



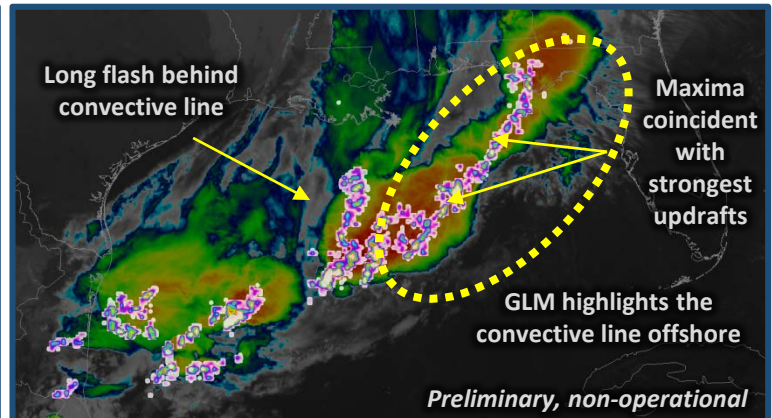
Geostationary Lightning Mapper

Information Sheet



Why the GOES-R GLM?

- Continuous, full disk total lightning measurements
- Detects >70% of all flashes (averaged over 24 h)
- Coverage to 54° N/S with 20 sec product latency
- Detect electrically active storms (IC precedes CG)
- Determine the areal extent of the lightning threat
- Track convective cells embedded in larger features
- Identify strengthening and weakening storms
- Monitor convective mode and storm evolution
- Supplement radar data where coverage is poor



GLM 1-min, 8 km Group Density overlaid on the ABI 11.2 μm infrared in AWIPS (highlights convective monitoring offshore)

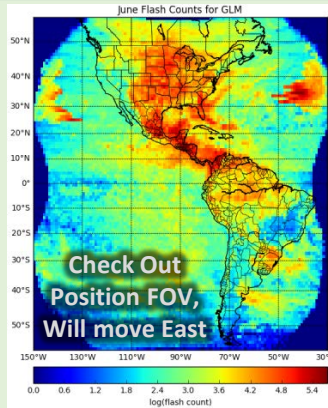
Primary Applications

Lightning Jump: Rapid increase in total lightning that signifies an increased threat for severe weather – supports warning decisions

Lightning Safety: IC lightning typically precedes the first CG, the GLM provides insights

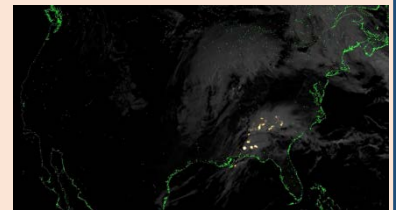
beyond point observations, revealing the spatial extent and distance lightning flashes travel

Situational Awareness: Rapidly updating GLM data reveal convective storm development and evolution throughout the GOES-16 field of view (see above)



Limitations

- Diurnal performance variations → easier to detect lightning at night
- New instrument undergoing an extended calibration and validation effort → performance may vary as the instrument and algorithms are optimized
- In certain environments (e.g., high shear, low CAPE, shallow convection) the effectiveness of lightning jumps are reduced or eliminated

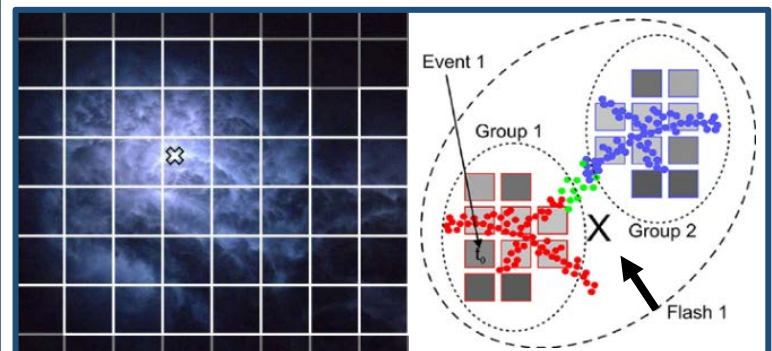


Three Basic GLM Products (Events, Groups, Flashes)



GLM Event, Group, and Flash Locations

- Radiance recorded for each illuminated pixel (Event)
- Group/Flash locations represent radiance-weighted centroids that consider all constituent Events/Groups
- Near Right: Lightning photograph with idealized GLM pixels (Events) that combine to form this one Group located at the brightest part of the scene (X)
- Far Right: Flash location (black X) represents radiance contributions from all Groups and may not always fall along the relatively narrow lightning channel





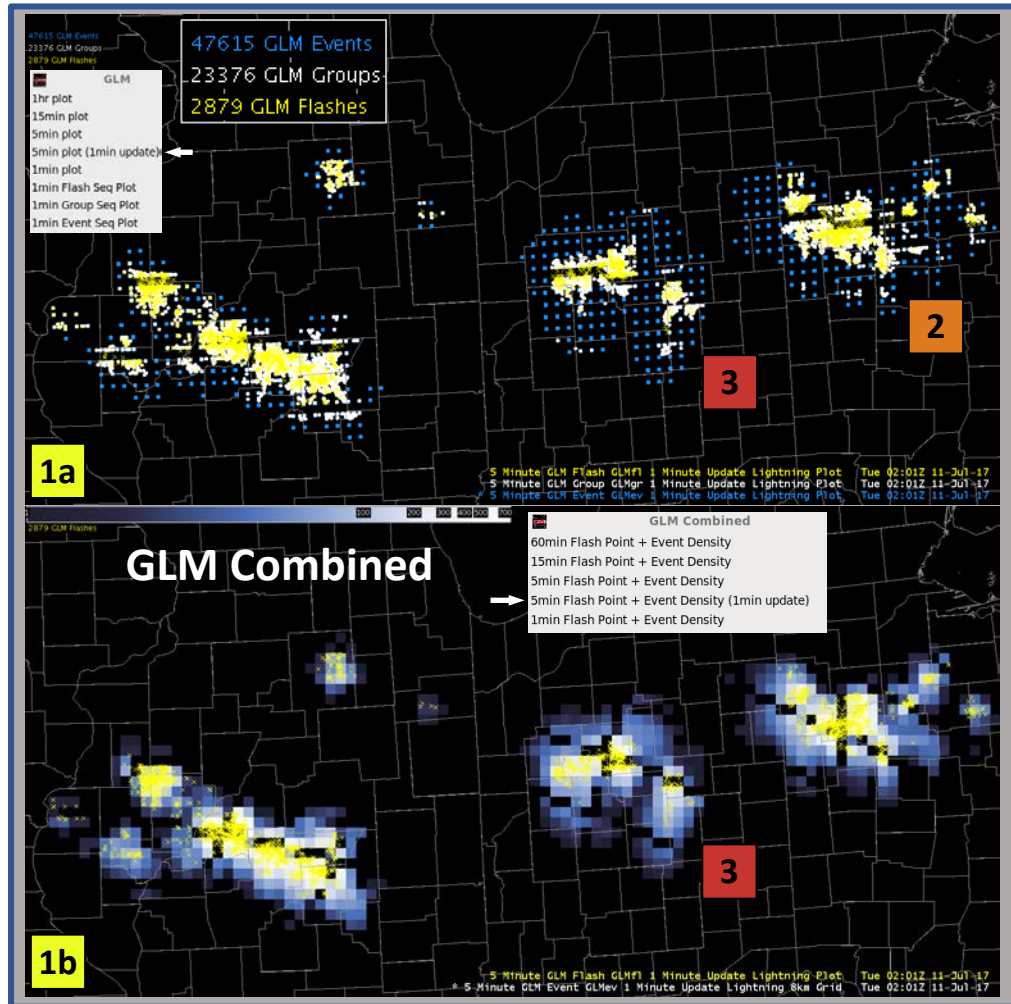
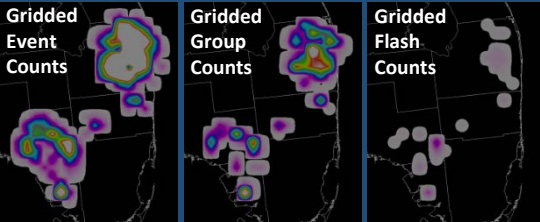
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Interpretation

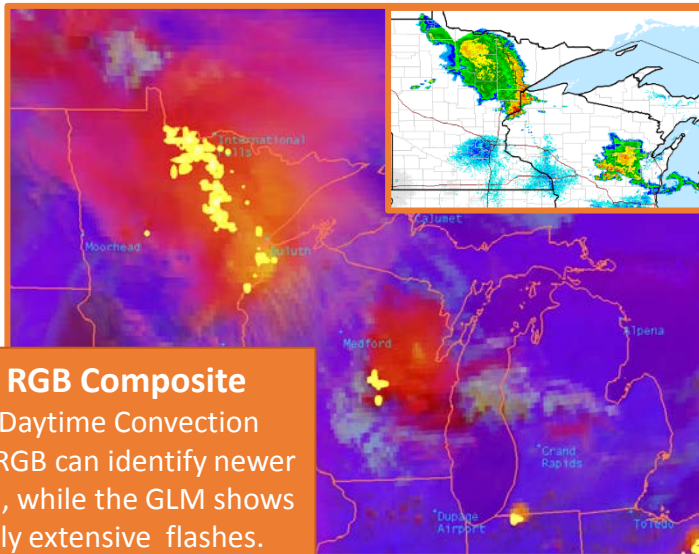
- 1** GLM Events, Groups, and Flashes are viewable in AWIPS as (a) plotted symbols or (b) gridded counts over various time and space scales
- 2** GLM reports Events on a fixed ~8x8 km grid, but Groups and Flashes are not evenly spaced
- 3** GLM Event points/grids show the full extent of the lightning, Groups cover a smaller area of the storm, and Flashes are most heavily concentrated in the deepest convection
- 4** Counts per grid cell vary considerably for Events, Groups, and Flashes (and for different time and space scales)



GLM differs from the ground-based networks – the GLM has no IC/CG discernment, polarity, or peak current, rather GLM provides information on extent, radiance, duration, and area of Groups and Flashes

GLM Event: occurrence of a single pixel exceeding the detection threshold during a single ~2 ms frame
GLM Group: one or more simultaneous GLM Events observed in adjacent (neighboring/diagonal) pixels

GLM Flash rates are most closely tied to updraft and storm evolution, Event locations best depict the spatial extent, and Groups are most similar to ground-based network strokes/pulses



GLM Flash: 1+ sequential GLM Groups separated by less than 330 ms and 16.5 km

Comparison with an ABI RGB Composite

GLM Groups overlaid on the Daytime Convection RGB (reflectivity inset). The RGB can identify newer and more mature convection, while the GLM shows main updrafts and horizontally extensive flashes.

Additional Resources

- GOES-R Program
- [GOES-R Lightning Training](#)
- [GOES-R Foundational Course](#)
- [GOES-R Foundational Course](#)
- NASA SPoRT
- [NASA SPoRT Home Page](#)
- NESDIS/STAR – CICS-MD
- [Lightning Resources at CICS-MD](#)
- Hyperlinks not available when viewing material in AIR Tool**