EXPLORING THE IMPACT OF GLM FRAME TIME AND PIXEL RESOLUTION ON GROUP AND FLASH DETECTION

Ken Cummins

September 2020

THE UNIVERSITY OF ARIZONA

WHY EXPLORE TEMPORAL AND SPATIAL RESOLUTION ?

Even in performance-matched regions

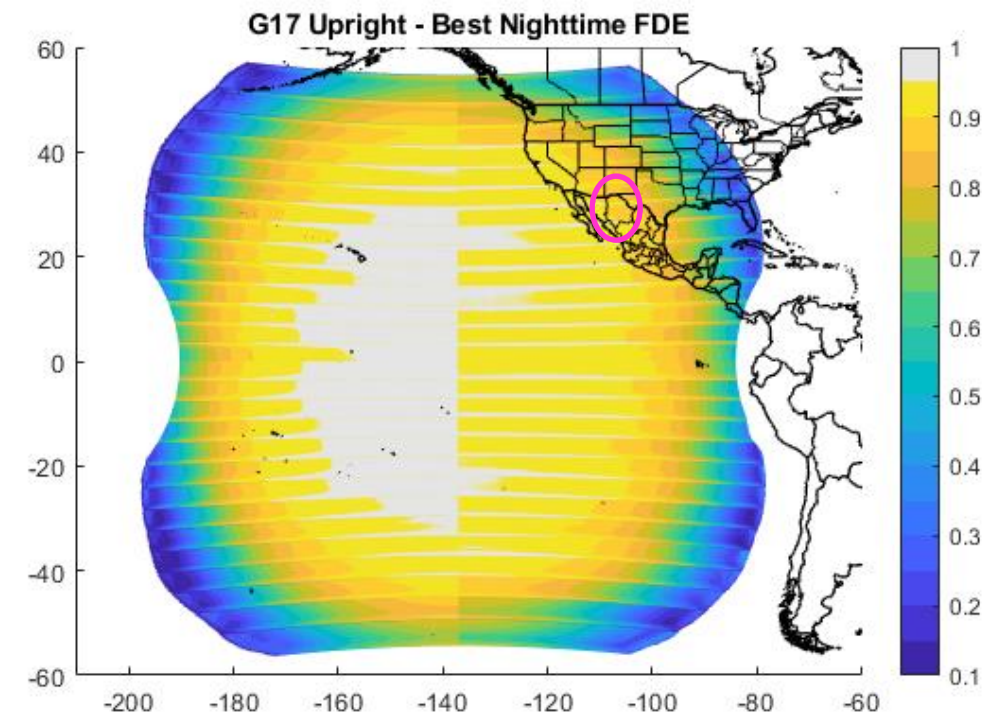
- **G16 and G17 do not always report the same groups and flashes**
- **G16 and G17 do not report all GLD360 CG strokes**

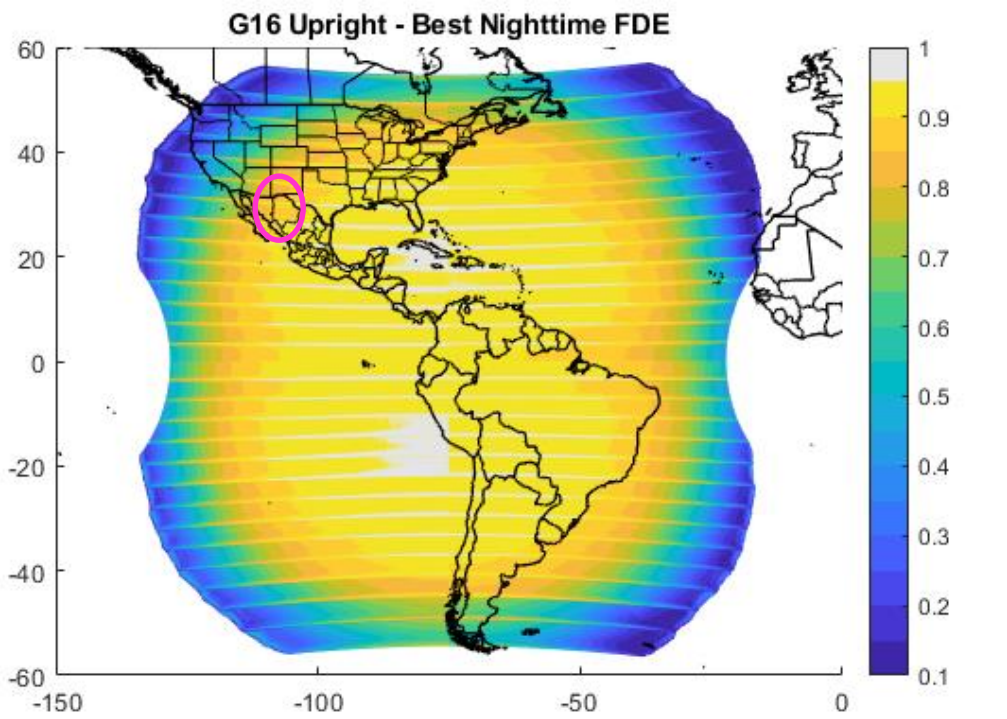
So –

what impact does pixel size and frame rate have on GLM detection?

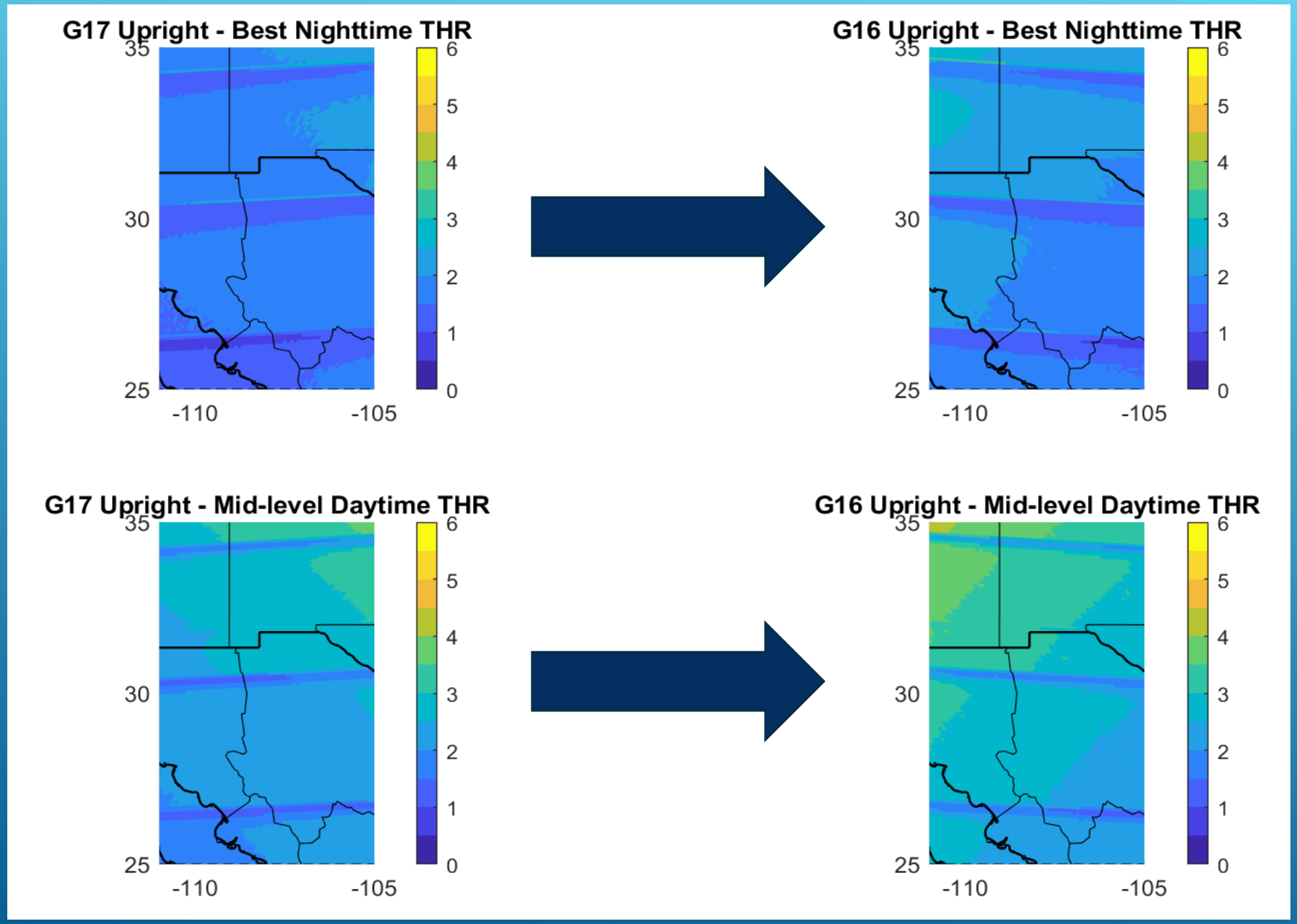
- ***Instrument values (~8 km and 500 fps) were a compromise between performance and technology/cost constraints, validated with LIS***
- ***Thus far, just exploring this (no answers)***

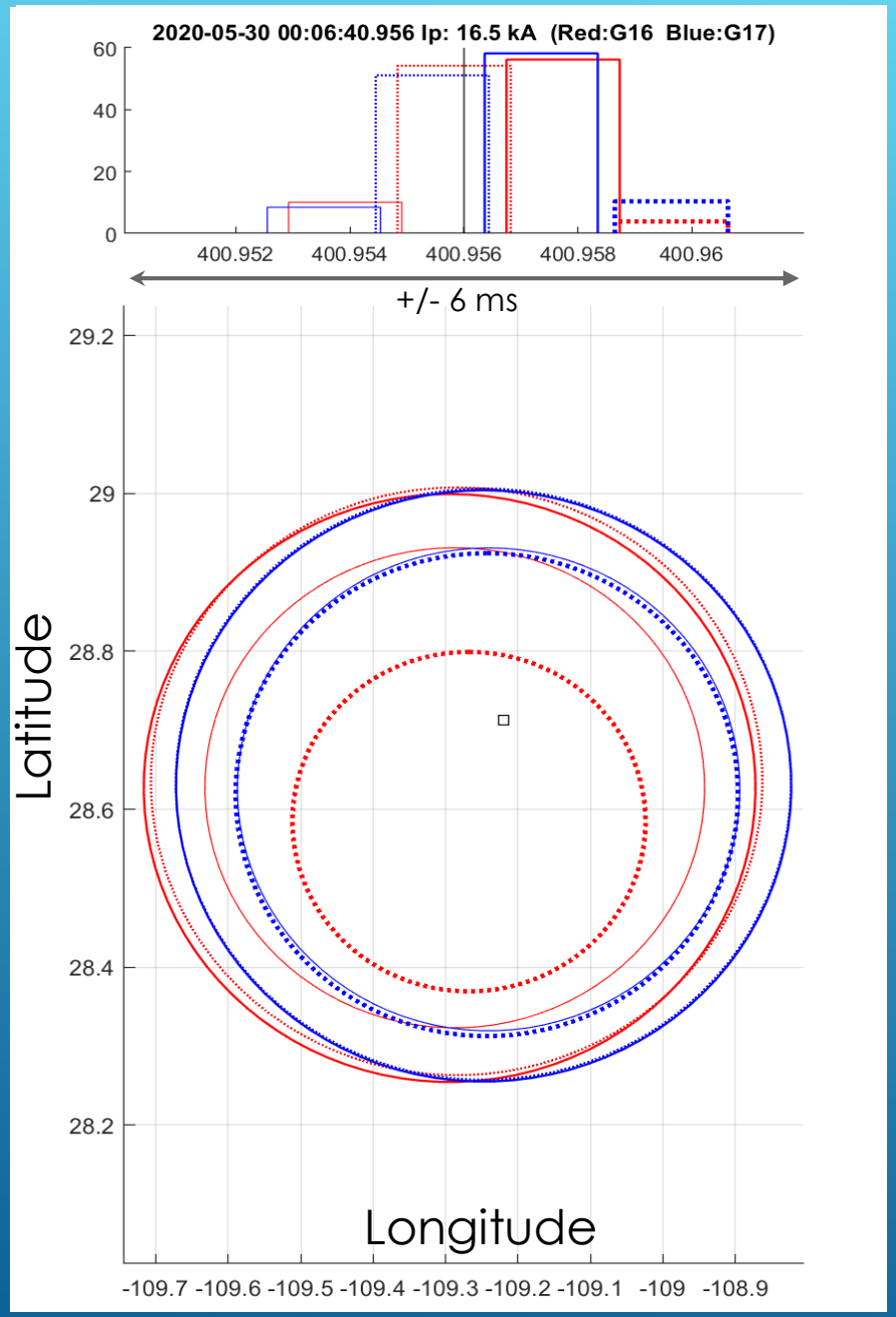
REMEMBER G17 AND G16 FLASH DE ESTIMATES





G16 and G17 Instrument Thresholds: "Best Match" Region

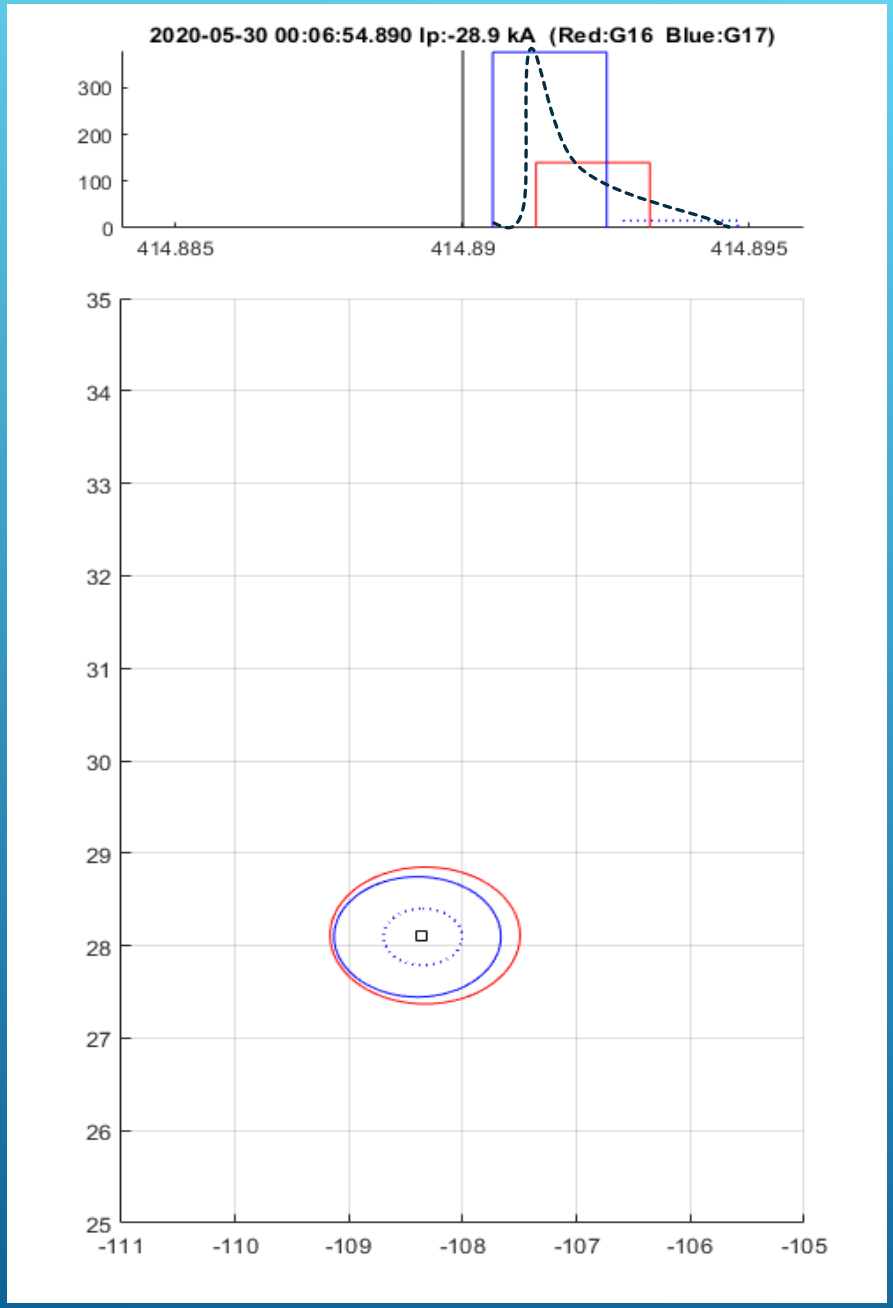




Visualization Approach

Red: G16 **Blue: G17**

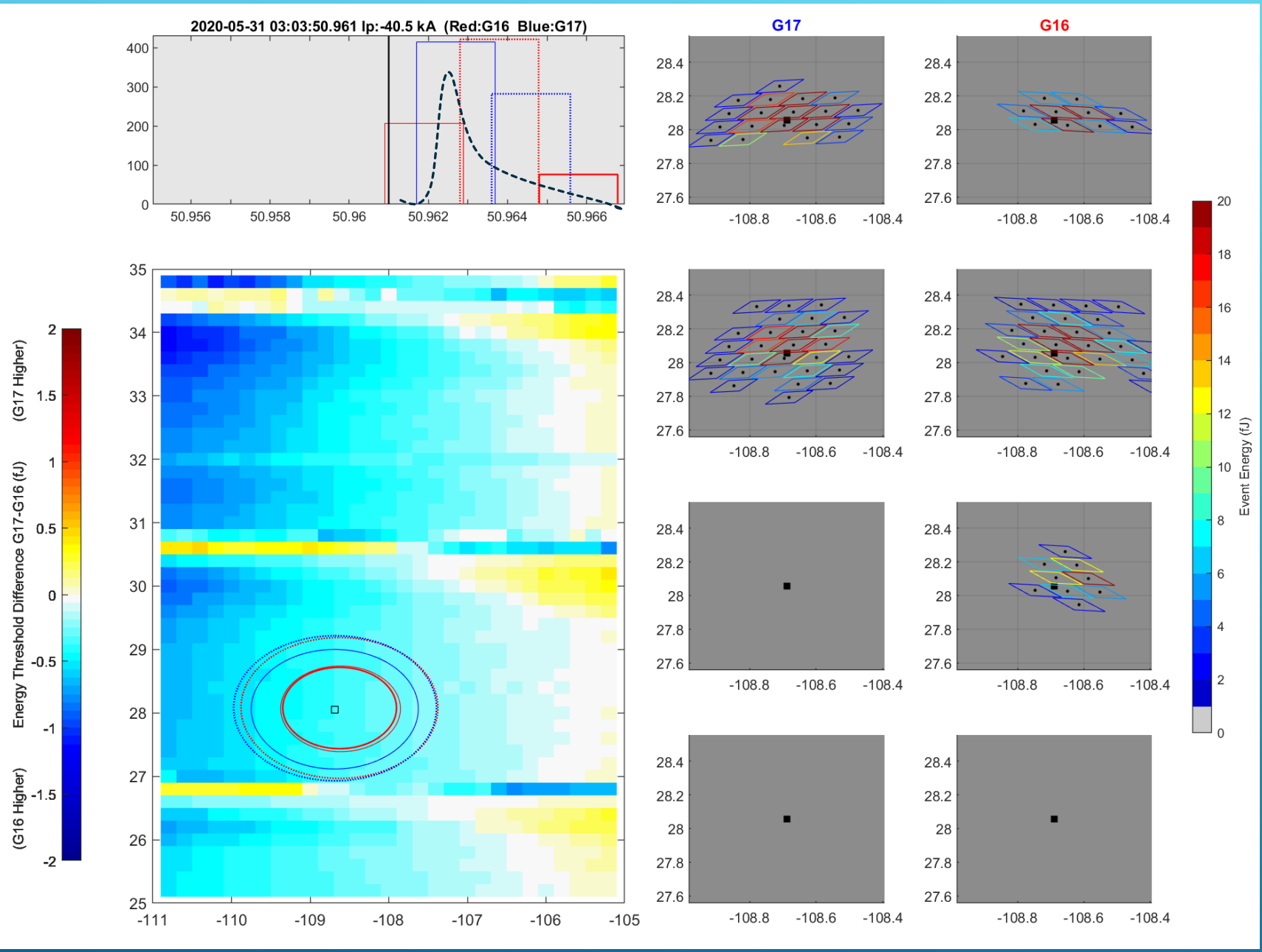
- Top Panel: Time:Energy
  - CG stroke time is central black line
  - ~2 ms frame time
  - G16 and G17 frames are not synchronous
- Lower Panel: Plan View
  - Black square is CG stroke location
  - "circle" Areas represent group area



Optical Pulse Duration

(assuming we can trust frame times)

- Top Panel: Time:Energy
  - Most energy lags stroke by 0.5 ms and is gone by 1.5 ms
  - Very small fraction of energy after ~3 ms
  - G17 missed some of the early light? (east- vs. west-viewing?)
- Lower Panel: Plan View
  - Good spatial correspondence between G16 and G17
  - "late light" is located closest to stroke location



Exploration Tool

- Top Left Panel:
  - Time:Energy
- Lower Left Panel:
  - Plan View
  - Threshold difference "background"
- Right-half Panels:
  - Events for each group
  - Color-coded by energy

NEXT STEPS

- Explore/confirm absolute frame time accuracy
- Relate stroke location to pixel splitting
- Deduce light-source size, temporal “shape”, and duration for millions of selected reports
- Explore impact of viewing angle for perfect time matches (to-west and to-east)
- Extend detection modeling based on these sources and pixel splitting