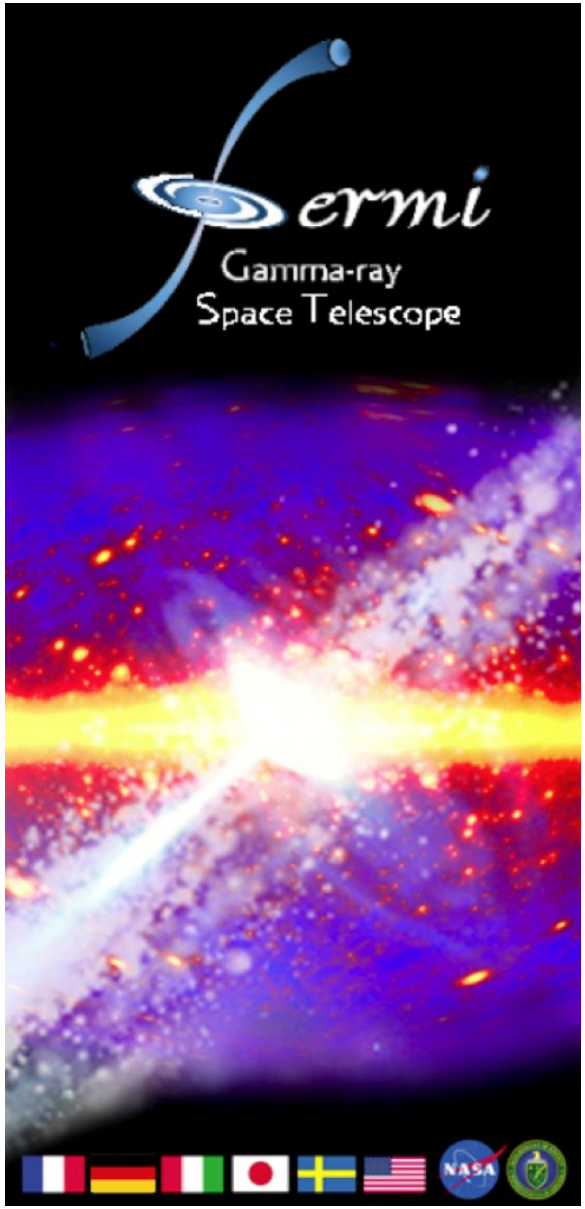


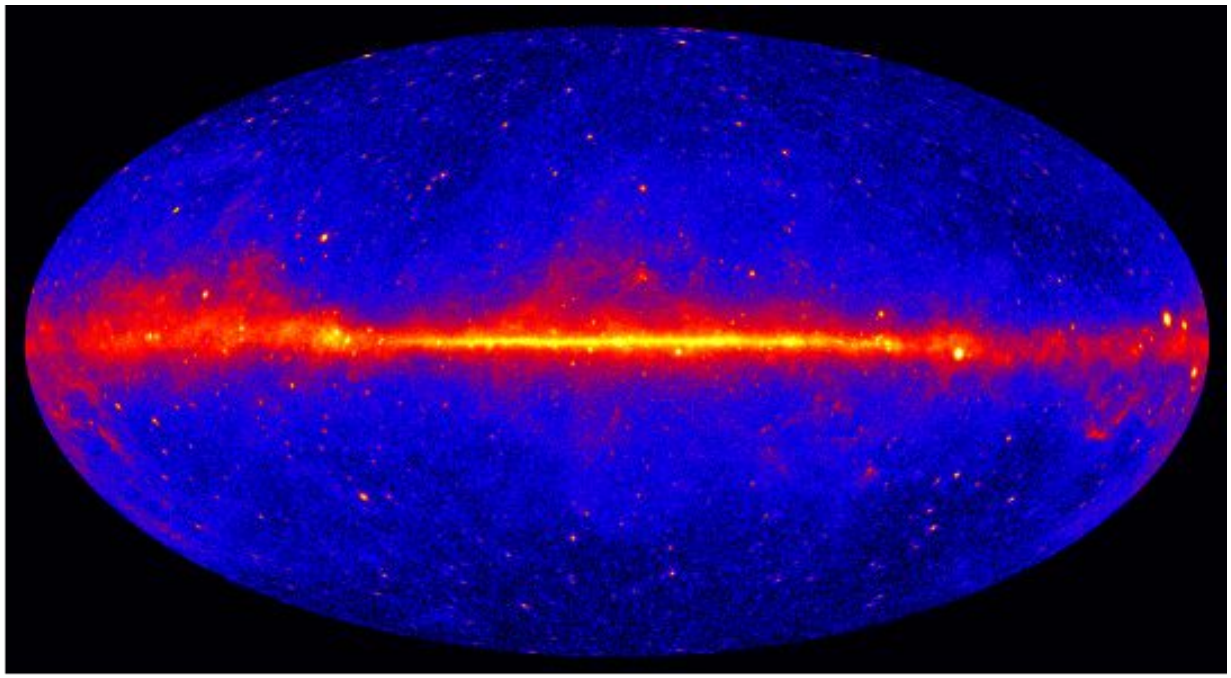
Fermi Gamma-Ray Telescope

Fermi's Survey Strategy

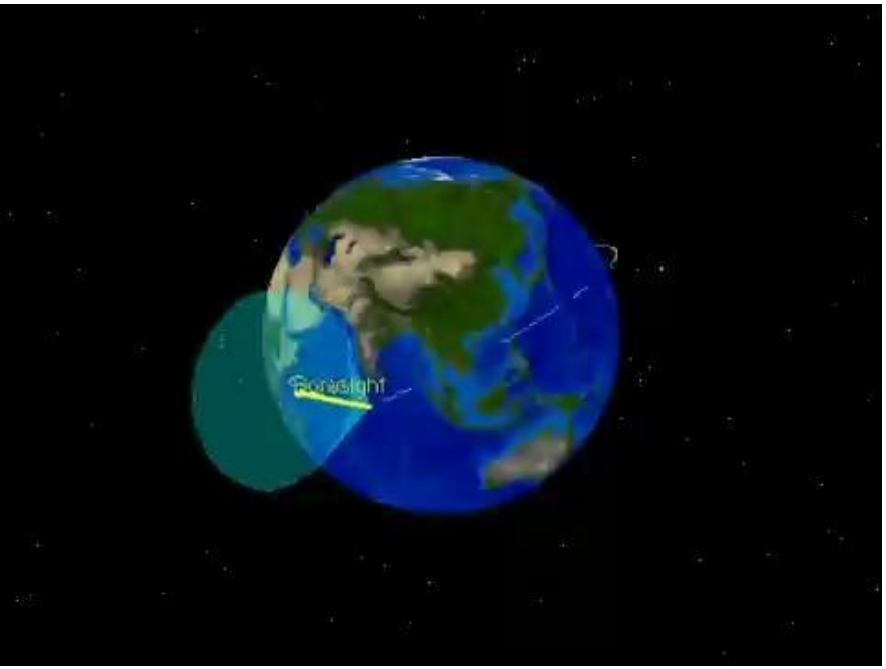
Joe Eggen
FSSC

Background Info

- Fermi orbits the Earth every ~90 minutes
- GBM sees the entire sky not occluded by the Earth
- LAT FoV is 2.4sr *or* ~20% of the sky
- Fermi can *rock* on alternating orbits to observe the whole sky every 3 hours…



The (LAT) All-Sky Survey



All-Sky Survey

- Utilized for vast majority of obs. time
- ±50° Rocking (alternates every orbit)
- LAT surveys the entire sky every 2 orbits
- GBM surveys sky every orbit

Targets of Opportunity (ToO)

- “Point” telescope at specific target
- Utilized much less often

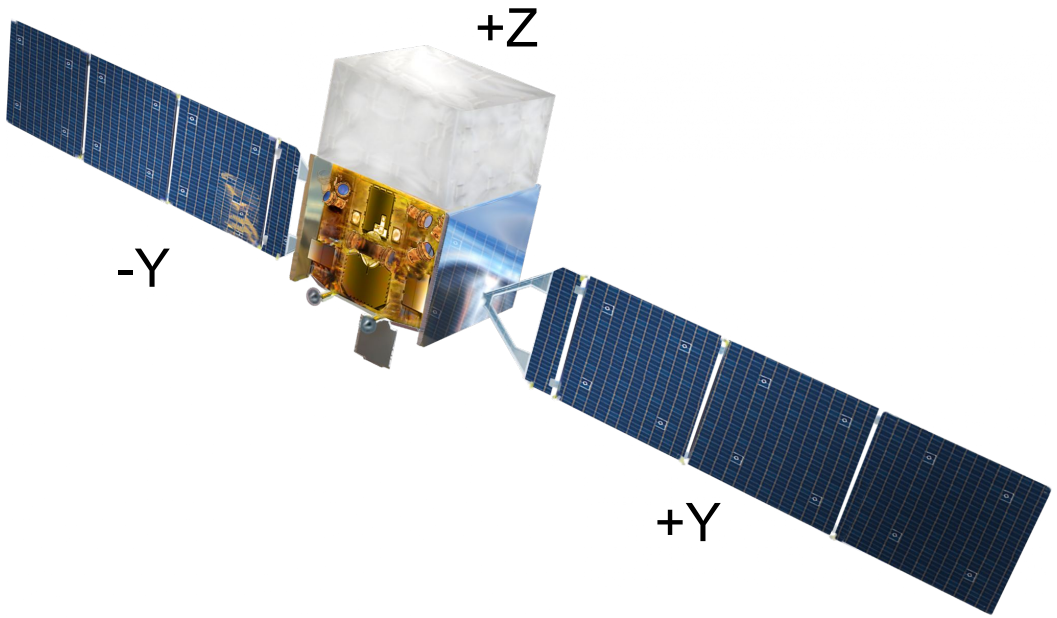
Automatic Autonomous Repoints (ARRs)

- Similar to ToOs, but… automatic

The 2018 -Y SADA Anomaly

Uh oh…

- **When**: March 16, 2018
- **What**: -Y SADA (Solar Array Drive Assembly) stopped moving
- **Why**: Good question!



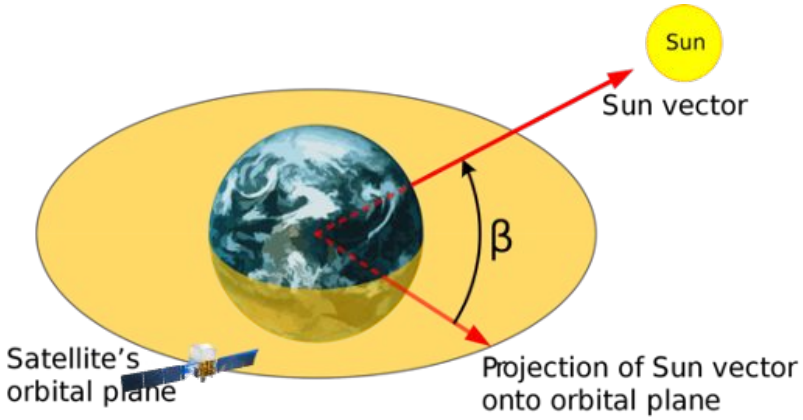
Current Status

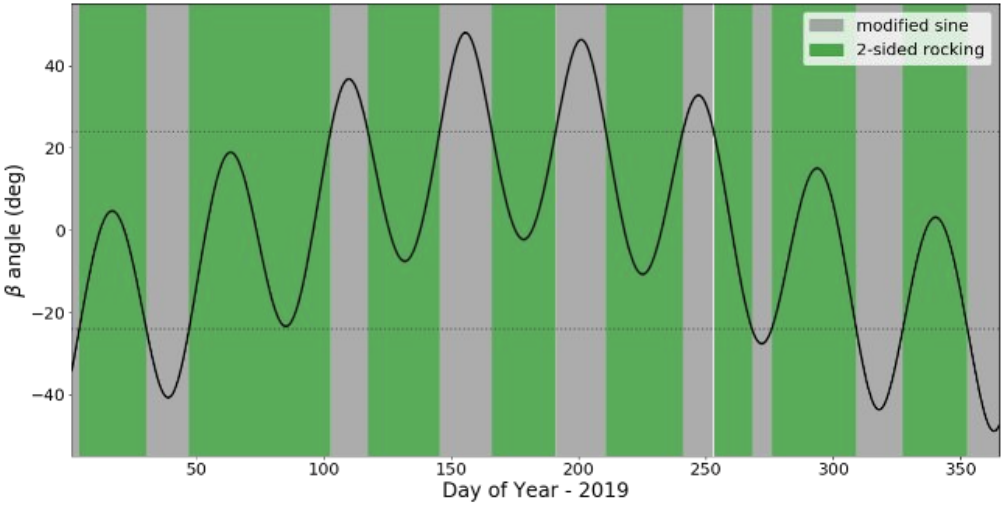
- -Y panel stuck at -17.5
- +Y still free to move
- Science instruments unaffected

Consequences

- No more ToOs
- No more ARRs
- ±50° Rocking survey no longer viable at high β angle

Post-Anomaly Considerations





It's all about the β angle

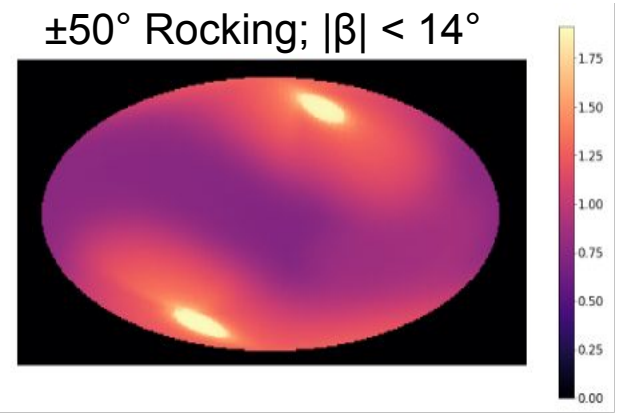
- Need power from both solar arrays to run spacecraft & instruments
- Max angle between Sun and -Y array changes with β
- When beta is "high" (|β| > 24°), 2-sided rocking no longer feasible

Some good news!

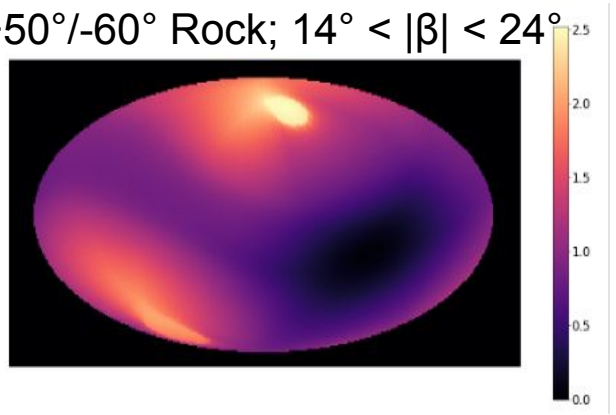
- -Y array stuck at -17.5° (not bad)
- Power generation capability is somewhat over-engineered

Life Post-Anomaly

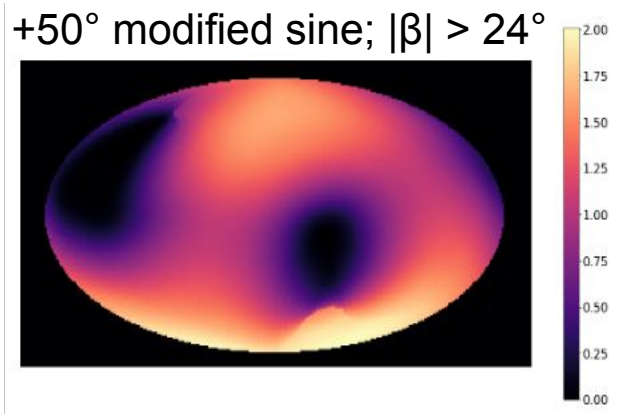
±50° Rocking; |β| < 14°



+50°/-60° Rock; 14° < |β| < 24°

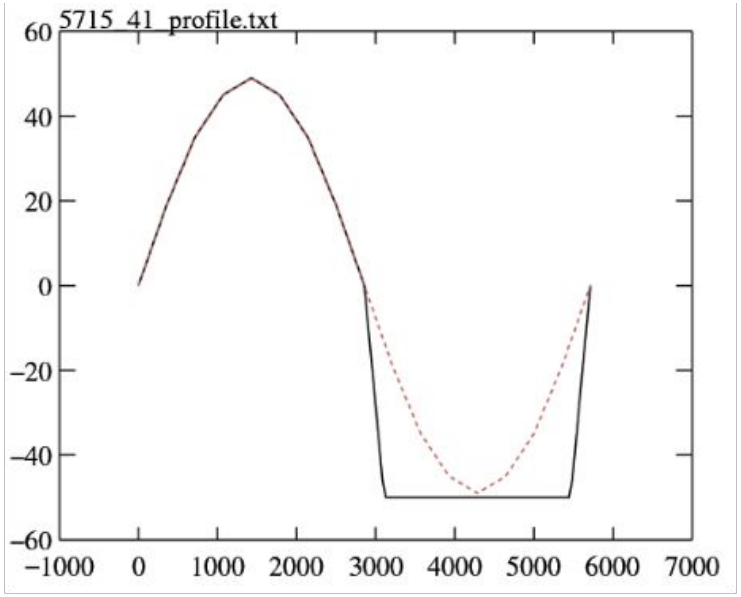


+50° modified sine; |β| > 24°



Fermi currently employs 3 rocking profiles, each used during a different range of the beta cycle (see above)

- +50°/-50° “symmetric” profile
  - Whole sky in 2 orbits
  - most-even sky coverage
- +50°/-60° “asymmetric” profile
  - Whole sky in 2 orbits
- +50° “modified sine” profile
  - 81% of sky covered
  - active 34% of the year
- ToO observations & ARRs no longer performed



Sky Survey & You: Some Considerations

- Fermi does not “stare” at a single source for a set length of time
- Source statistics improve steadily over time
- User has freedom to “cut” the data in a variety of ways
- Observations taken since March 2018 **may** have limited exposure
  - Mostly affects sources on the ecliptic
  - Longer integration times reduce impact