Virtual Network and Extended Time Window Techniques for Improving Detection Efficiency & False Alarm Rates for the Geostationary Lightning Mappers aboard GOES-16 and GOES-17

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Introduction

- A major issue with determining the GLM DE and FAR values is that over much of the instrument Field Of View (FOV), there are no high DE systems
- In an attempt to overcome these limitations, we have created a “virtual” lightning network by clustering flashes from several different ground-based networks, using a technique similar to the clustering of GLM pixels
  - Earth Network’s Total Lightning Network (ENTLN)
  - World Wide Lightning Location Network (WWLLN)
  - The Global Lightning Dataset (GLD360)
  - National Lightning Detection Network (NLDN)
  - Canadian Lightning Detection Network (CLDN).
- All ground truth sources that are within 330 ms and 16.5 km of any other ground truth source are added to the current cluster
- This creates a single “virtual” network, which we compare to the GLM flashes to estimate DE and FAR
- To further improve the GLM DE and FAR estimates over these regions, we modified our criteria by increasing the time window from +/-1 s to as much as +/-10min to account for the lower DE of the ground truth systems
- Using the virtual network and the expanded time window, we compare GLM flash data from August 1, 2019 to January 31, 2020

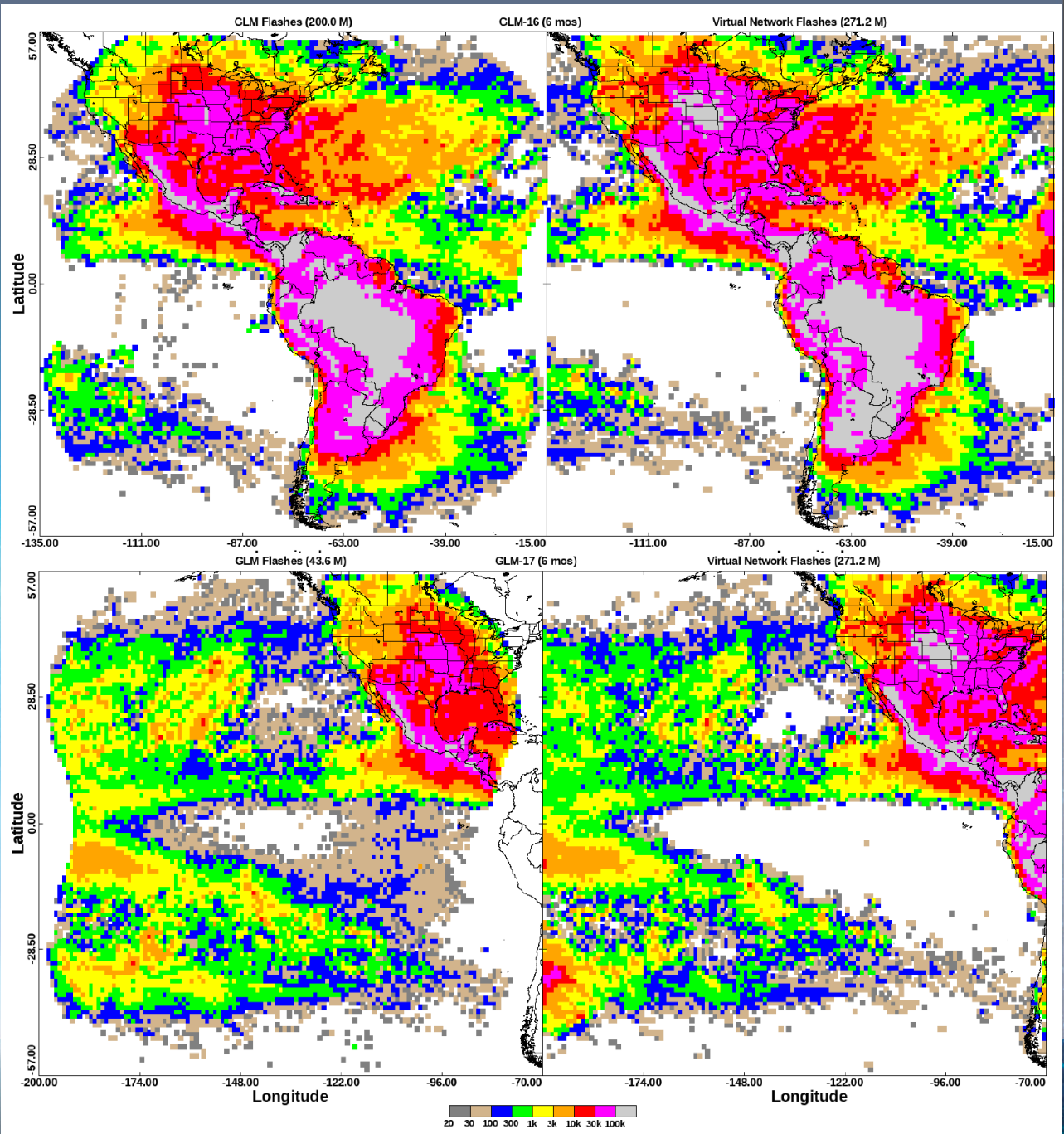

Figure 3. Flash density for GLM-17 (left) and the virtual network (right).

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Effect of Increased Time Window

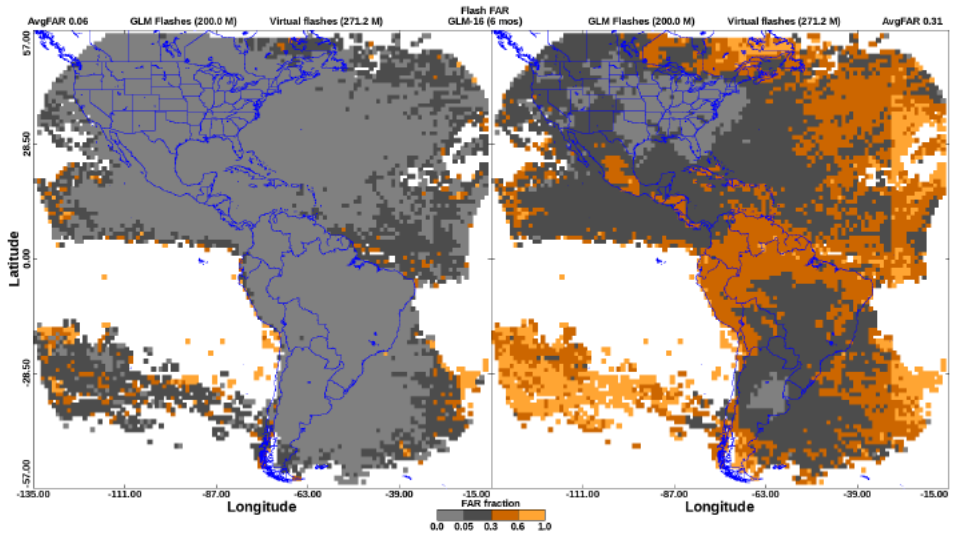

Figure 8. Comparison of FAR calculated with a time window of 20 min (left) and 2 s (right).

The upper plots are for GLM-16 while the lower plots are for GLM-17.

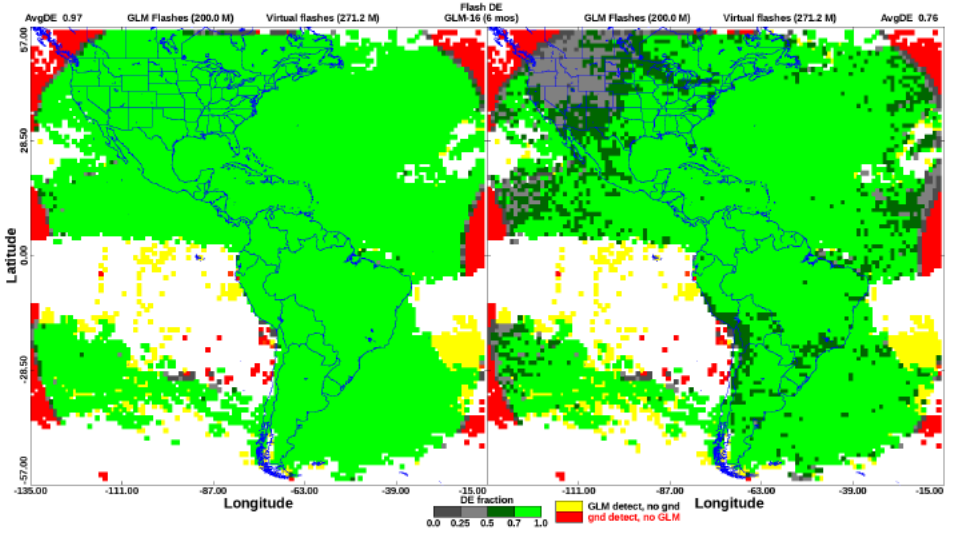

Figure 4. Comparison of DE calculated with a time window of 20 min (left) and 2 s (right).

The upper plots are for GLM-16 while the lower plots are for GLM-17.

References

- DOI: 10.1029/2020EA001237
- DOI: 10.1117/1.JRS.14.032406