2025 AMS

Global Lightning Mapping with the New Generation of the Geostationary Satellites

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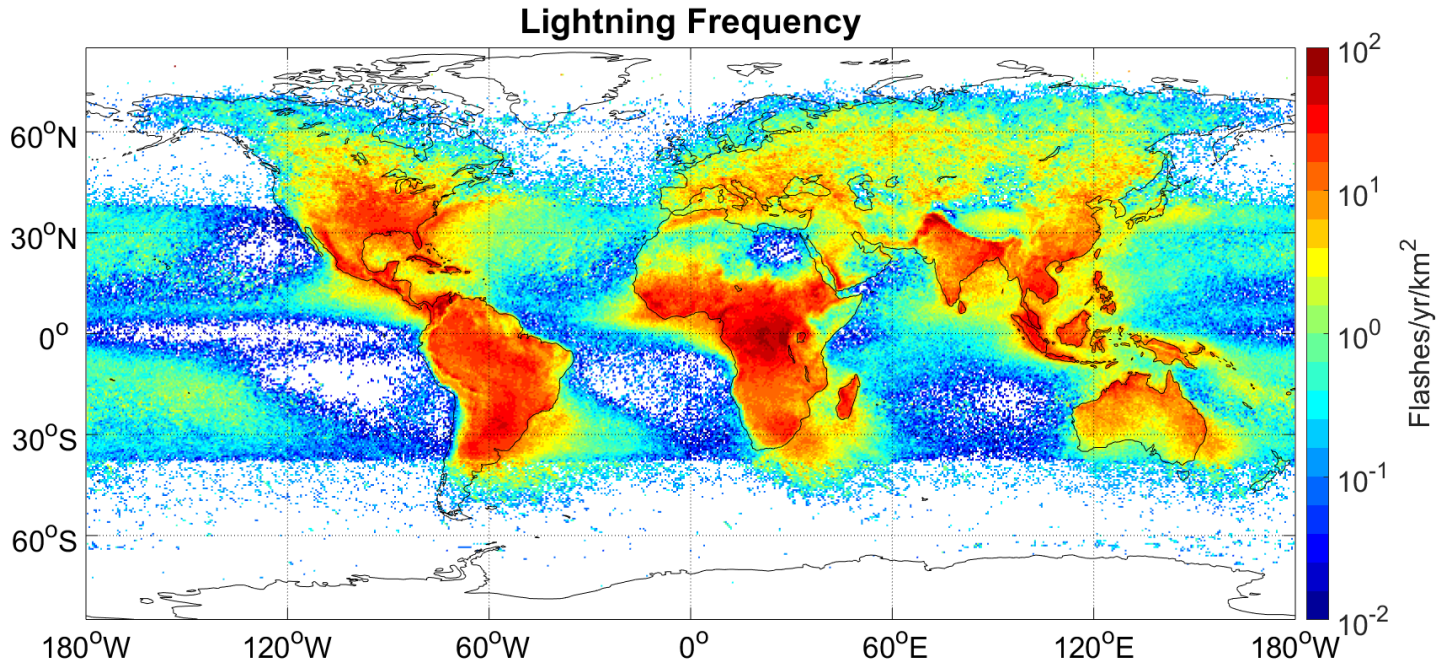
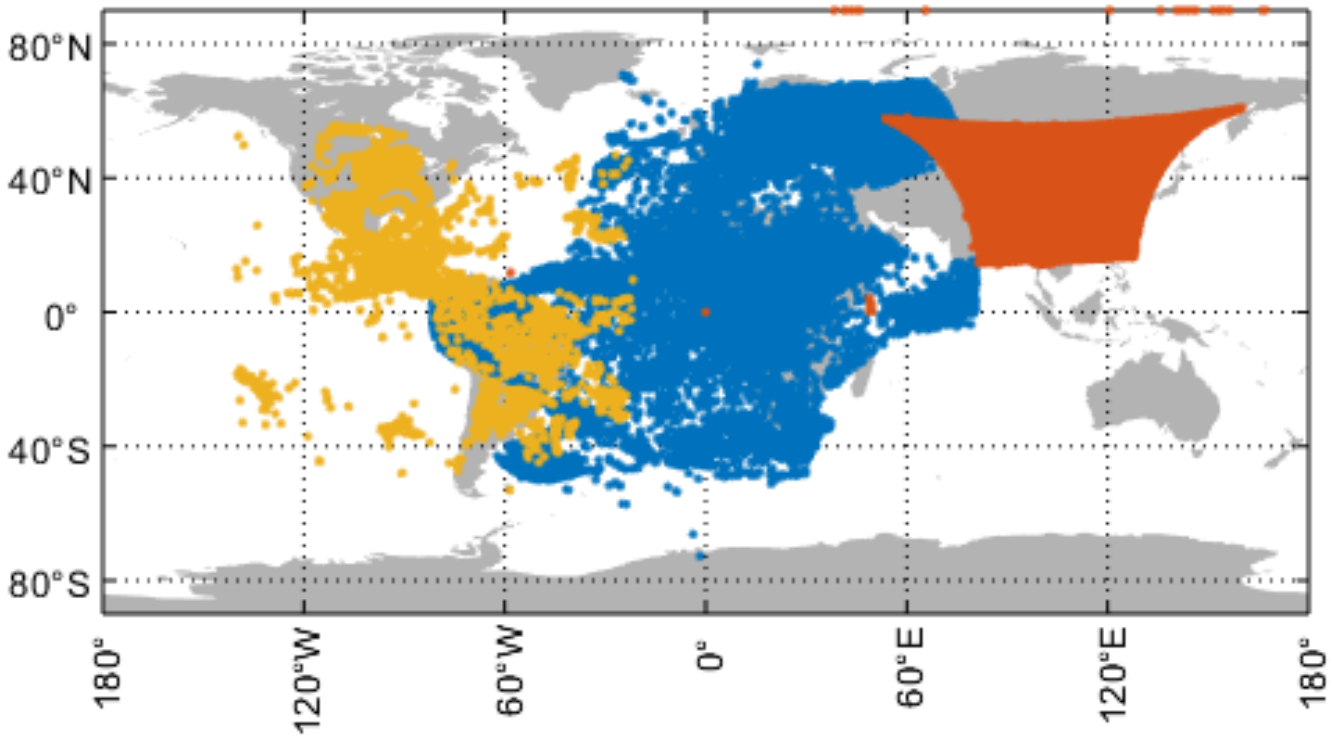
2. NOAA NESDIS Geo Earth Observations Office
3. University of Maryland
4. Kent State University
5. EUMETSAT
6. Chinese Academy of Meteorological Sciences

Global Lightning Activity from LEO



TRMM Lightning Imaging Sensor (LIS) + Optical Transient Detector (OTD)

Global Lightning Activity from GEO



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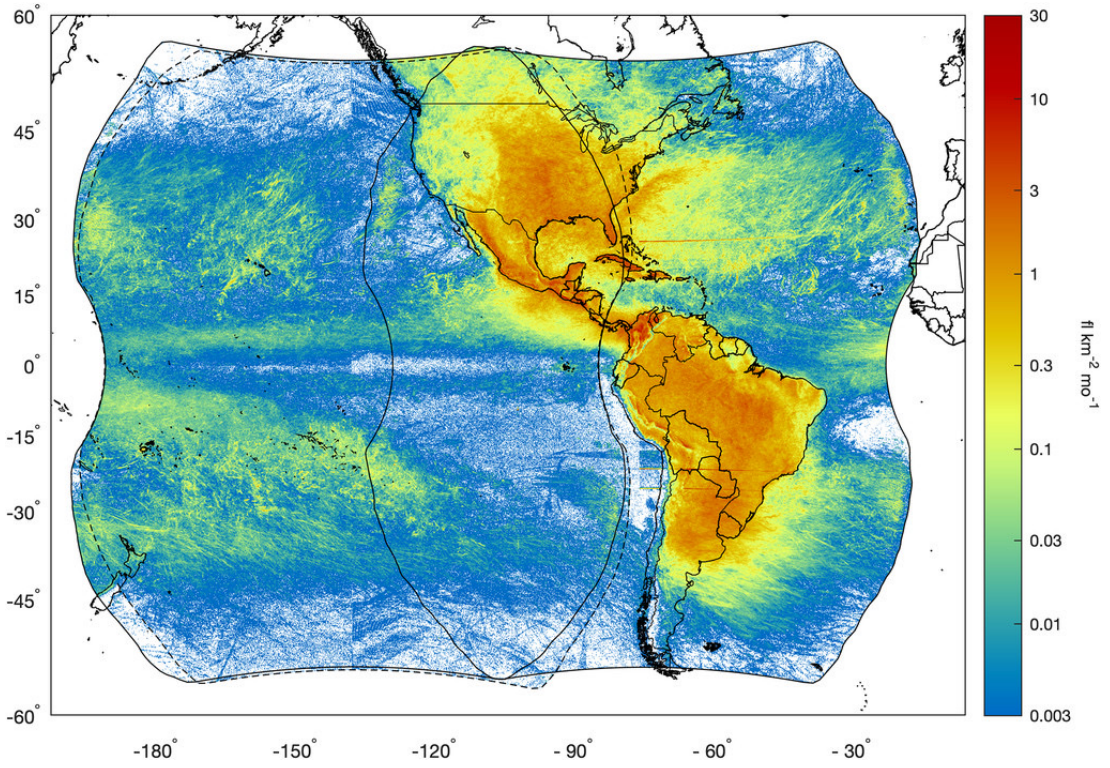
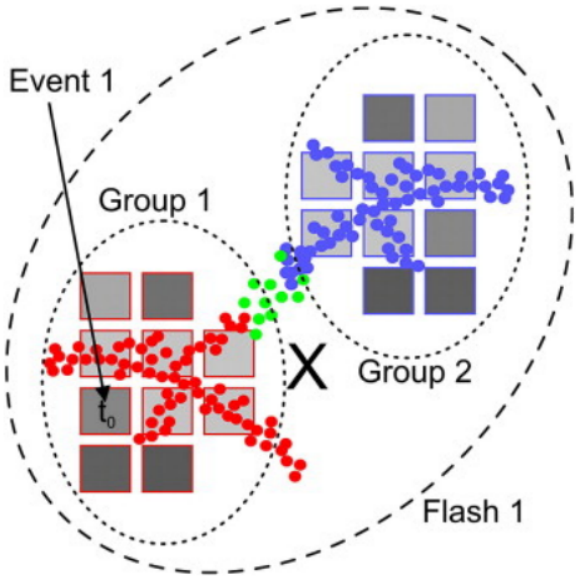
Geostationary Lightning Mappers (GLMs)

- Onboard GOES-East satellite since 2016 and West satellite since 2018
- Spatial resolution: 8-14 km
- Temporal resolution: 2 ms
- Band: 777.4 nm



Rudlosky and Virts, 2021

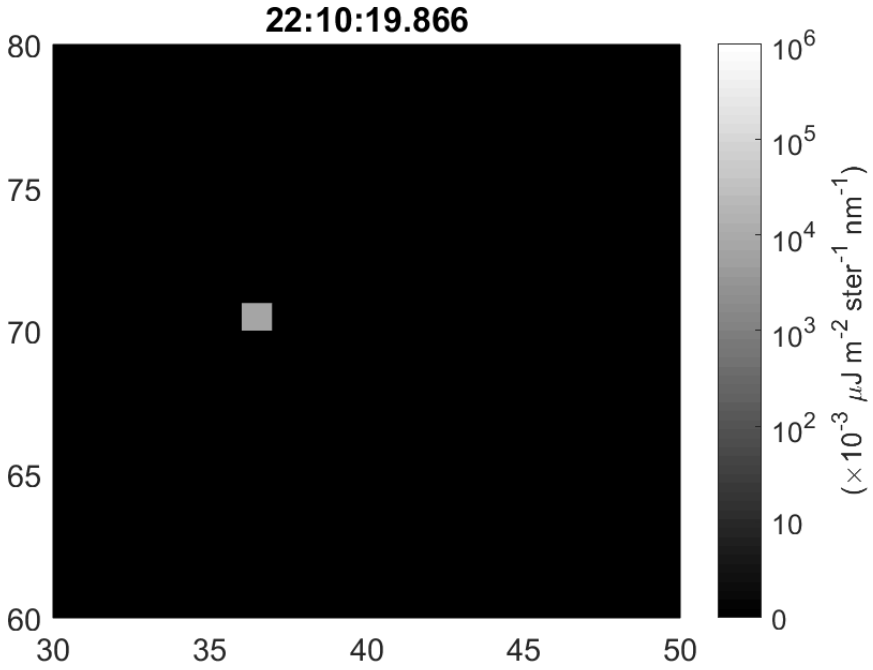
Satellite Data Products



Goodman et al., 2013

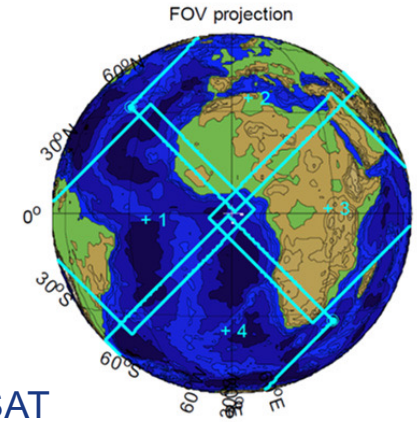
Event (lit-up pixel), Group, Flash

A LIS Flash Example with 25 Groups

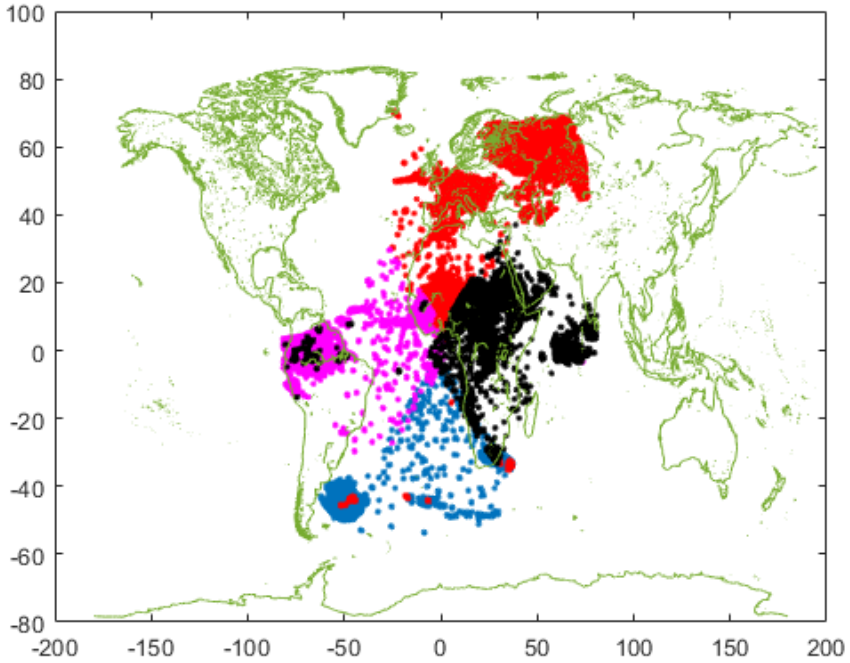


Lightning Imager (LI)

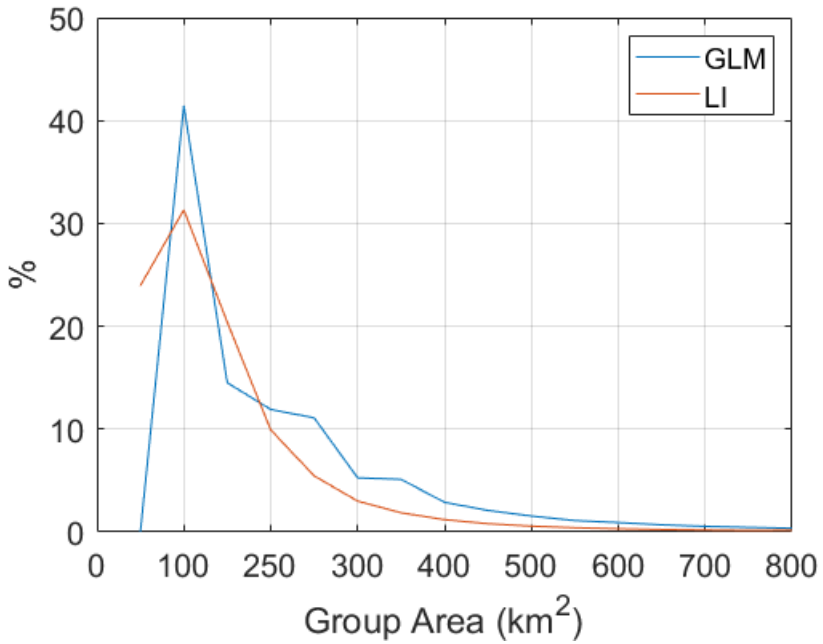
- Onboard MTG satellites
- 4 optical cameras
- Spatial resolution: 4.5-7 km
- Temporal resolution: 1 ms
- Band: 777.4 nm

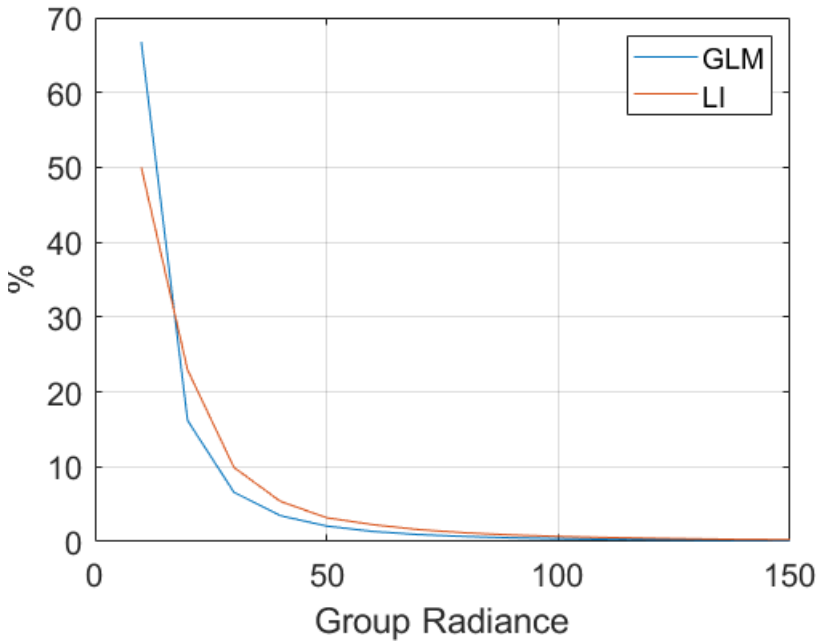


Courtesy of EUMETSAT



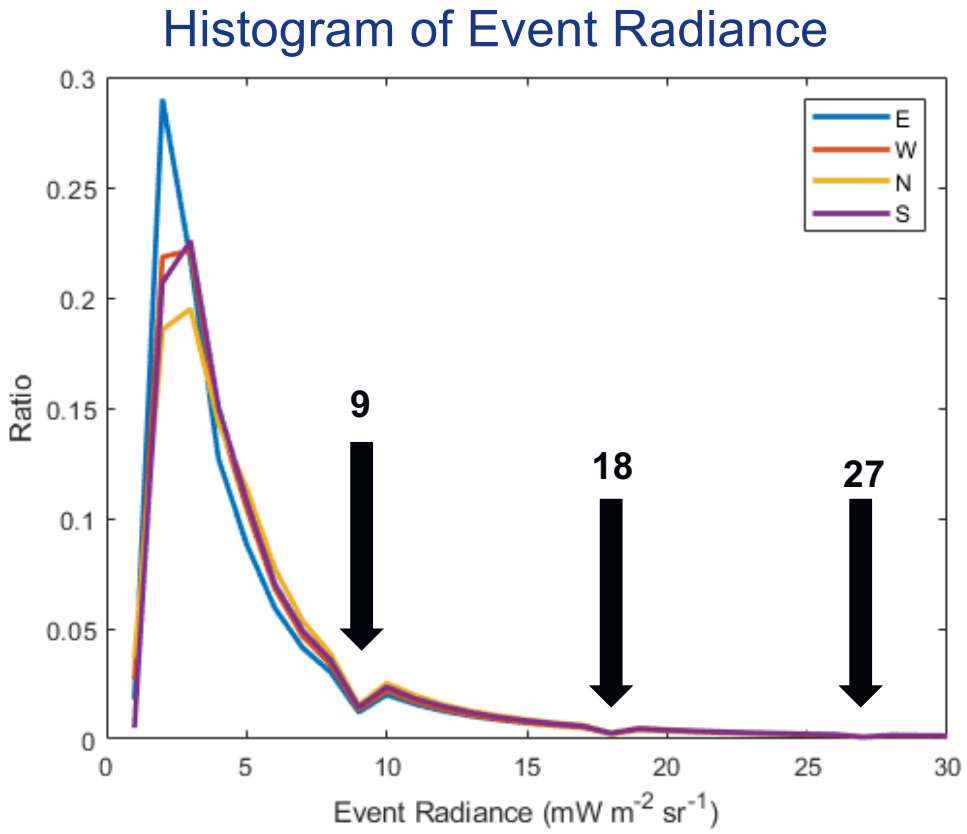
Group Comparison





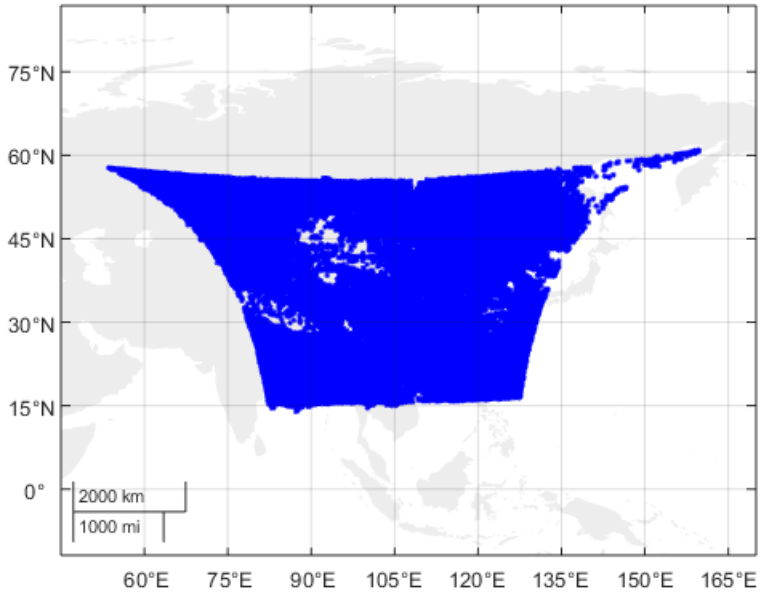
Event Radiance Dips

There are 3 dips in the event radiance histograms. All four cameras had the exact same dips at 9, 18, and 27 mW m^{-2} sr^{-1}.



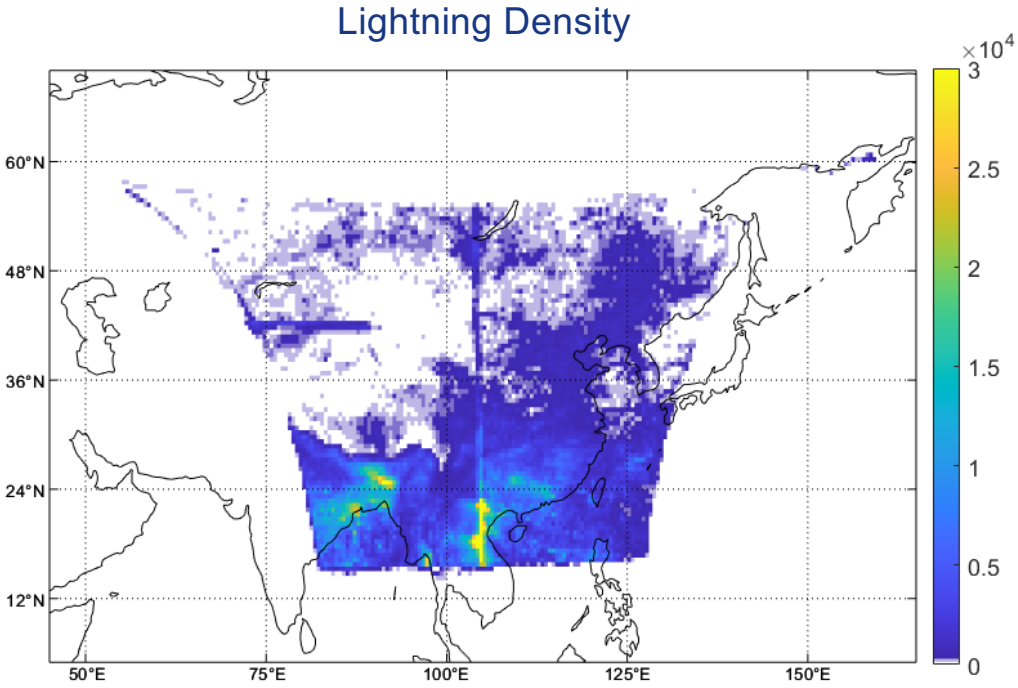
Lightning Mapping Imager (LMI)

- Onboard the FY-4A satellite since 2018
- An enhanced LMI will be launched onboard the FY-4C in 2025
- Spatial resolution: 7.8 km
- Temporal resolution: 2 ms
- Northern hemisphere during Mar. – Sep. and southern hemisphere during Oct. – Feb.

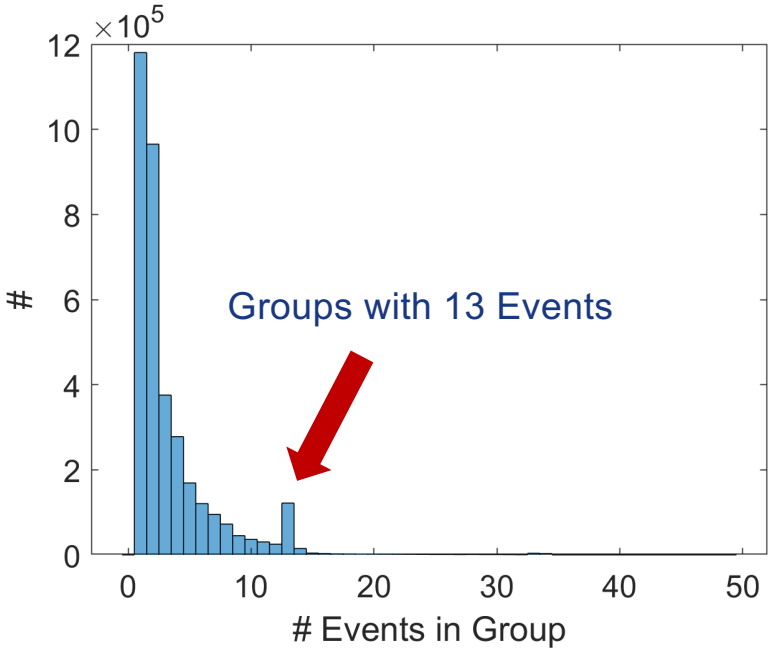


Limitations of LMI L2 Data

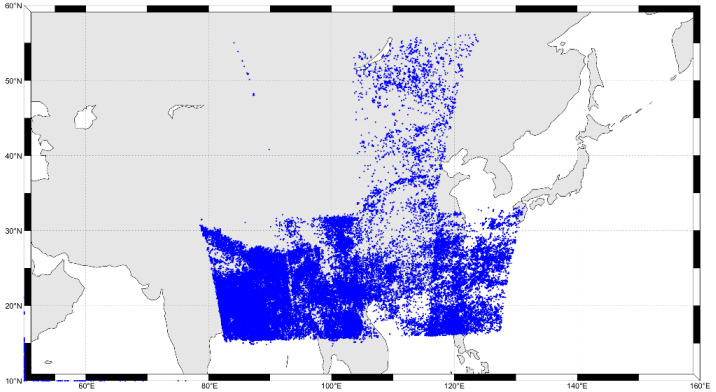
- Flashes need to be recalculated.
- Footprint data are incorrect as they neglect pixel size, shape, and angles, etc, merely counting events without context/reference.
- Not fully calibrated and evaluated, and need further data cleaning.
- Additional filter applied in 2020 resulted in significantly reduced data post-2020.



Subarray Issue

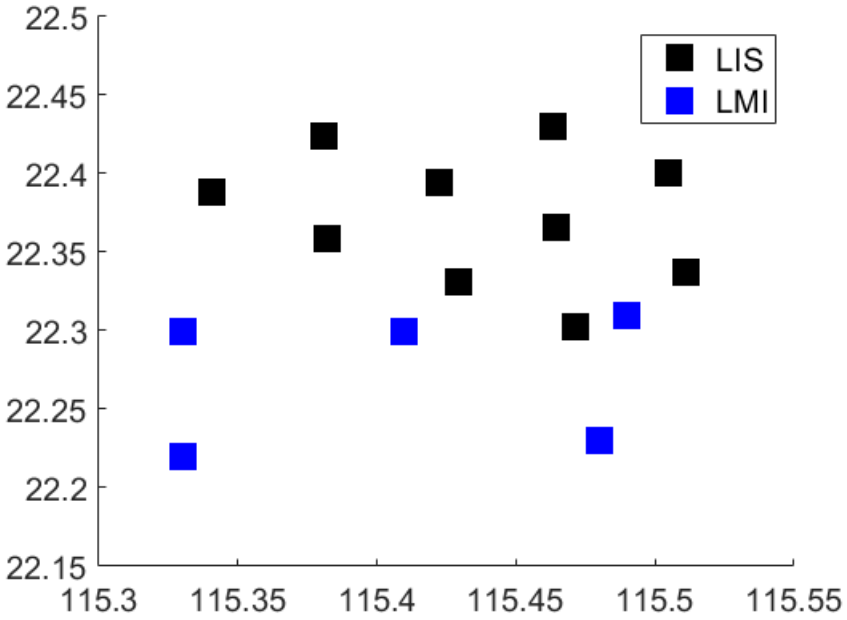


Groups with 13 Events

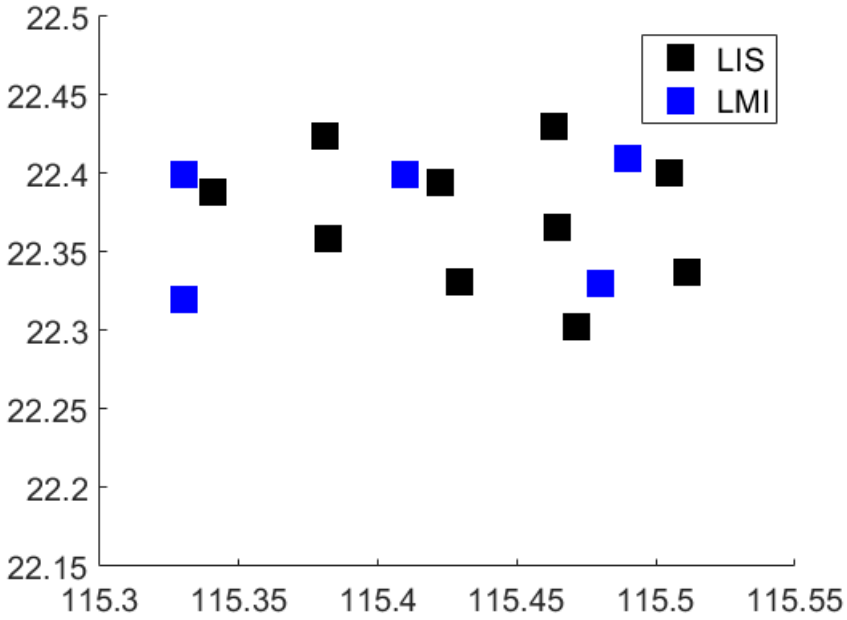


Parallax Correction

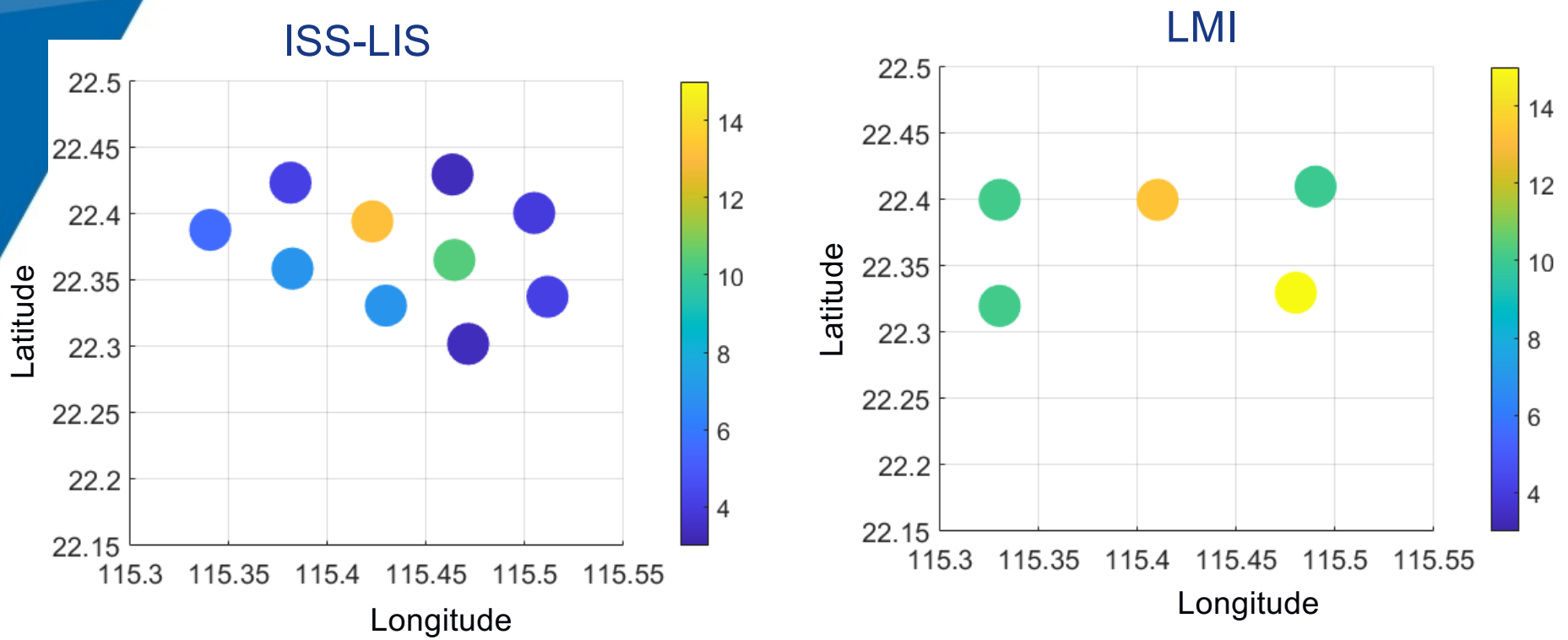
Uncorrected



Corrected

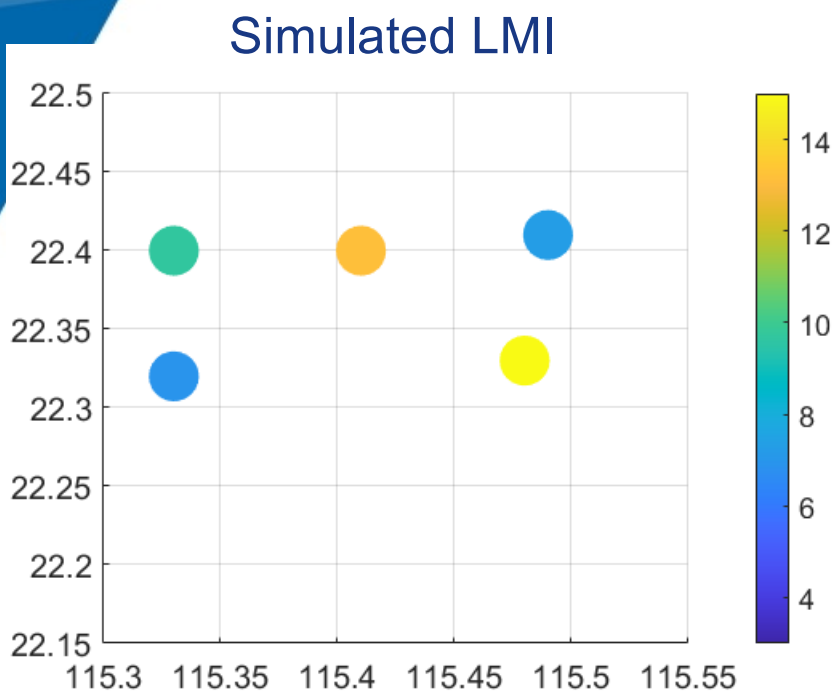


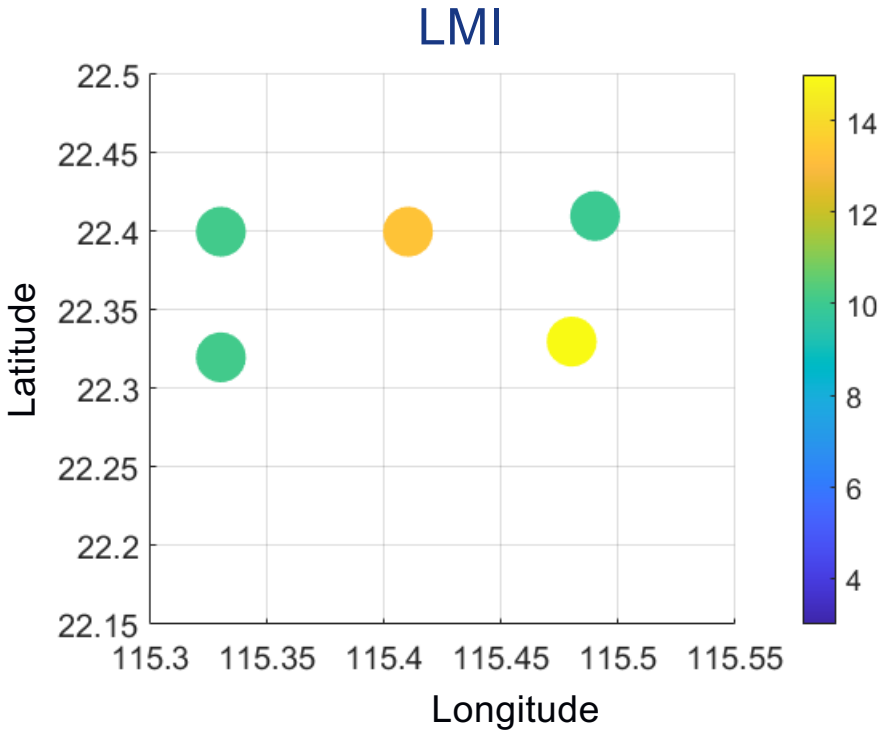
Intercomparison with ISS-LIS



Event (pixel) radiances reported by LMI is similar to ISS-LIS.

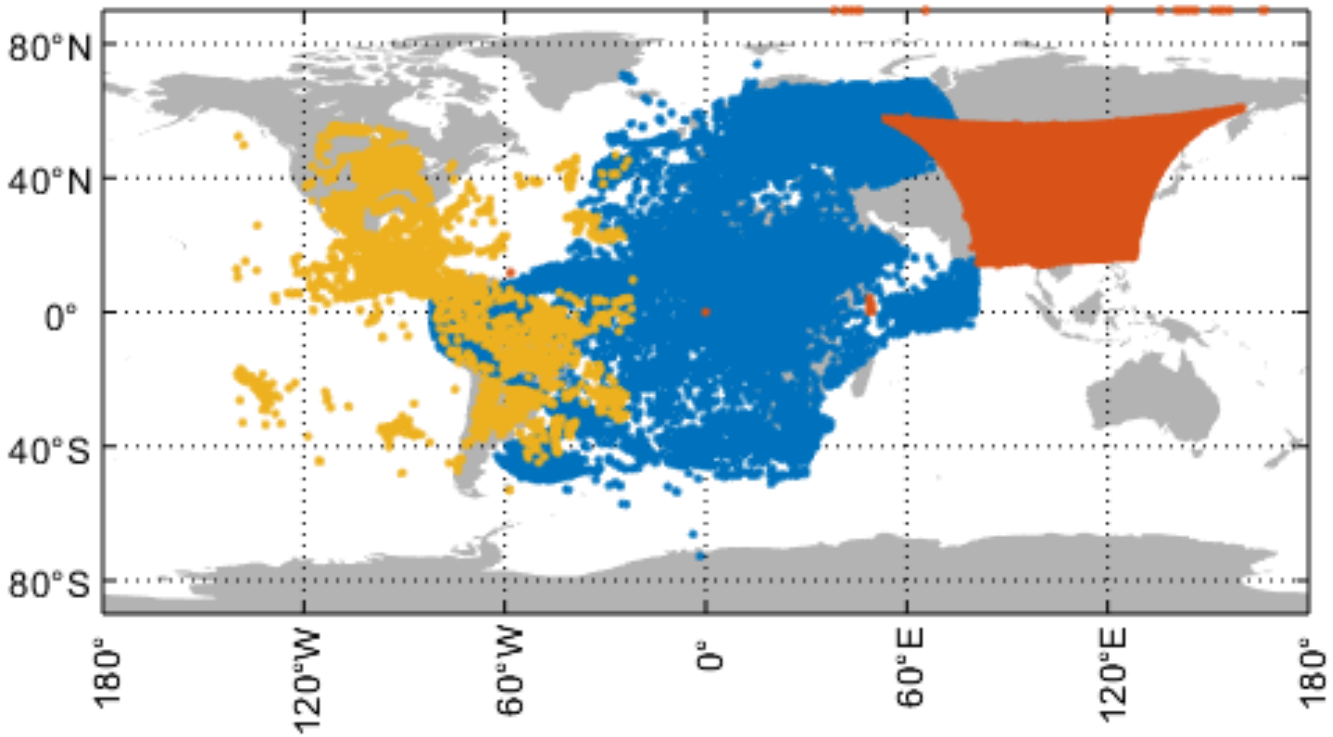
Intercomparison with ISS-LIS (cont.)





Simulated LMI (radiance and distance weighted) is similar to LMI observation.

Global Lightning Activity from GEO



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Thank you!

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