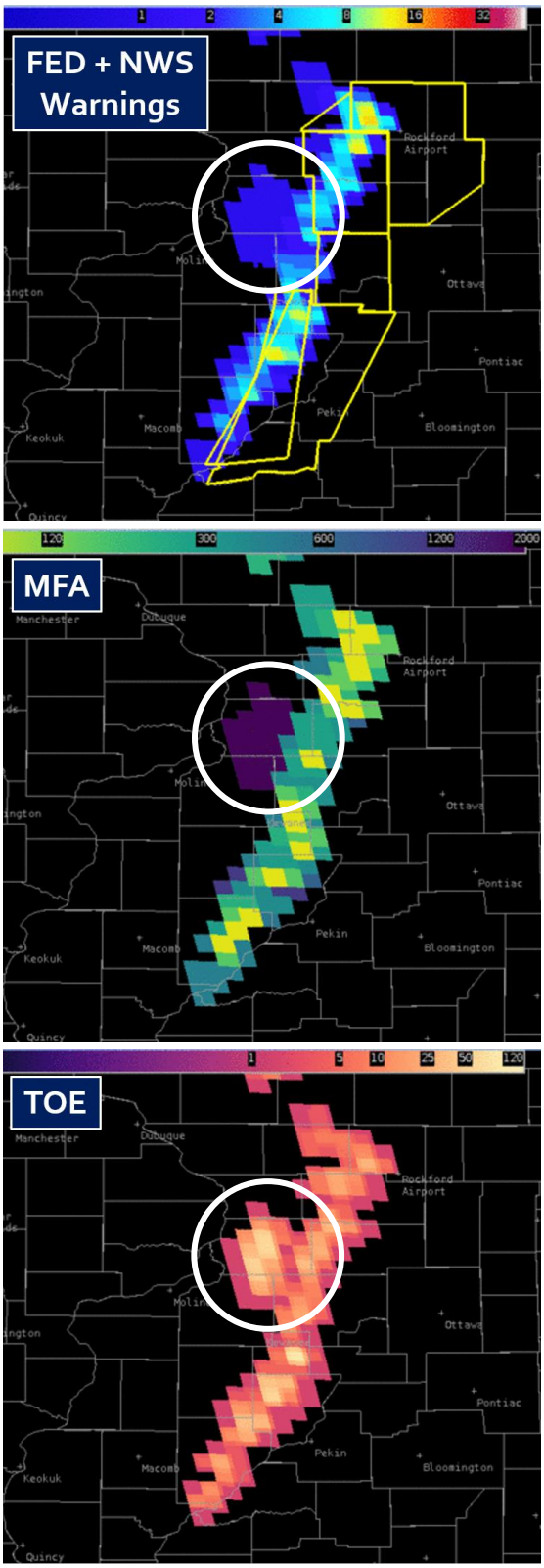
Geostationary Lightning Mapper: Large Stratiform Flashes

Quick Guide

***Fig. 1**. GLM gridded products for squall line with large stratiform flash circled*



GLM Gridded Products

- **GLM gridded products help differentiate large anvil/stratiform flashes from nearby mature convection (Fig. 1), indicated by**
  - **Small Flash Extent Density (FED) (not always, see page 2)**
  - **Large Minimum Flash Area (MFA)**
  - **Bright Total Optical Energy (TOE)**
- **Large TOE values result from both thinner clouds (fewer hydrometeors and lightning nearer cloud top) and energetic (optically bright) cloud-to-ground (CG) flashes often located in the stratiform region**

Considerations for Large Stratiform Flashes

- **Stratiform lightning threatens public safety because it**
  1) **Commonly produces multiple, strong cloud-to-ground strikes**
  2) **Occurs behind the main convection, where lighter precipitation may lead to a false sense of security regarding the lightning threat**
  3) **Can break the well known "30-30" rule (i.e., wait 30 minutes after thunder to go back outside) which has been widely advertised to the public as lightning safety guidance**
- **Anvil flashes (Fig. 2) also present a public safety hazard ahead of the main convection before people have stopped outdoor activities**

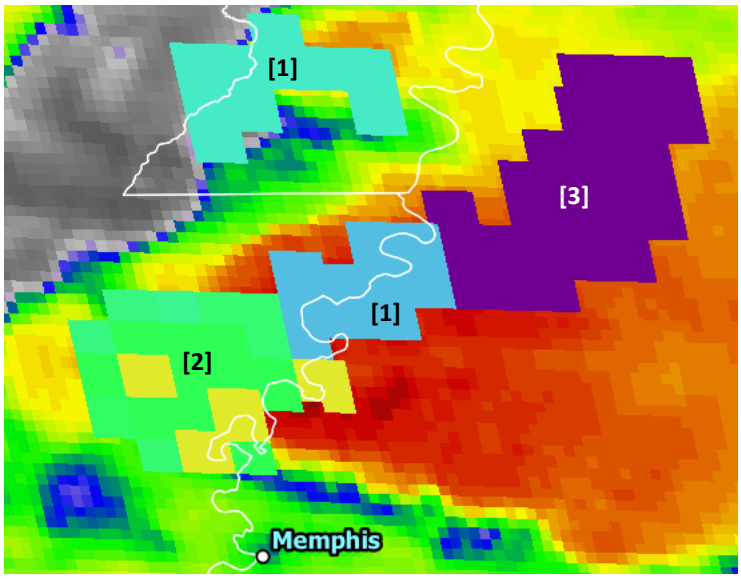


***Fig. 2**. Depiction of small [1], medium [2], and large [3] GLM flashes illustrating a large anvil flash which likely struck ground multiple places well ahead of a supercell thunderstorm*

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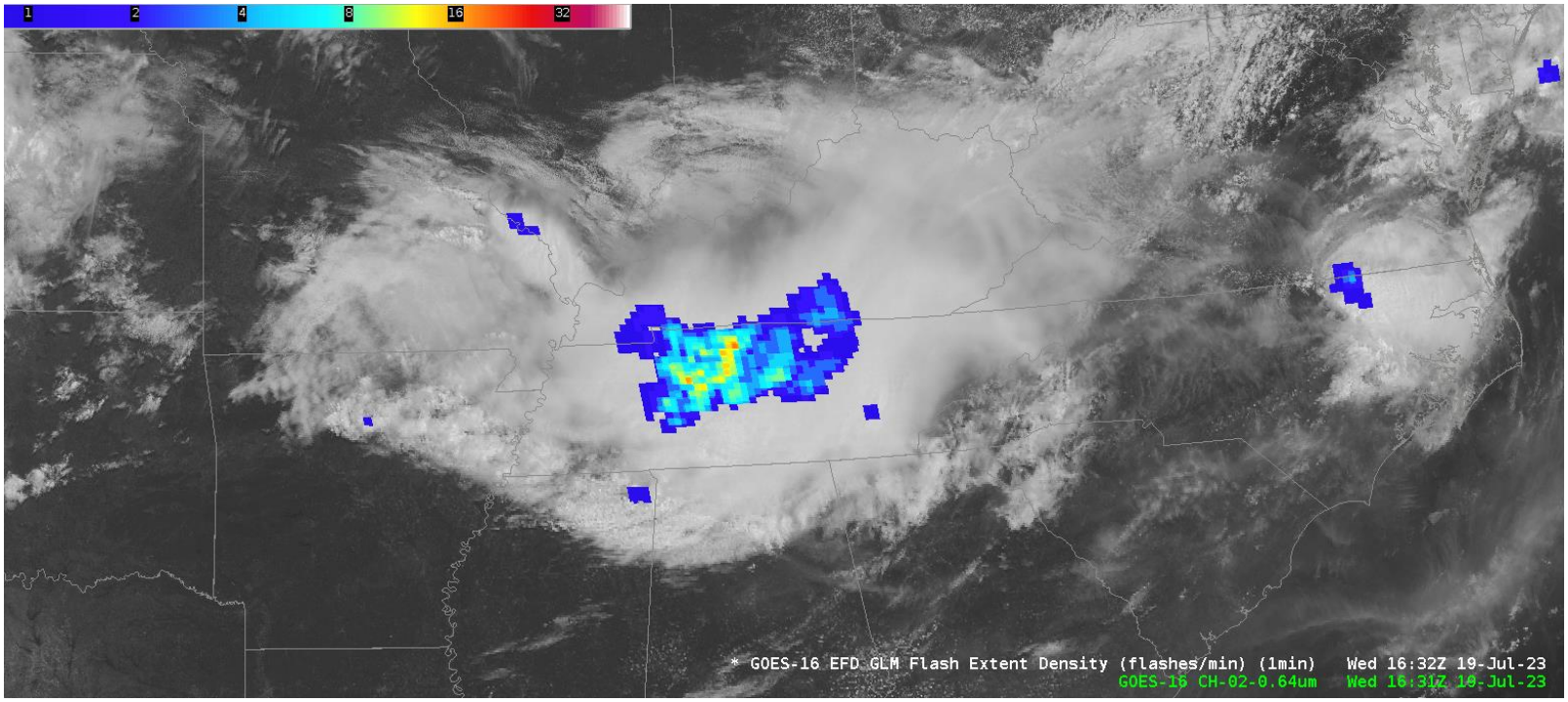

***Fig. 3**. Flash Extent Density and IR visible imagery (top) from a mesoscale convective system showing a large stratiform flash*

Flash Extent Density Overestimates

- **Since GLM is operational, the ground system limits the maximum number of events in a group (100), groups in a flash (100), and flash duration (3 sec) to prevent latency**
- **Flashes exceeding these thresholds are artificially split in the L2 data, translating to anomalous Flash Extent Density (Fig. 3) and Minimum Flash Area (not pictured) indicating more numerous, smaller flashes**
- **Split flash segments typically are spread out spatially, reducing the impact on FED, but long-lasting stationary pulses can have multiple, overlapping split flashes, artificially enhancing the FED**

From Leading to Trailing Stratiform Flashes

- **Large stratiform flashes leading the main updraft core (Fig. 4) are indicative of hazards within discrete convection (tornado, hail)**
- **Trailing stratiform flashes indicate a transition to more linear or multicellular convection (Fig. 5) and increased wind/flooding threats**
- **The transition from leading to trailing stratiform flashes can provide a visual cue that the convective hazards might be changing as the storm mode evolves**

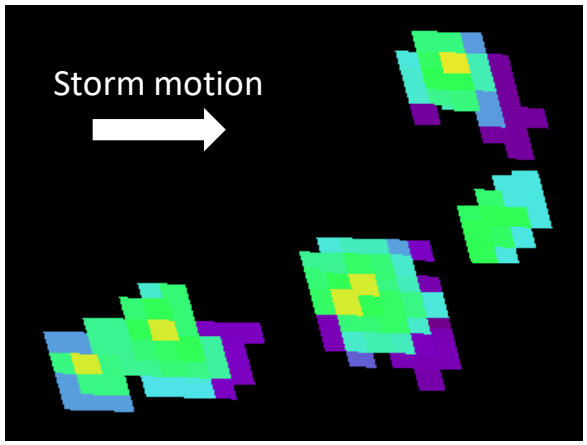

***Fig. 4**. Minimum Flash Area from discrete convection, with leading stratiform flashes (purple)*

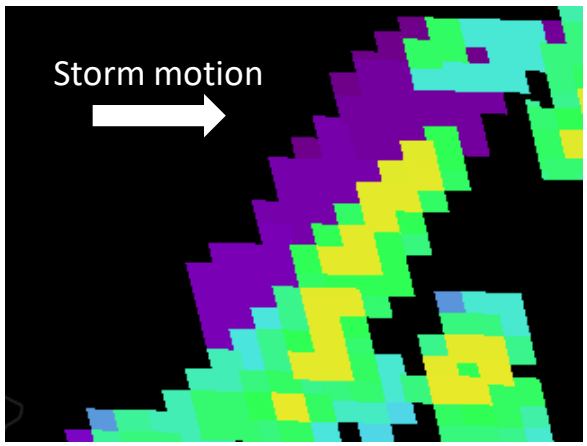

***Fig. 5**. Minimum Flash Area from linear convection, with trailing stratiform flashes*