Geostationary Lightning Mapper: Data Quality Quick Guide

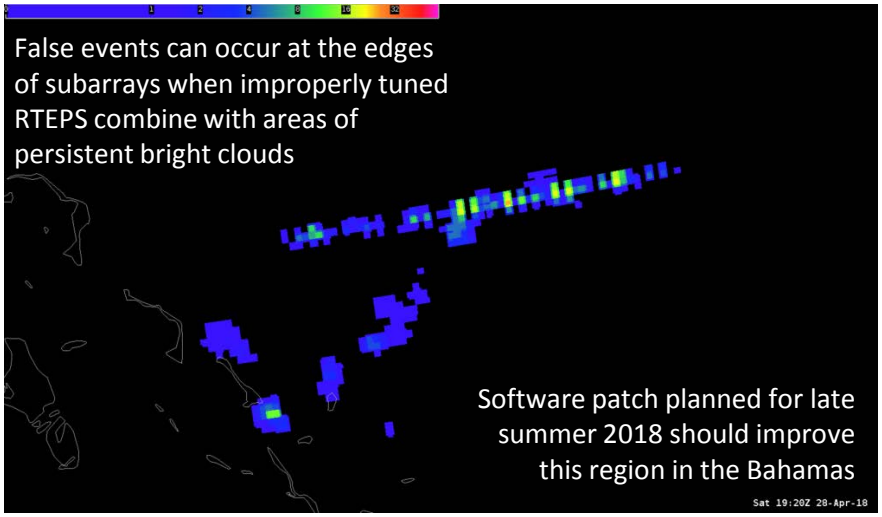
GLM Data Quality Evolves

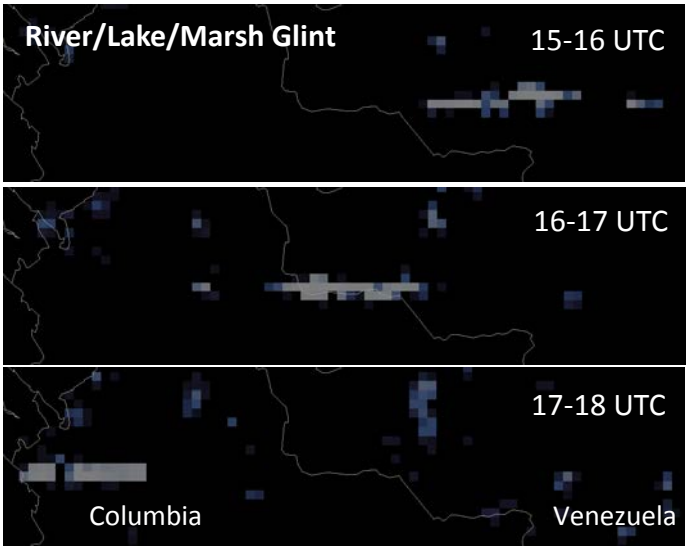
- GLM is a new instrument, extensive calibration and validation efforts
- The GOES team worked alongside the instrument vendor to reach beta (July 2017) and provisional (January 2018) maturity status
- The GLM appears to be meeting its performance requirements despite the data quality issues illustrated in this document
- Issues described include geospatial considerations and false events
- All known issues are being worked in preparation for the full validation review (process is repeated for each new GLM)

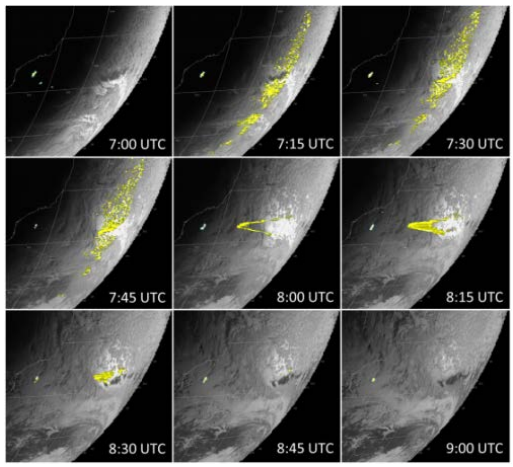
Performance Requirements
Full disk coverage
Detection efficiency > 70%, averaged over full disk and 24 h
Flash false alarm rate less than 5%, averaged over 24 hours
Navigation error within ±112 microradians (~1/2 pixel or ~4 km)
Dynamic range greater than 100 at all times everywhere in FOV

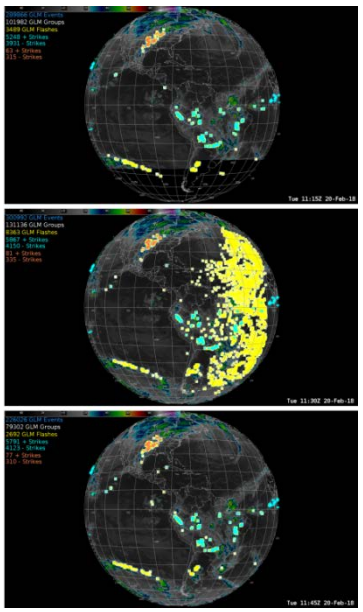
False GLM Events

- GLM seeks to maximize detection efficiency while minimizing the false alarm rate
- False alarm rate is defined as the number of false flash detections divided by the average true flash rate
- Each subarray is independently tuned to optimize the dynamic range and sensitivity
- 56 Real Time Event Processors or RTEPS are used to tune the GLM
- These images shown herein illustrate the known sources of false events









Above: Glint over the south Atlantic ocean during sunrise

Right: Sudden spike in events due to momentum adjust maneuver

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

Version 2 – June 11, 2018

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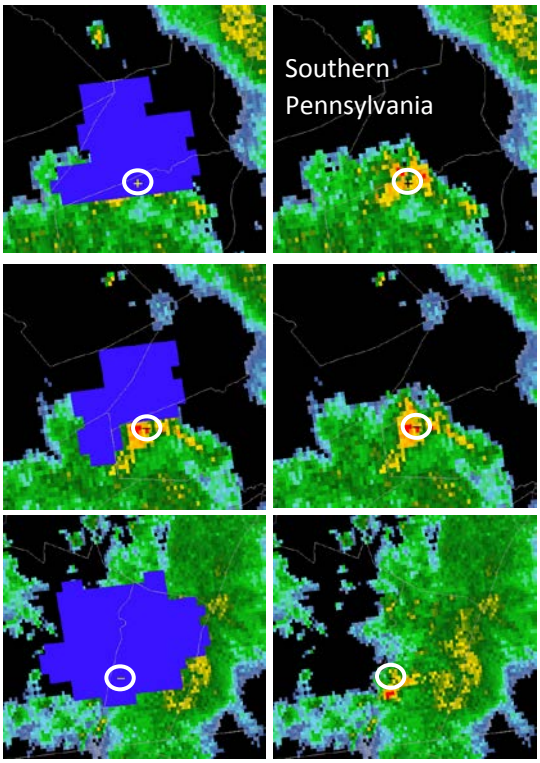
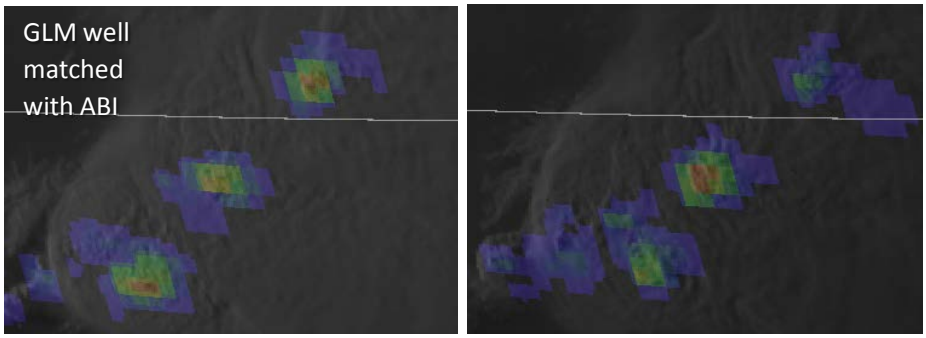
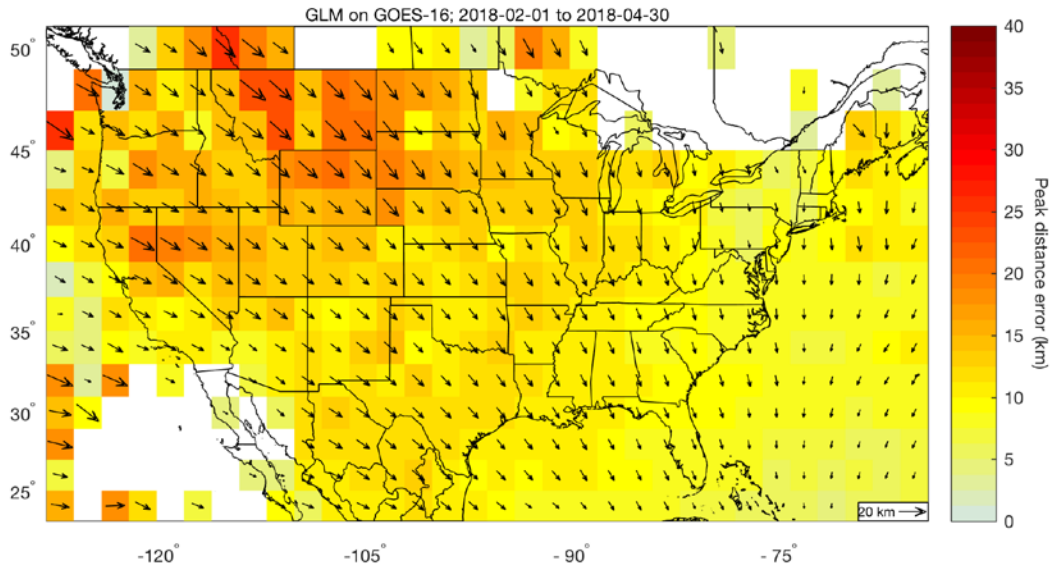
Geospatial Considerations

- The GLM is a variable pitch charge coupled device (CCD) array with 56 sub arrays and a footprint of 1372 by 1300 pixels
- The variable pitch 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 nadir relative to radar and ground lightning networks (*right*)
- Near the limbs, GLM observations of side-cloud illumination partially counteract the parallax by shifting the GLM towards nadir





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



Additional Resources

Virtual Lab

Virtual Lab for the GLM

Virtual Faculty Training

GLM Faculty Virtual Course

NASA SPoRT

NASA SPoRT Home Page

NESDIS/STAR – CICS-MD

http://lightning.umd.edu

Hyperlinks not available when viewing material in AIR Tool