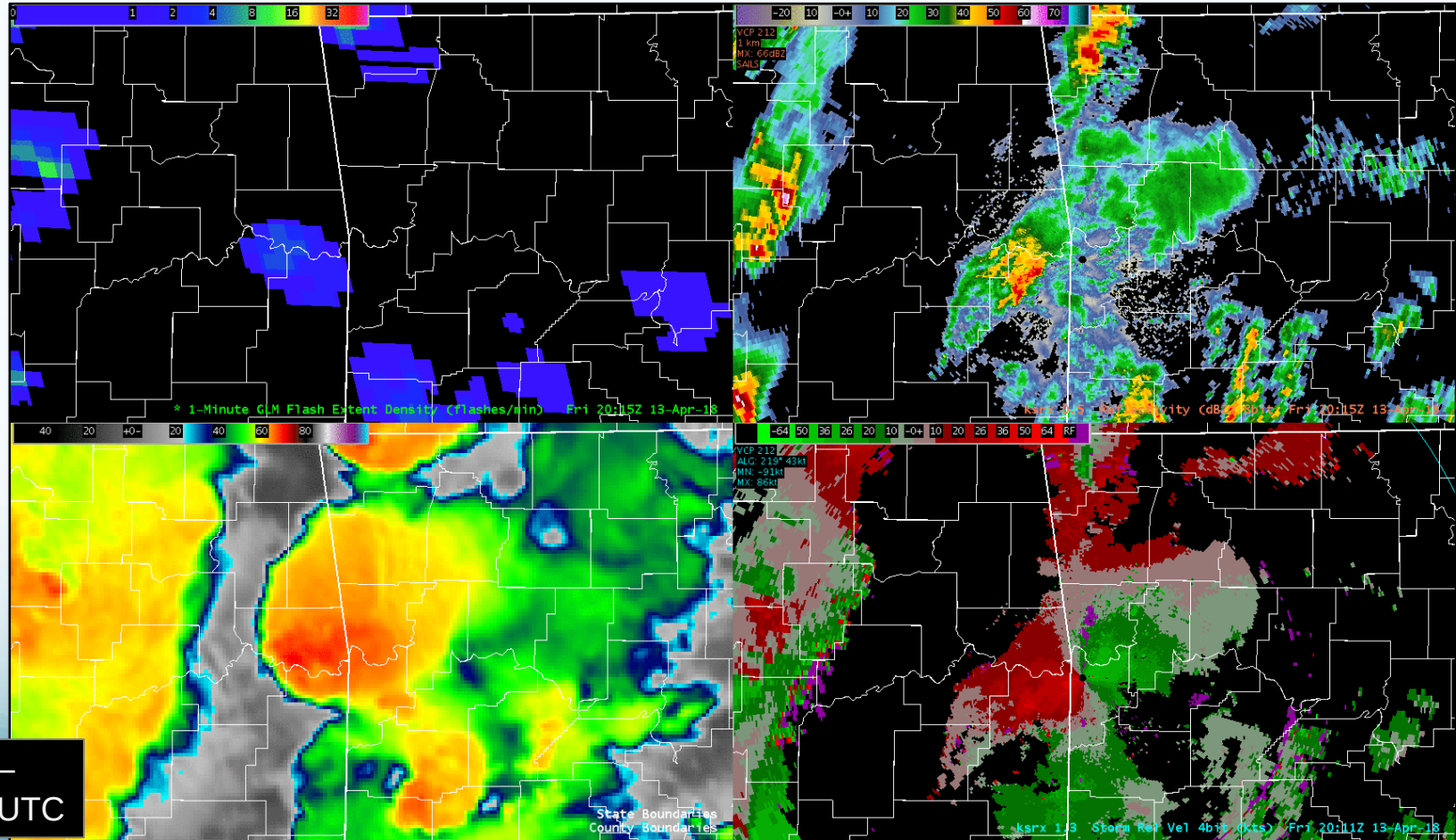


Severe Weather Interpretation Case (4)



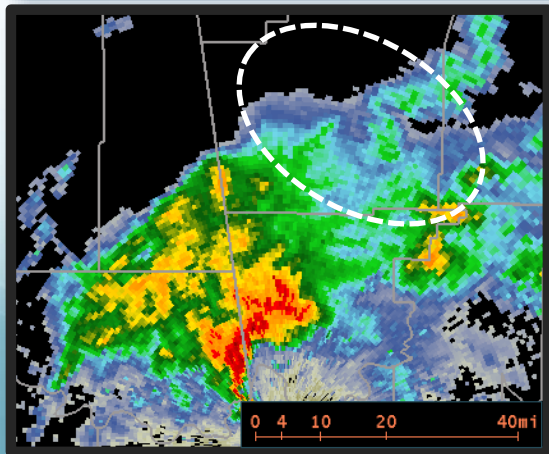
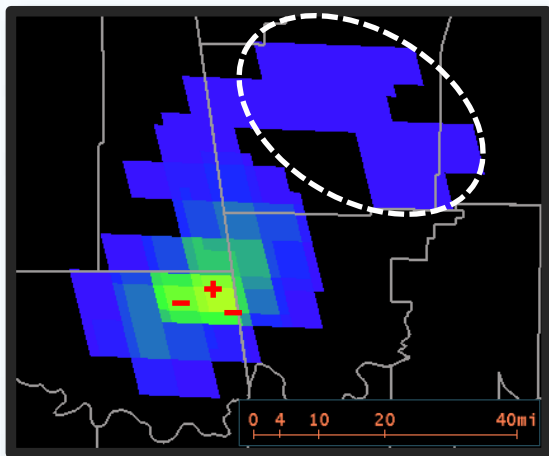
2102 UTC

Severe Weather Animation



2015 –
2105 UTC

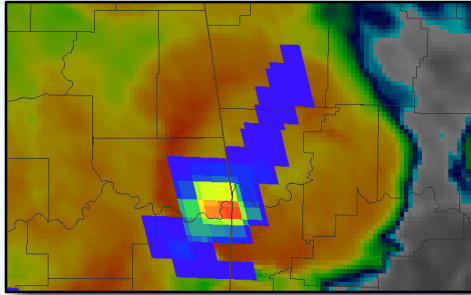
Long Flash Example



- Completely new ability – **Spatial Extent**
- NLDN and Earth Networks primarily point observations
- Lightning can, and does, travel many miles from its point of origin
- Can extend far into the stratiform region
- These flashes can also come to ground
- GLM is not proprietary – Can be shown on web in real-time (Great for safety)
- Beyond safety, can impact aviation interests

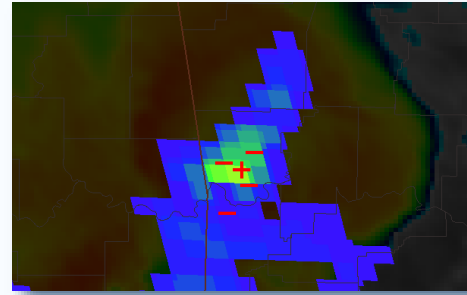
Summary

Advantages



- Lightning tied to storm intensity – jumps signal potential severe weather
- Situational awareness to “triage” time to investigate specific storms
- Lightning safety with spatial extent and intra-cloud often precedes first cloud-to-ground
- Available in data sparse regions

Limitations



- Does not distinguish intra-cloud or cloud-to-ground
- No polarity observations
- High shear / low CAPE can result in null events (severe weather with limited lightning observed)
- Best detections at night