

# Early Operational Activities with the Geostationary Lightning Mapper

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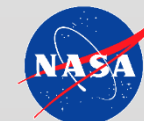
<sup>4</sup>Marshall Space Flight Center, Earth Science Division,

<sup>5</sup>Jacobs Technology, ESSSA Group

52<sup>nd</sup> Canadian Meteorological and Oceanographic Society Congress

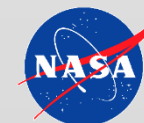
Halifax, Nova Scotia

12 June 2018

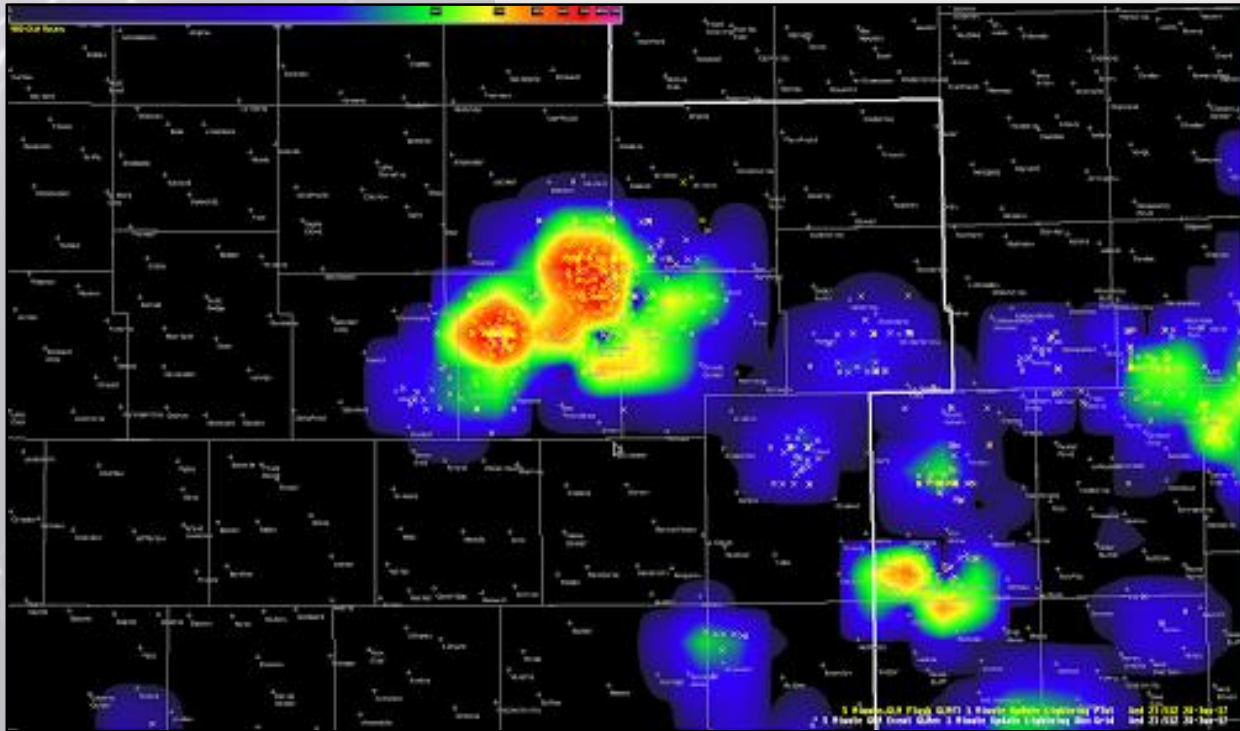


# A Short Outline

- Role with the GOES-R Proving Ground
- Goals of an operational assessment
- Early, potential uses (examples)
- Future Work

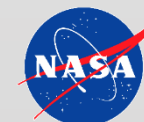


# Role With the GOES-R Proving Ground



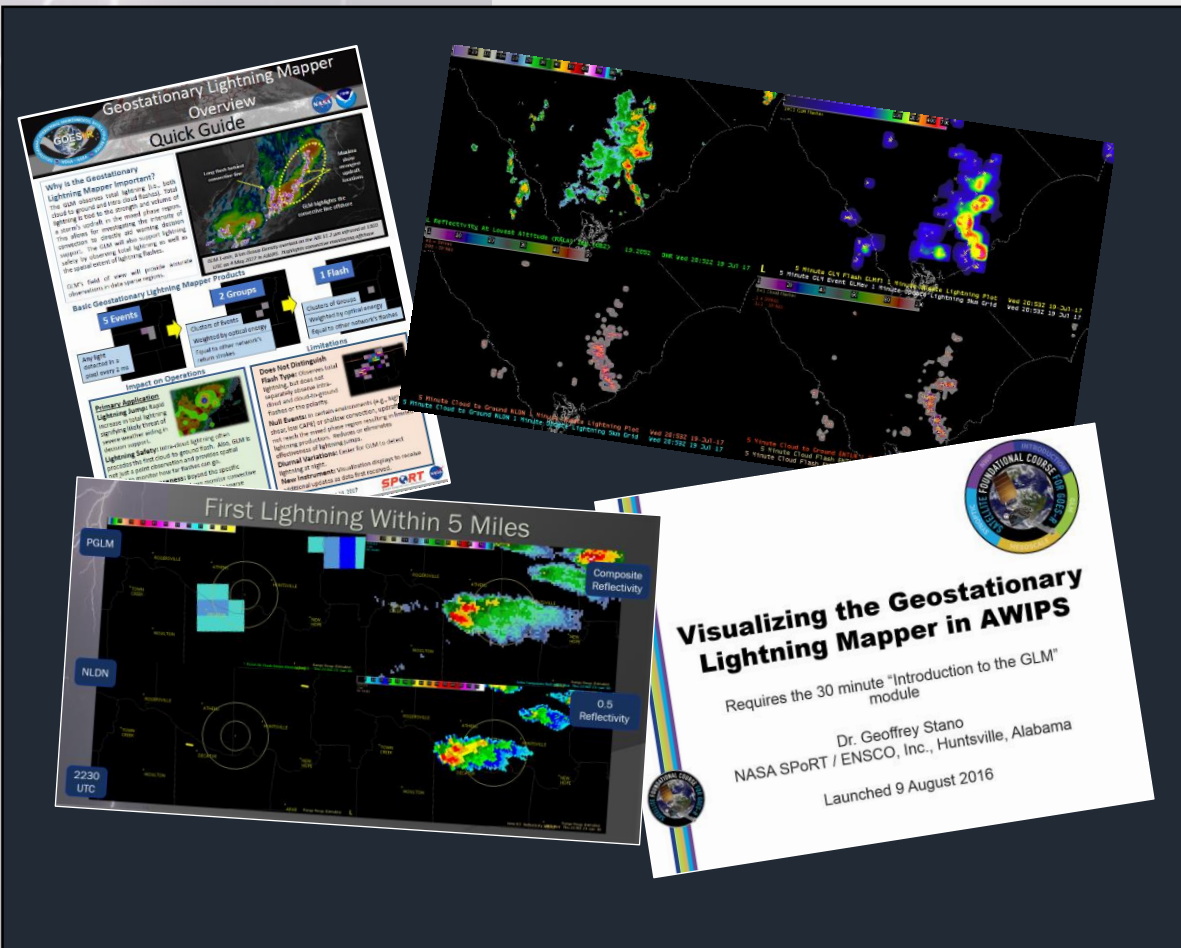
*Sample of GLM event density with flash centroid points. (Preliminary, non-operational)*

- Liaison to the U.S. National Weather Service for NASA SPoRT
  - Work with multiple operational partners
- Serve as GLM liaison for GOES-R
  - Focus on training
  - Focus on operational applications
- Work to advocate for operational needs
- Greatly supported by co-authors in developing quality training material

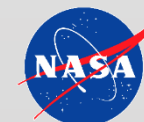


# Goals of the Operational Assessment

- Provide initial training
- Variety of geographic and forecast needs
- Evaluate GLM in day-to-day operations
- Compliment other Proving Ground work
- Identify uses (more than just severe weather)
- Identify forecaster-requested training
- Identify forecaster-requested “products”
- Incorporate forecaster examples into an applications library for training



Examples of initial training material.

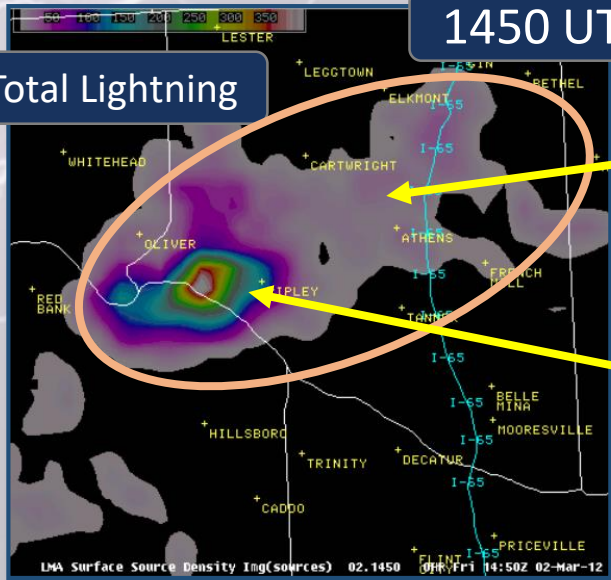




# Total Lightning

1450 UTC

Total Lightning

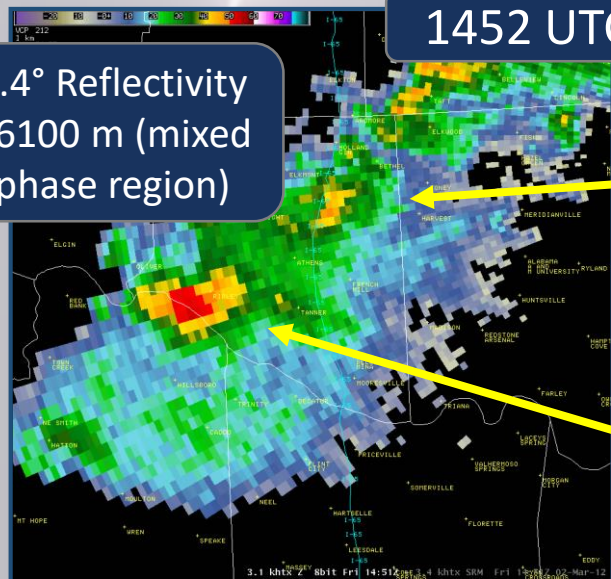


Spatial extent

Developing updraft

1452 UTC

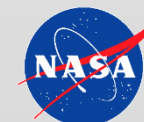
3.4° Reflectivity  
~6100 m (mixed phase region)



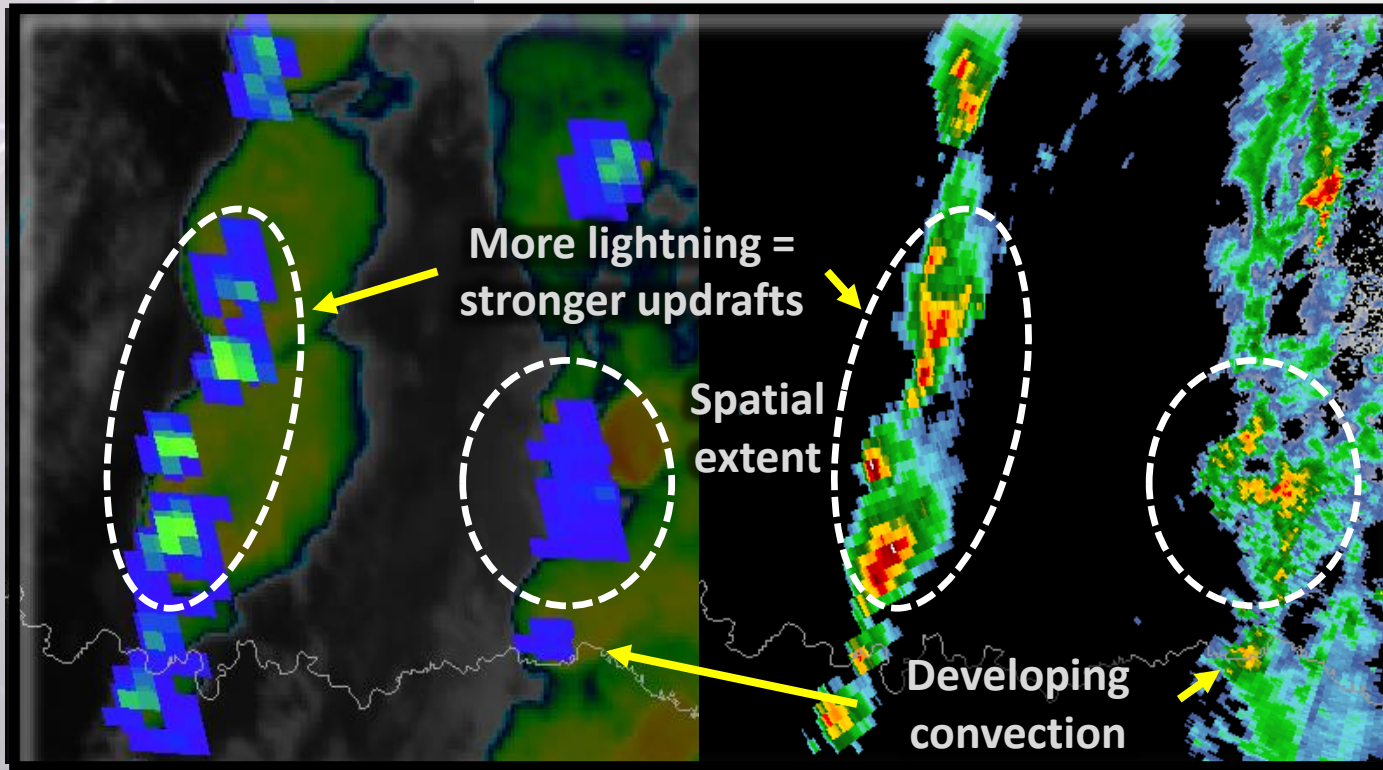
Lightning 10s of km from updraft

Maximum of lightning coincident with updraft

- Total lightning = cloud-to-ground **and** intra-cloud
- Physical reasoning for total lightning
  - Charging occurs in mixed phase region
  - Larger, stronger updrafts = more total lightning
- Advantages
  - Intra-cloud often precedes first cloud-to-ground
  - Total lightning proxy for storm strength
  - Monitor convective development / weakening
  - Observe the spatial extent
- Early training matches GLM to forecaster conceptual model
  - Builds trust in GLM, particularly for data sparse areas



# GLM Capabilities: Monitor Convection



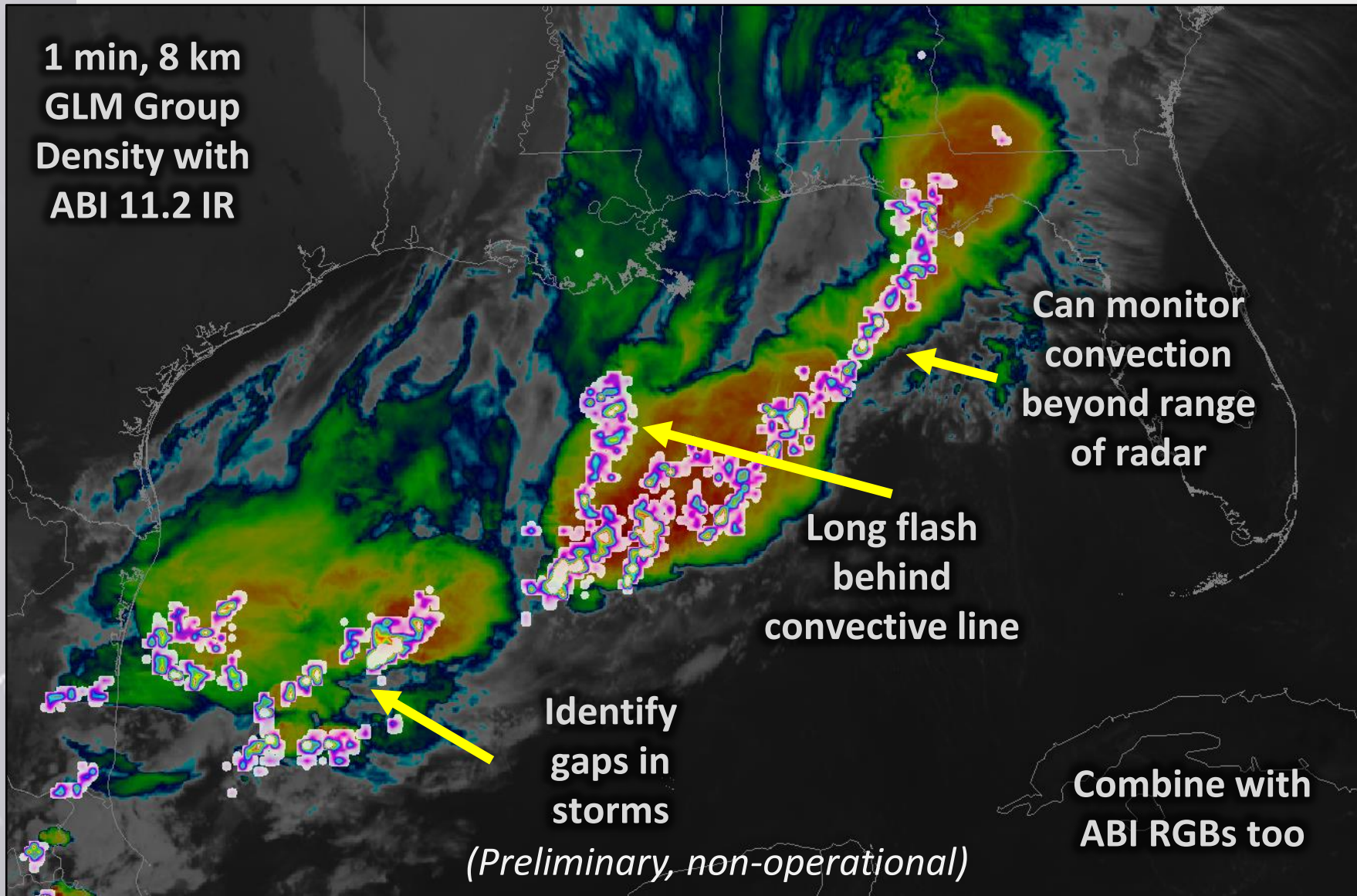
*Example of GLM flash extent density overlaid on 10.3 micron ABI IR (left) compared to radar reflectivity (right)*

- Identify spatial extent of lightning
  - Can extend well into the stratiform region
  - Signify possible updates to convective SIGMETs?
- Monitor convective updrafts
  - Train in regions with radar to earn trust
  - Use GLM alone in data sparse regions
  - Identify convective / non-convective
  - Monitor development



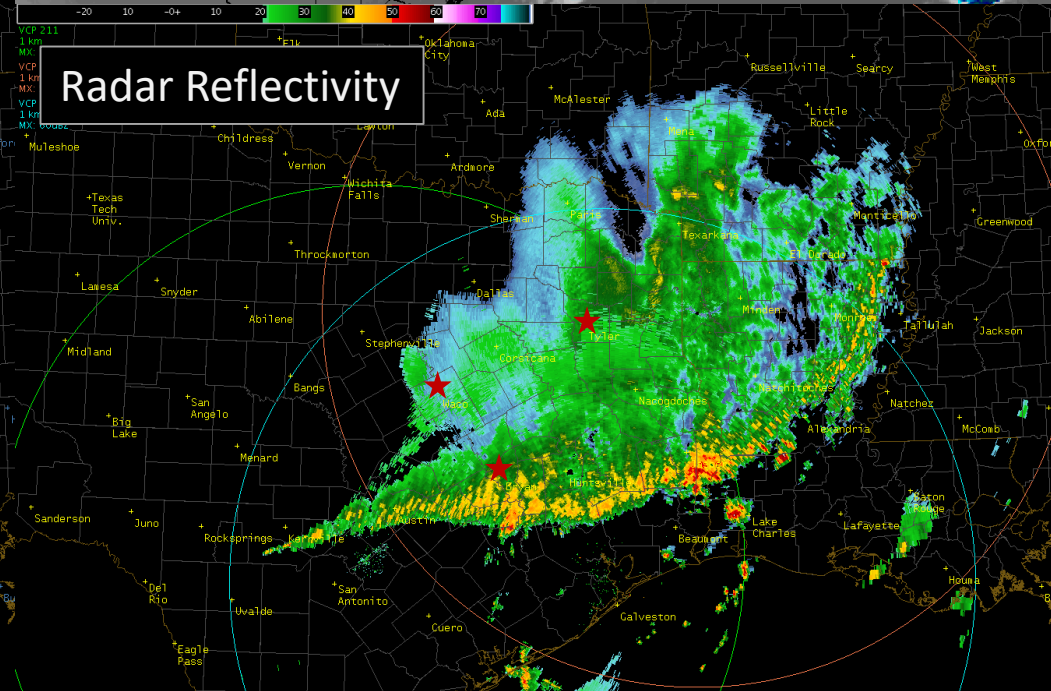
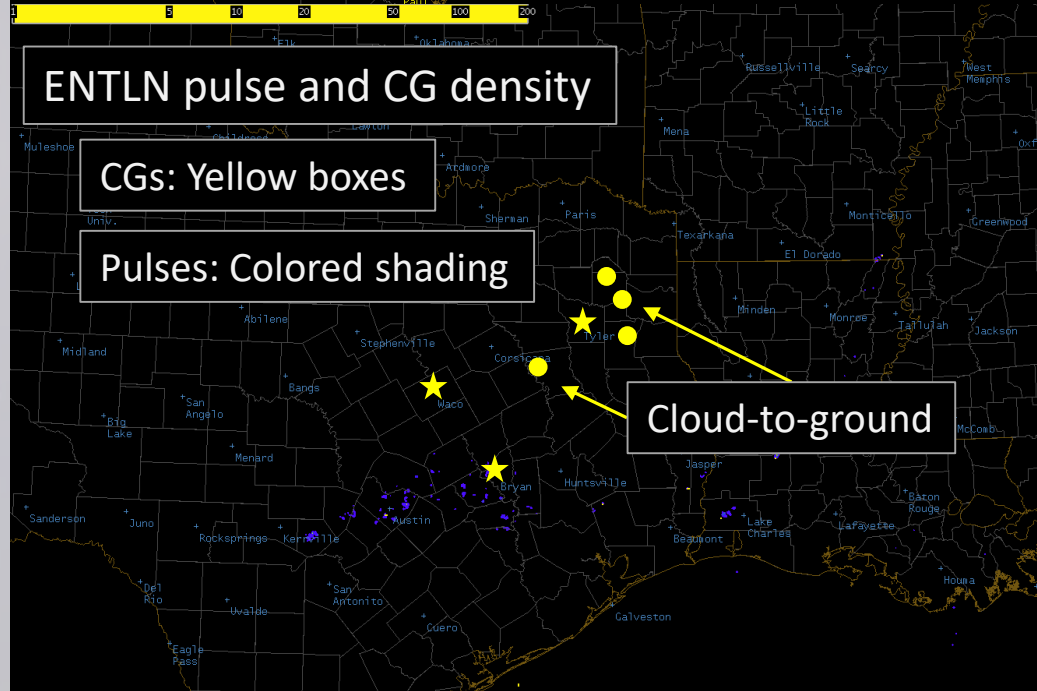
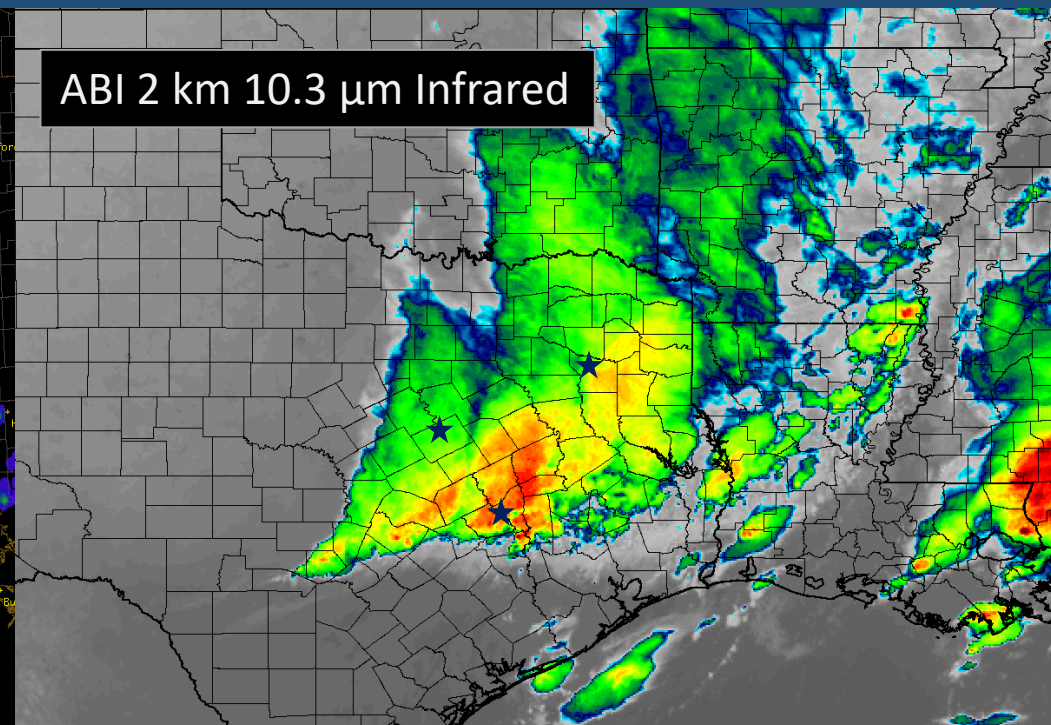
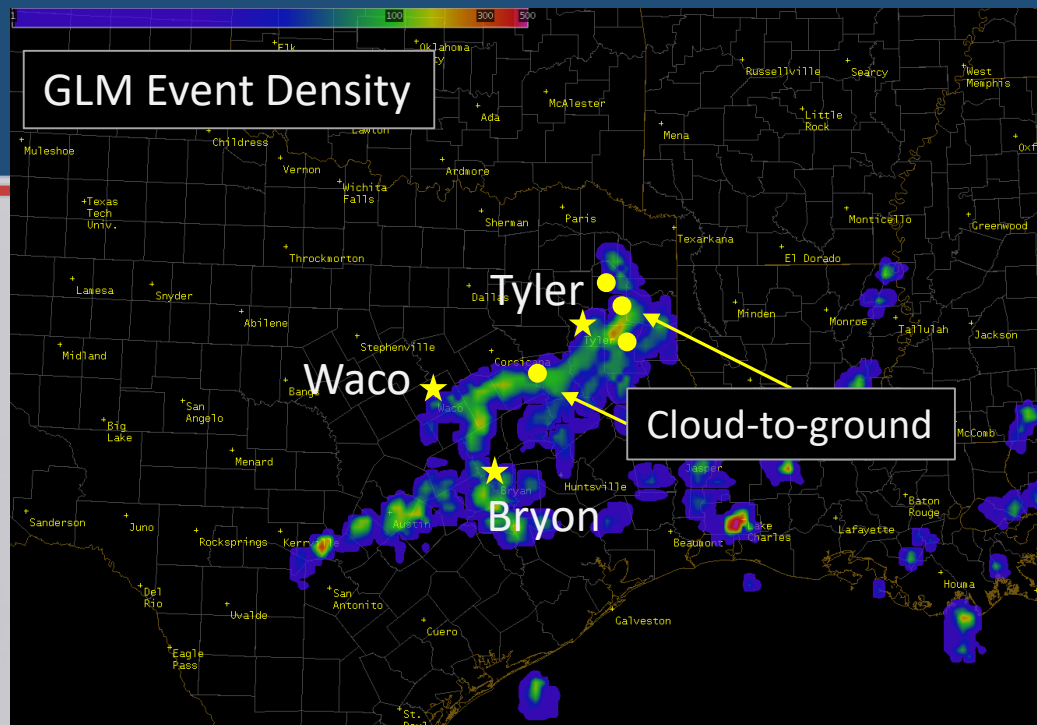
# Data Sparse Region (Gulf of Mexico)

1 min, 8 km  
GLM Group  
Density with  
ABI 11.2 IR



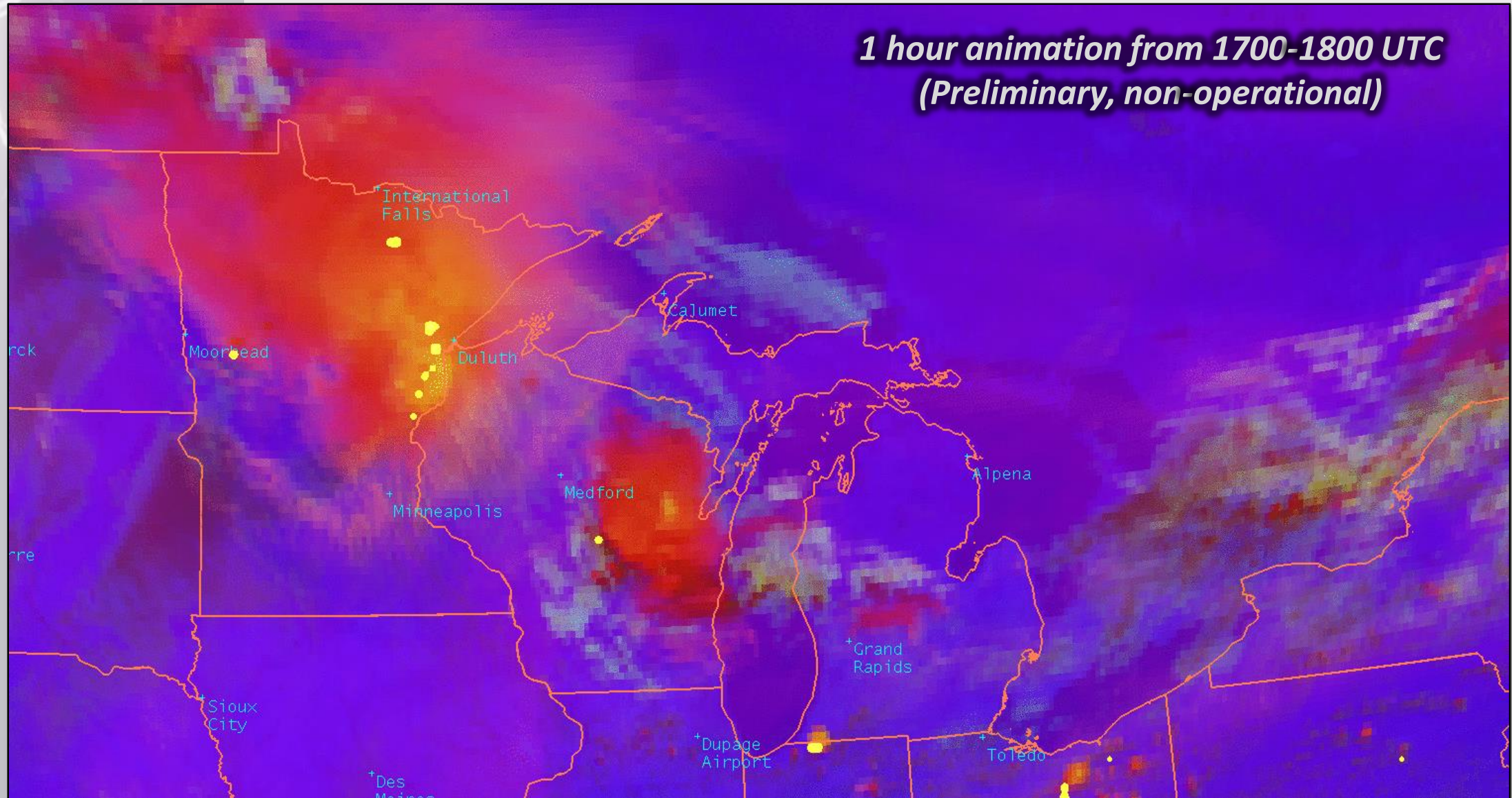
# Lightning Safety

- Flash extended 100+ miles
- GLM “connects the dots” – Earth Networks individual obs part of 1 contiguous flash

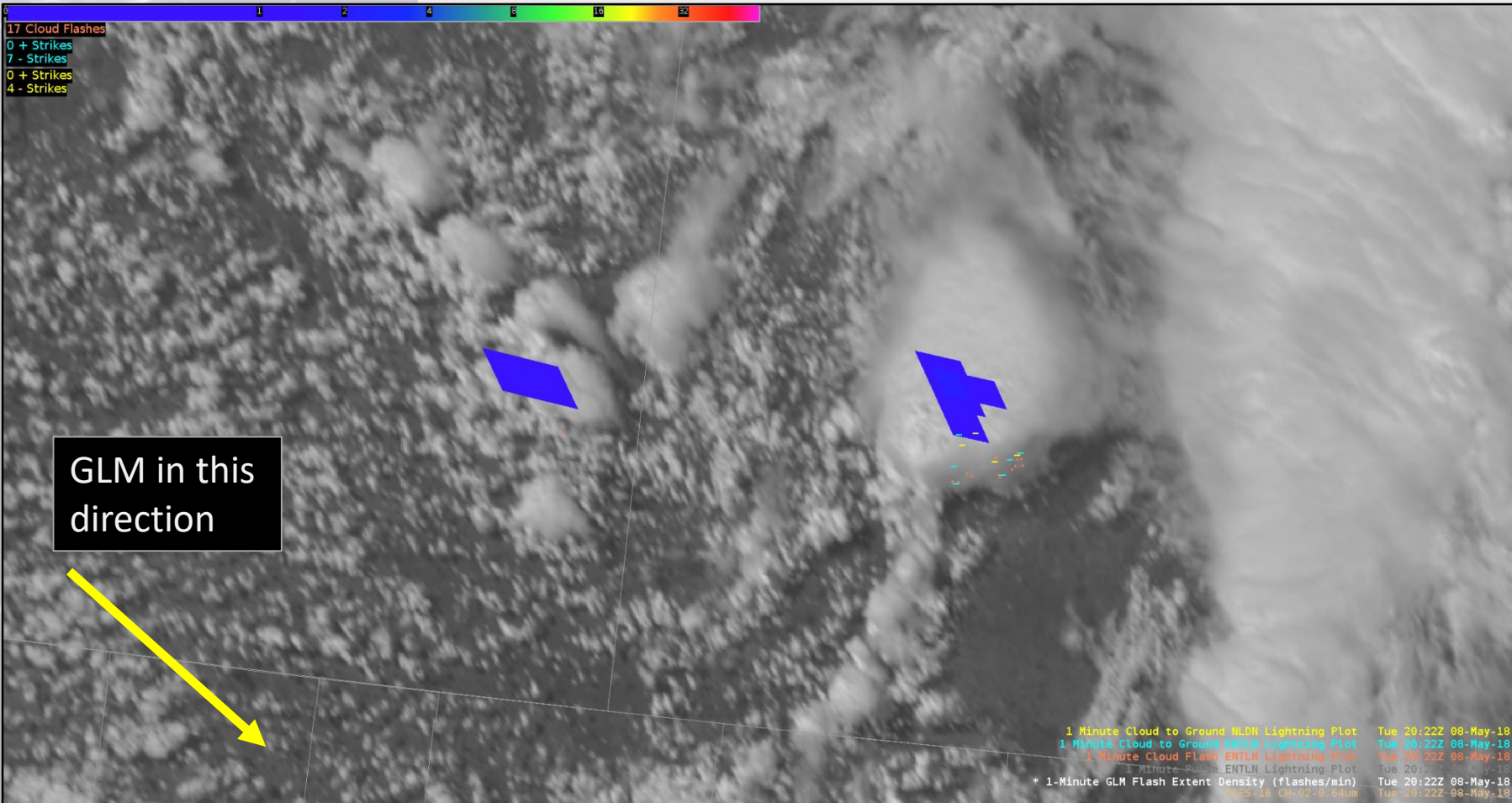




# Long Flash Example Animation (Lightning Safety)



# Dealing with Parallax

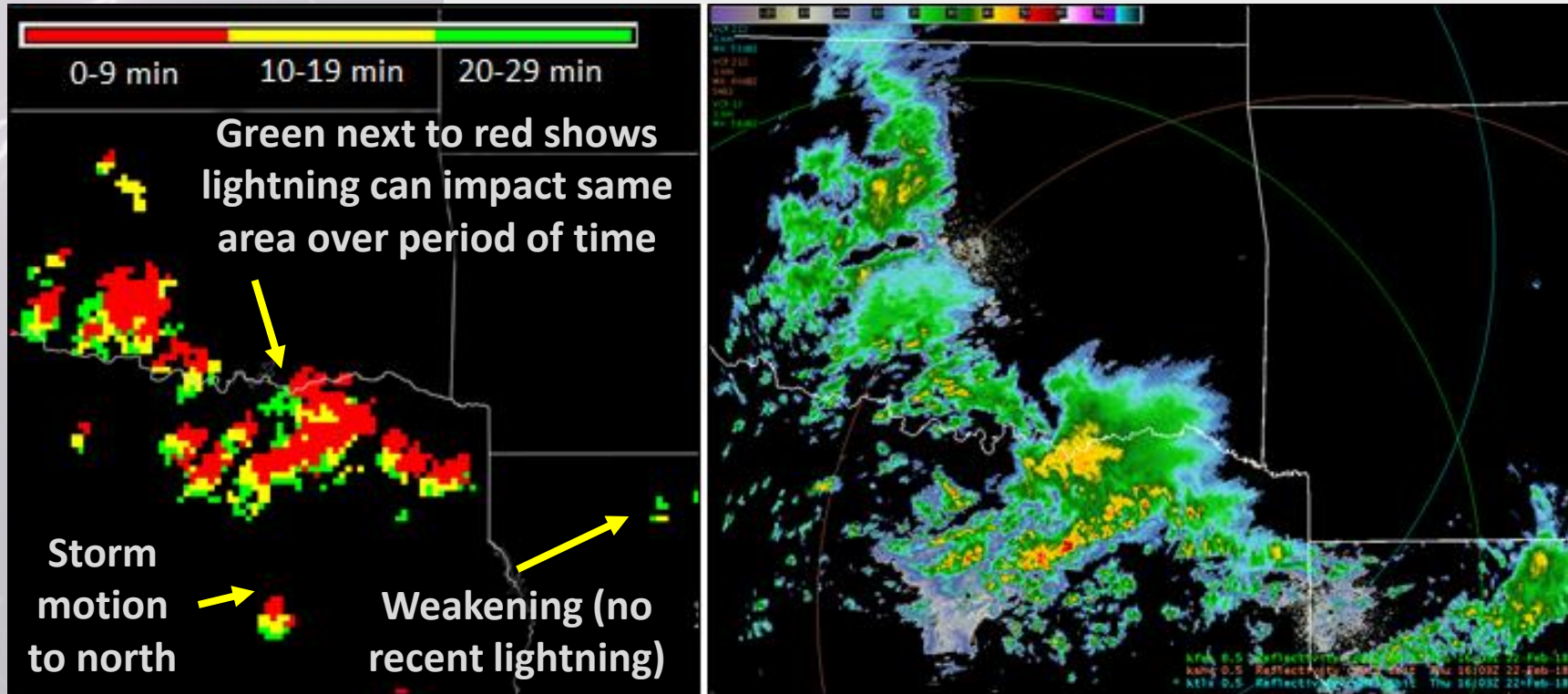


Will need to note the difference over Ontario and Nova Scotia

*One minute GLM observations with NLDN and Earth Networks over southeast Alberta and southwest Saskatchewan*



# GLM Capabilities: The “stoplight” product

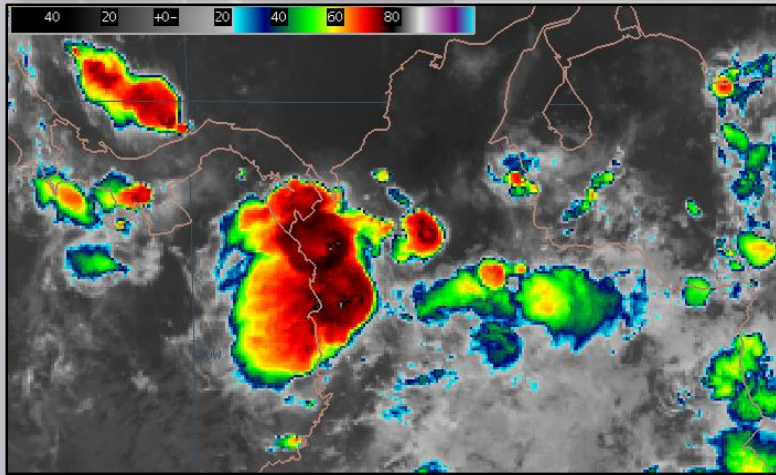
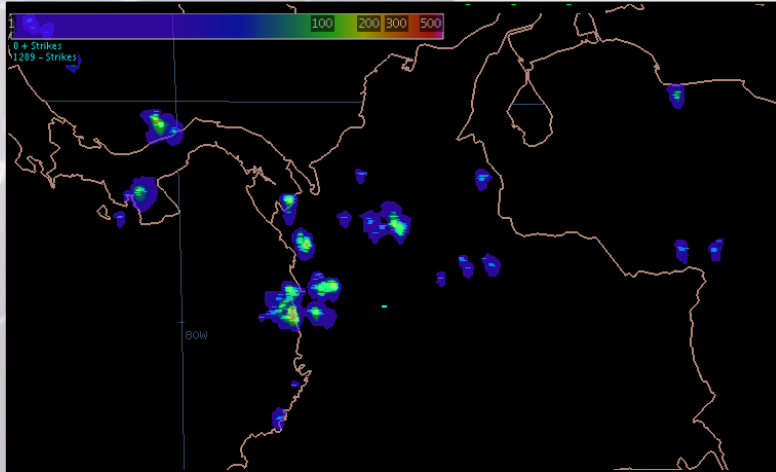


Example of the GLM stoplight product (left) with radar reflectivity covering 30 minutes from 1743-1813 UTC on 7 March 2018.

- New SPoRT ability
- Collaboration with local emergency managers
- Based on 30 min rule
- Show location and age of lightning obs in a single image
  - 0-9 min (red)
  - 10-19 min (yellow)
  - 20-29 min (green)
- Early reviews suggest not using green (may suggest safe)

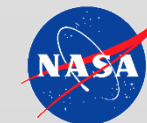


# Future Activities / Acknowledgements



- Continue developing Proving Ground training
- Conduct GLM assessment (Summer 2018)
- Conduct assessment with local emergency managers
- Collaborate on GLM uses with aviation partners
- Develop GLM applications library examples (from forecasters!)
- New visualizations (GLM stoplight)
- Investigate using optical energy observations
- Many thanks to the GOES-R Proving Ground for funding

*GLM event density with flash centroid points (top) with ABI 11.2 micron IR (bottom) (Preliminary, non-operational)*



# Questions?

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NASA SPoRT

<https://weather.msfc.nasa.gov/sport>

NASA SPoRT Blog

<https://nasasport.wordpress.com>

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