



# Geostationary Lightning Mapper: Minimum Flash Area Quick Guide



## MFA Background

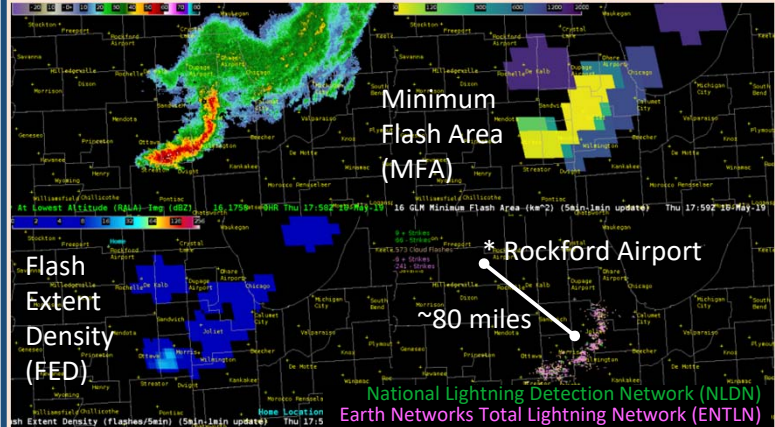
- Minimum Flash Area (MFA) reports the minimum size of any GLM flash spatially coincident with each 2x2 km grid cell during a specified time period
- MFA values range from a minimum of 1 GLM pixel (~64 km<sup>2</sup>) to thousands of km<sup>2</sup>
- MFA portrays several features of interest:
  - Strengthening storm cores often produce smaller, more frequent flashes; using MFA alongside Flash Extent Density (FED) helps identify this
  - MFA indicates the spatial extent of large flashes and helps differentiate anvil/stratiform flashes from embedded, newly-developing convection
  - MFA helps monitor the development, growth, and displacement of the stratiform region (i.e., lead, side, trailing), providing insights into system evolution and the primary convective mode/hazard

## Primary MFA Applications

- Detect/Monitor Thunderstorm Growth – MFA color map accentuates small flashes to highlight the earliest lightning, then MFA provides a visual cue to help quantify subsequent storm growth
- Monitor Convective Mode and Storm Evolution – MFA trends are indicative of storm life cycles [e.g., frequent small flashes within the most intense convection (< 300 km<sup>2</sup>) and a tendency for larger flashes as storms weaken (> 600 km<sup>2</sup>)]
- Monitor the Lightning Areal Extent – Extensive anvil and stratiform flashes result in large MFA values; regions with large MFA are important due to their less obvious risk of cloud-to-ground (CG) lightning, an important consideration during IDSS operations

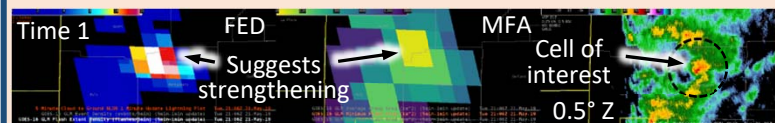
## Hazardous Weather Testbed Cases

- “From an IDSS standpoint, MFA and FED proved it’s necessary to look at both GLM products and ground based lightning products to see the “total” picture.”

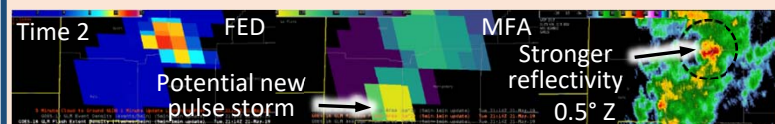


- “GLM products captured a larger flash that extended out into the stratiform area behind the main line that is not seen in the ENTLN and NLDN products. This information can be especially important for Airport Weather Warnings and/or outdoor venues. You can easily see that the flash extends almost back to the Rockford Airport, while the main line and most of the flashes are ~80 miles.”

- “Storms are trending sub-severe across most of our CWA at this hour, but one cell behind the initial line started getting its act together.”



- “The large FED and MFA bullseye imply the updraft is intensifying on this storm. This proved to be a useful proxy because this was the result 8 min later:”



- “This suite of products has a lot of utility for pulse severe events and IDSS on-site weather events.”





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## Yellow/Green MFA Reveals:

- (A)** Smaller flashes occurring in newly developing (isolated or embedded) or strengthening convection (can suggest growing severe weather potential)

## Blue/Purple MFA Reveals:

- (B)** Larger flashes occurring in the anvil / stratiform regions of mature storms and in the cores of decaying storms
  - Extensive stratiform flashes often break the 30/30 lightning safety rule, and are important for public safety via aviation and IDSS applications
- (C)** Flashes connecting distant storm cores, also indicative of CG lightning threat (see below)

