GCN notices: interpretations and improvements

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GBM trigger alert: 5 s to wake up TDRSS

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TITLE:           GCN/FERMI NOTICE
NOTICE_DATE:     Sat 28 Feb 15 20:16:23 UT
NOTICE_TYPE:     Fermi-GBM Alert
RECORD_NUM:      1
TRIGGER_NUM:     446847381
GRB_DATE:        17081 TJD;    59 DOY;   15/02/28
GRB_TIME:        72978.11 SOD {20:16:18.11} UT
TRIGGER_SIGNIF:  7.2 [sigma]
TRIGGER_DUR:     0.064 [sec]
E_RANGE:         3-4 [chan]   47-291 [keV]
ALGORITHM:       5
DETECTORS:       0,0,0, 0,0,0, 0,0,0, 0,1,1, 0,0,
LC_URL:          http://heasarc.gsfc.nasa.gov/FTP/fermi/data/gbm/triggers/2015/bn150228845/quicklook/glg_lc_medres34_bn150228845.gif
COMMENTS:        Fermi-GBM Trigger Alert.
COMMENTS:        This trigger occurred at longitude,latitude = 210.80,0.78 [deg].
COMMENTS:        The LC_URL file will not be created until ~15 min after the trigger.
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GBM Flight classification and localization: 1st one uses 1.9s of data. Latency: 5s TDRSS wakeup

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TITLE:            GCN/FERMI NOTICE
NOTICE_DATE:      Sat 28 Feb 15 20:16:42 UT
NOTICE_TYPE:      Fermi-GBM Flight Position
RECORD_NUM:       46
TRIGGER_NUM:      446847381
GRB_RA:           236.217d {+15h 44m 52s} (J2000),
                  236.478d {+15h 45m 55s} (current),
                  235.356d {+15h 41m 25s} (1950)
GRB_DEC:          -43.850d {-43d 51' 00"} (J2000),
                  -43.897d {-43d 53' 47"} (current),
                  -43.693d {-43d 41' 35"} (1950)
GRB_ERROR:        7.07 [deg radius, statistical plus systematic]
GRB_INTEN:        549 [cnts/sec]
DATA_SIGNIF:      20.40 [sigma]
INTEG_TIME:       0.512 [sec]
GRB_DATE:         17081 TJD;    59 DOY;   15/02/28
GRB_TIME:         72978.11 SOD {20:16:18.11} UT
GRB_PHI:          134.00 [deg]
GRB_THETA:         70.00 [deg]
DATA_TIME_SCALE:  0.5120 [sec]
HARD_RATIO:       0.32
LOC_ALGORITHM:    3 (version number of)
MOST_LIKELY:       96%  GRB
2nd_MOST_LIKELY:    3%  Generic Transient
DETECTORS:        0,0,0, 0,0,0, 0,0,0, 0,1,1, 0,0,
SUN_POSTN:        341.46d {+22h 45m 50s}   -7.85d {-07d 50' 54"}
SUN_DIST:          95.15 [deg]   Sun_angle= 7.0 [hr] (West of Sun)
MOON_POSTN:       106.83d {+07h 07m 19s}  +17.29d {+17d 17' 40"}
MOON_DIST:        130.18 [deg]
MOON_ILLUM:       80 [%]
GAL_COORDS:       332.99,  8.67 [deg] galactic lon,lat of the burst (or transient)
ECL_COORDS:       244.09,-23.40 [deg] ecliptic lon,lat of the burst (or transient)
LC_URL:           http://heasarc.gsfc.nasa.gov/FTP/fermi/data/gbm/triggers/2015/bn150228845/quicklook/glg_lc_medres34_bn150228845.gif
COMMENTS:         Fermi-GBM Flight-calculated Coordinates.
COMMENTS:         This trigger occurred at longitude,latitude = 210.80,0.78 [deg].
COMMENTS:         The LC_URL file will not be created until ~15 min after the trigger.
```

Position: cruder than ground (5 deg grid, simplification of spectral response and Earth assumed underneath)

GRB_Inten: in packet used here (integ_time). These are peak flux locations

Classification - based on many factors, including localization. Has got worse during mission because it works best for zenith-pointing and Fermi does this less and less - larger rocking angle and pointed observations.

GBM GND POSITION: automated ground position. Latency: TDRSS wakeup + a few seconds ground processing. Only sent out if Flight Software classifies as GRB - can be problem

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TITLE:           GCN/FERMI NOTICE
NOTICE_DATE:     Sat 28 Feb 15 20:17:43 UT
NOTICE_TYPE:     Fermi-GBM Ground Position
RECORD_NUM:      0
TRIGGER_NUM:     446847381
GRB_RA:          234.490d {+15h 37m 58s} (J2000),
                 234.754d {+15h 39m 01s} (current),
                 233.623d {+15h 34m 29s} (1950)
GRB_DEC:         -45.250d {-45d 15' 00"} (J2000),
                 -45.299d {-45d 17' 55"} (current),
                 -45.087d {-45d 05' 11"} (1950)
GRB_ERROR:       2.17 [deg radius, statistical only]
DATA_SIGNIF:     29.90 [sigma]
DATA_INTERVAL:   2.048 [sec]
GRB_DATE:        17081 TJD;    59 DOY;   15/02/28
GRB_TIME:        72978.11 SOD {20:16:18.11} UT
GRB_PHI:         136.00 [deg]
GRB_THETA:        70.00 [deg]
E_RANGE:         44.032 - 279.965 [keV]
LOC_ALGORITHM:   41531 (Gnd S/W Version number)
SUN_POSTN:       341.46d {+22h 45m 50s}   -7.85d {-07d 50' 53"}
SUN_DIST:         95.93 [deg]   Sun_angle= 7.1 [hr] (West of Sun)
MOON_POSTN:      106.84d {+07h 07m 21s}  +17.29d {+17d 17' 36"}
MOON_DIST:       128.61 [deg]
MOON_ILLUM:      80 [%]
GAL_COORDS:      331.14,  8.31 [deg] galactic lon,lat of the burst (or transient)
ECL_COORDS:      243.16,-25.06 [deg] ecliptic lon,lat of the burst (or transient)
LC_URL:          http://heasarc.gsfc.nasa.gov/FTP/fermi/data/gbm/triggers/2015/bn150228845/quicklook/glg_lc_medres34_bn150228845.gif
COMMENTS:        Fermi-GBM Ground-calculated Coordinates.
COMMENTS:        This is likely a Long GRB.
COMMENTS:        This Notice was ground-generated -- not flight-generated.
COMMENTS:        The LC_URL file will not be created until ~15 min after the trigger.
```

Position: best latency vs quality localization for follow-up.
No human but full ground code.
Reported uncertainty: statistical only

DATA_INTERVAL: now uses more than just peak flux snapshot!

GRB_THETA: gives angle to LAT

NEW: short/long flag
Comment in email, flag in sockets
Other flags: In LAT FoV
Bright GRB in BGO detectors (HE)

GBM FINAL POSITION: human intervention.
Latency: 16 minutes to ~2 hours

```
TITLE:           GCN/FERMI NOTICE
NOTICE_DATE:     Sat 28 Feb 15 20:57:16 UT
NOTICE_TYPE:     Fermi-GBM Final Position
RECORD_NUM:      0
TRIGGER_NUM:     446847381
GRB_RA:          231.320d {+15h 25m 17s} (J2000),
                 231.573d {+15h 26m 18s} (current),
                 230.486d {+15h 21m 57s} (1950)
GRB_DEC:         -41.870d {-41d 52' 11"} (J2000),
                 -41.923d {-41d 55' 20"} (current),
                 -41.694d {-41d 41' 39"} (1950)
GRB_ERROR:       2.03 [deg radius, statistical only]
GRB_DATE:        17081 TJD;    59 DOY;   15/02/28
GRB_TIME:        72978.11 SOD {20:16:18.11} UT
GRB_PHI:         135.09 [deg]
GRB_THETA:        73.92 [deg]
E_RANGE:         50.000 - 300.000 [keV]
LOC_ALGORITHM:   415 (Gnd S/W Version number)
SUN_POSTN:       341.48d {+22h 45m 56s}   -7.84d {-07d 50' 16"}
SUN_DIST:         99.20 [deg]   Sun_angle= 7.3 [hr] (West of Sun)
MOON_POSTN:      107.19d {+07h 08m 45s}  +17.26d {+17d 15' 28"}
MOON_DIST:       126.84 [deg]
MOON_ILLUM:      80 [%]
GAL_COORDS:      331.24, 12.39 [deg] galactic lon,lat of the burst (or transient)
ECL_COORDS:      239.78,-22.40 [deg] ecliptic lon,lat of the burst (or transient)
LC_URL:          http://heasarc.gsfc.nasa.gov/FTP/fermi/data/gbm/triggers/2015/bn150228845/quicklook/glg_lc_medres34_bn150228845.gif
LOC_URL:         http://heasarc.gsfc.nasa.gov/FTP/fermi/data/gbm/triggers/2015/bn150228845/quicklook/glg_locplot_all_bn150228845.png
COMMENTS:        Fermi-GBM Final Position.
COMMENTS:        This Notice was ground-generated -- not flight-generated.
COMMENTS:        The LC_URL file should be available by the time this FINAL notice is produced.
```

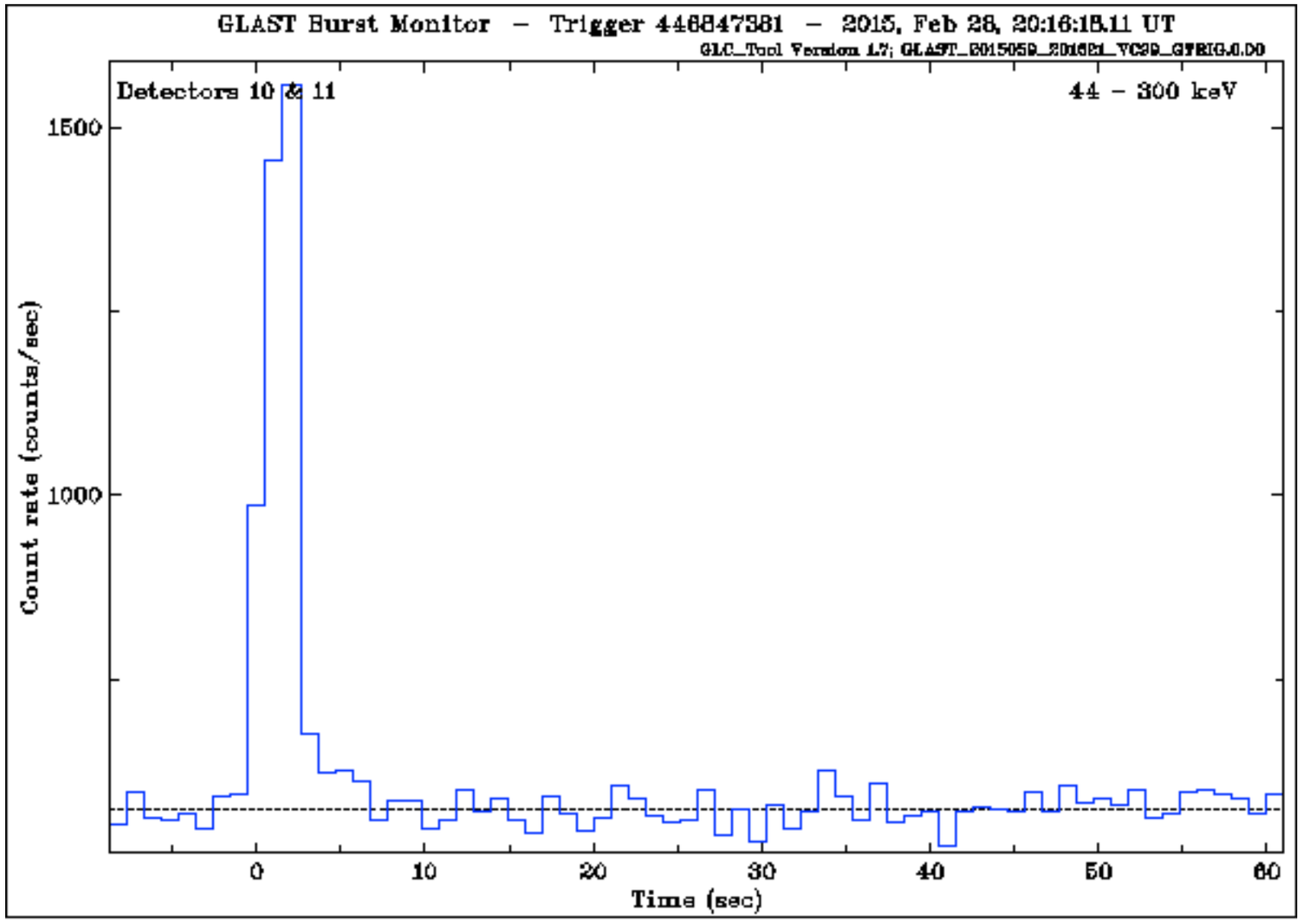
Reported uncertainty: statistical only

Link to lightcurve:

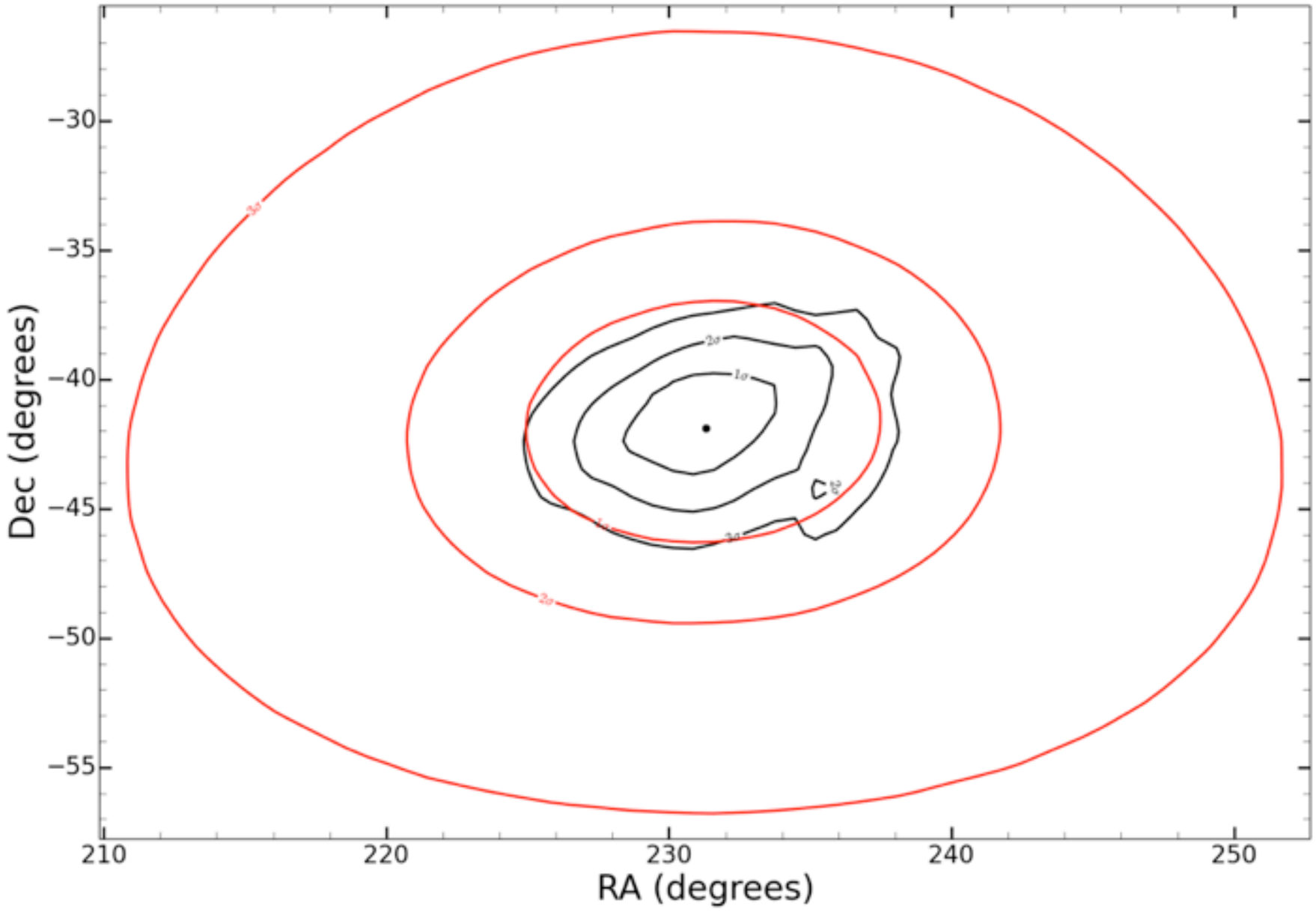
Link to sky map + associated files (fits, ascii)

Includes systematic component

Lightcurve link: available ~10min after trigger for ALL trigggers
Lots of other lcs available in parent directory (timescale, energy)



Localization sky map: currently for FINAL
Currently in works: deliver to Scott for GND POSITION



In The Works

- GBM GND POSITION to replace human-intervention GBM FINAL POSITION (soon) - improved background fitting and automated source selection - we have trained ourselves so now we can code it.
- Rough T90 calculation using quicklook data - to be included in new FINAL position - how useful is this?
- Classification of triggers to be done on the ground - this will improved sending of GRB triggers as non and vice versa (medium term)
- Improvement of localization????? Maybe, maybe not, longer term
- Connaughton et al. 2015 ApJS 216, p32 arXiv:1411.2685 shows the study of systematic errors on GBM GRB localizations