Early Assessment of the Geostationary Lightning Mapper

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Background on the Assessment

- GLM display completed Spring 2018
- Initial evaluation at Hazardous Weather Testbed
- This effort focuses on forecasters in their local offices

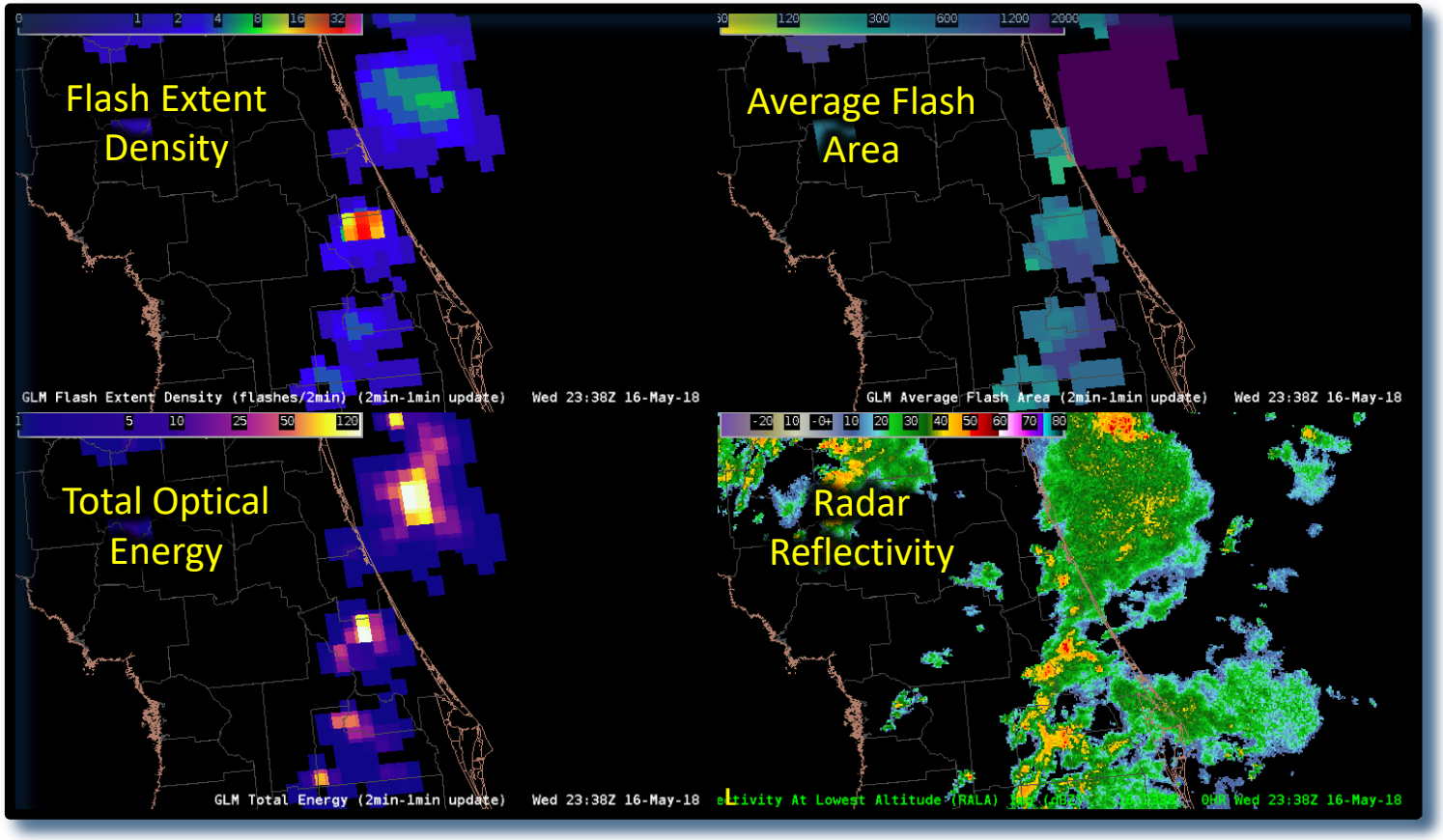
Goals

- Assess GLM in an operational setting
- Identify training gaps and cases

Other Details

- Used flash extent density, average flash area, and total optical energy
- Training: quick guides and webinar
- Timeframe:
  - June 25 – July 6
  - Extended July – August
- 28 offices and aviation sites

GLM flash extent density (upper left) with average flash area (upper right), total optical energy (lower left), and radar reflectivity (lower right)



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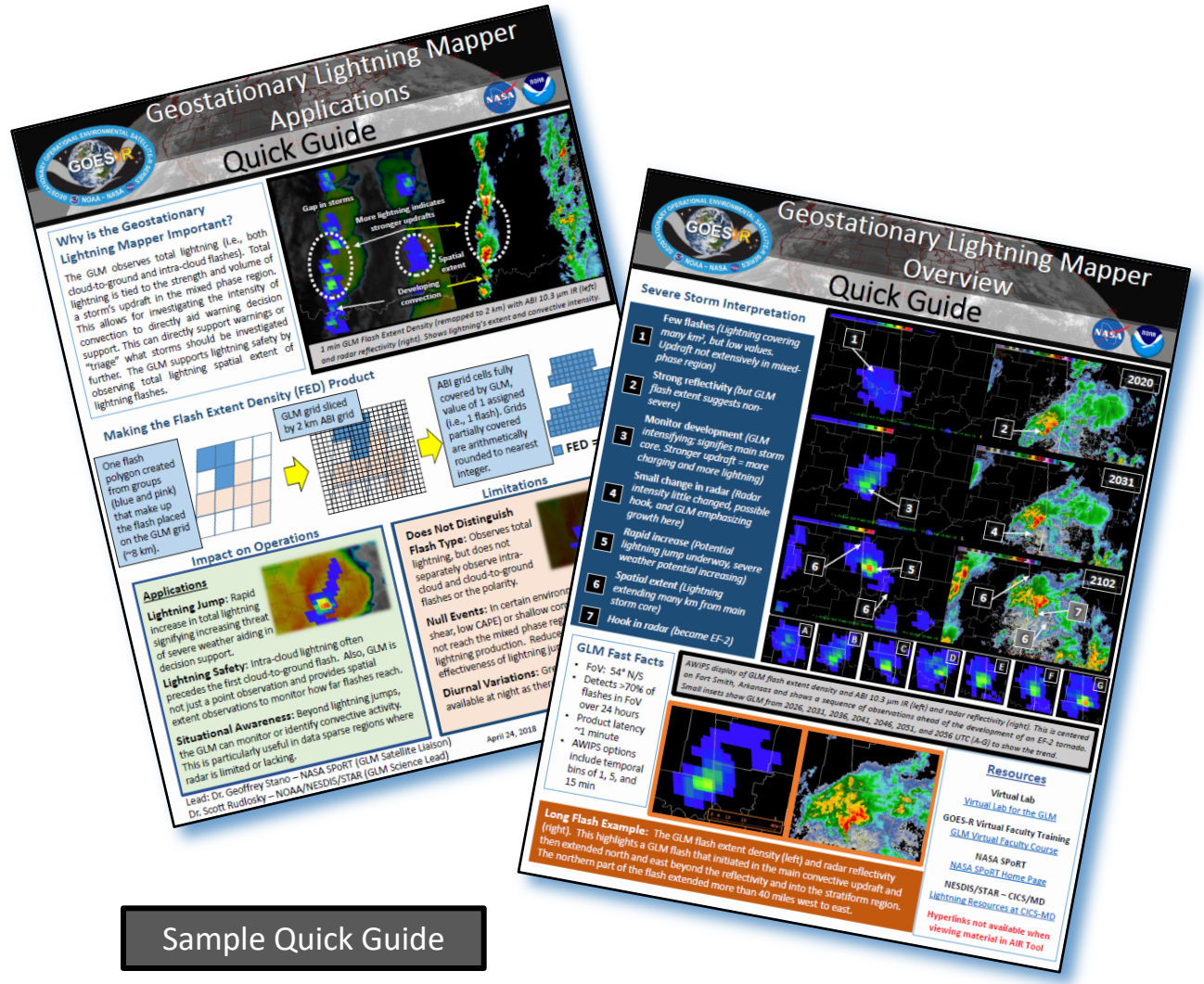

Sample Quick Guide

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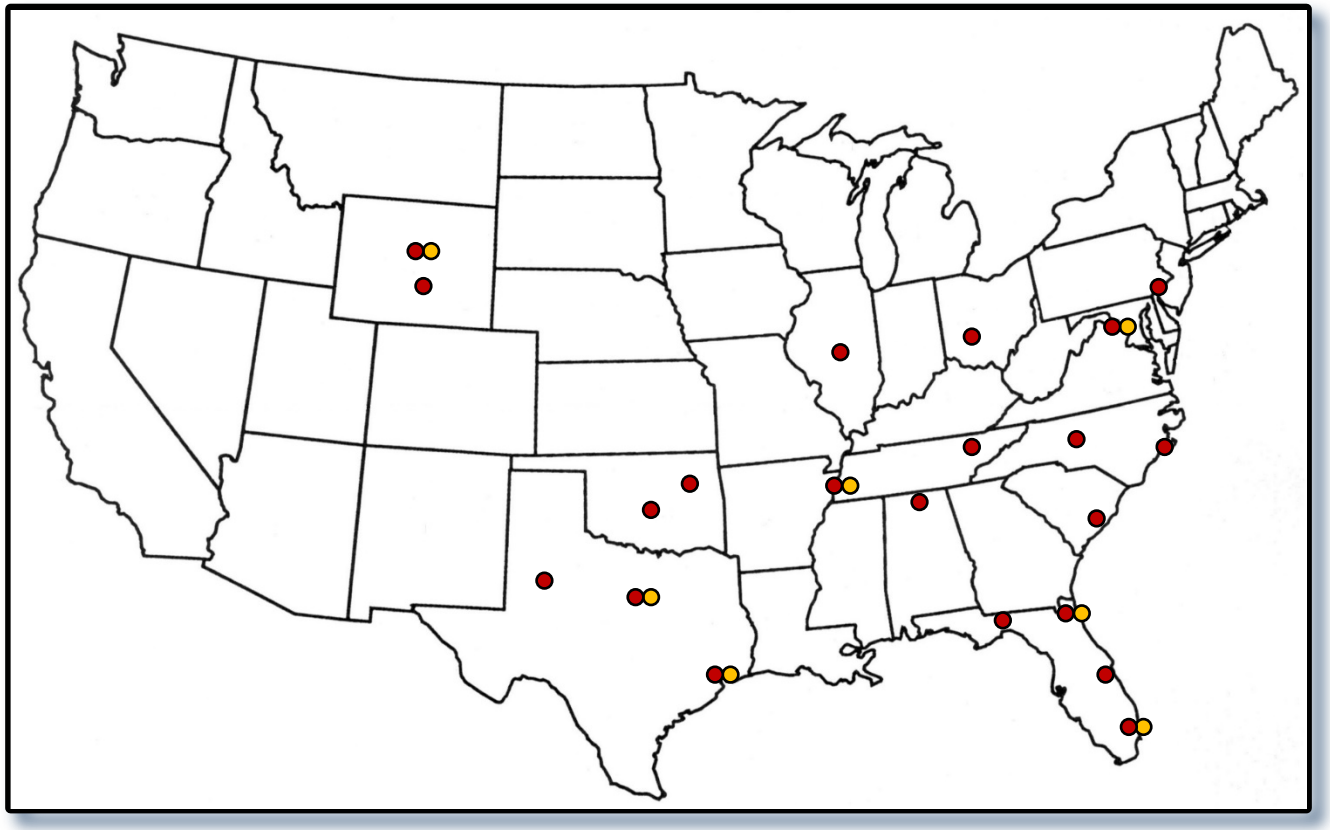
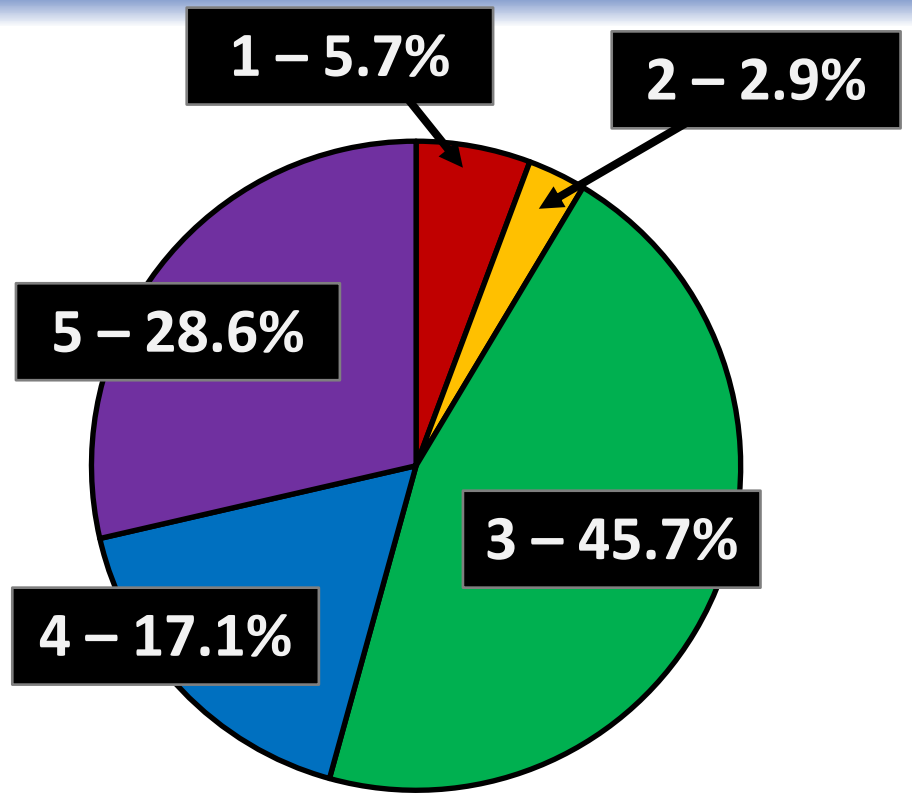
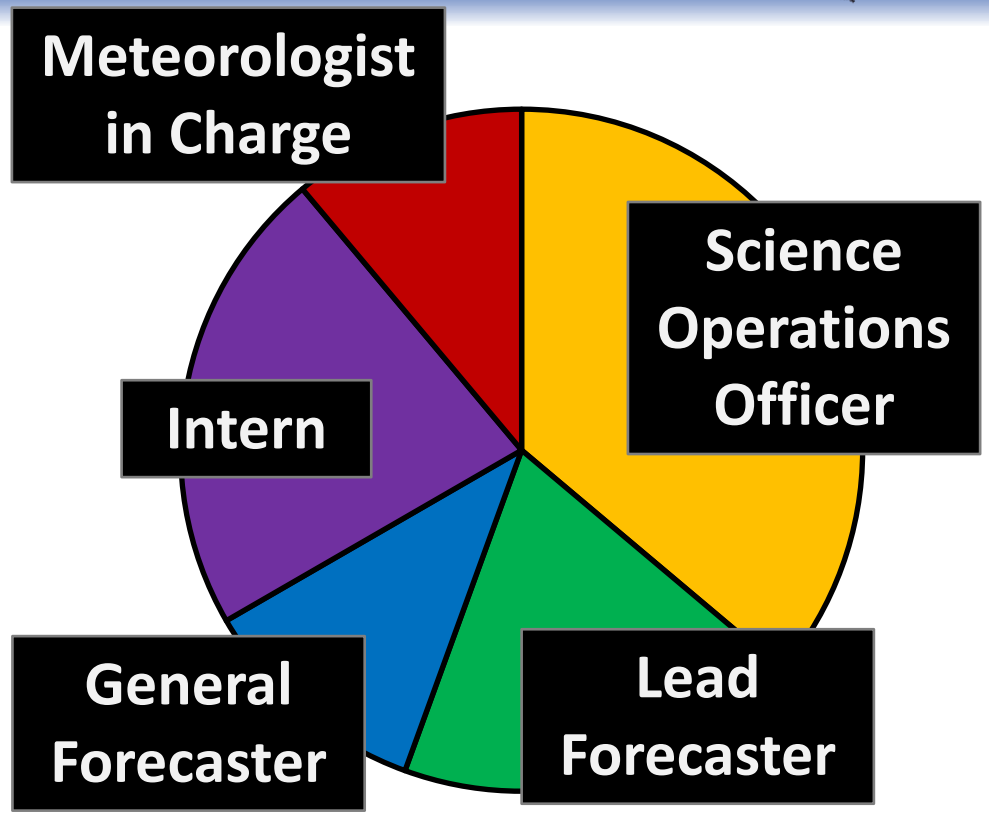
Participating Weather Forecast Offices (red) and Center Weather Service Units (orange) during the assessment of the GLM.



Initial Overview of Results

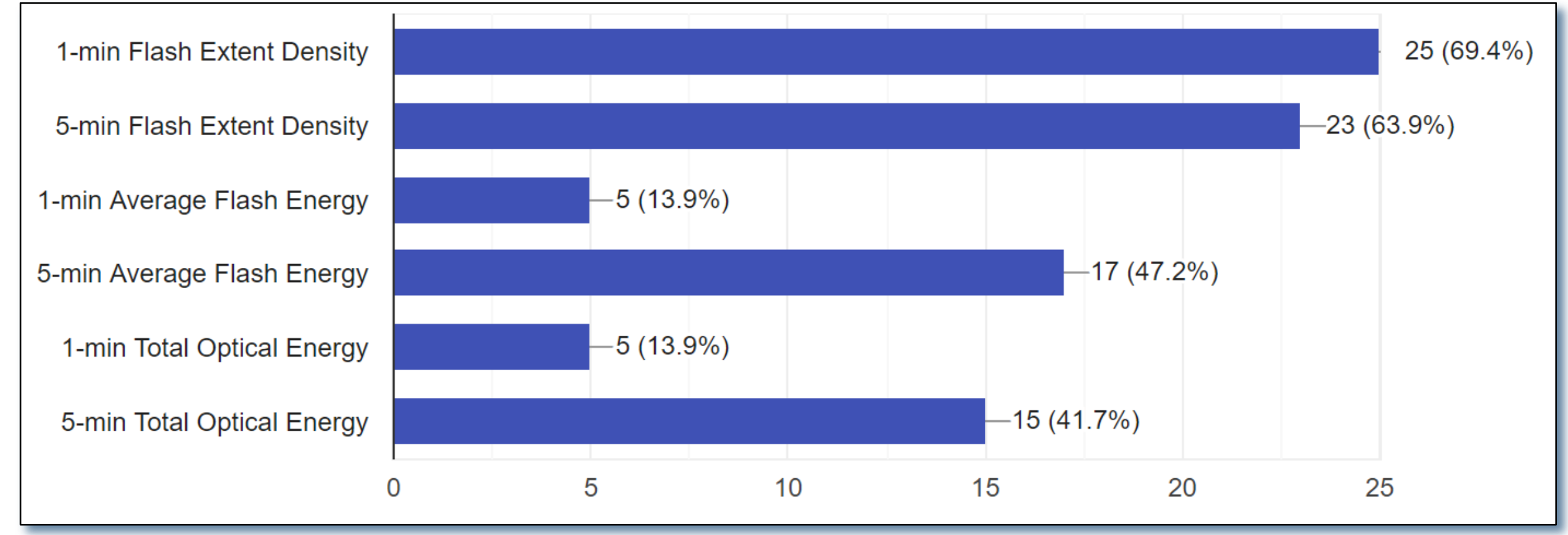


(Above) End user rating of GLM's usefulness from 1 (Not Useful) to 5 (Very Useful) from all feedback.



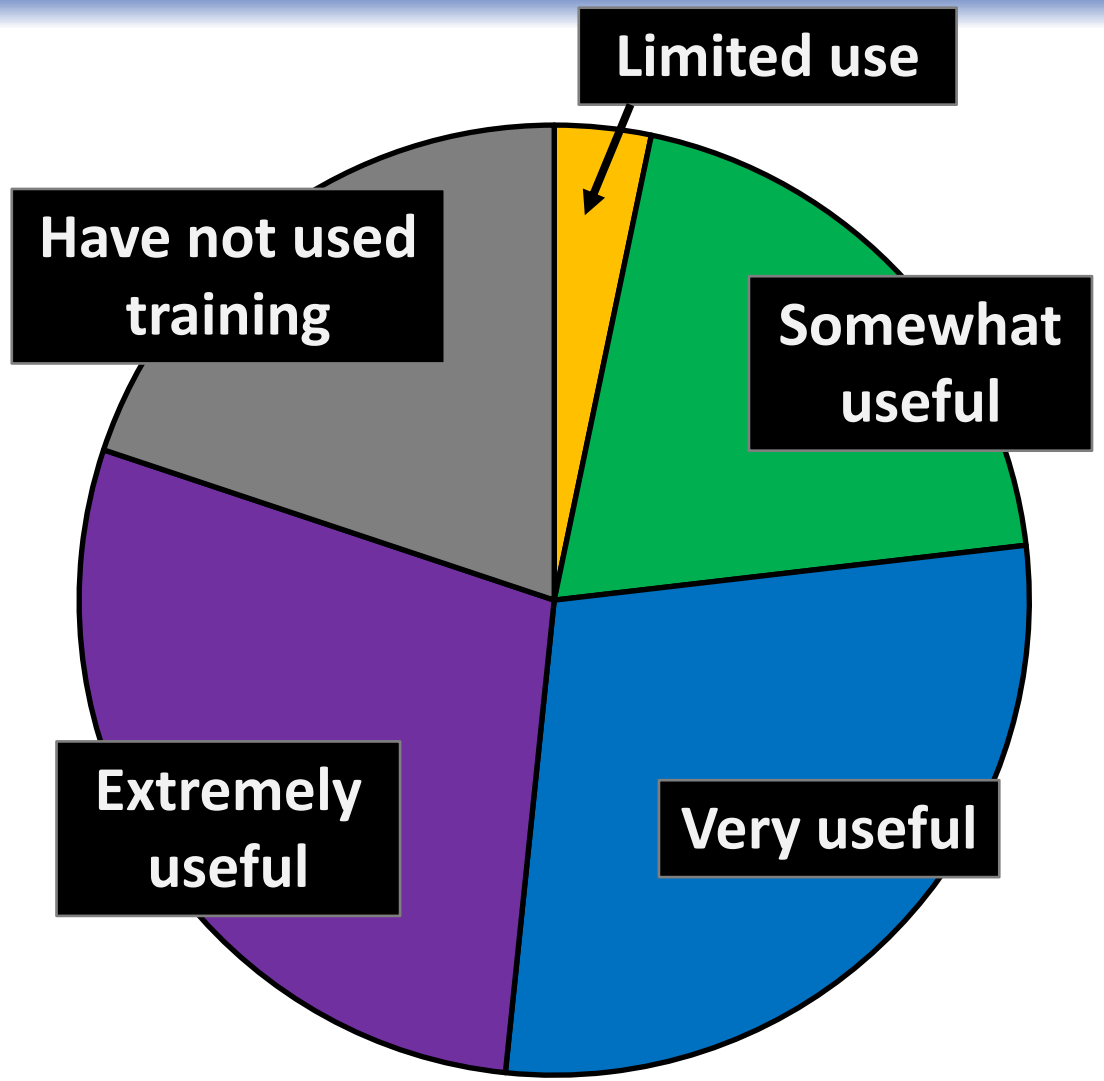
(Above) Position within the officer of the respondents.

Specific Product Usage



What products were used to monitor the development and evolution of convection? Note: subsequent written responses heavily favored the flash extent density products.

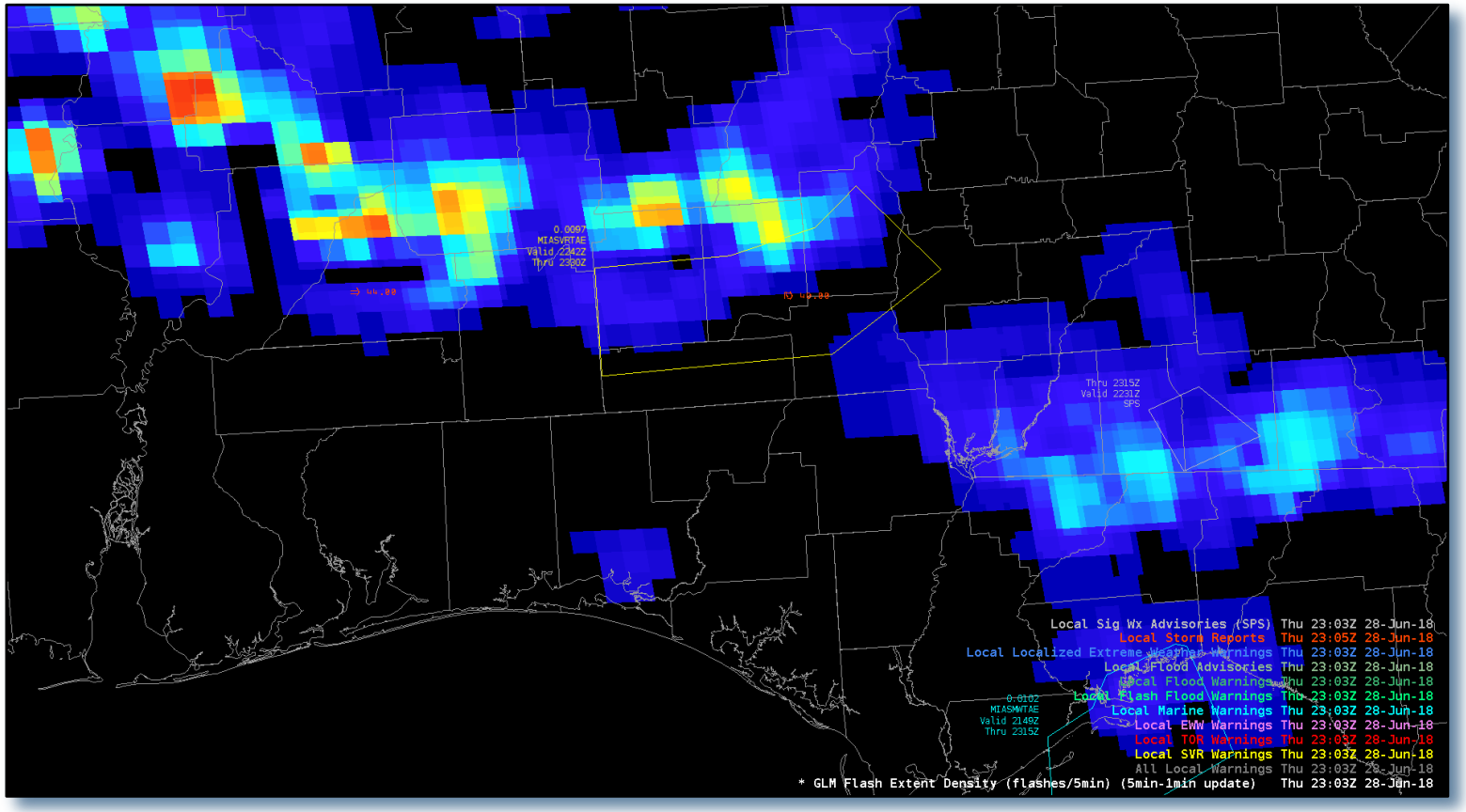
Training Effectiveness



How did participants view the training?

- Available training relatively well received
- ~20% had not yet used any training
- Positives:
  - Operational focus
  - Examples
- Concerns:
  - Need more information on total optical area
  - Too “in the weeds” in some places
- Consensus that additional training necessary
- Important to note that positive reviews had in-depth recommendations for the future

Operational Case: Decision Support

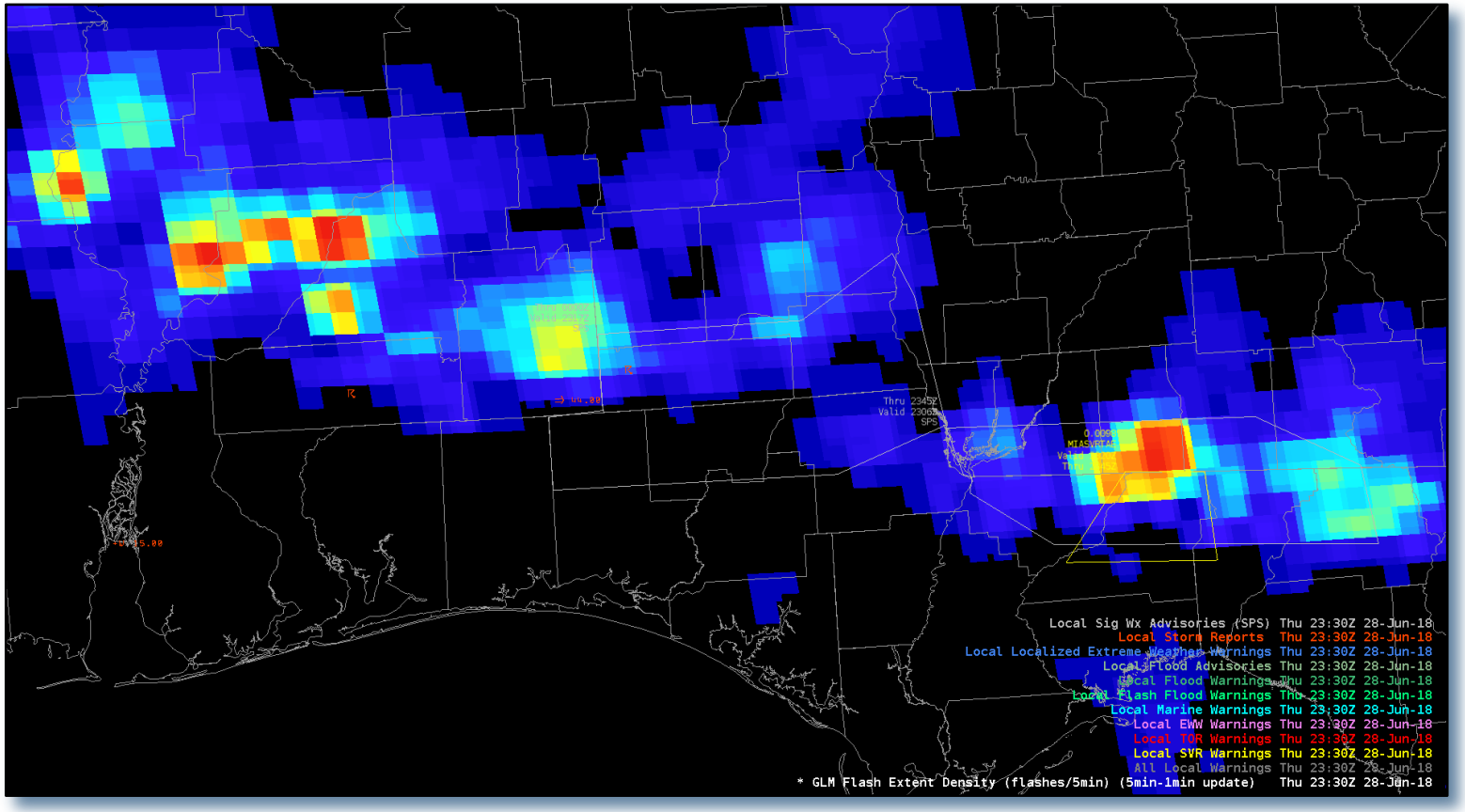


- WFO Tallahassee, Florida
- Previously severe storms approaching Gulf of Mexico
- GLM observed weakening through 2303 UTC
- Forecasters shifted to alerts / special weather statements versus warnings.

5 min Flash Extent Density

2303 UTC

Operational Case: Decision Support

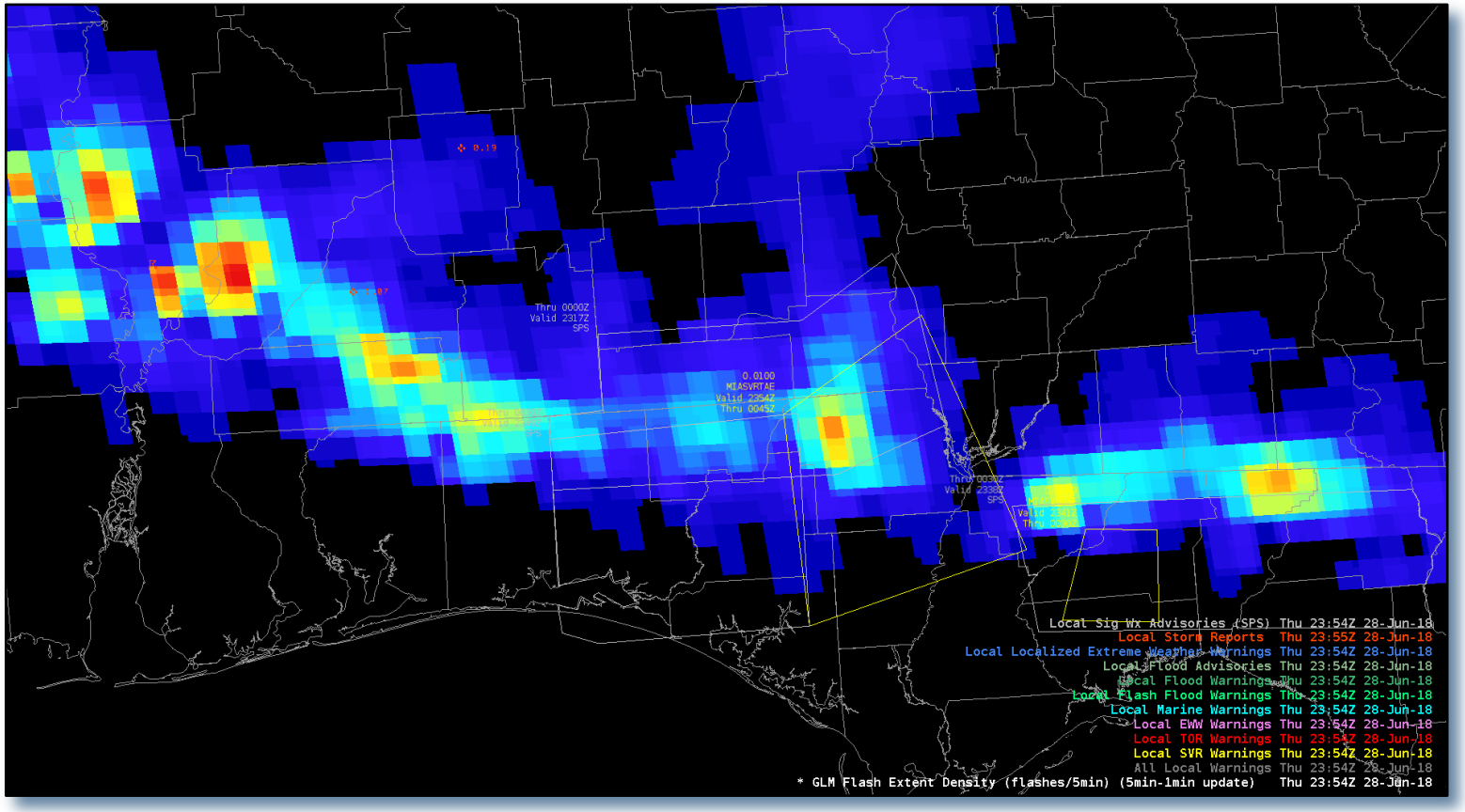


- Storms begin to re-intensify by 2330
- Forecasters resume severe weather warnings

5 min Flash Extent Density

2330 UTC

Operational Case: Decision Support

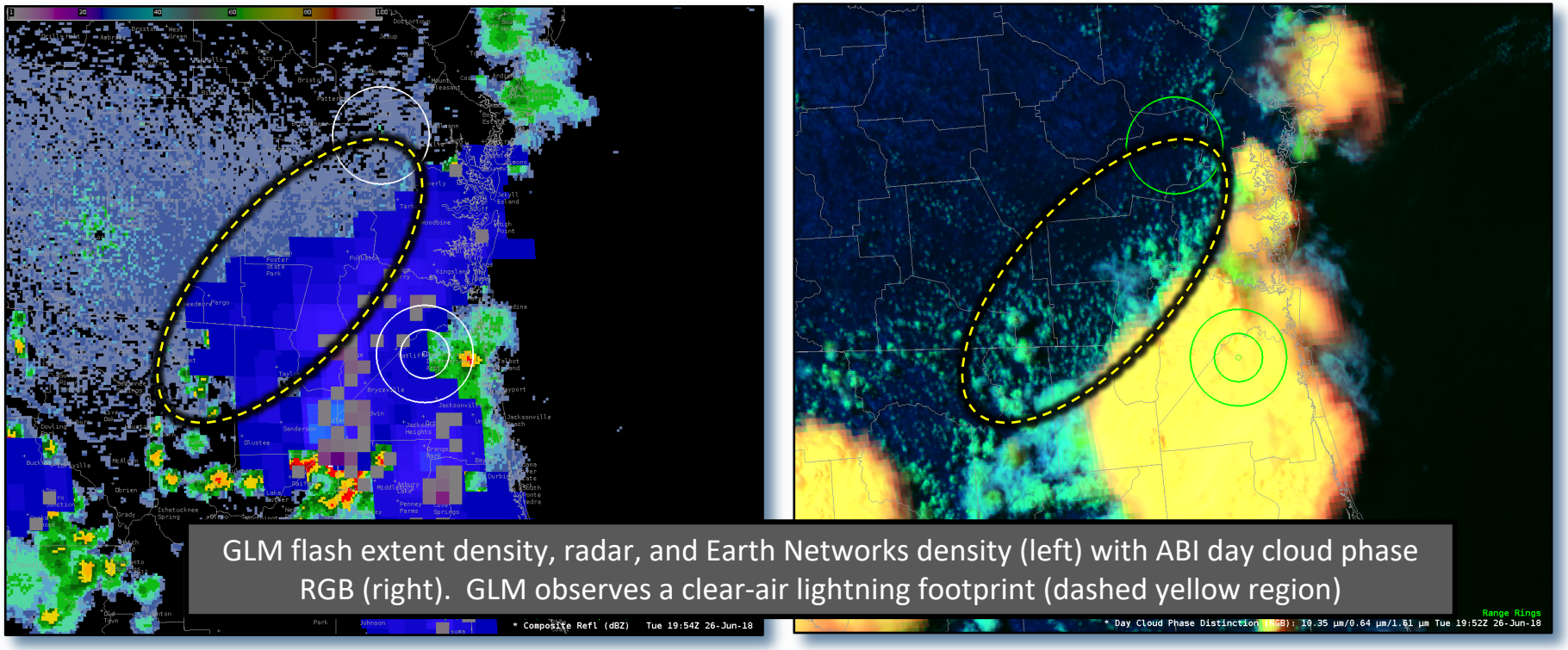


- Intensification continues through 2354
- Line also filling in
- Forecasters issue new warnings

5 min Flash Extent Density

2354 UTC

Operational Issue: “Clear Air” Flashes

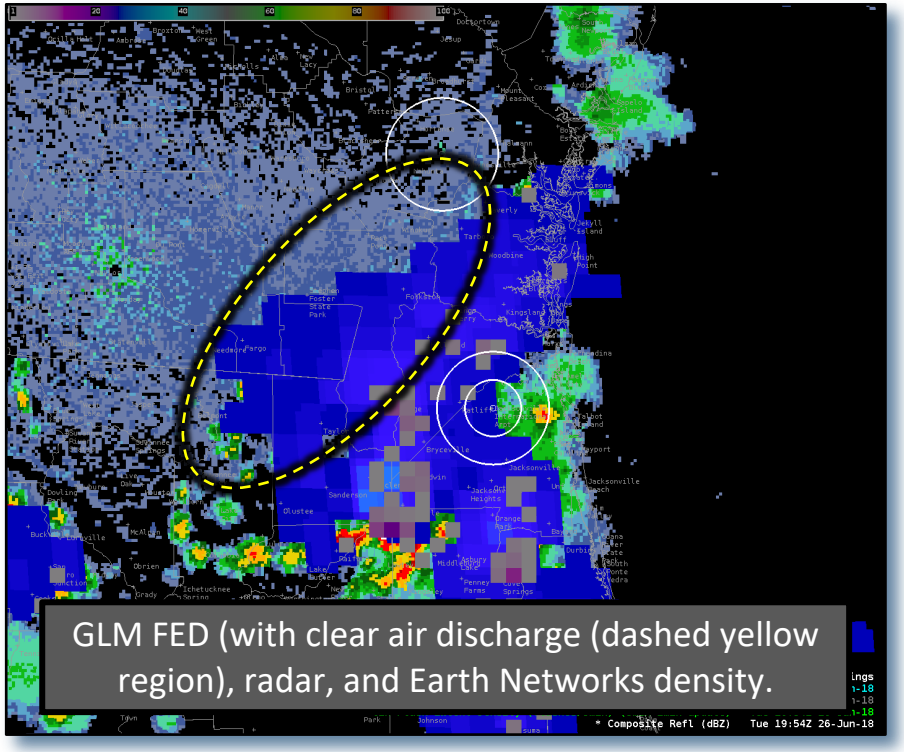


GLM flash extent density, radar, and Earth Networks density (left) with ABI day cloud phase RGB (right). GLM observes a clear-air lightning footprint (dashed yellow region)

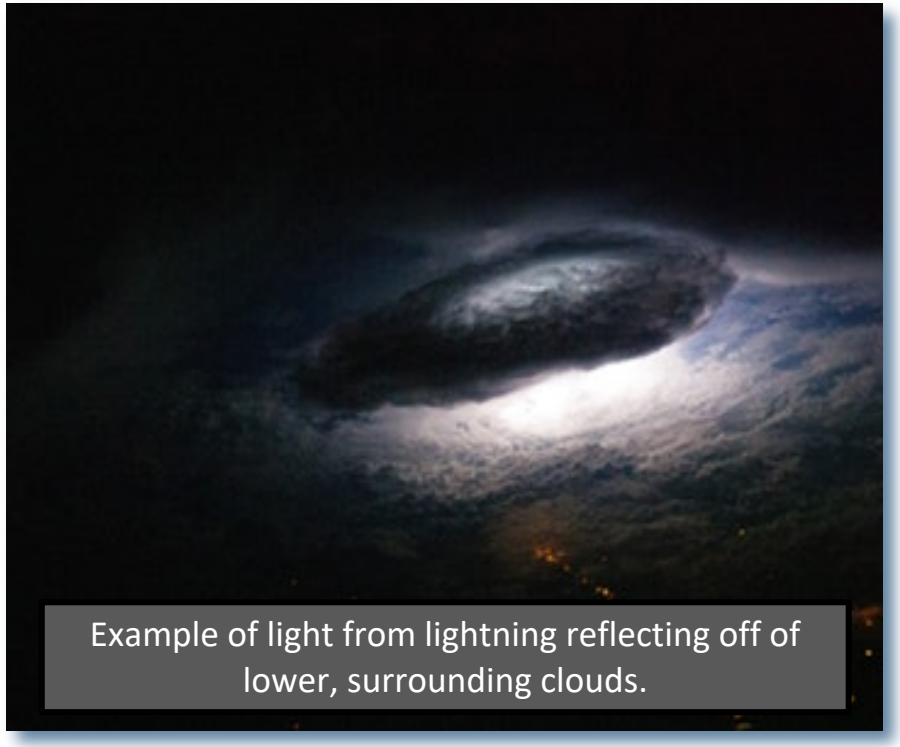
- Large spatial extent (or footprint) into a clear-air region to the north-west
- Why is GLM observing lightning beyond the edge of the cloud?

- Large spatial extent will be seen with flashes into the stratiform region and can be 100s of km long.
- However, clear-air cases (above) can occur. Likely due to GLM observing light from flash.
- Light emitted throughout cloud and can reflect off of lower clouds adjacent to main thunderstorm.

Operational Issue: “Clear Air” Flashes



GLM FED (with clear air discharge (dashed yellow region), radar, and Earth Networks density.



Example of light from lightning reflecting off of lower, surrounding clouds.

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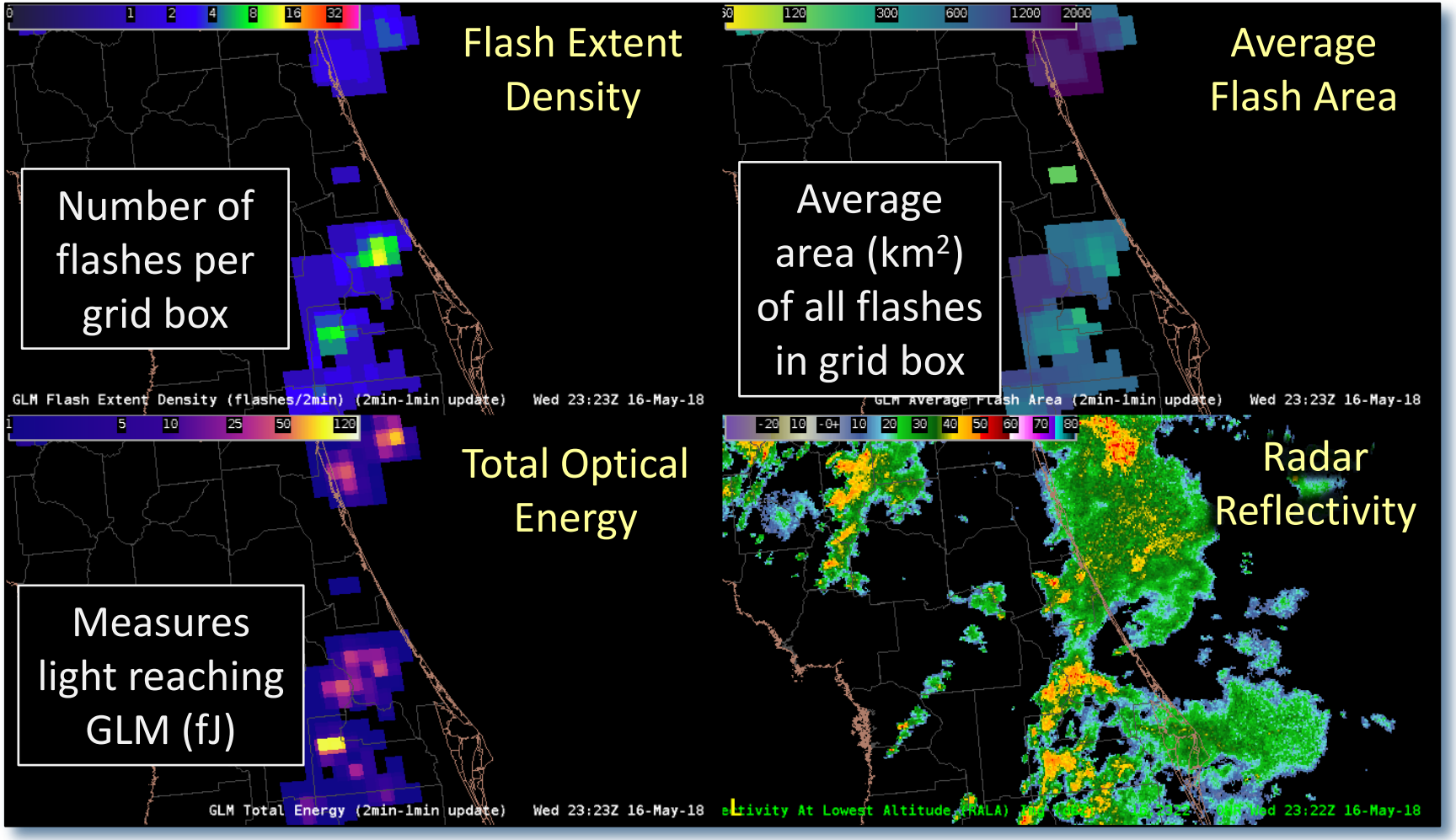
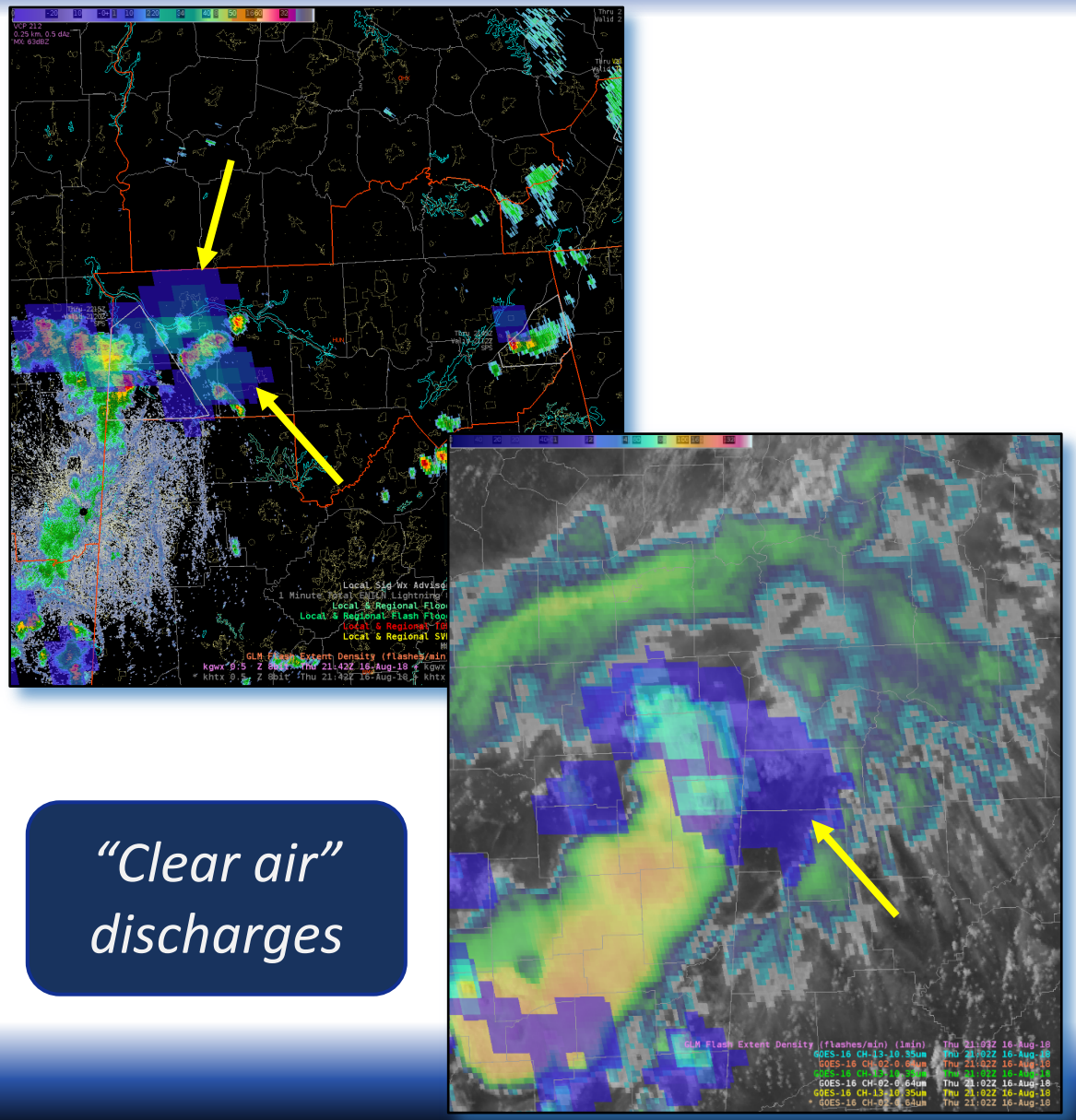
Future Work: Additional Training



- Focus on operational use and impact a major recommendation
- Continue to address the average flash area and total optical energy
- “Clear air” flashes
- Assessment also noted cases of significantly low GLM flashes in strong storms

Future Work: Additional Training



"Clear air" discharges

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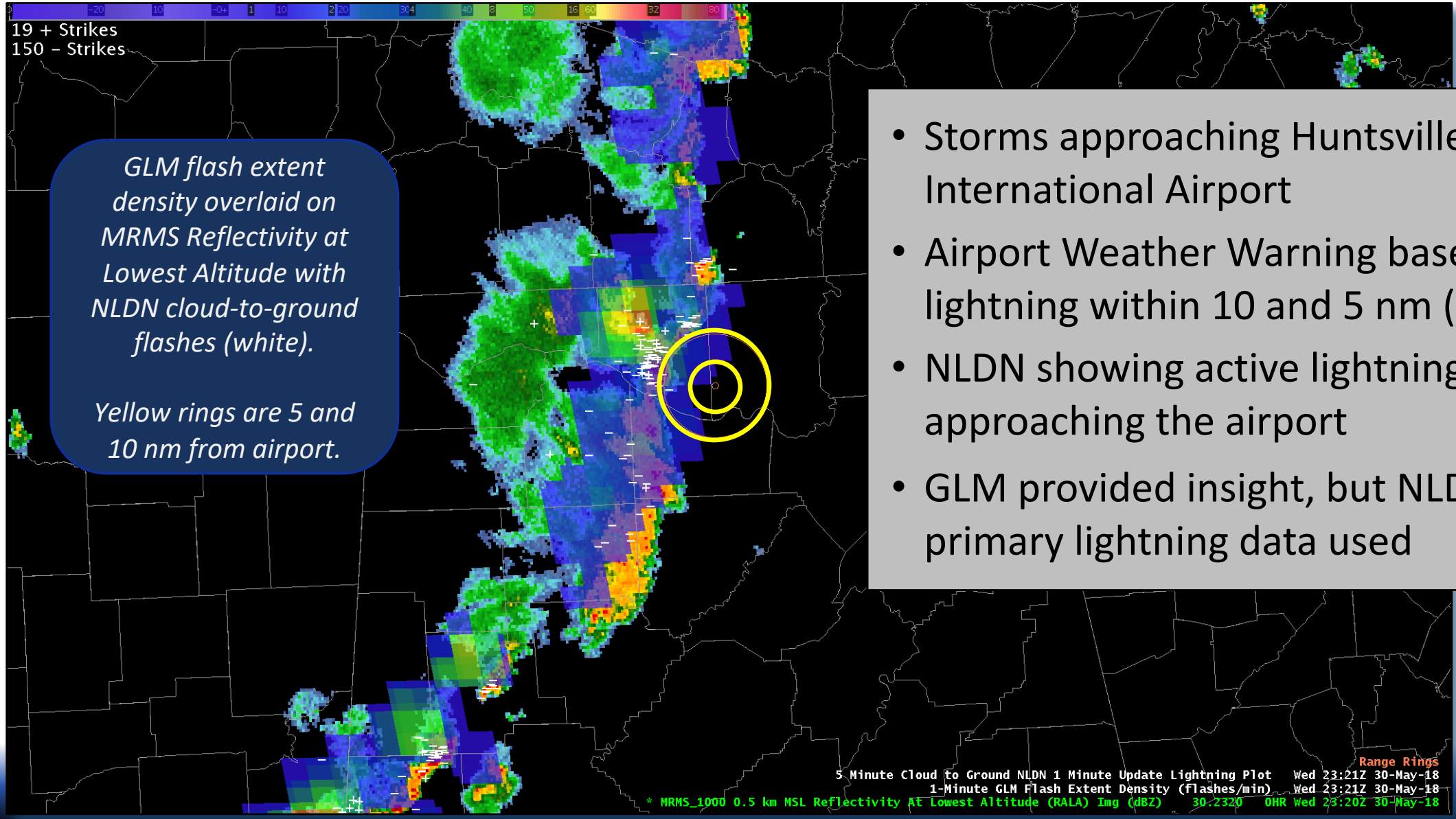
Future Work: Applications Library Example



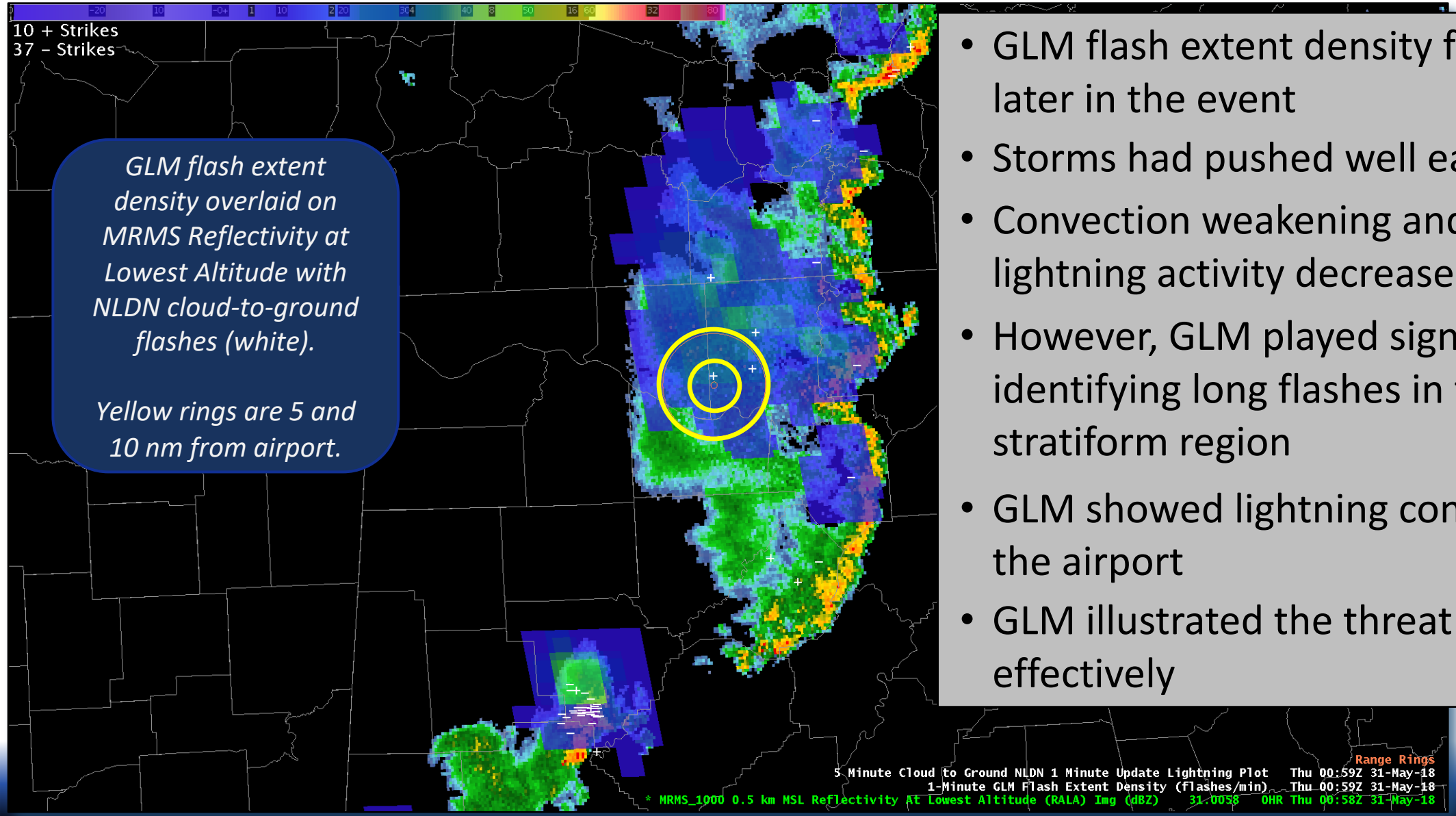
GLM flash extent density overlaid on MRMS Reflectivity at Lowest Altitude with NLDN cloud-to-ground flashes (white).

Yellow rings are 5 and 10 nm from airport.

- Storms approaching Huntsville International Airport
- Airport Weather Warning based on lightning within 10 and 5 nm (yellow rings)
- NLDN showing active lightning approaching the airport
- GLM provided insight, but NLDN was primary lightning data used

2321 UTC

Future Work: Applications Library Example



GLM flash extent density overlaid on MRMS Reflectivity at Lowest Altitude with NLDN cloud-to-ground flashes (white).

Yellow rings are 5 and 10 nm from airport.

- GLM flash extent density far more useful later in the event
- Storms had pushed well east of airport
- Convection weakening and overall lightning activity decreased
- However, GLM played significant role in identifying long flashes in trailing stratiform region
- GLM showed lightning continuing over the airport
- GLM illustrated the threat simply and effectively

0059 UTC

Links and Questions

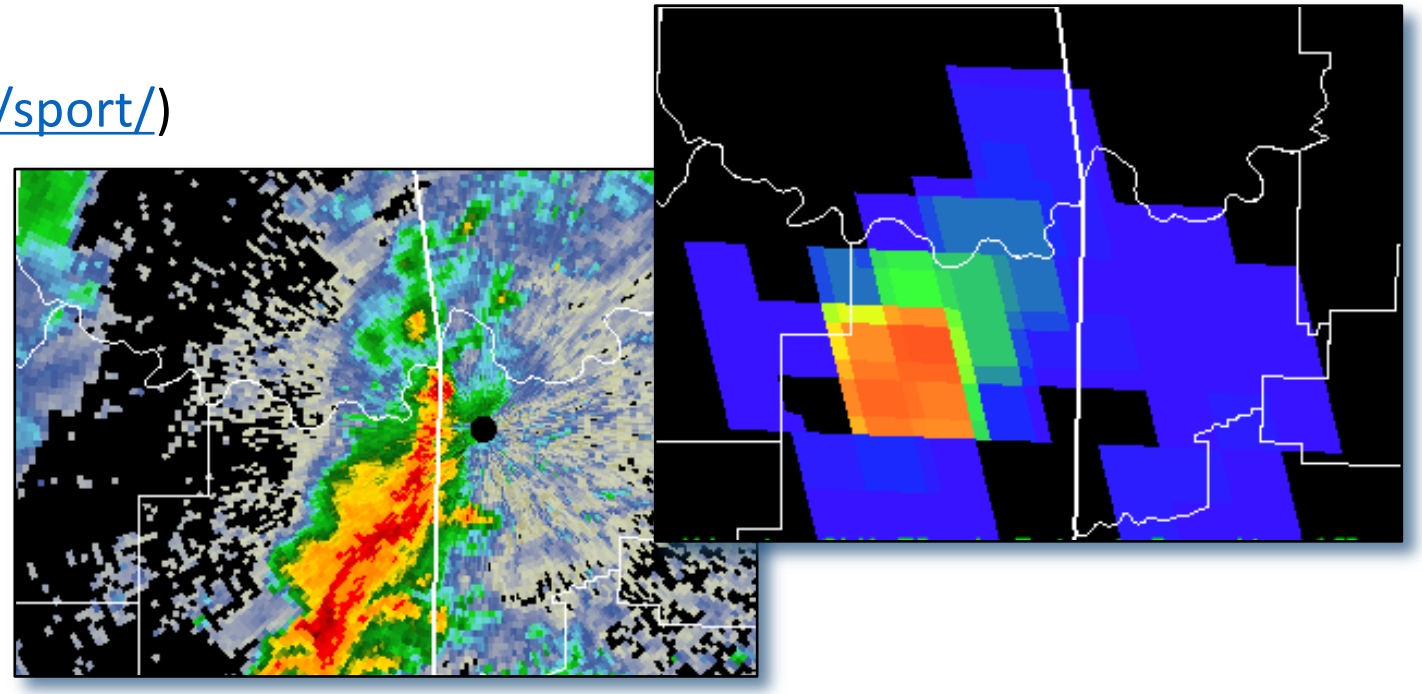
Links:

GLM VLab Page (https://vlab.ncep.noaa.gov/group/geostationary-lightning-mapper/home)

Short Course (https://www.meted.ucar.edu/satmet/goesr_faculty_recordings/glm_lightning)

UMD Website (http://lightning.umd.edu/)

NASA SPoRT (https://weather.msfc.nasa.gov/sport/)



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