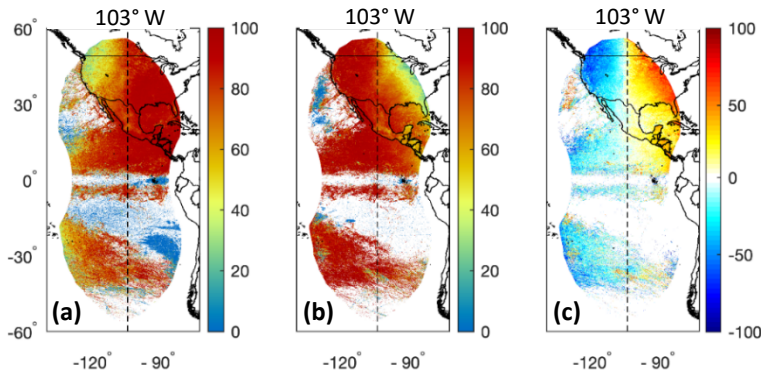# Geostationary Lightning Mapper: Full Disk Gridded Products
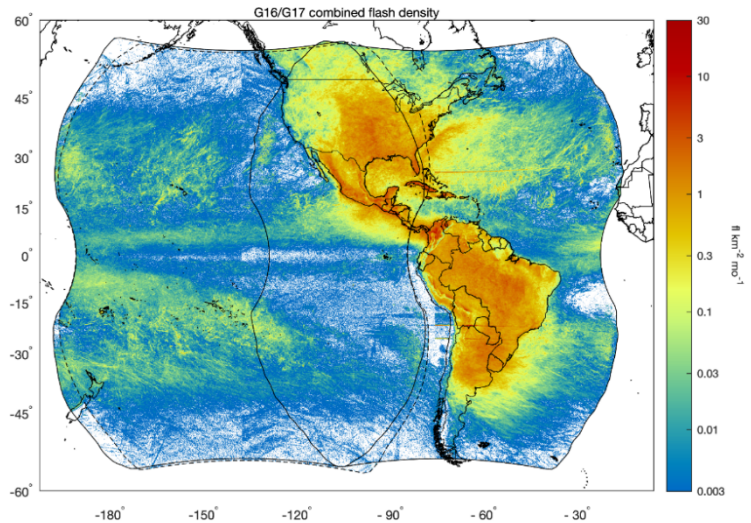# Quick Guide

Full Disk GLM Products

- Full Disk (FD) GOES-16 (G16) and GOES-17 (G17) GLM grids report the vast majority of lightning in the Western Hemisphere (note: not the entire ABI FD)

- FD GLM products are mapped on the 2×2 km Advanced Baseline Imager (ABI) fixed grid

- Products include Flash Extent Density (FED), Total Optical Energy (TOE), and Minimum Flash Area (MFA, replaces Average Flash Area)
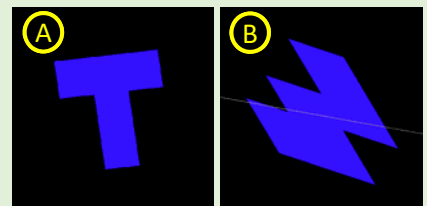

Combined G16/G17 flash densities during 12/1/18 – 5/31/20. Black lines indicate the FOV boundaries, for G17, the solid (dashed) line depicts coverage during boreal summer (winter)[1]

Panel a indicates the % of G17 flashes observed by G16 (and visa versa in panel b). Panel c illustrates the difference (i.e., panel a minus panel b) with warm (cool) colors in indicating G16 (G17) detects more flashes[1]

Operational Full Disk Considerations

- Both instruments observe CONUS, with 103° W providing a good delineation between using G16/17

- GLM pixel size increases toward the edges of field of view (FOV), reducing detection efficiency (DE) as smaller/weaker flashes are less likely to be detected

- Reduced G16 GLM performance in the northwest U.S. relates to the proximity to the edge of the FOV, where larger pixels and steeper viewing angles reduce the instrument sensitivity

- This limitation also appears for the G17 GLM, with similarly poor relative performance over the eastern U.S. near the edge of its FOV

Primary Full Disk Applications

- In a recent value assessment (VA), the GLM was shown to improve lightning safety, severe thunderstorm and tornado warnings, safety and effectiveness of wildfire response, short term model forecasts (via data assimilation), precipitation estimation, tropical cyclone diagnosis and warning, and climate applications

- The VA also described the value GLM yields through filling data gaps and mitigating aviation hazards

- The GLM now provides a national and international baseline of publicly available lightning data and establishes a baseline for widespread government and industry implementation and cooperation
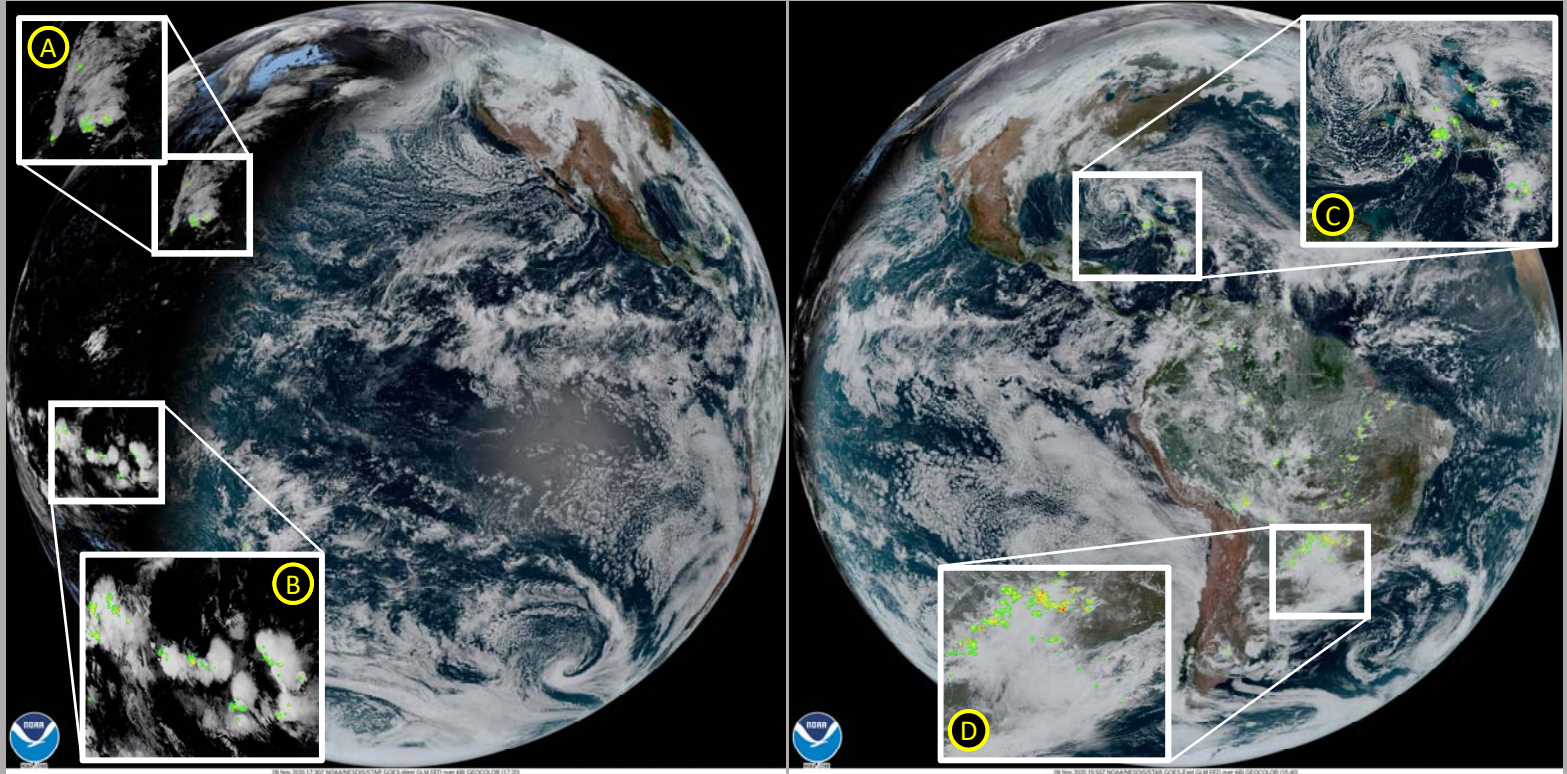
GLM Pixel Geometry Varies

- Ⓐ Five G16 GLM pixels south of Cuba
- Ⓑ Five G16 GLM pixels on the border of Montana and Canada

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Quick Guide
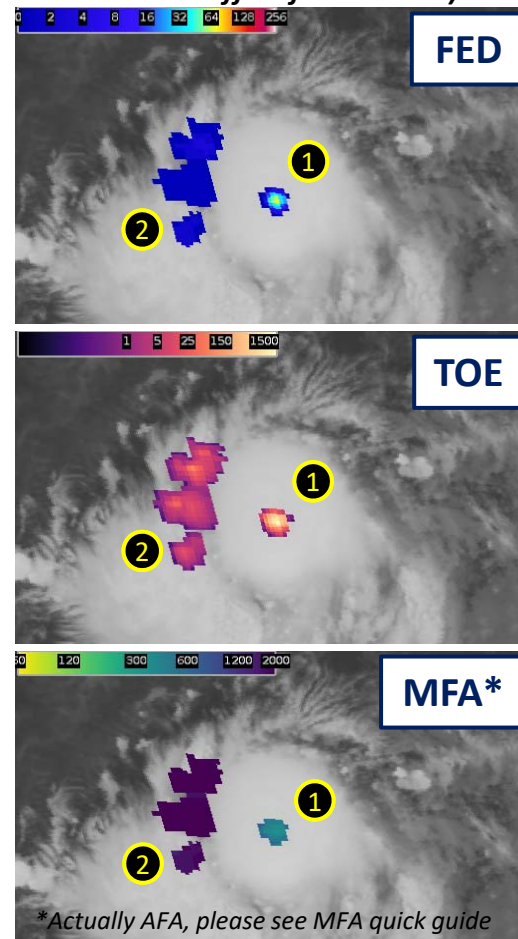

Above imagery from https://www.star.nesdis.noaa.gov/GOES/index.php (FED color scale differs from AWIPS)

Examples of the Full Disk GLM Advantage

(A) **Characterizing Pacific storms as they approach the U.S. (also helps diagnose the intensity of convection associated with atmospheric rivers)**

(B) **Providing coverage for U.S. territories in the central and western Pacific**

(C) **Helping to diagnose convective trends for oceanic storms that remain outside of radar range (e.g., tropical waves or invests, tropical cyclones, extratropical cyclones, and other thunderstorm activity that creates hazardous conditions for mariners)**

(D) **Monitoring storms as they transition offshore both North and South America (important for protecting maritime and aviation assets)**

Diagnosing TC Structure (e.g., Hurricane Flossie 2019)

(1) **Eyewall has more frequent but smaller flashes than rain bands; greater FED (flash counts) and smaller MFA indicate flashes associated with convective bursts/strengthening; eyes often appear bright in the TOE**

(2) **GLM products provide insights into the convective state in the rain bands and important information regarding their evolution in time**

1. Indicates figures and statements from Rudlosky, S. D., and K.S. Virts, 2020: Dual Geostationary Lightning Mapper Observations, Mon. Wea. Rev., Conditionally accepted.

FED

TOE

MFA*

*Actually AFA, please see MFA quick guide