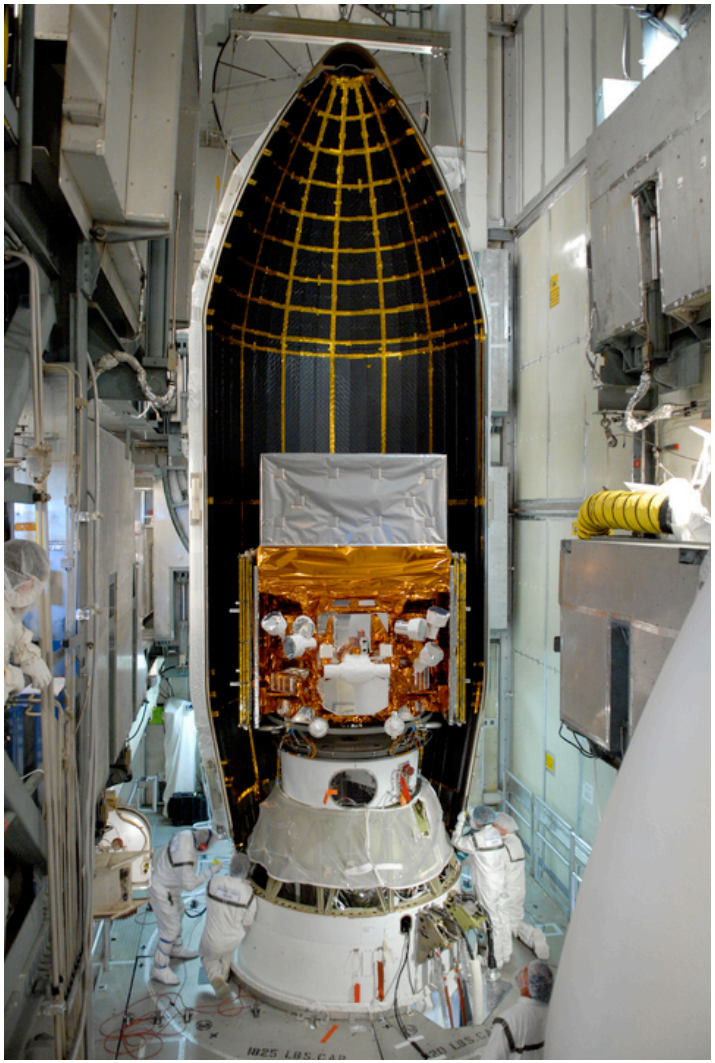
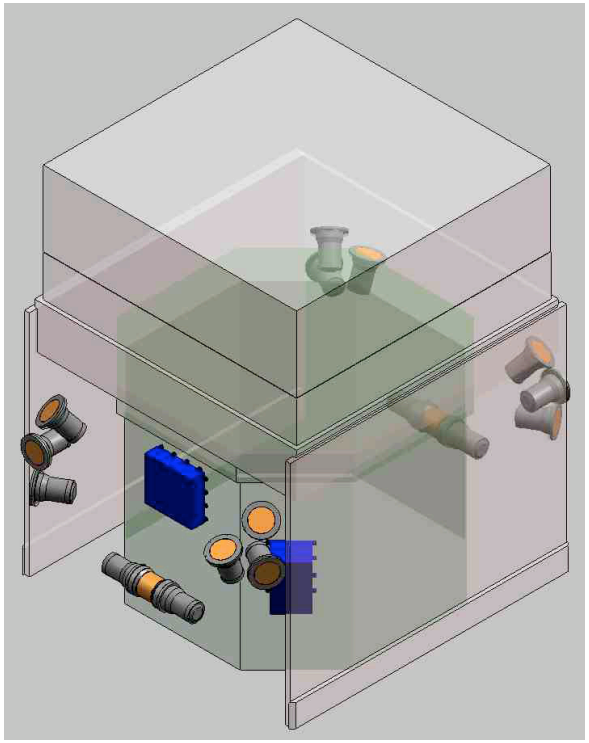
GAMMA-RAY BURST MONITOR

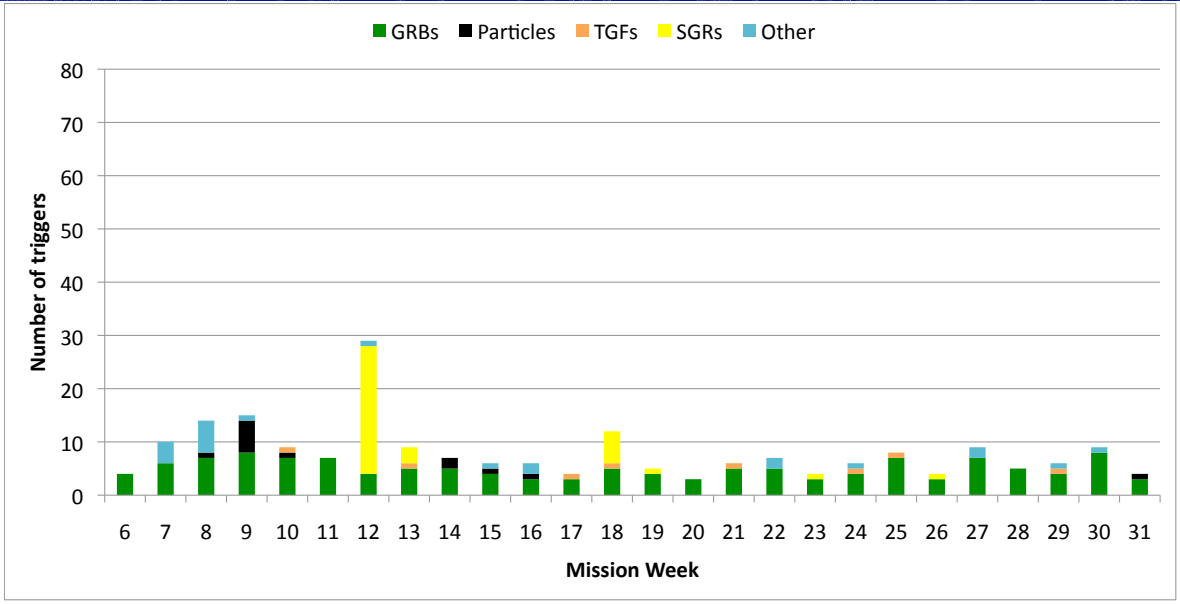


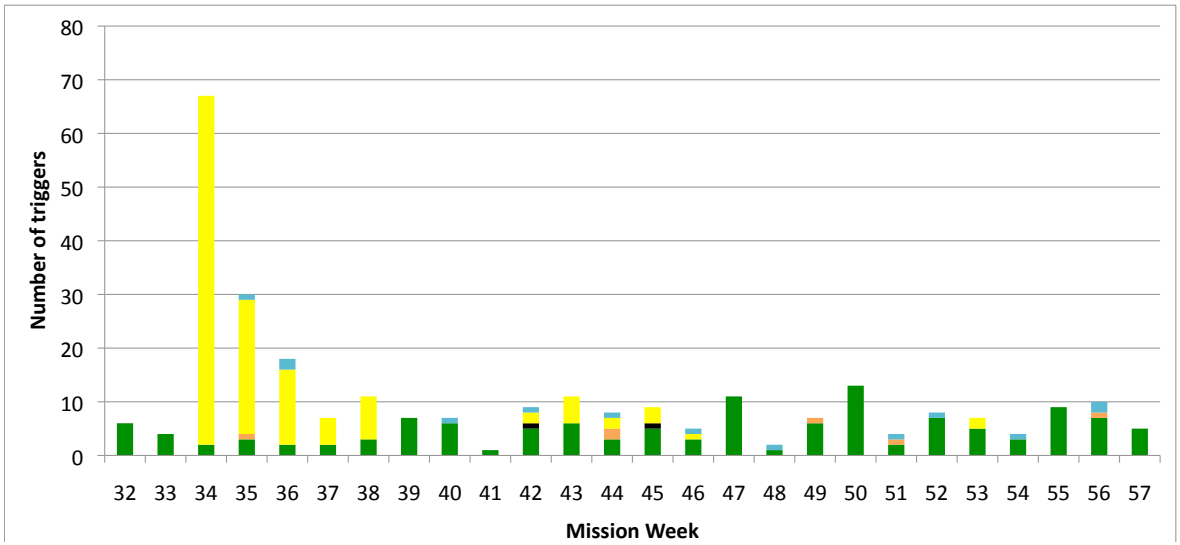
Status, Results, Plans

Bill Paciesas



GBM Triggers – First Year History

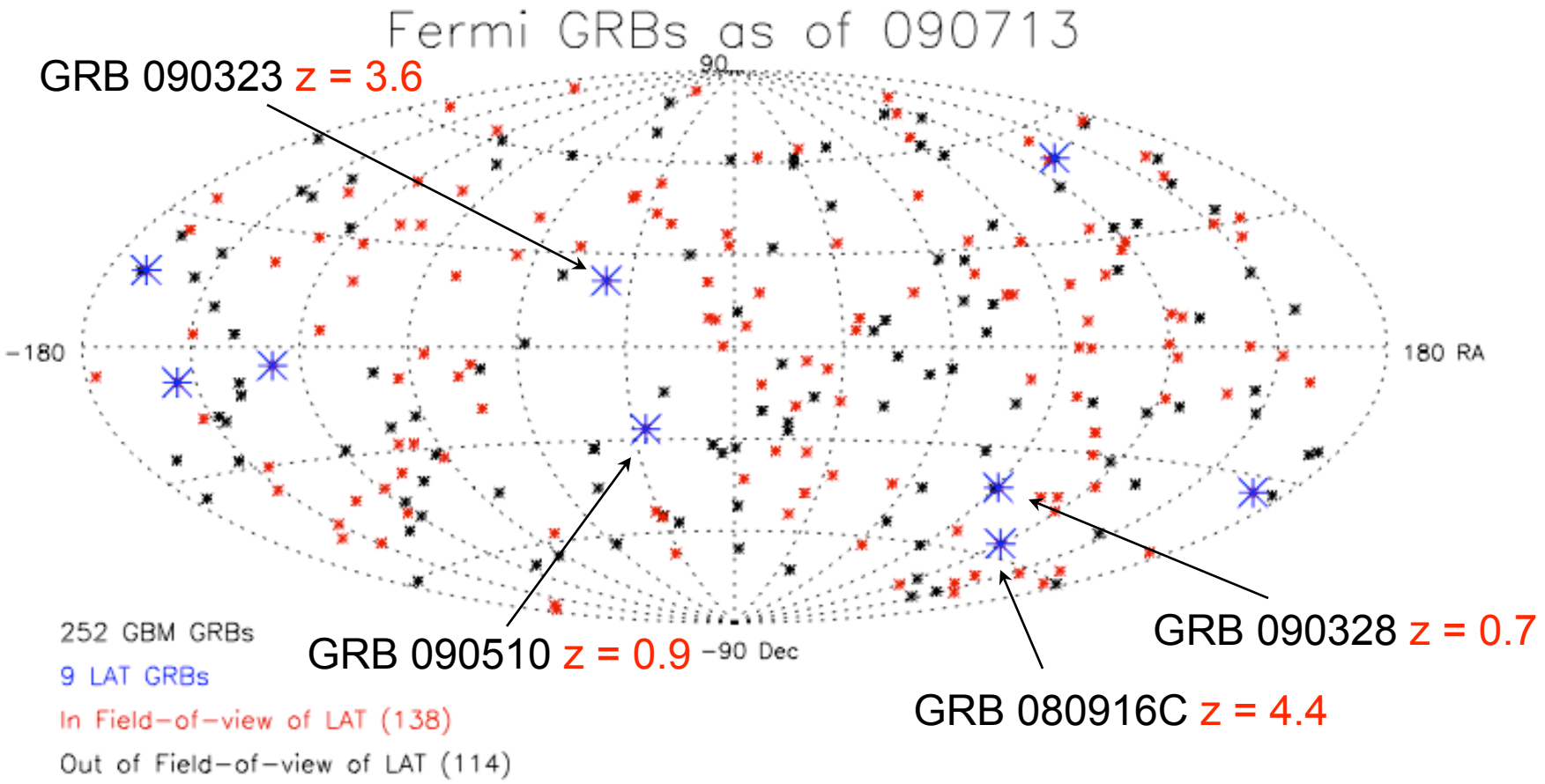




GBM First Year Trigger Summary

- 253 GRBs
  - 242 between 50—300 keV
    - 67 on timescales > 1 s of which 37 did not also trigger ≤ 1 s
    - 21 on timescales < 64 ms of which 0 did not also trigger ≥ 64 ms
  - 11 between 25—50 keV, 4 of which failed to trigger 50—300 keV
  - No GRBs triggered on hard energy ranges.
  - i.e. 212 BATSE-like GRBs in 1 year.
- 62 commanded (test)
- 168 SGRs — most on soft, short trigger algorithms.
- 14 TGFs — all on hard, short trigger algorithms.
- 1 solar flare
- Others are Cyg X-1 rises, accidentals, and particle events.

One year of Fermi GRBs



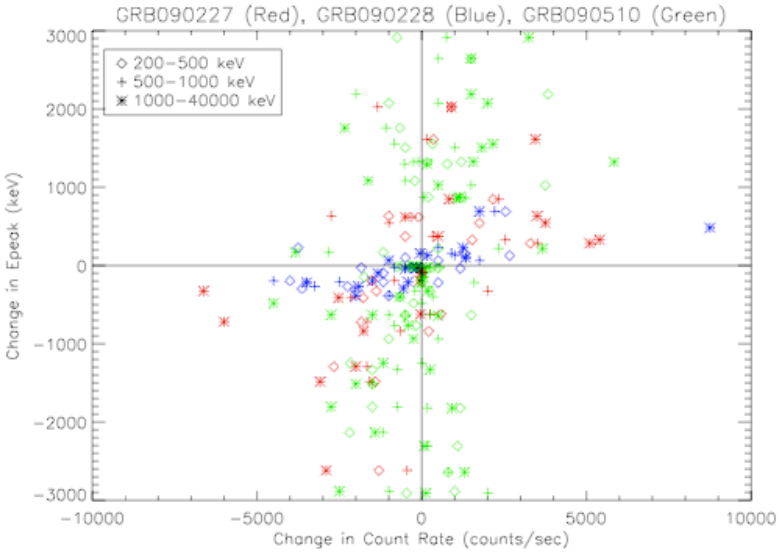
Three Short Bursts

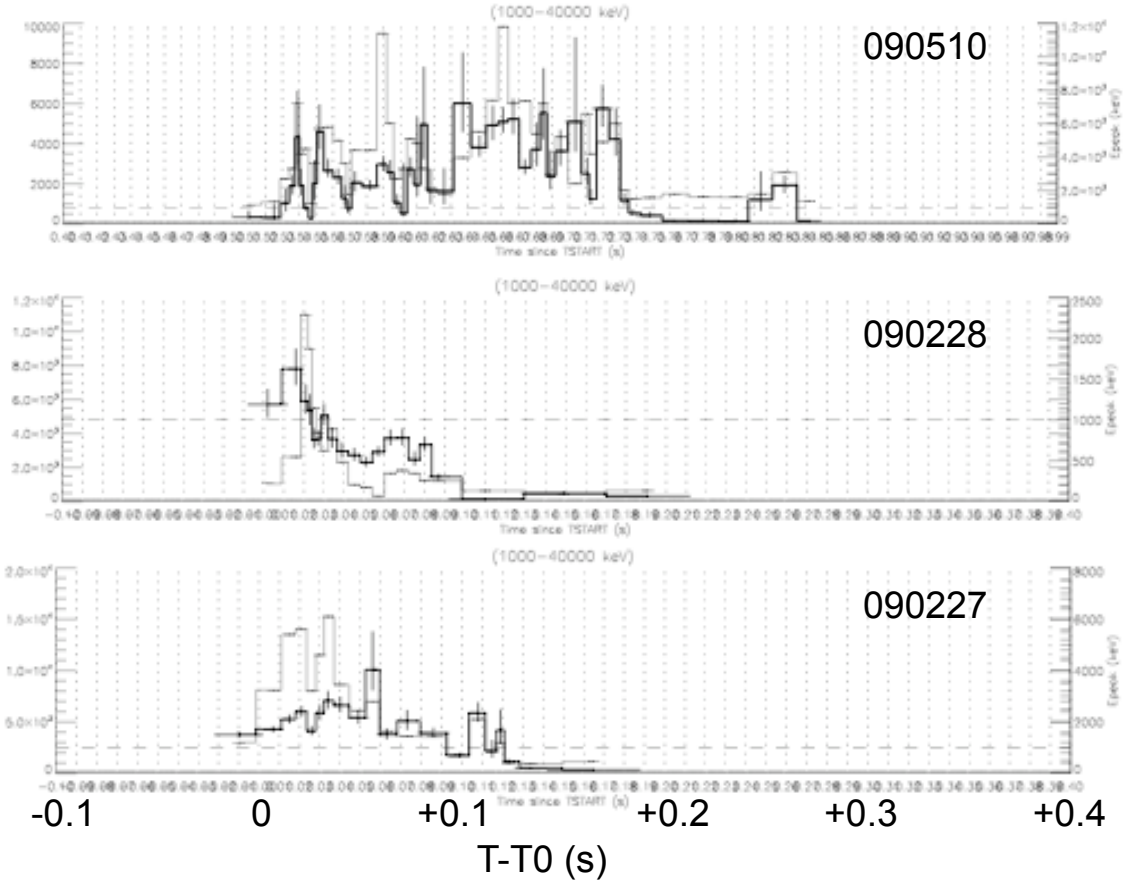
Preliminary

Short GRBs with hard spectra (E_p ~ few MeV)

Spectral evolution similar to long bursts but harder & finer timescales

Soft-to-hard spectral evolution not typically seen in long GRBs



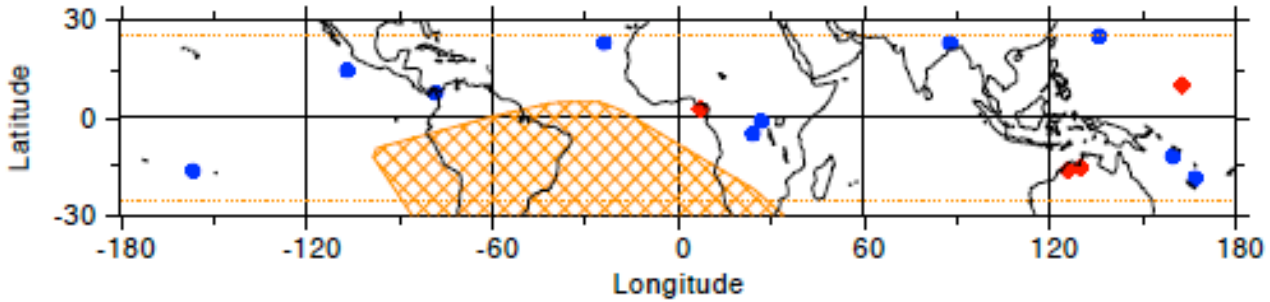


GBM TGFs

Preliminary

Table 1: GBM TGFs

#	Date	Trigger Time h:min:sec UT	Start Time w.r.t Trigger Time (ms)	Pulse Duration (ms)	Rise μs	Fall μs	Spacecraft Position East Long.	Spacecraft Position Latitude	total counts
1	2008 Aug 7	08:33:24.191042	-10.48 ± 0.01	3.48 ± 0.8	80	3200	253.1	+15.3	365
2	2008 Aug 28	10:46:30.271448	-11.55 ± 0.01	0.35 ± 0.03	60	140	87.6	+23.6	339
3	2008 Oct 1	09:24:44.927230	-13.10 ± 0.10	0.50 ± 0.05	100	160	162.8	+10.5	360
4	2008 Oct 6	19:08:10.745324	-1.02 ± 0.01	0.32 ± 0.03	80	180	159.6	−12.4	247
5	2008 Oct 25	16:34:45.557752	-9.84 ± 0.02	0.48 ± 0.05	80	120	26.8	−1.1	350
6	2008 Nov 13	07:44:04.238298					7.2	+2.9	231
6a				0.30 ± 0.01	40	40			138
6b				0.37 ± 0.01	20	80			93
7	2008 Nov 23	20:58:42.331554	-10.35 ± 0.02	0.30 ± 0.01	40	100	129.8	−15.9	230
8	2008 Dec 23	01:13:14.665124	-12.28 ± 0.03	1.18 ± 0.04	100	140	203.3	−16.9	333
9	2009 Feb 3	08:32:44.380242	-11.49 ± 0.04	1.18 ± 0.06	280	280	125.8	−16.6	330
10	2009 Apr 3	05:14:04.223016	-10.71 ± 0.01	0.68 ± 0.08	20	140	336.0	+23.6	284
11	2009 Apr 8	14:01:52.388780	-0.67 ± 0.01	0.67 ± 0.10	20	180	135.9	+25.6	365
12	2009 May 10	11:57:15.985436	-2.84 ± 0.15	1.40 ± 0.1	120	1300	24.0	−5.2	276
13	2009 May 22	04:33:46.890568	-6.54 ± 0.02	0.59 ± 0.02	160	60	167.0	−19.1	299
14	2009 June 27	06:34:48.325250					281.7	+8.0	422
14a			-21.40 ± 0.05	0.70 ± 0.05					59
14b			-12.76 ± 0.03	0.62 ± 0.02					363

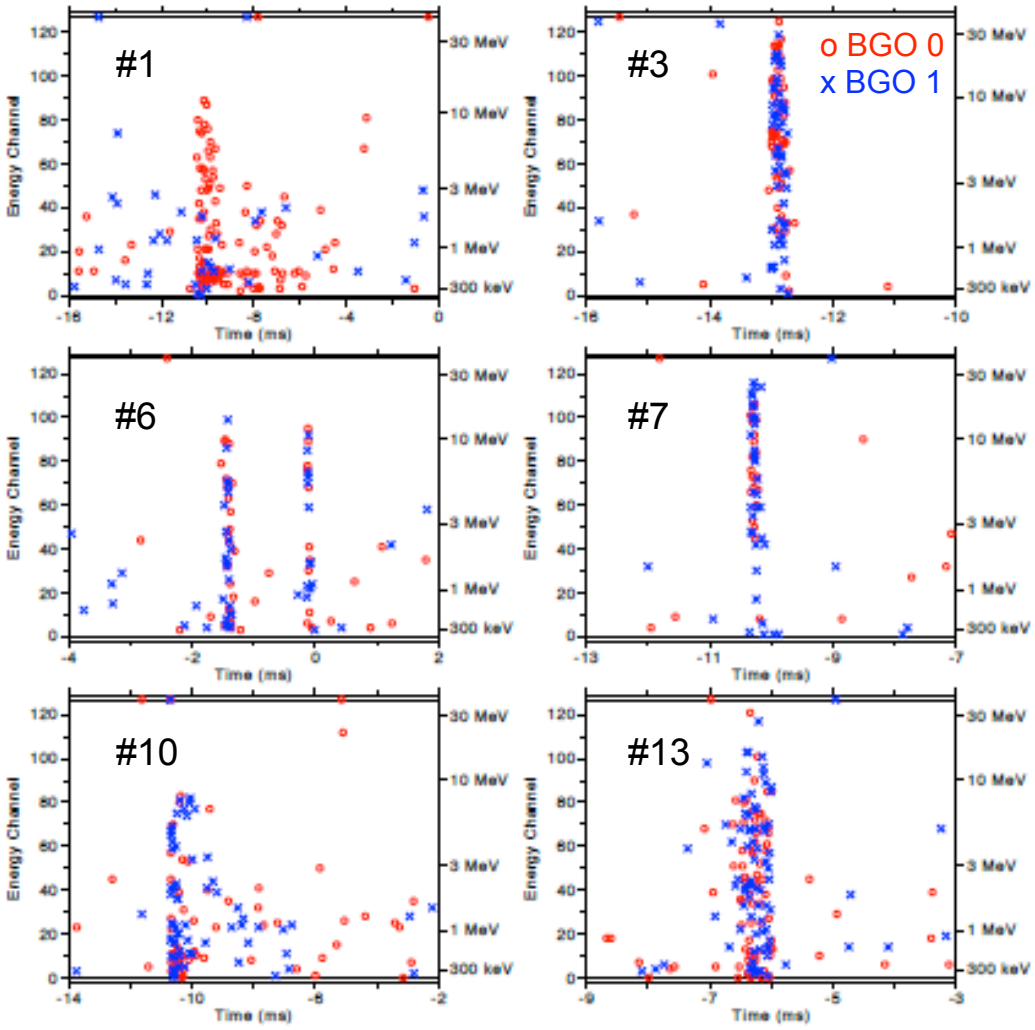


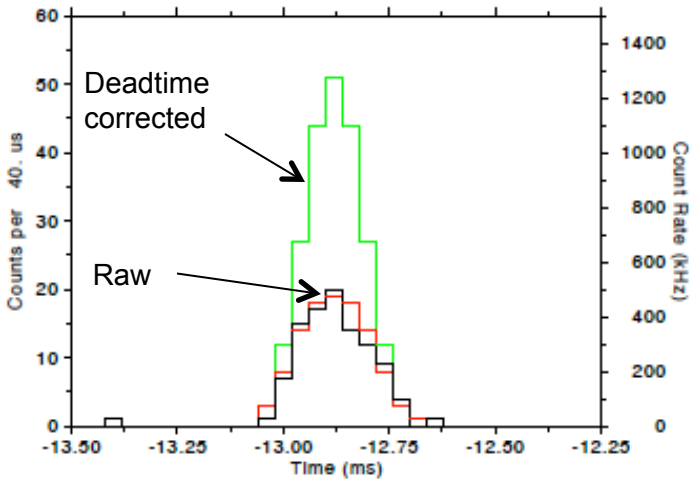
- ◆ WWLLN sferics
- • others

Associated with thunderstorms: "Runaway electron" processes

TGFs are Short and Bright

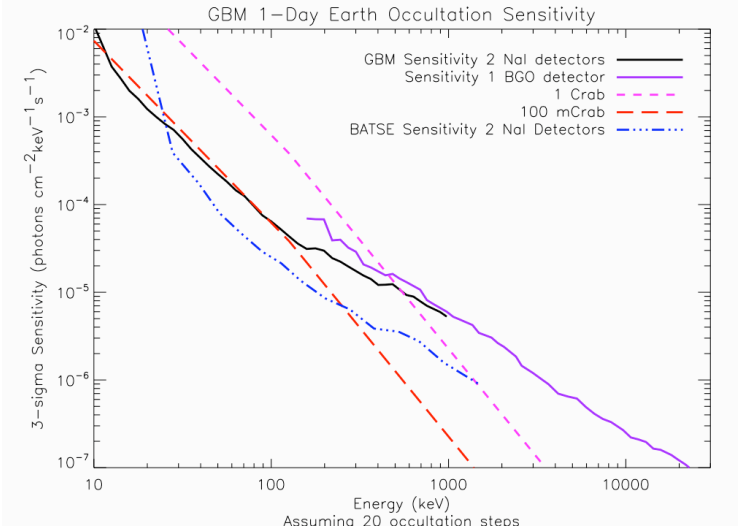
Preliminary

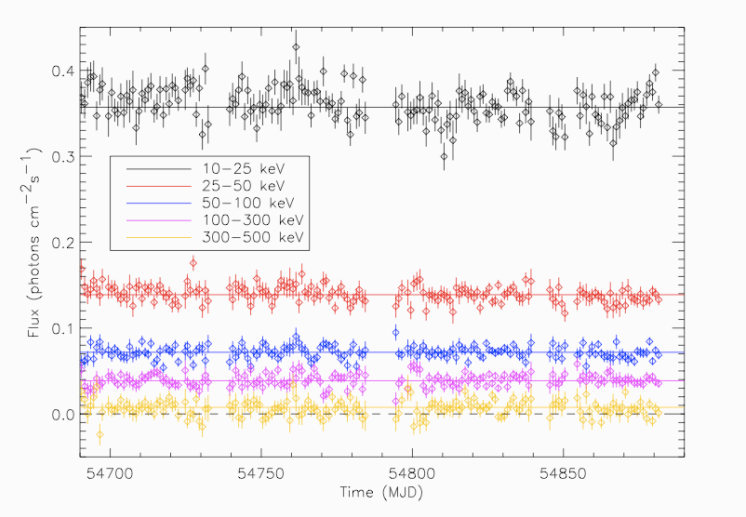


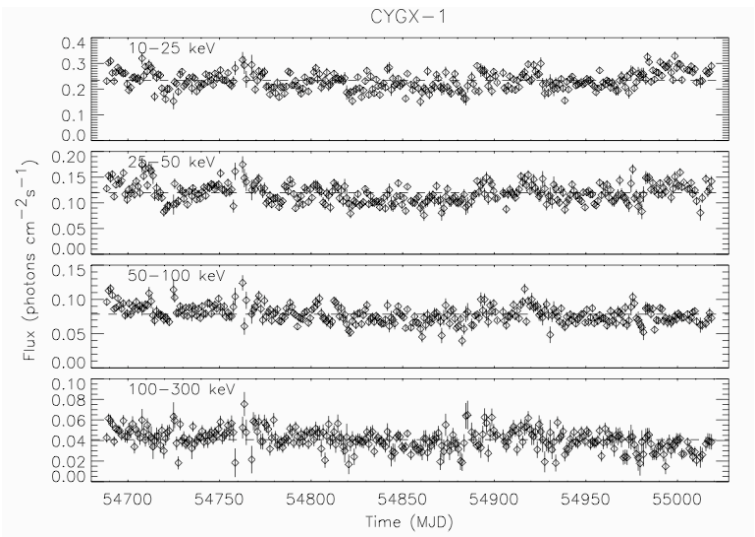


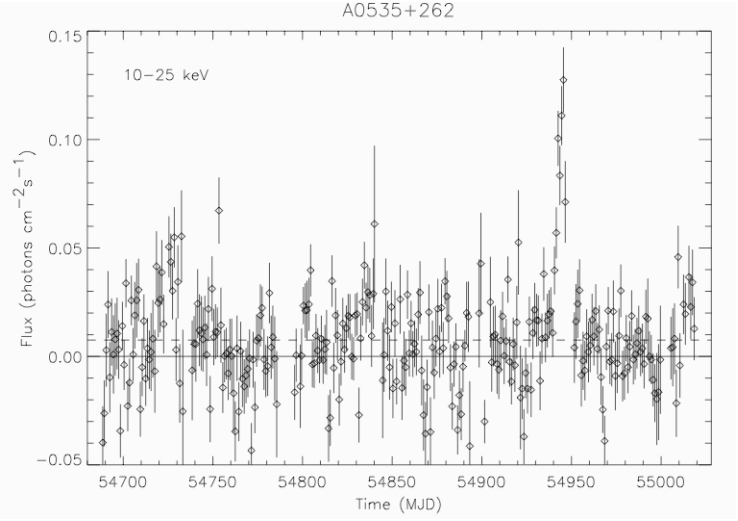
- Duration ~few ms, maximum energy > 30 MeV
- Pulses are usually fairly symmetric but some (e.g. #10) are FRED-like
- High instantaneous rates imply significant deadtime
- Usually seen in all detectors with similar rates but some (e.g. #1) seen only in detectors on one side of the spacecraft

Occultation Source Monitoring





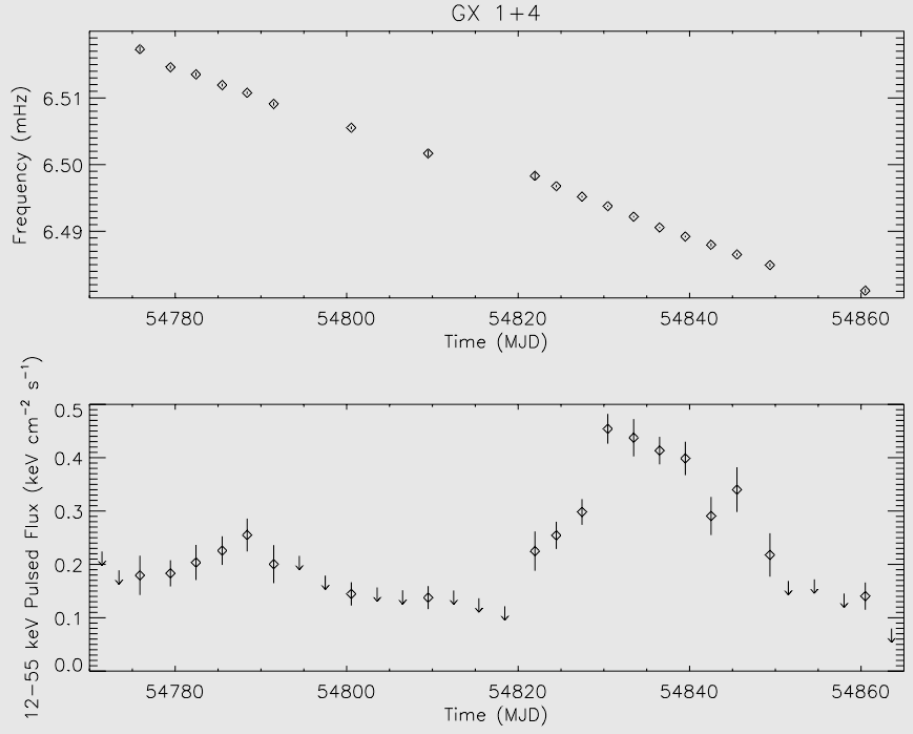


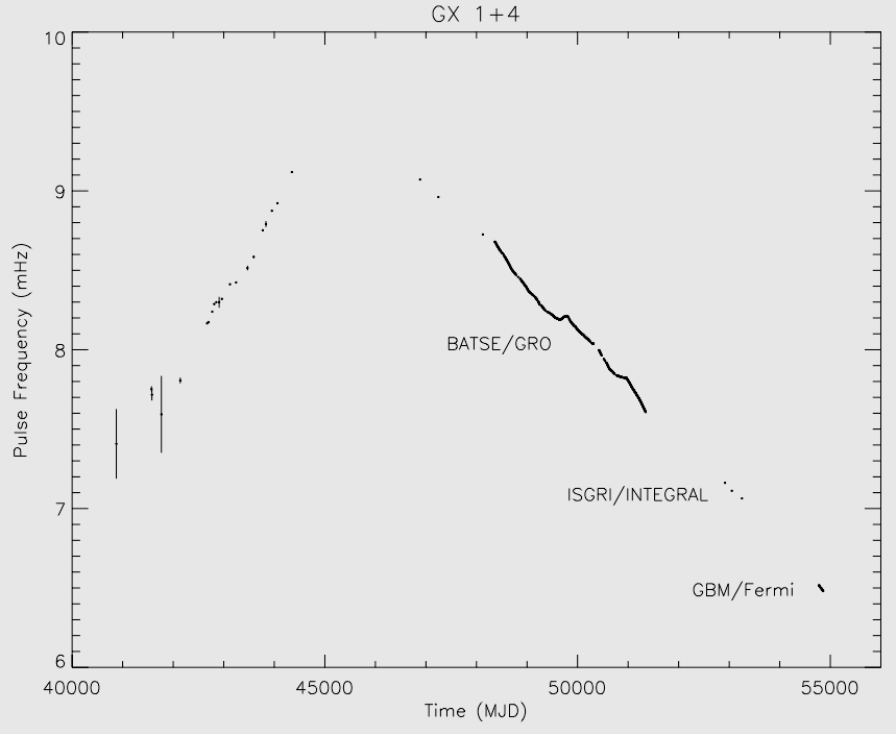


http://gammaray.nsstc.nasa.gov/gbm/science/occultation

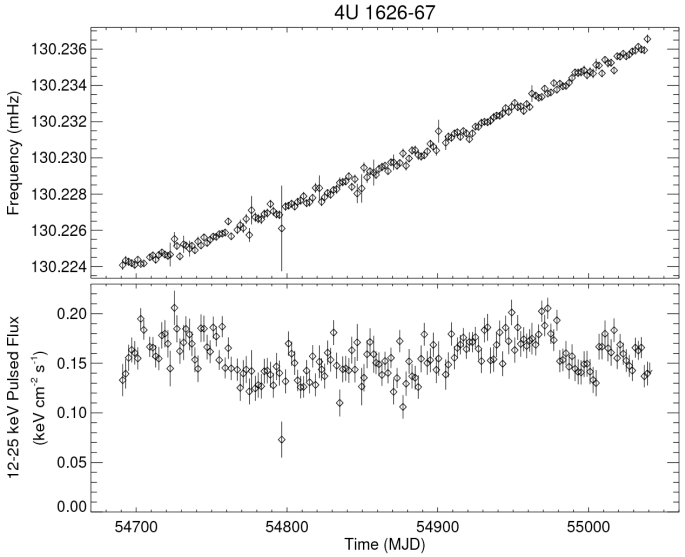
Pulsed Source Monitoring
GX 1+4

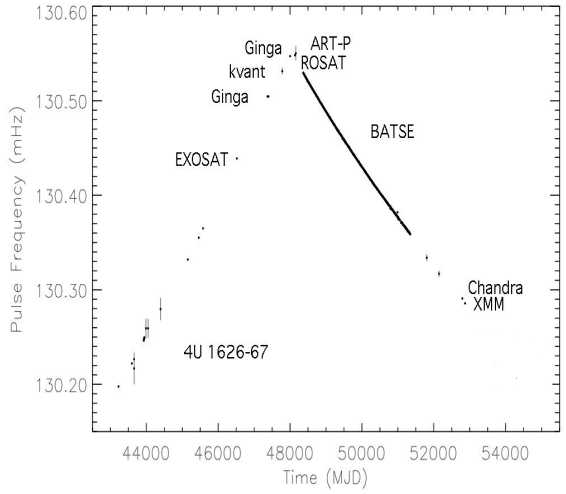
Preliminary



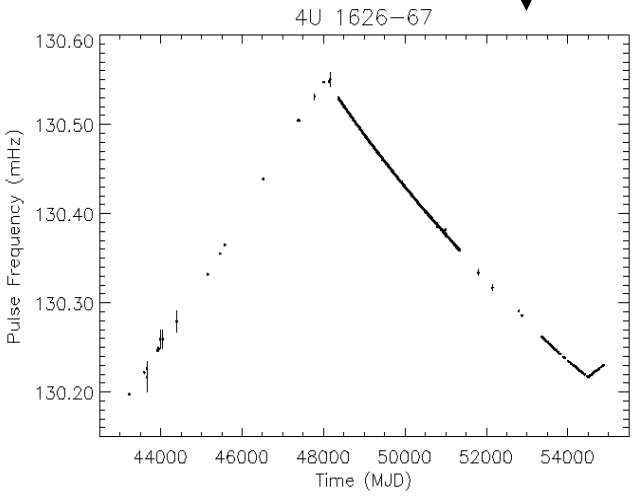


Pulsed Source Monitoring
4U 1626-67





Fill gap with BAT



"New Torque Reversal and Spin-Up of 4U 1626- 67 Observed by Fermi/GBM and Swift/BAT"

Camero-Arranz et al. arXiv:006.4224

Near-Term Plans

- **FSW revision 2.5**
  - **Add special trigger algorithms for TGFs**
    - **Algorithm 116 triggers based on a significant rate increase being present in at least two NaIs and at least one BGO. The detectors can be any NaI detectors and either of the BGO detectors.**
    - **Algorithms 117 and 118 also require a significant rate increase in at least two NaIs and at least one BGO, but impose the additional requirement that the detectors with the rate increase be on the same side of the spacecraft (117 ➔ +X, 118 ➔ -X).**
    - **Algorithm 119 requires a significant rate increase in both BGO detectors (independent of NaIs).**
    - **All algorithms use the same (configurable) BGO energy range.**
    - **All algorithms currently use the same trigger timescale (16 ms).**
  - **Add more ARR decision info to TRIGDAT**
  - **Misc operational improvements**
- **Improve ground-based quick-look trigger processing**
  - **Generate GCN notices from human-in-the-loop locations**