



Lightning: A secondary mission for a new bolide sensing instrument

GLM Science Meeting

15 November 2023

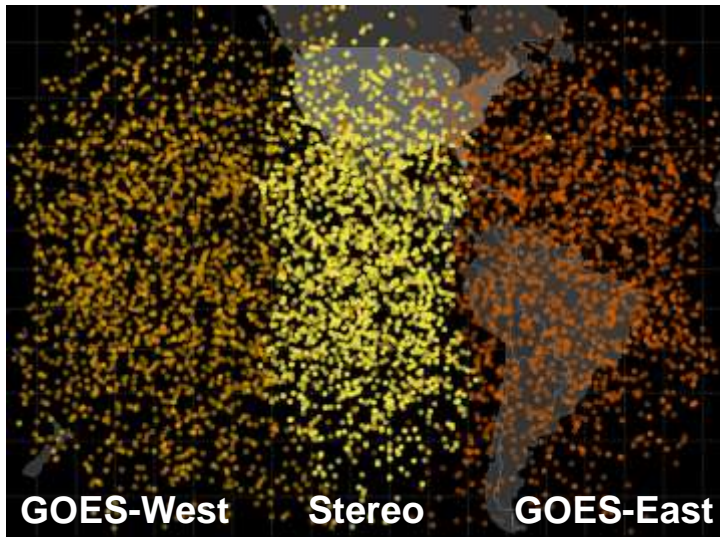
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A secondary mission for a dedicated bolide sensor

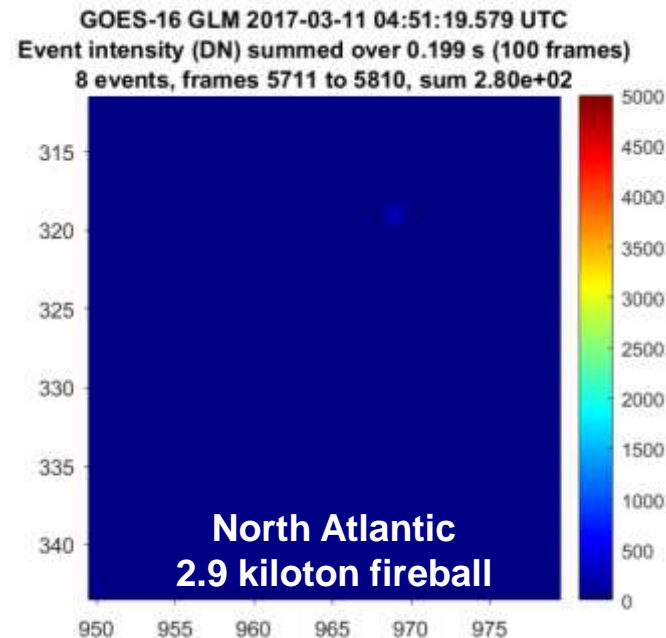
Bolide detection is a secondary mission for the current lightning mappers

~6000 bolides detected by GLM



neo-bolide.ndc.nasa.gov / Public Domain

Problem: large bolides saturate GLM, complicating characterization



Turn the problem upside-down:

Primary mission: Detect and characterize large bolides without saturating

~37 objects 1 meter or larger collide with Earth every year

- Geolocate / triangulate
- Multiple spectral bands

Secondary mission: Detect and characterize lightning

What can a dedicated bolide sensor tell us about lightning?

Introducing GeoBoSS

GeoBoSS = Geostationary Bolide Sensing System

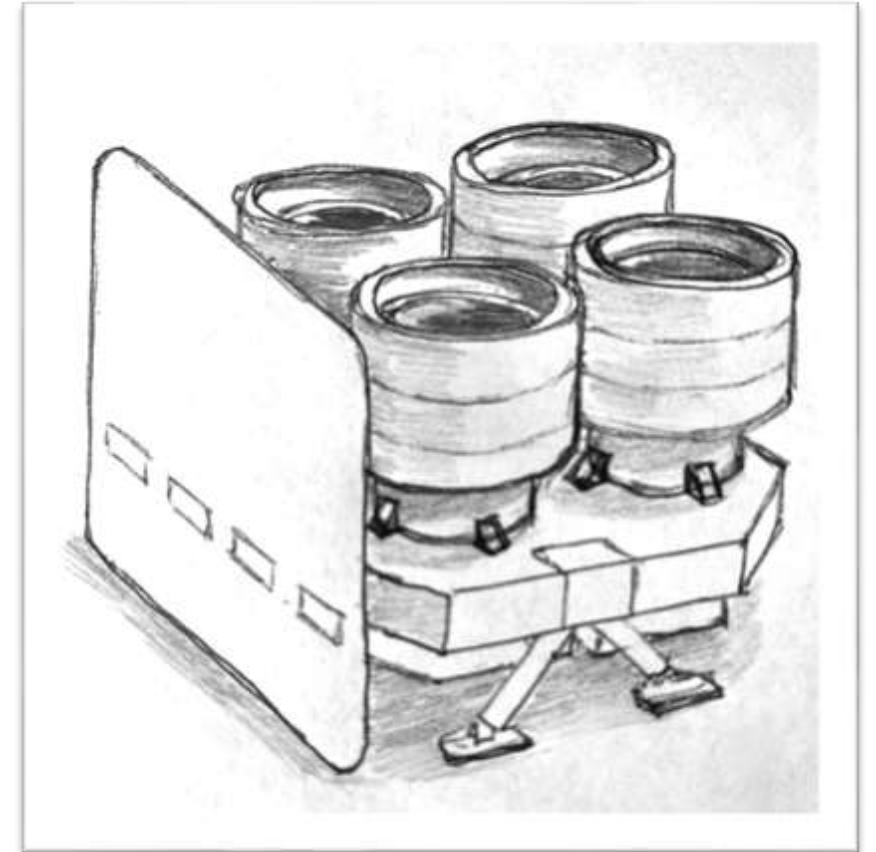
Based on the technologies developed for the Lockheed Martin LMX proposal

4 telescope instrument with 4 different spectral bands

Smaller apertures due to wider spectral bands and desire to detect larger signals (> 1 m bolides)

→ Not as sensitive to lightning

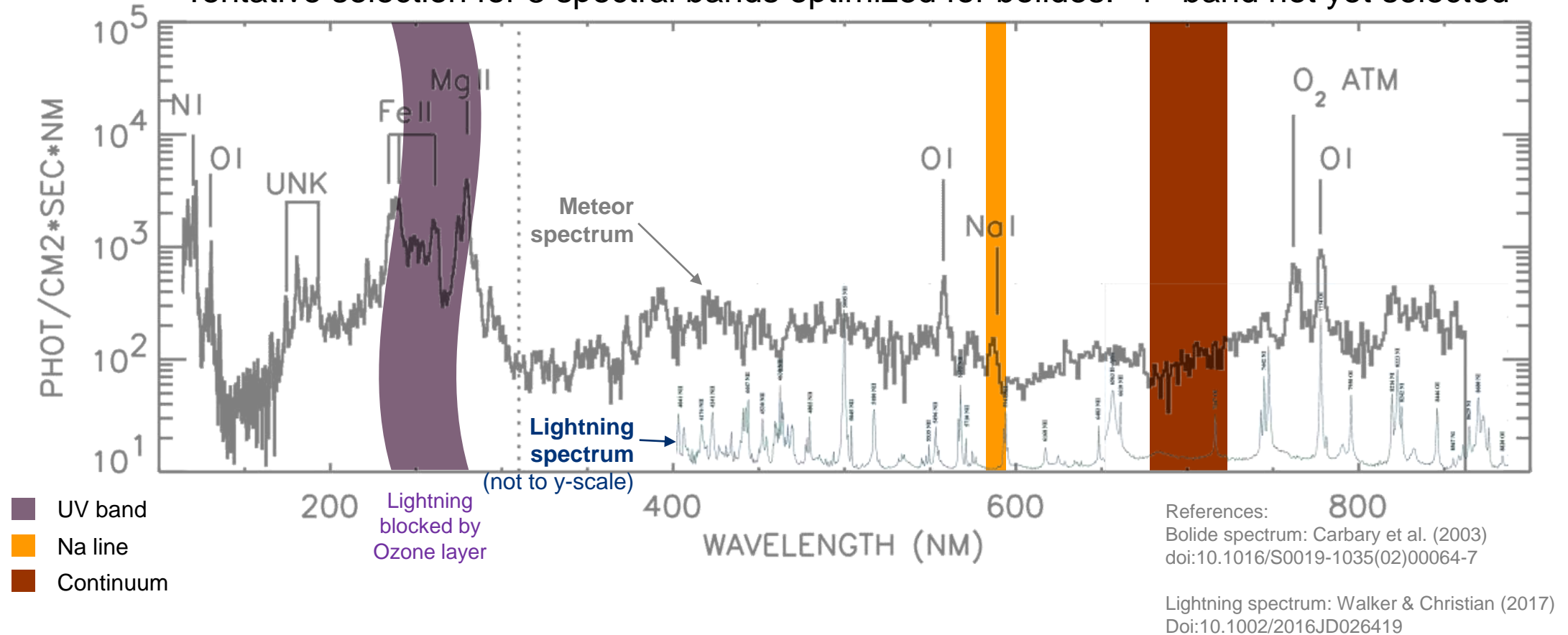
On-board processing hardware and algorithms similar to LMX design



Lightning mapper technology enables GeoBoSS

Spectral: what might lightning look like to GeoBoSS?

Tentative selection for 3 spectral bands optimized for bolides. 4th band not yet selected



GeoBoSS bands can explore areas of the lightning spectrum not usually covered

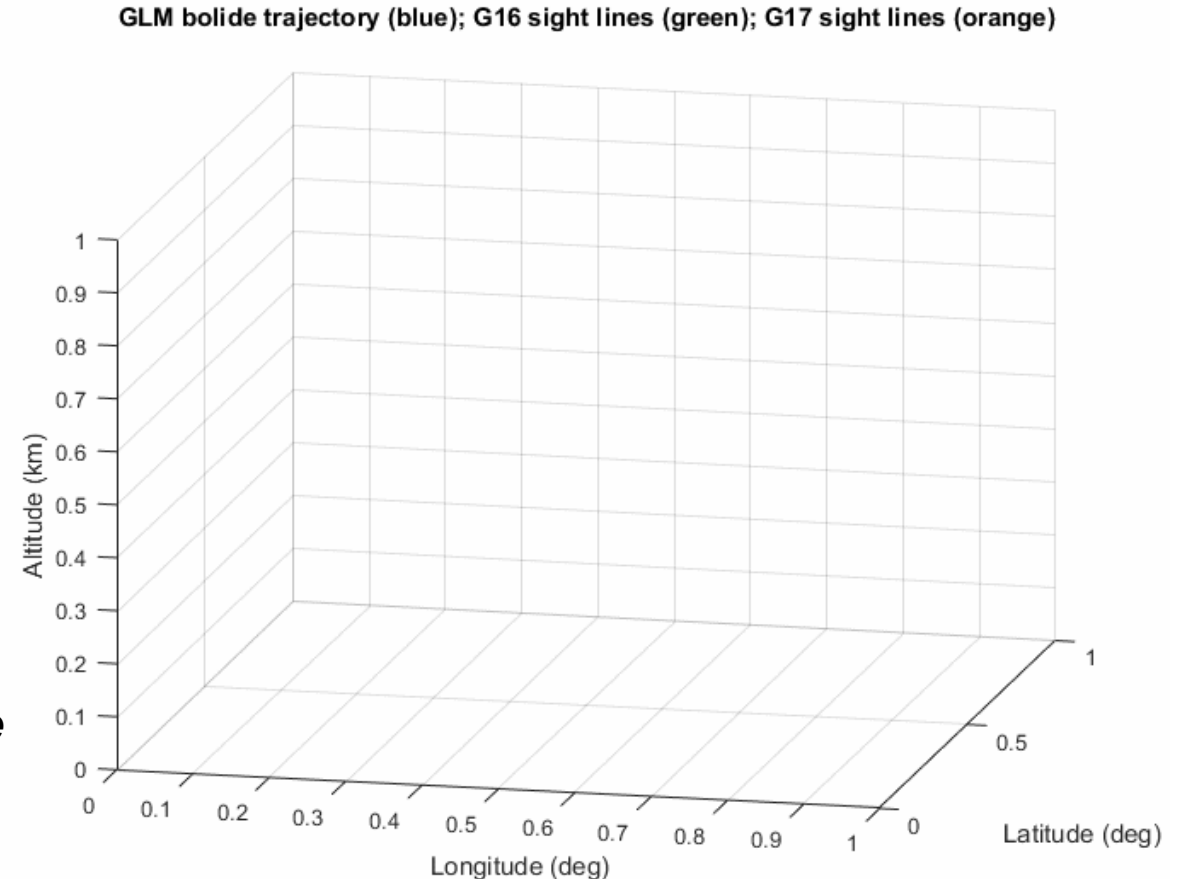
Spatial: triangulating signals with existing lightning mappers

If the FOV of GeoBoSS overlaps with existing lightning mappers, we can triangulate the location and velocity of detected bolides

... and retrieve an orbit

Will also allow us to cross calibrate lightning detected

*Example:
triangulating a bolide
with two GLMs*



Lightning mappers provide stereo augmentation for GeoBoSS

How can GeoBoSS best contribute to lightning science?

GeoBoSS will observe large lightning pulses in unconventional spectral bands

Overlapping with existing lightning mapper coverage gives additional information

Open Question for Discussion:

- **Which bands are the most interesting for learning more about lightning?**

GeoBoSS: the first dedicated space-based bolide sensor

LOCKHEED MARTIN 