Geostationary Lightning Mapper: Data Quality (May 2019) Quick Guide

GLM Data Quality Evolution

- GLM calibration and validation efforts continue with all known issues being worked (e.g., recently mitigated the "Bahama Bar" artifacts)
- The GLM appears to meet its performance requirements despite the data quality issues illustrated in this document
- False events (pg 1) and geospatial considerations (pg 2) are described

Performance Requirements

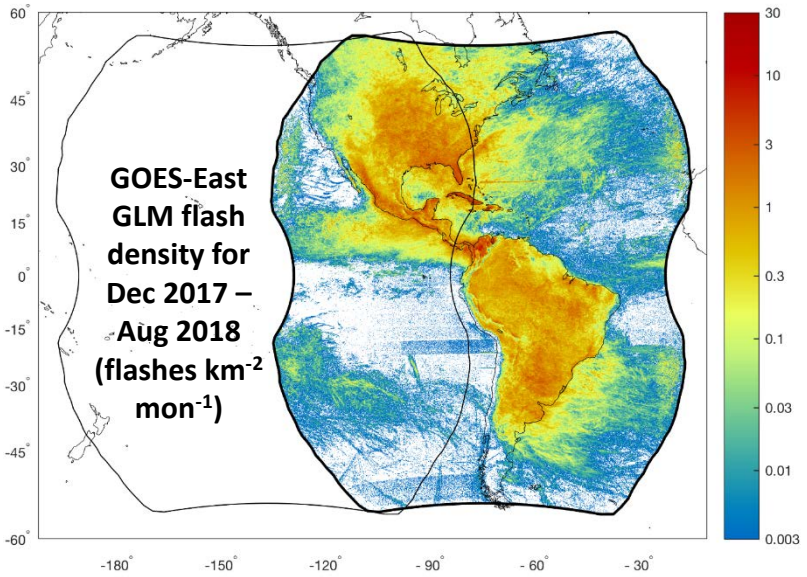
Detection efficiency > 70%, averaged over full disk and 24 h
Flash false alarm rate less than 5%, averaged over 24 hours
Navigation error within ±112 microradians (~1/2 pixel or ~4 km)

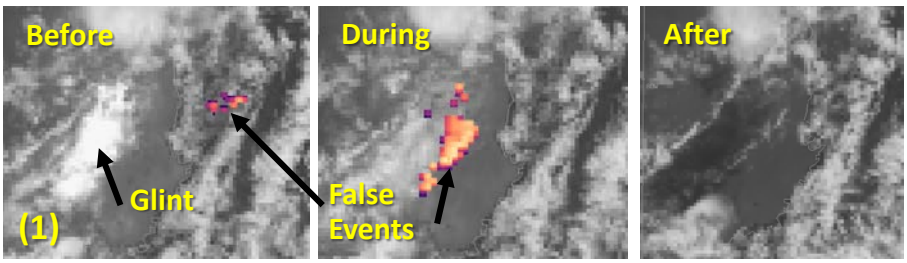
False GLM Event Sources

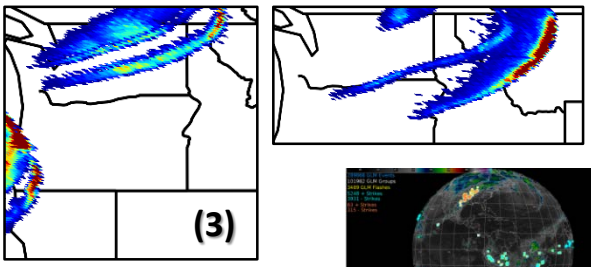
- GLM seeks to maximize detection efficiency while minimizing the false alarm rate
- False alarm rate is the number of false flash detections divided by the average true flash rate
- Each of the 56 subarrays are independently tuned
- Images below illustrate known false event sources

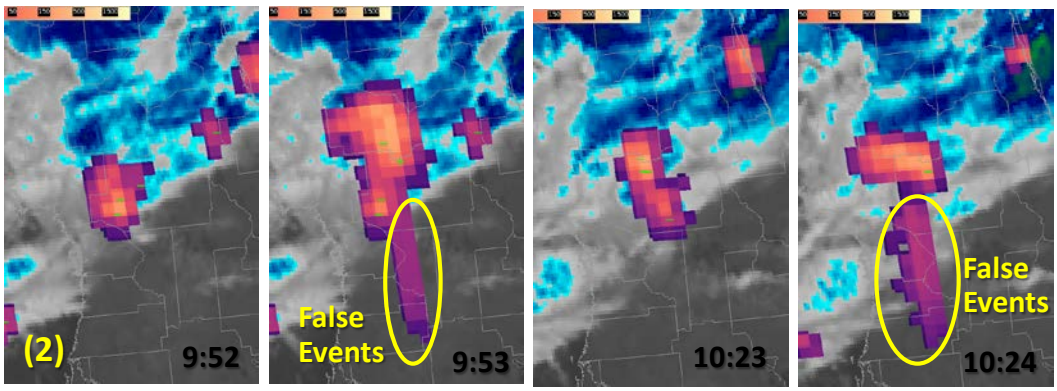
1) Sun glint – sunrise/sunset over the oceans and at satellite nadir / local noon over bodies of water
2) Rebound events (occur at night, indicative of flashes with continuing current = fire hazard)
3) Solar intrusion – transient false events that occur during the spring/fall eclipse seasons

GOES-East and GOES-West GLM Field of View

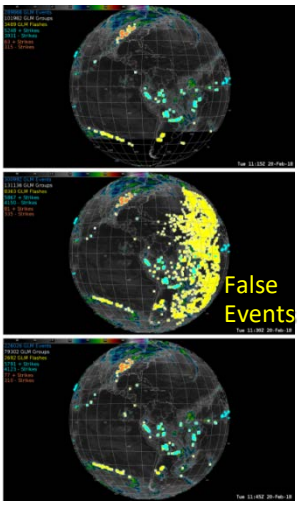








4) Platform Stability Disturbances: Sudden false events along cloud edges during day caused by spacecraft maneuvers →



Author: Dr. Scott Rudlosky
NOAA/NESDIS/STAR (CICS-MD)

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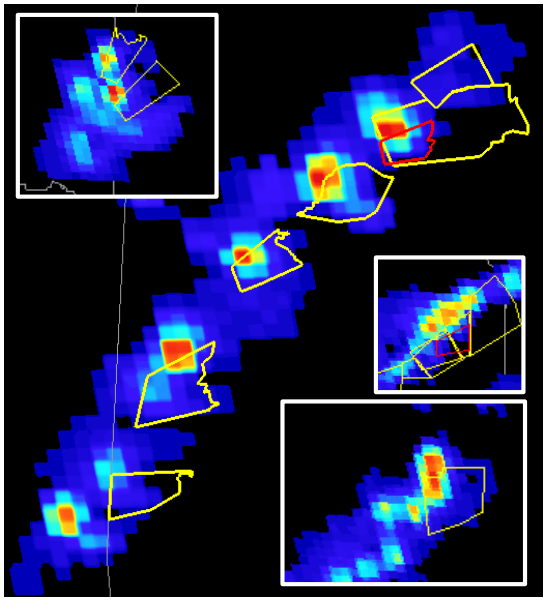
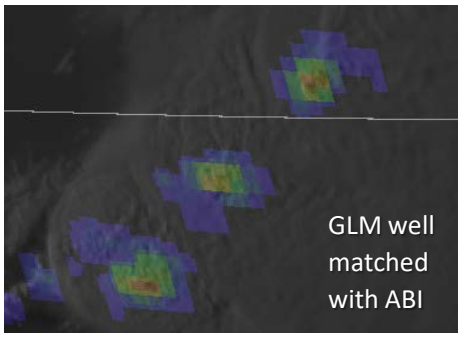
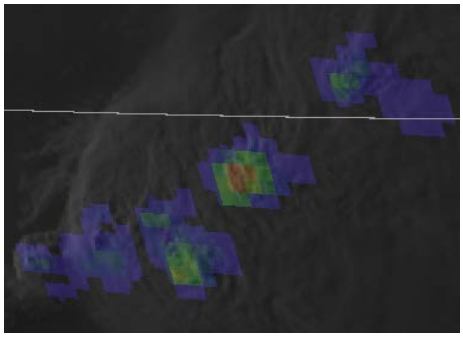
Geospatial Considerations

- **Each GLM has footprint of 1372 by 1300 pixels**
- **The instrument was designed to reduce the growth of GLM pixel footprints away from nadir, but the pixel size and shape still vary as shown by the two images below (*bottom left*)**
- **Although the GLM Level 2 product attempts to navigate the observations to an estimated cloud top, the GLM gridded products do not, resulting in a similar parallax effect to the Advanced Baseline Imager (ABI) – as illustrated by two screen captures of the collocated GLM FED and visible ABI imagery (*bottom right*)**
- **Parallax results in the gridded GLM products appearing shifted away from satellite nadir relative to radar and ground-based lightning networks – this offset must be considered when using the GLM gridded products for IDSS and during warning operations (*right*)**

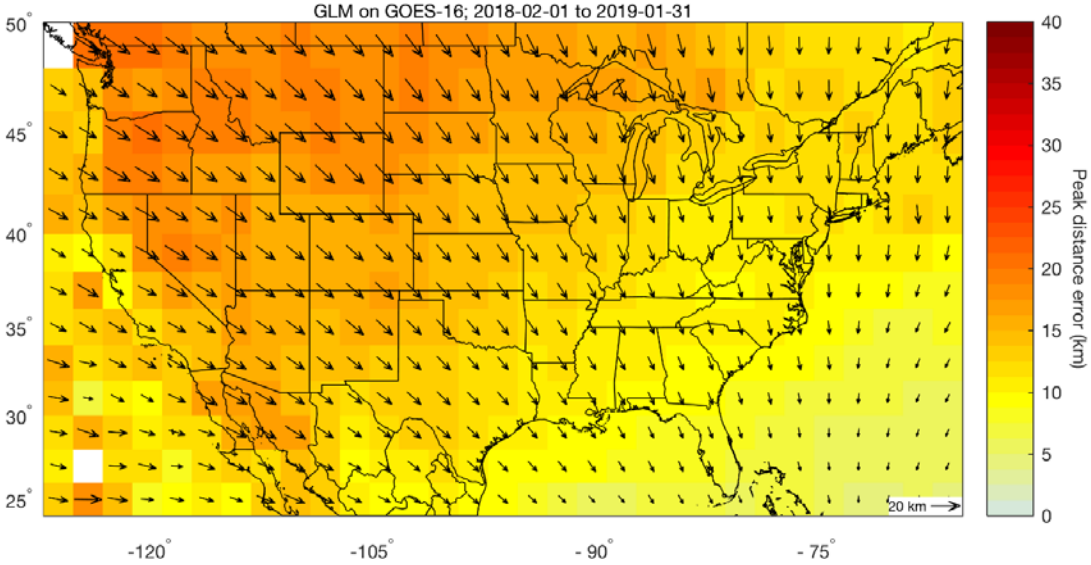


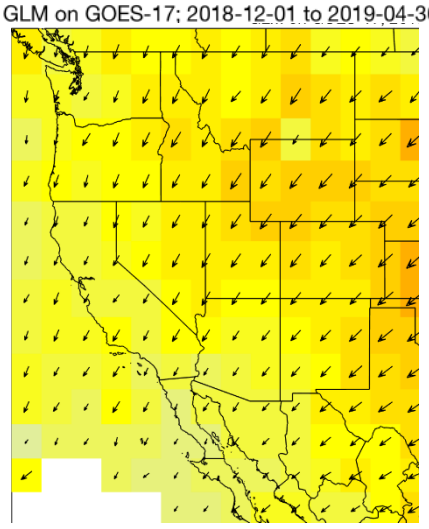
Above: GLM FED and severe thunderstorm/tornado warnings, main image (3/14), inlaid images (4/18)





Below: Direction vector and peak distance offset that must be applied for the GLMs to match the ground networks





Additional Information: https://vlab.ncep.noaa.gov/web/geostationary-lightning-mapper/