



Geostationary Lightning Mapper

Quick Guide

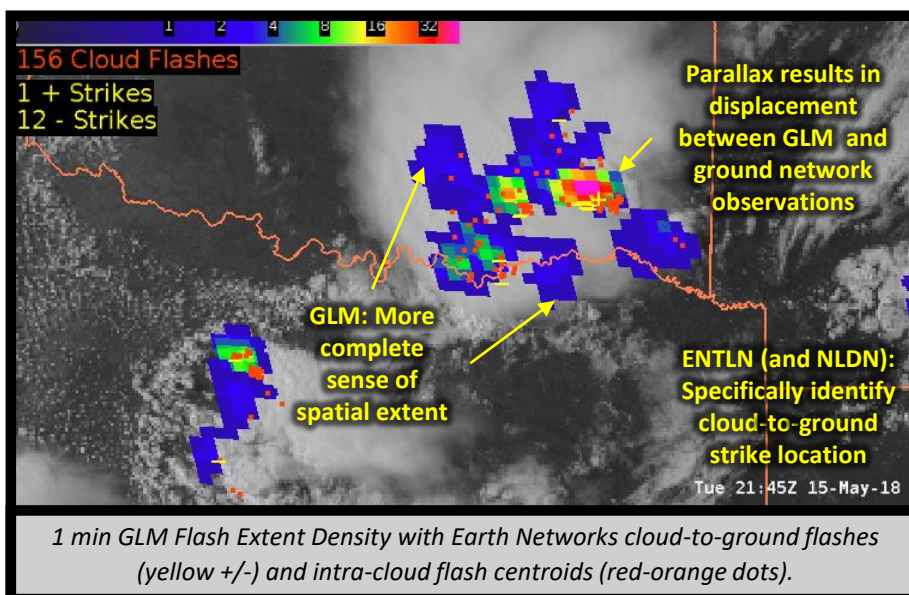


Geostationary Lightning Mapper (GLM) and Ground-Based Networks

Forecasters now have access to GLM observations alongside those from the ground-based Earth Networks and National Lightning Detection Network.

Each system has inherent strengths and weaknesses related to how they detect lightning. One system may be more appropriate depending on the operational application.

Used in conjunction, these datasets provide extremely detailed insights into convective processes.

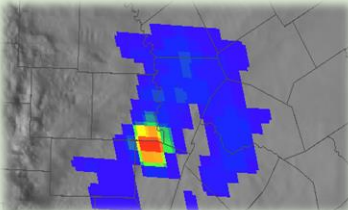


Basic Intercomparison of the GLM with the Ground-based Networks

	Domain	Resolution	Frequency	Detects (Efficiency)
GLM	54° N/S	8-14 km mapped to 2 km ABI grid	20 s (1 min AWIPS)	Flash extent density, average area, total optical energy (~70% day, 90+% night)
NLDN	CONUS + 200 km offshore	~200 m	1 min	Point location of cloud-to-ground (>95%) and polarity
ENTLN	Near global, best over CONUS	~500 m	1 min	Point of cloud-to-ground strike (90%), intra-cloud centroid (>50%), and polarity / peak current

GLM Strengths

Spatial Extent: Observes more than a point location. Identifies the full areal coverage of detected flashes in the field of view.



Detections: Detection efficiency similar across field of view but does decrease at the edge.

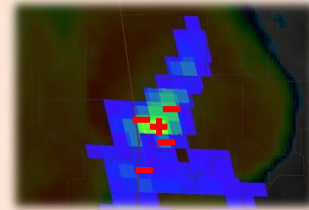
Data sparse regions: Due to detection efficiency and not being reliant on a network of ground sensors, the GLM can provide high quality observations in locations difficult to observe (e.g., over oceans).

New capabilities: Total energy can be used to investigate storm energetics and severity.

Ground Network Strengths

Distinguish Flash Type:

Can identify the difference between intra-cloud and cloud-to-ground lightning. (Note: NLDN in AWIPS only provides cloud-to-ground.)

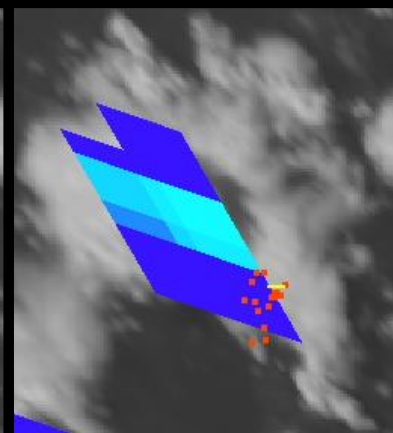
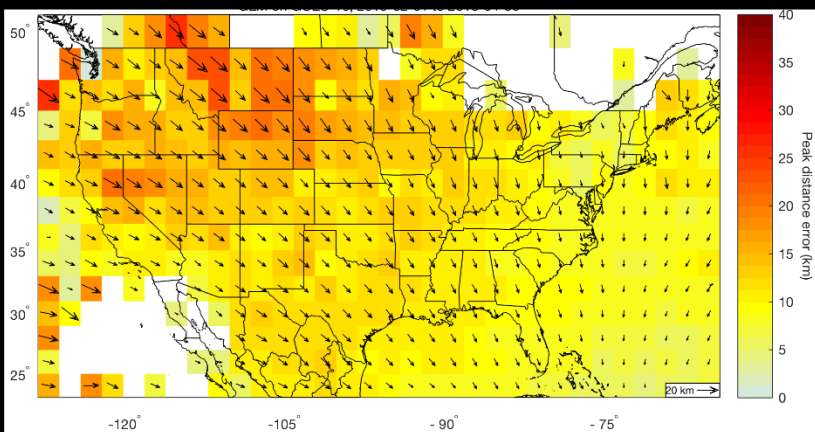


Location accuracy: Ground networks provide very accurate locations of where cloud-to-ground flashes strike the ground.

Polarity: Ground networks identify polarity and estimated peak current of cloud-to-ground flashes.

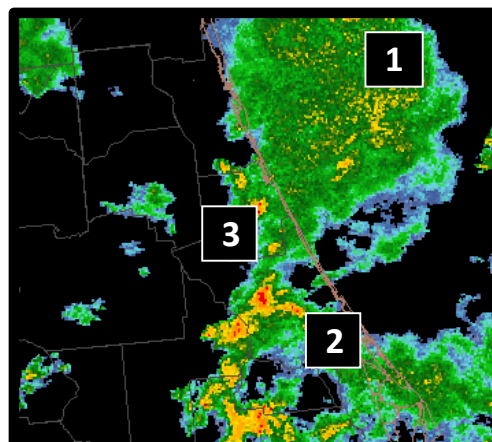
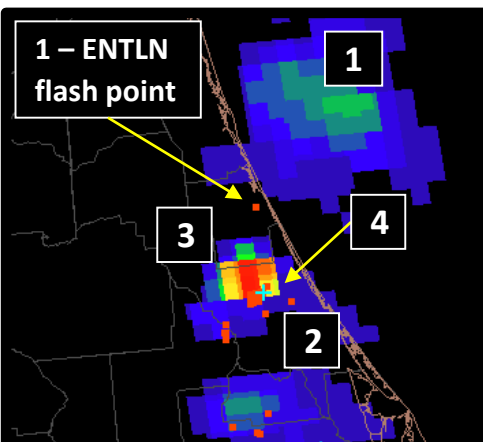
Familiarity: The ground networks have been available for many years and are well integrated into operational applications.

Parallax Interpretation



Unlike the ground networks, the GLM must deal with parallax. In AWIPS, the GLM is intentionally designed to match the ABI's parallax and both observations will always coincide. On the left (courtesy Katrina Virts) is an image showing direction vector and peak distance error that GLM needs to be moved to be in the correct position. The middle (ABI visible) and right (ABI, GLM, and Earth Networks) images show a storm in south-central Oregon. These show the parallax of ABI/GLM and how the ground networks identify the "real" storm location.

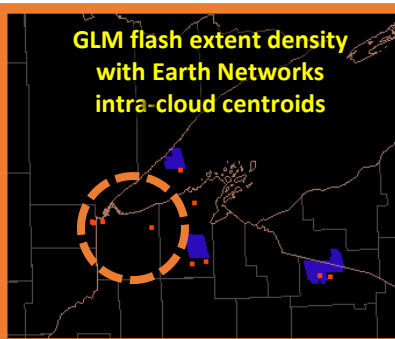
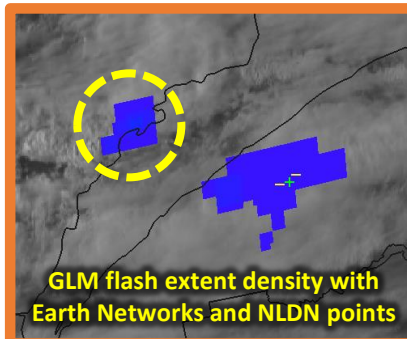
- 1** Large flash (GLM observes areal coverage in stratiform. ENTNL observes intra-cloud flash as point.)
- 2** Parallax (GLM displaced relative to the ground networks.)
- 3** Intensity (Total lightning proxy of strength of updraft in mixed phase region. GLM flash extent better IDs storm core than ground network point locations.)
- 4** Type (Ground networks show only one flash is cloud-to-ground.)



GLM flash extent density and Earth Networks cloud-to-ground points and intra-cloud centroids (left) with radar reflectivity (right) over central Florida.

GLM Fast Facts

- FoV: 54° N/S
- Detects >70% in FoV over 24 hrs
- Latency ~1 min
- 1 min and 5 min summations



Differences: GLM has the potential to observe intra-cloud flashes that the ground networks may miss (left circle). Also, due to detection methods or thick clouds attenuating the light to the GLM, the ground networks may observe flashes that the GLM will not observe (right circle).

Resources

Virtual Lab

[Virtual Lab for the GLM](#)

GOES-R Virtual Faculty Training

[GLM Virtual Faculty Course](#)

NASA SPoRT

[NASA SPoRT Home Page](#)

NESDIS/STAR – CICS/MD

[Lightning Resources at CICS-MD](#)

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