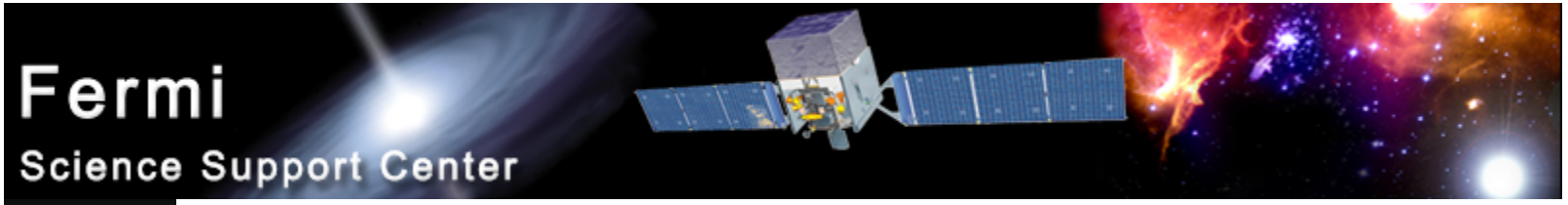
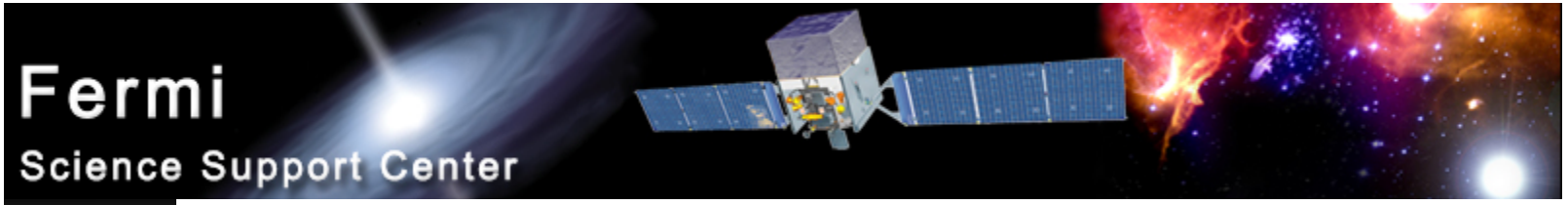


Fermi LAT and GBM

Data Access, File Structure and the Standard Tools



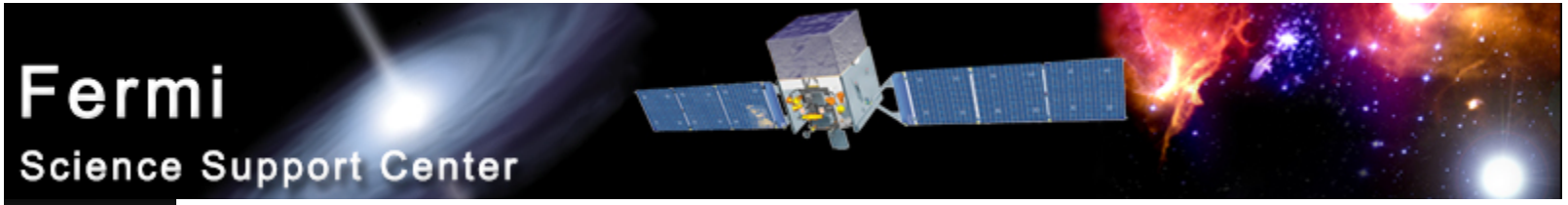
Fermi Science Support Center

Home | Observations | Data | Proposals | Library

- *Home*
  - *Current News, FAQ, Helpdesk*

http://fermi.gsfc.nasa.gov/ssc/

- *Observations*
  - *Descriptions of observing modes, planned and as-flown timelines, **multiwavelength observation coordination tools***
- *Data*
  - *Links for GBM and LAT data, **data caveats**, data and analysis methods documentation, source catalogs, analysis tools, sample analyses*
- *Proposals*
  - *Detailed information on applying to the Fermi GI program (January deadline)*
- *Library*
  - *User's Group information, articles/publications, conferences, historical and mission overview documentation, **mailing lists**, news archive*



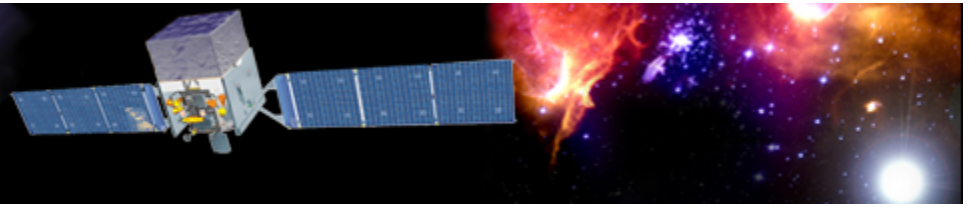
Fermi Data Access http://fermi.gsfc.nasa.gov/ssc/data/access/

- **Data Access**
  - + LAT Data
  - + LAT Catalog
  - + LAT Data Queries
  - + LAT Query Results
  - + LAT Weekly Files
  - + GBM Data
- Data Analysis
- Caveats
- Newsletters
- FAQ

along with LAT source lists, can be accessed through the Browse interface specific to Fermi. I through the LAT data server.

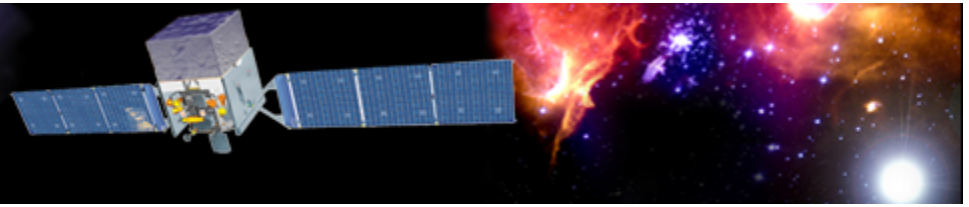
The FITS files can also be downloaded from the Fermi FTP site. The file version number is th extension in each filename; you should keep track of the version numbers of files you analyz update them.

- LAT Photon and Extended Data
  - LAT Data Server (Pass 7 data updated Apr-18-2012)
  - Pass 7 (V6) Weekly files (Archived)
  - Pass 6 (V11) Weekly files (Archived)
  - Pass 6 (V3) Weekly files (Archived)
- LAT Data (high-level products only)
  - LAT Monitored Source List Light Curves
  - LAT Pulsar Ephemerides
  - LAT Burst Catalog
  - LAT 2-year Point Source Catalog
  - LAT 1-year Point Source Catalog
  - LAT Bright Source List
  - LAT Background Models
  - LAT List of Detected Gamma-Ray Pulsars
- GBM Data
  - GBM Trigger Catalog
  - GBM Burst Catalog
  - GBM Daily Data
  - GBM Earth Occultation Light Curves
  - GBM Pulsar Spin Histories



LAT "Normal" Science Data

- *Events Files*
  - ***Photon files:*** *all events needed for most science analyses*
  - ***Extended files:*** *contain additional information about each event that is used for specialized analysis*
    - *Not required for any science analysis tool*
  - ***Weekly files:*** *all events recorded in a specific mission week*
    - *xTime utility can provide LAT Mission Week*
  - *LAT Event classes:*
    1) *Transient - Loose quality definition, significant background, good on short timescales*
    2) ***Source - Balanced quality, recommended for most analyses***
    3) *Clean - High quality, very low background, less effective area*
    4) *Ultraclean - Highest quality, recommended for diffuse studies*
- *Spacecraft File*
  - *Spacecraft Orientation and orbit position information*
  - *One entry every 30 seconds*



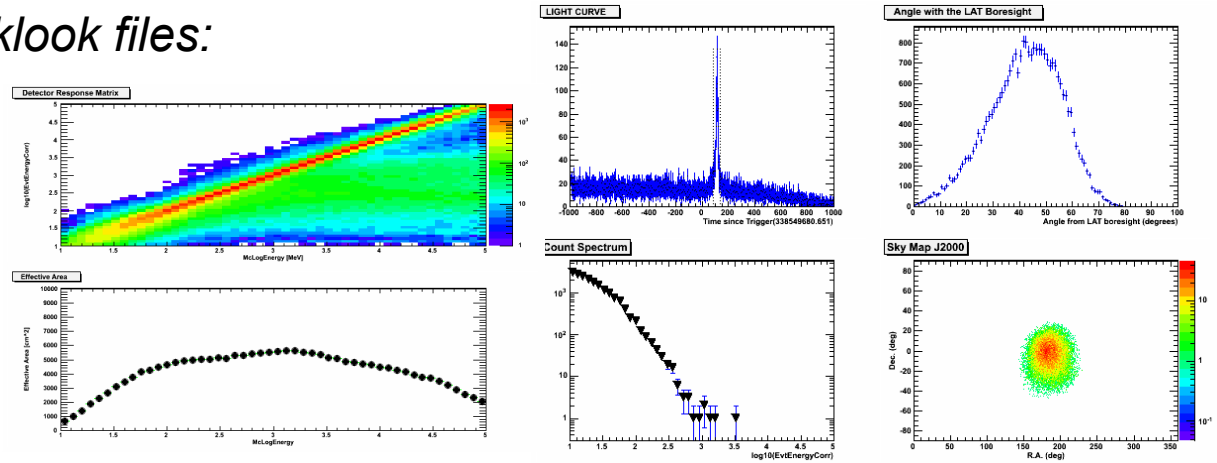
LAT "Normal" Data Access

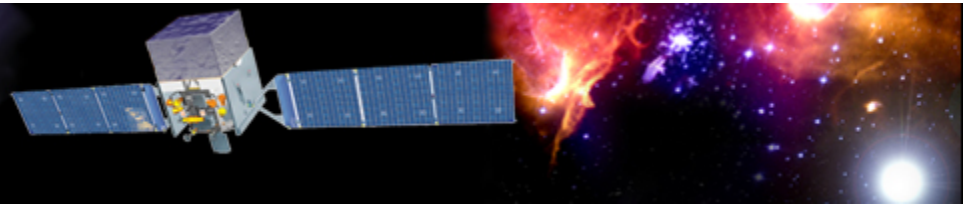
- *Download data from:*
  - *http://fermi.gsfc.nasa.gov/cgi-bin/ssc/LAT/LATDataQuery.cgi*
    - *Allows retrieval of data for a specified region*
    - *Default values correspond to suggested data selections for most analysis types*
    - *Energy range limited to 30 MeV - 300 GeV*
  - *http://heasarc.nasa.gov/cgi-bin/W3Browse/w3table.pl*
    - *Weekly files contain all event classes (10 MeV - 300 GeV)*
    - *Weekly spacecraft files are also available, but full mission file is recommended (see below)*
  - *FTP: Weekly files can be retrieved using wget*
    - *Photon: ftp://legacy.gsfc.nasa.gov/fermi/data/lat/weekly/photon/*
    - *Spacecraft: ftp://legacy.gsfc.nasa.gov/fermi/data/lat/weekly/spacecraft/*
    - *Mission S/C file: ftp://legacy.gsfc.nasa.gov/fermi/data/lat/mission/spacecraft/*

LAT "Low Energy" (LLE) Data

- *Trigger Products for each period of interest (GRB, Solar Flare)*
  - ***LLE FITS file:*** *time-tagged events for 2000 seconds around trigger time*
  - ***CSPEC PHA file:*** *binned events in both energy (50 bins) and time (1 sec)*
  - ***CSPEC RSP file:*** *Response matrix for the CSPEC PHA file*
  - ***PHA-I FITS file:*** *Count spectrum*
  - ***LLE "Selected" file:*** *LLE file with time cuts that match CSPEC and PHA-I files*
  - ***Pointing file:*** *Spacecraft file with 1-second resolution*

- *Quicklook files:*





LAT LLE Data Access

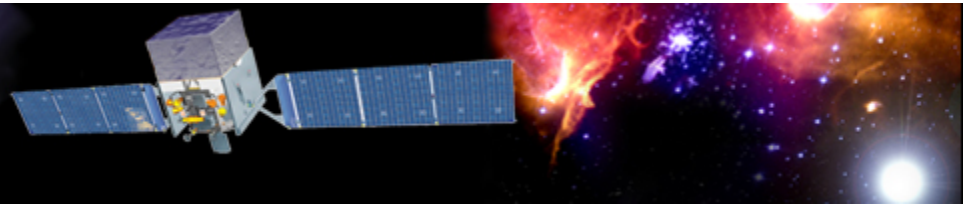
- *Download data from HEASARC Browse:*
  - *http://heasarc.nasa.gov/cgi-bin/W3Browse/w3table.pl*
    - *Select Fermi-LAT Low Energy Events Catalog and run Search*
    - *Returns table with list of GRBs and Solar flares*
    - *Select the periods of interest and the desired data products*
    - *Generate and retrieve .tar file*

Data products that you have selected will be appear below

☑ Select all rows

Fermi LAT Low-Energy Events Catalog

	trigger name	name	ra	dec	trigger time	trigger type	version
☑	bn120603745	SFLARE120603745	04 47 52.8	+22 24 11	2012-06-03 17:52:33.902	SFLARE	2
☑	bn100612038	SFLARE100612038	05 37 33.6	+18 47 24	2010-06-12 00:55:05.645	SFLARE	4
☑	bn110809334	SFLARE110809334	09 14 50.4	+15 57 51	2011-08-09 08:01:01.196	SFLARE	1
☑	bn110906929	SFLARE110906929	11 00 21.4	+06 21 55	2011-09-06 22:17:17.880	SFLARE	1
☑	bn110924399	SFLARE110924399	12 03 05.0	-00 20 03	2011-09-24 09:34:38.651	SFLARE	1

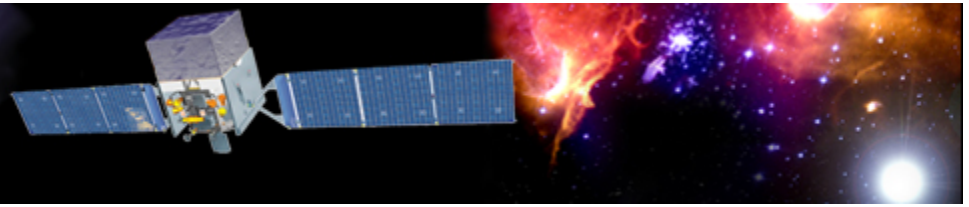


LAT Event Data

- *LAT Photon and LLE data structures are very similar*
  - *Both file types contain:*
    - *Position, energy, time, incidence angles, event identifiers, livetime*
  - *Photon file also has:*
    - *Event class, reconstruction version, conversion type, precalculated diffuse responses*
  - *Photon file **does not contain** the Transient event class*
  - *LLE file does not use standard "event class" construct*

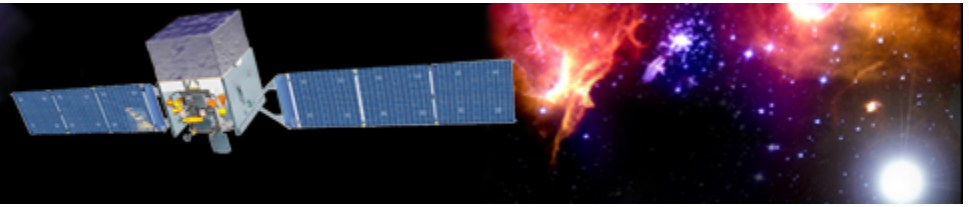
- *LAT Event data:*
  - *Contains reconstruction information for each event (~2x number of columns)*
  - *Has all events in photon database PLUS the Transient class events*
    - *Photon database = 207,000,000 events*
    - *Event database = 1,450,000,000 events*

      → MUCH more data



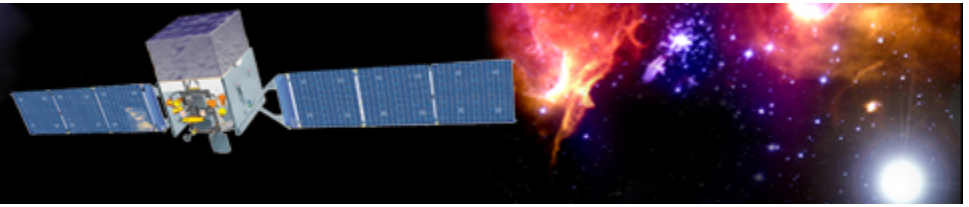
LAT Spacecraft Files

- *Required for analysis*
  - *Can have different entry spacing (60 sec, 30 sec, 1 sec)*
  - *Files contain basic information about the spacecraft and instrument:*
    - *Time interval, spacecraft position and direction, ground track position, geomagnetic parameters, SAA flag, rocking angle, spacecraft and instrument modes*
  - *Also contain data that is used for science analysis*
    - *Spacecraft orientation, zenith direction, LAT configuration, position of the orbit pole,* ***position of the sun****,* ***data quality flag***
  - *Data quality flag values:*
    - *0 = Bad data: Do not use.*
    - *1 = Good data: Use for normal science.*
    - *2 = Bright GRB event: Can use in standard analysis. Excluded from catalog analysis.*
    - *-1 = Solar Flare: The standard IRFs do not properly describe the data.*
    - *-2 = Particle event: The standard IRFs do not properly describe the data.*
  - *In standard LAT analysis, you can filter on any set of values in the spacecraft file*
    - *E.g., (DATA_QUAL==1) && (LAT_CONFIG==1) && ABS(ROCK_ANGLE)<52*



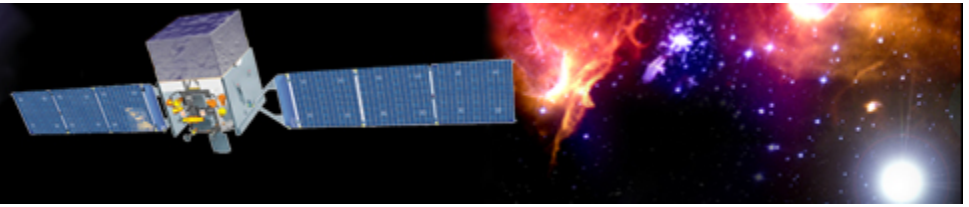
Flagging Solar Flares

- *High flux of X-rays on the Anticoincidence Detector*
  - *LAT team watches the ACD for pile-up due on sun-facing tiles*
  - *Look for pile-up that coincides with a drop in the gamma-ray event rate (transient class)*
    - *Drop is due to events being inappropriately classified in ground reconstruction as something other than likely photons.*
  - *If both conditions are true, the LAT team will review the data and may flag the period that the event rate was affected as a "bad time interval" (BTI)*
  - *BTIs due to solar flares are assigned DATA_QUAL = -1*



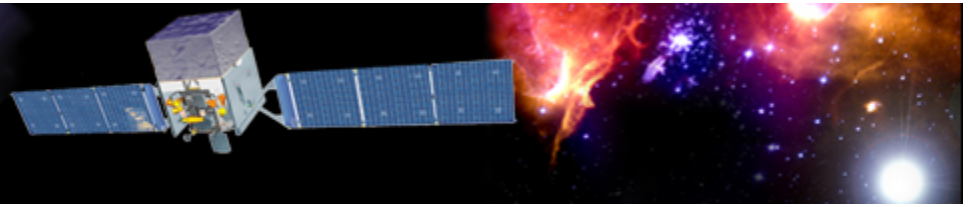
GBM Science Data

- *Daily data (per day ~ 1470)*
  - ***CTIME file:*** *Accumulated counts in 0.256 second bins in 8 channels for each detector*
  - ***CSPEC file:*** *Accumulated counts in 8.192 second bins in 128 channels for each detector*
  - ***Gain and Energy resolution history:*** *For calculating Detector Response Matrices (DRMs)*
  - ***Position and Attitude history:*** *For calculating DRMs*
  - ***TTE files:*** *for periods when the GBM was in TTE collection mode*
- *Burst data (per GRB ~ 600)*
  - ***CTIME file:*** *Accumulated counts in 0.064 second bins in 8 channels for each detector*
  - ***CSPEC file:*** *Accumulated counts in 1024 second bins in 128 channels for each detector*
  - ***Time Tagged Events (TTE) file :*** *One file for each detector*
  - ***Detector Response Matrices:*** *Precalculated DRM for each detector*
  - ***Spectral Background files:*** *To be used for spectral fitting*
- *Trigger data (per trigger ~ 2130)*
  - ***CTIME file:*** *Accumulated counts in 0.064 second bins in 8 channels for each detector*
  - ***CSPEC file:*** *Accumulated counts in 1024 second bins in 128 channels for each detector*
  - ***Time Tagged Events (TTE) file :*** *One file for each detector*



GBM Data Access

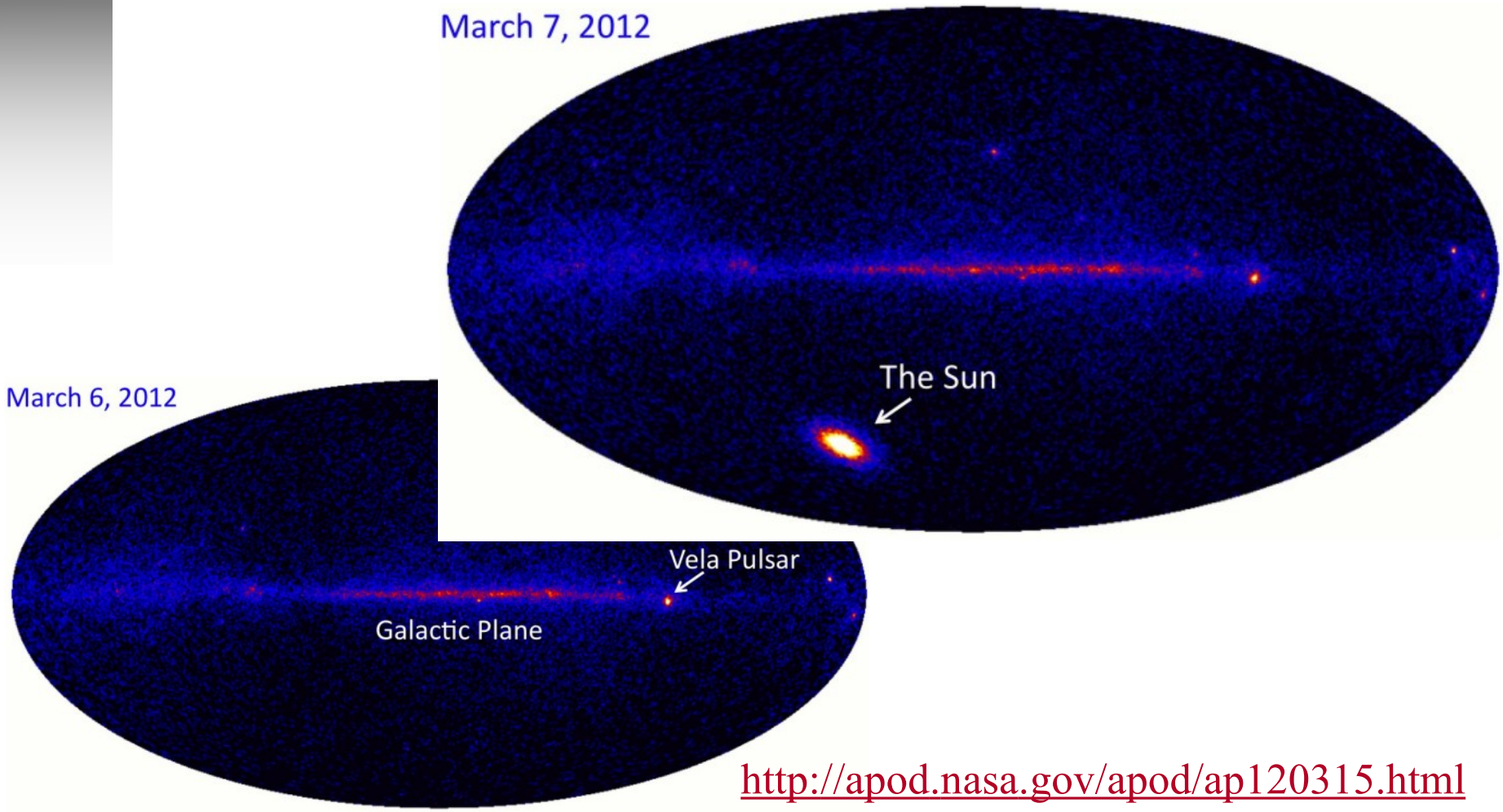
- *Download data from HEASARC Browse:*
  - *http://heasarc.nasa.gov/cgi-bin/W3Browse/w3table.pl*
    - *Select which GBM Data Catalog you want (Trigger Cat for Solar Flares)*
    - *Filter on Trigger Type to narrow down the list. Trigger types are: DISTPAR, GALBIN, GRB, LOCLPAR, SFLARE (399), SGR (162), TGF (273), TRANSNT, UNCERT, UNRELOC (1)*
    - *Returns table with list of Triggers*
    - *Continue as for LAT LLE...*



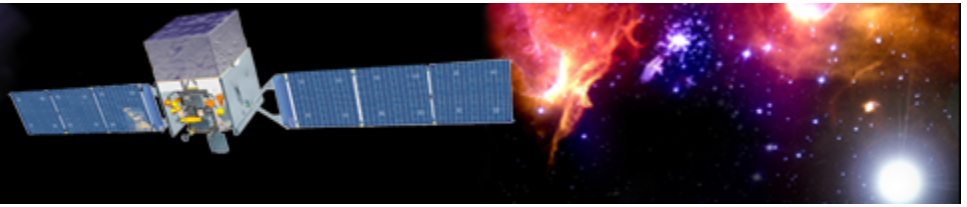
GBM Event Data

- *GBM Time-Tagged Events data*
  - *List of event time and associated energy bin (128 bins)*
  - *Energy bin min/max values are included in the same file*
- *GBM CSPEC data*
  - *Array of 128 counts values (one for each energy bin)*
  - *Start/end times for the integration (8.192 sec), exposure, and quality flag*
  - *Energy bin min/max values are included in the same file*
- *GBM CTIME data*
  - *Array of 8 counts values (one for each energy bin)*
  - *Start/end times for the integration (0.256 sec), exposure, and quality flag*
  - *Energy bin min/max values are included in the same file*

Standard LAT Science Tools



http://apod.nasa.gov/apod/ap120315.html



Available at FSSC

http://fermi.gsfc.nasa.gov/ssc/data/analysis/software/

Data

- Data Policy
- Data Access
- **Data Analysis**
  - + System Overview
  - + Software Download
  - + Documentation
  - + Cicerone
  - + Analysis Threads
  - + User Contributions
- Caveats
- Newsletters
- FAQ

Installing the Fermi Science Tools

You can install the Fermi Science Tools using either a source distribution or using a precompiled binary. The preferred method is to use the **binary** distribution. If you are unsure which distribution to select contact your system administrator. On a unix command line you can find your machine type with the command

uname -m

and you should see something like i686, x86_64, or powerpc.

To determine the version of libc you can try

ls /lib/libc-*

and you should see something like

/lib/libc-2.5.so

where the 2.5 is the libc version.

Please read the release notes.

Current software version v9r27p1, released April 18, 2012.

- If your system is not supported, try the closest binary distribution first
- If that doesn't work, you can try building from source (not recommended)

Downloading and installing the Fermi science tools from the binary tar files below is strongly recommended. The many minor variations in the various Unix systems makes building the tools from source challenging.

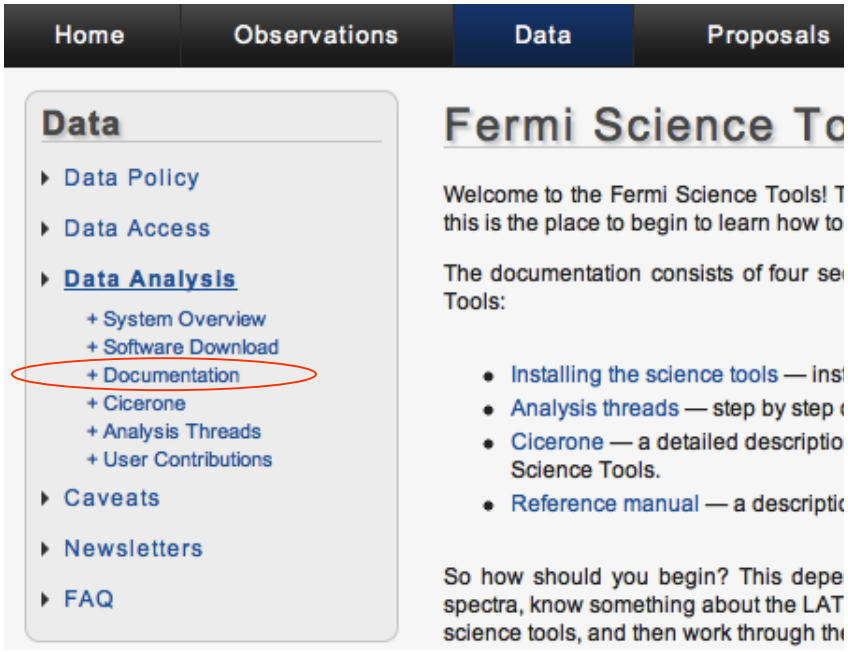
This list gives the systems that the HEADAS distribution of the Fermi science tools have been successfully tested on (but not built) and gives the Release (Code Name), Kernel Version, GCC Version, and Architecture. If you use one of the systems below, we recommend using one of the binary builds that most closely matches your system.

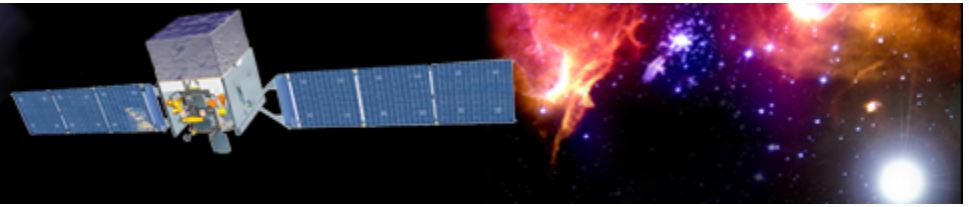
Supported platforms

- Scientific Linux release 6 (Carbon), 2.6.32, gcc version 4.4.6, x86_64
- Fedora release 15, 2.6.42, gcc version 4.6.3, i686
- Fedora release 15, 2.6.42, gcc version 4.6.3, x86_64
- Fedora release 16, 3.3.1, gcc version 4.6.3, x86_64
- Ubuntu release 10.04, 2.6.32, gcc version 4.4.3, i686
- Ubuntu release 10.04, 2.6.32, gcc version 4.4.3, x86_64
- Ubuntu release 11.11, 3.0.0, gcc version 4.6.1, i686
- Ubuntu release 11.11, 3.0.0, gcc version 4.6.1, x86_64
- Darwin 11.3.0 (Lion), xnu-1699.24.23~1/RELEASE_X86_64, gcc version 4.2.1, x86_64

Science Tools: Documentation

- *Multiple levels of Documentation*
  - *Detailed] analysis description ('Cicerone')*
    - *Describes instrumentation and data acquisition*
    - *Explains analysis methods*
    - *Provides current recommendations from instrument teams*
  - *Analysis threads*
    - *Follow the analysis chain step-by-step*
  - *Individual tool descriptions (like fhelp)*
    - *Explains individual parameters in detail*

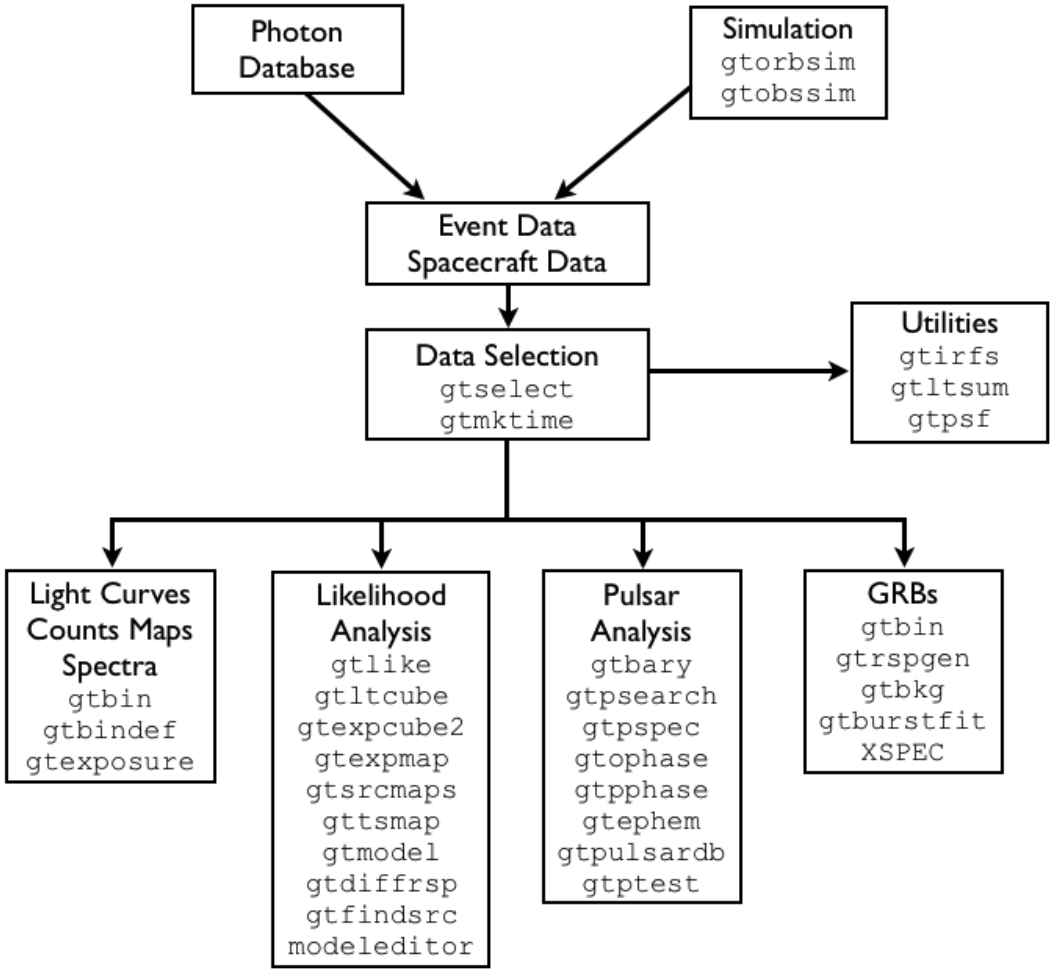


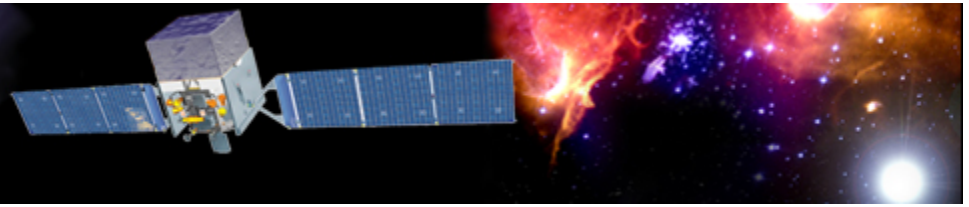


Science Tools: Structure

- *"Atomic" executables*
  - *Allows for divergent analysis without task repetition*
  - *Scriptable into more complex analysis chains*
- *Standard file types*
  - *FITS data i/o*
  - *IRAF style param files*
    - *Previous input values stored for re-use*
  - *XML source models*
  - *Text-based supporting files*
- *Standard toolsets for astronomy*
  - *FV, DS9, XSPEC*

Science Tools: Relationships

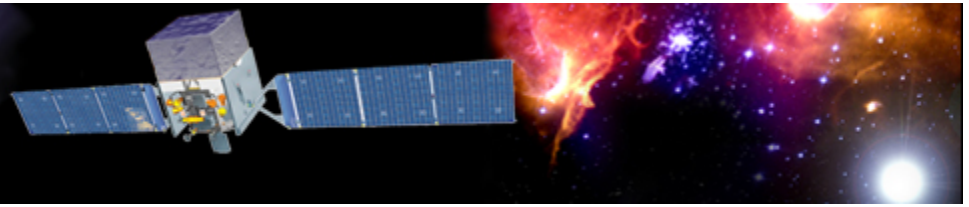




Science Tools: Execution

- *Parameters can be input in three ways*
  - *Command line entry - useful for scripting*
    - *Allows modification of "hidden" parameters (likely not needed for standard analyses)*
  - *Last value stored in param file for next use*
  - *Interactive prompted entry*
    - *No access to hidden parameters*

- *Parameter input can be mixed*
  - *%gtselect*
  - *%gtselect clobber=no*
  - *%gtselect clobber=no, infile=events.fits, outfile=events_cut.fits, etc...*



Analysis Threads

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Analysis Threads

NOTE: These threads have been updated to account for changes in the LAT Pass 7 data. If you need information on P analysis, look here. A detailed discussion of the performance of the Large Area Telescope Pass 7 data is available on a

- Overview
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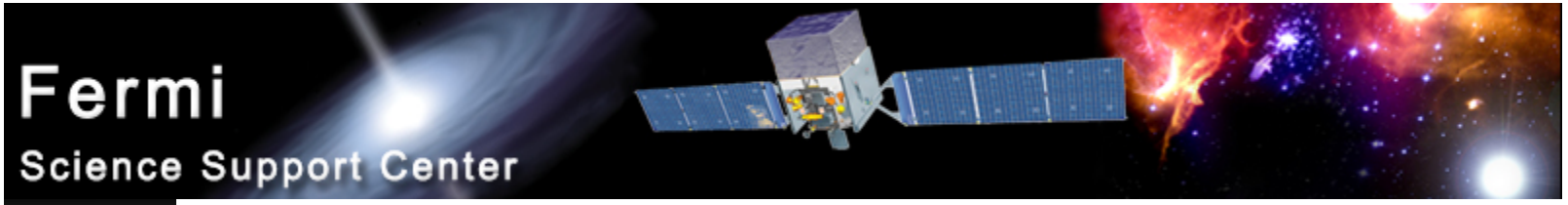
  - Extract LAT Data
  - Data Preparation
  - Explore LAT Data
  - Explore LAT Data (for Burst)
- Source Analysis
  - Likelihood Tutorial
  - Binned Likelihood Tutorial
  - Likelihood Analysis from Python
  - Extended Source Analysis (Binned Analysis from Python)
  - LAT Aperture Photometry Analysis
  - Source Identification
  - Pulsar Gating Tutorial
  - Upper Limit Calculation (LATAnalysisScripts)
- GRB Analysis
  - LAT GRB Analysis
  - GBM GRB Analysis
  - Combined LAT and GBM analysis
  - Generating Customized GBM Response Matrices
- Pulsar Analysis
  - Pulsar Analysis Overview

These threads describe the most common analyses.

(gtselect, gtbin, gtlike, etc.)

Specialized analyses are also explained in detail.



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  - Generating Customized GBM Response Matrices
- Pulsar Analysis
  - Pulsar Analysis Overview

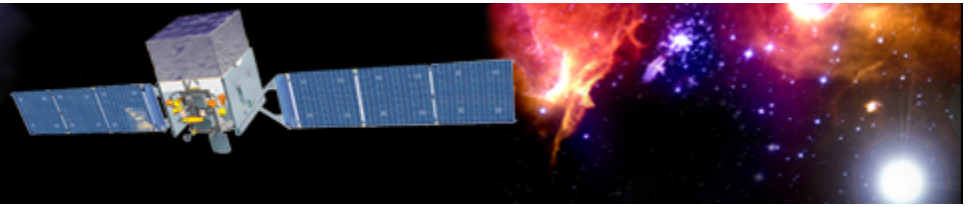
But remember:

Solar Analysis

is not considered

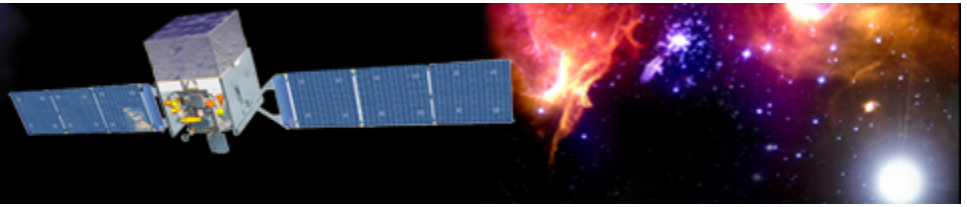
“standard” LAT analysis.

You WILL need to modify recommended values.

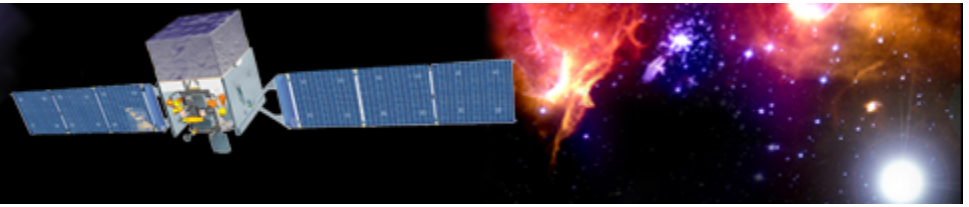


Need Help?

- *Try the FAQ!*
  - *http://fermi.gsfc.nasa.gov/cgi-bin/ssc/faq/glastfaq.cgi*
- *Or contact the Fermi Helpdesk at:*
  - *http://fermi.gsfc.nasa.gov/ssc/help/*
  - *Or by emailing fermihelp@milkyway.gsfc.nasa.gov*



Backup Slides



Data Access: LAT Data Server

LAT Photon, Event, and Spacecraft Data Query

April 19 2012: The data server is now loaded with Pass7 photon data. This data has the updated diffuse response columns. We do not recommend mixing the data downloaded before April 18 with the current data if you are doing unbinned analysis. Analysis using Binned Likelihood is unaffected.

NOTE: For queries encompassing the whole sky (or close to it), please use the pre-generated Weekly All-Sky Files available through HEASARC Browse.

For all-sky data, you must download these

NOTE: Additional selections must be applied to data downloaded from the data server prior to use in a data analysis. See **recommended data selections** and **LAT caveats** for more details.

The photon database currently holds 206781719 photons, collected between 2008-08-04T15:43:37 UTC and 2012-08-20T17:23:46 UTC (Mission Elapsed Time (MET) 239557417 to 367176226 seconds).

The event database currently holds 1449947386 events, collected between 2012-04-18T09:42:58 UTC and 2012-08-20T17:23:46 UTC (Mission Elapsed Time (MET) 356434978 to 367176226 seconds).

Use xTime to convert between MET and other time systems.

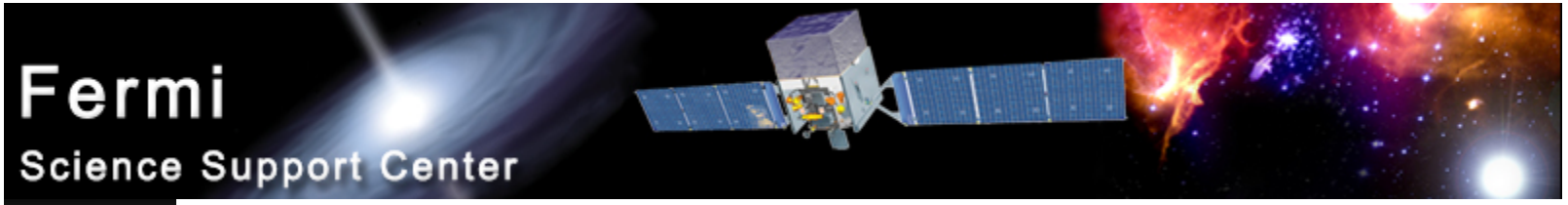
Start Search | Reset

Object name or coordinates:	Vela
Coordinate system:	J2000
Search radius (degrees):	20
Observation dates:	START,END
Time system:	MET
Energy range (MeV):	30,300000
LAT data type:	Photon
Spacecraft data:	☑

Will write DSS position keywords into FITS header

Can use “START” and “END”

Maximum range for data server (Default is 100 MeV - 300 GeV)



Data Access: Data Server - 2

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+ FSSC Home

Data

Data Policy

Data Access

+ LAT Data
+ LAT Catalog
+ LAT Data Queries
+ LAT Query Results
+ LAT Weekly Files
+ GBM Data

Data Analysis

Caveats

Newsletter

FAQ

Query L1208202134395BE3BD9309 submitted.

Please see LAT Data Caveats for important information about Fermi LAT data.

Your search criteria were:

Equatorial coordinates (degrees)	(128.5,-45.8333)
Time range (MET)	(239557417,367176226)
Time range (Gregorian)	(2008-08-04 15:43:37,2012-08-20 17:23:46)
Energy range (MeV)	(30,300000)
Search radius (degrees)	20

The estimated time for your query to complete is 137 seconds. The results of your query may be found at http://fermi.gsfc.nasa.gov/cgi-bin/ssc/LAT/QueryResults.cgi?id=L1208202134395BE3BD9309.

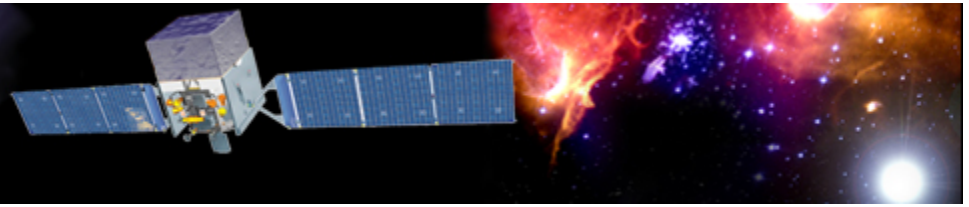
Duration of query can be very long (~ hours) for extended data files

+ Privacy Policy and Important Notices
+ Get Plugins (Acrobat, etc.)
+ Contact NASA
+ Learn More About Fermi
+ FSSC Helpdesk

For questions, contact the Helpdesk

Curator: J.D. Myers
Responsible NASA Official: Phil Newman
NASA Science Official: Neil Gehrels

Last Modified:



Data Access: Data Server - Results

Search was for Vela →

Results for query L1208202134395BE3BD9309

Your search criteria were:

Equatorial coordinates (degrees)	(128.5,-45.8333)
Time range (MET)	(239557417,367176226)
Time range (Gregorian)	(2008-08-04 15:43:37,2012-08-20 17:23:46)
Energy range (MeV)	(30,300000)
Search radius (degrees)	20

Save this information for future reference

The state of your query is 2 (Query complete)

Server	Position in Queue	Estimated Time Remaining (sec)
Photon Server	Query complete	N/A
Spacecraft Server	Query complete	N/A

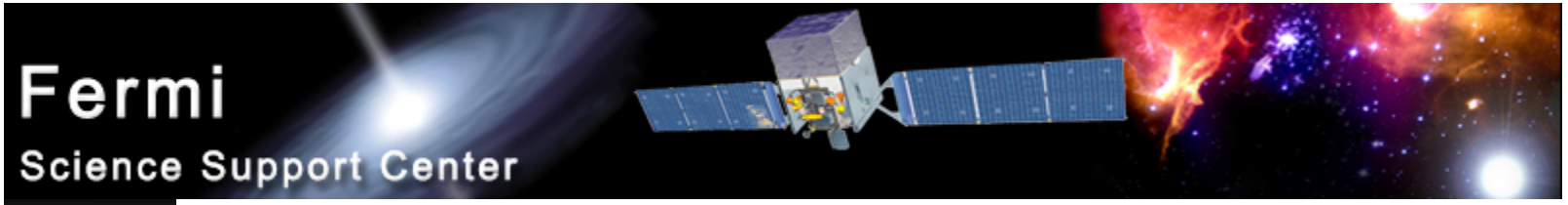
The filenames of the result files consist of the query ID string with an identifier appended to indicate which database the file came from. The identifiers are of the form: _DDNN where DD indicates the database and NN is the file number. The file number will generally be '00' unless the query resulted in a large data volume. In that case the data is broken up into multiple files. The values of the database field are:

- PH - Photon Database
- SC - Spacecraft Pointing, Livetime, and History Database
- EV - Extended Database

In the event that you do not see any files with the data type you requested listed below, you should try resubmitting your query as there may have been a problem.

Filename	Number of Entries	Size (MB)	Status
L1208202134395BE3BD9309_PH00.fits	468366	42.05	Available
L1208202134395BE3BD9309_SC00.fits	3583114	505.76	Available
L1208202134395BE3BD9309_PH02.fits	1072210	96.18	Available
L1208202134395BE3BD9309_PH03.fits	1278928	114.71	Available
L1208202134395BE3BD9309_PH01.fits	557897	50.08	Available
L1208202134395BE3BD9309_PH04.fits	1245741	111.74	Available
L1208202134395BE3BD9309_PH05.fits	1380344	123.80	Available
L1208202134395BE3BD9309_PH08.fits	814361	73.05	Available
L1208202134395BE3BD9309_PH07.fits	920698	82.59	Available
L1208202134395BE3BD9309_PH06.fits	1415495	126.96	Available
L1208202134395BE3BD9309_PH09.fits	612163	54.92	Available

← Spacecraft file is largest



Data Access: Browse

1. Please select one or more of the tables below.

Sort by a column in order: 1,2,3 Sort by column in reverse order: 3,2,1

Select: All	Description	Catalog	Data	Default Radius (arcmin)	Mission	Table Type
☑	Fermi GBM Burst Catalog	fermigbrst	Y	180	FERMI	Object
☑	Fermi LAT Weekly Data	fermilweek	Y	***	FERMI	Observation
☑	Fermi LAT Low-Energy Events Catalog	fermille	Y	180	FERMI	Object
☑	Fermi GBM Trigger Catalog	fermigtrig	Y	180	FERMI	Object
☑	Fermi GBM Daily Data	fermigdays	Y	***	FERMI	Observation
☑	Fermi LAT Monitored Source List	fermilasp	N	20	FERMI	Object
☑	Fermi LAT Second Source Catalog	fermilpsc	Y	10	FERMI	Object
☑	AT20G/Fermi 1FGL Source Catalog	at20g1fgl	N	10	FERMI	Object
☑	Fermi LAT Second AGN Catalog	fermilac	N	10	FERMI	Object
☑	Fermi LAT Bright Source List	fermilbsl	N	30	FERMI	Object

2. Do you want to change any of your current query selections?

Object Name Or Coordinates: (e.g. Cyg X-1 or '12 00 00, 4 12 6') Use semi-colons (;) to separate multiple object names or coordinate pairs (e.g. Cyg x-2; 12.235, 15.345)

Coordinate System: J2000

Search Radius: Default arcmin Default uses the optimum radius for each catalog searched.

Name Resolver: GRB, SIMBAD, else NED

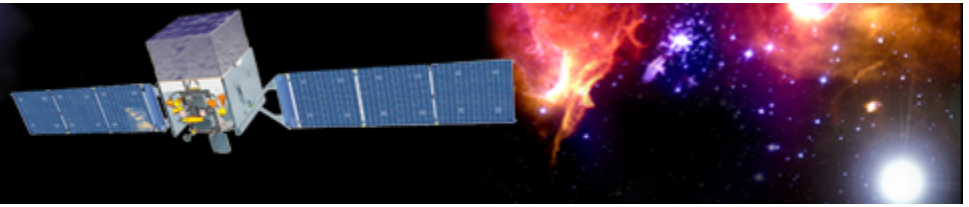
Observation Dates: Not all tables have observation dates. For those that do, the time portion of the date is optional. Separate multiple dates/ranges with semicolons (;). Range operator is '..'. (e.g. 1992-12-31; 48980.5; 1995-01-15 12:00:00; 1997-03-20 .. 2000-10-18)

Limit Results To: 1000 rows

Output Format: Tabbed Display

Show All Parameters: ☐ Select to display all catalog parameters instead of only defaults

3. Submit Search Reset Specify Additional Parameters



Data Access: Browse LLE

Query Information | Query Results | Data Products Retrieval | Help

fermi

fermille

Click mission tabs (middle tab level) to display table tabs. Move cursor over tabs to see more information.

Table Legend:
Display all parameters for a row
Sort by a column in order: 1,2,3 Sort by column in reverse order: 3,2,1 Current table sort
Services links: O: Digitized Sky Survey image, R: ROSAT All-Sky Survey image, N: NED objects near coordinates,
S: SIMBAD objects near coordinates, D: get list of data products, B: ADS bibliography holdings, F: FOV plot for observation

Data Products: Click checkbox to add row to Data Product Retrieval List

Fermi LAT Low-Energy Events Catalog (fermille) Bulletin README

Select All	Services	trigger name	name	ra	dec	trigger time	trigger type	version
☐	O R N S D	bn100225115	GRB100225115	20 41 12.0	-59 24 00	2010-02-25 02:45:31.147	GRB	1
☐	O R N S D	bn110721200	GRB110721200	22 12 48.0	-38 30 00	2011-07-21 04:47:43.761	GRB	2
☐	O R N S D	bn110731465	GRB110731465	18 42 01.0	-28 32 14	2011-07-31 11:09:29.954	GRB	1
☐	O R N S D	bn100826957	GRB100826957	18 56 00.0	-23 11 24	2010-08-26 22:58:22.898	GRB	1
☑	O R N S D	bn110924399	SFLARE110924399	12 03 05.0	-00 2			
☐	O R N S D	bn101123952	GRB101123952	09 00 38.4	+01 5			
☐	O R N S D	bn110906929	SFLARE110906929	11 00 21.4	+06 2			
☐	O R N S D	bn120624933	GRB120624933	11 23 45.6	+08 5			

Data Product Retrieval

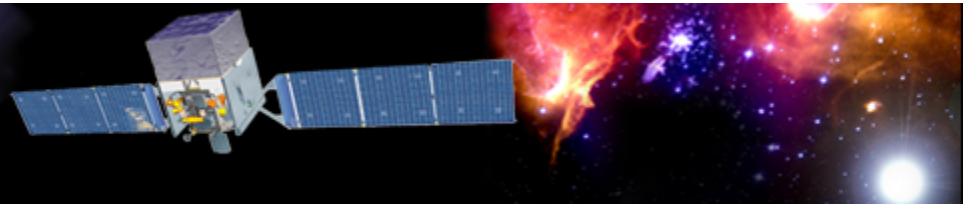
- Select the checkboxes for the rows of interest above,
- Un-check any data products below you are not interested in
- Select the Data Product Retrieval tab for retrieval options

Data Products **available for fermille**
☑ All
☐ LAT Trigger Products - Entire Directory (dir)
☐ LAT Trigger Quicklook Products (ql)

Show current rows selected for Data Products Retrieval

Further Actions:

Do you want to Plot your fermille results? (help)
Do you want to Cross-correlate your fermille results with another catalog or table? (help)



Data Access: Browse LLE

Query Information | Query Results | Data Products Retrieval | Help

Data Products Download Options and Other Services

Data Products Download Options

Create Download Script	for data products for selected rows
Preview and Retrieve	data products for selected rows
Retrieve	data products for selected rows
Save to Hera What is Hera?	data products for selected rows

Optionally, add a file name constraint to specify product types,
e.g., */hri/*.gif* Use a semicolon (;) for multiple contraints, e.g., *fits*;*gif*

File name filter

Other services for selected rows

Display all the columns for selected rows

Web-based services for selected rows

NED
SIMBAD
SkyView:ROSAT All-Sky
SkyView:DSS
CoCo

GO

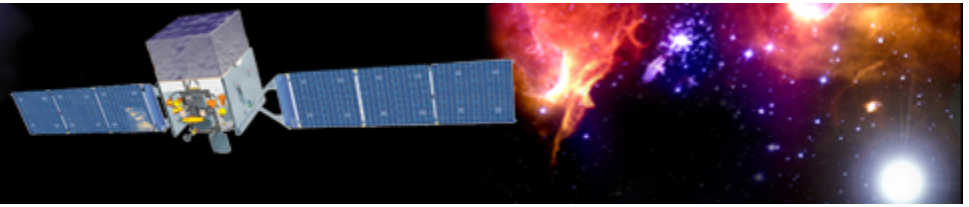
Web-based services help

Data products that you have selected will be appear below

☑ Select all rows

Fermi LAT Low-Energy Events Catalog

	trigger name	name	ra	dec	trigger time	trigger type	version
☑	bn110924399	SFLARE110924399	12 03 05.0	-00 20 03	2011-09-24 09:34:38.651	SFLARE	1



Data Access: Browse LLE

Archive — Data Products Retrieval for selected rows

Choose Tables > **Retrieve Data Products**

Estimated size of TAR file: 4 MB
Your TAR file is being created now. When finished you may retrieve it via the following link

http://heasarc.gsfc.nasa.gov/FTP/retrieve/w3browse/w3browse-190822.tar.

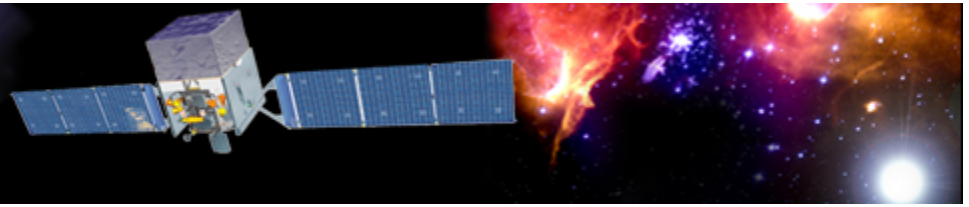
Note: We have phased out retrieval of data product tar files via FTP.

Please wait until the "TAR complete" message appears below before retrieving.

Data products included in the TAR file: (filenames ending in '.gz' or '.Z' have been compressed for faster downloading.)

Tarred: /FTP/fermi/data/lat/triggers/2011//bn110924399/quicklook/gll_cspec_bn110924399.png
Tarred: /FTP/fermi/data/lat/triggers/2011//bn110924399/quicklook/gll_edisp_bn110924399.png
Tarred: /FTP/fermi/data/lat/triggers/2011//bn110924399/quicklook/gll_effarea_bn110924399.png
Tarred: /FTP/fermi/data/lat/triggers/2011//bn110924399/current
Tarred: /FTP/fermi/data/lat/triggers/2011//bn110924399/quicklook/gll_quick_bn110924399.png
Tarred: /FTP/fermi/data/lat/triggers/2011//bn110924399/quicklook/gll_mcvar_bn110924399.png

TAR complete: Actual size: 4 MB.



Science Tools: Parameter Files

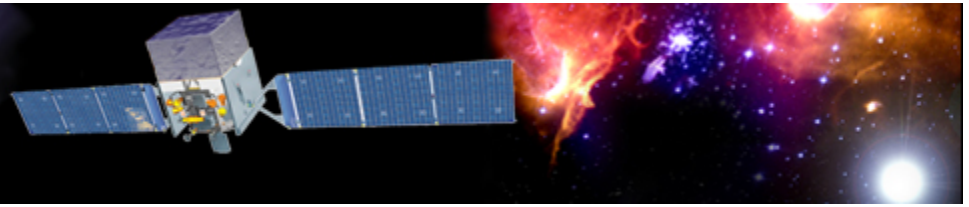
- *Contain parameter defaults or previous values*

```
#
# $Header: /nfs/slac/g/glast/ground/cvs/dataSubselector/pfiles/gtselect.par,v 1.19 2010/02/08
21:22:50 jchiang Exp $
#
infile,f,a,"",,,"Input FT1 file"
outfile,f,a,"",,,"Output FT1 file"
ra,r,a,INDEF,0,360,RA for new search center (degrees)
dec,r,a,INDEF,-90,90,Dec for new search center (degrees)
rad,r,a,INDEF,0,180,radius of new search region (degrees)
tmin,r,a,INDEF,0,,start time (MET in s)
tmax,r,a,INDEF,0,,end time (MET in s)
emin,r,a,30,0,,lower energy limit (MeV)
emax,r,a,300000,0,,upper energy limit (MeV)
zmax,r,a,180,0,180,maximum zenith angle value (degrees)
evclsmin,i,h,3,0,1000,"Minimum event class ID"
evclsmax,i,h,4,0,1000,"Maximum event class ID"
convtype,i,h,-1,-1,1,"Conversion type (-1=both, 0=Front, 1=Back)"
phasemin,r,h,0,0,1,minimum pulse phase
phasemax,r,h,1,0,1,maximum pulse phase

evtable,s,h,"EVENTS",,,"Event data extension"

chatter,i,h,2,0,4,Output verbosity
clobber,        b, h, yes, , , "Overwrite existing output files"
debug,          b, h, no, , , "Activate debugging mode"
gui,            b, h, no, , , "GUI mode activated"
mode,           s, h, "ql", , , "Mode of automatic parameters"
```

Parameters can be:
a = prompted
h = hidden

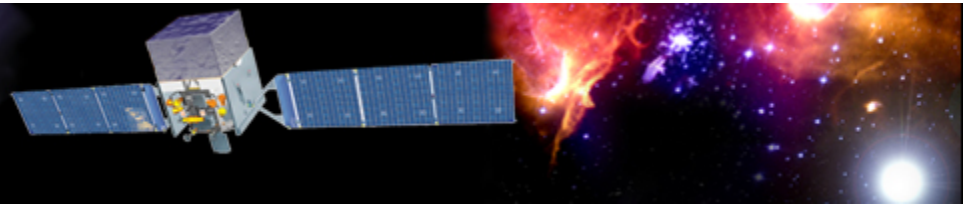
Hidden parameters must be given on command line.

To keep from overwriting files, set clobber=no



Preparing LAT data

- *Prior to beginning an analysis you must:*
  - *Select the event class (for Pass 6 data, use Diffuse in almost all cases)*
  - *Decide how you intend to exclude time intervals where the bright Earth limb comes close to the edge of your region of interest*
- *Combine photon files if necessary*
  - *For large time ranges you will likely have multiple photon files*
  - *Combine using @filelist.txt syntax where filelist.txt is a listing of all photon files to be included, one per line*
- *Combine spacecraft files if necessary*
  - *Easiest method is to request the full time range from the data server*
  - *Can use **ftmerge** to concatenate the files together (not recommended)*
    - *Be aware of updates to the header keywords*



LAT Data Selection

- *Event-specific cuts can be made with **gtselect***
  - *Time range, energy range, position, ROI radius, zenith angle*

Hidden parameters defined on the command line

```
[wcne-128-154-203-60:Workshops/Datasets/3c454] eferrara% gtselect evclsmin=3
Input FT1 file[] L090923112502E0D2F37E71_PH00.fits
Output FT1 file[] 3c454_ecut.fits
RA for new search center (degrees) (0:360) [INDEF] 343.490616
Dec for new search center (degrees) (-90:90) [INDEF] 16.148211
radius of new search region (degrees) (0:180) [INDEF] 15
start time (MET in s) (0:) [INDEF] 266976000
end time (MET in s) (0:) [INDEF] 275369897
lower energy limit (MeV) (0:) [30] 100
upper energy limit (MeV) (0:) [300000] 300000
maximum zenith angle value (degrees) (0:180) [180] 105
Done.
```

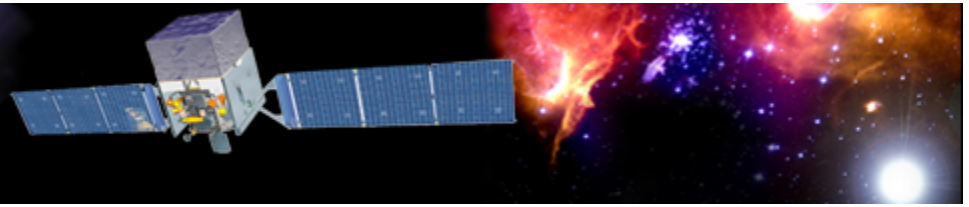
Or @filelist.txt

Parameter values can be read from the header keywords by inputting INDEF

- *Temporal cuts using spacecraft file keywords are made with **gtmktime***
  - *This MUST be applied if a zenith cut was used with gtselect*

```
[wcne-128-154-203-60:Workshops/Datasets/3c454] eferrara% gtmktime
Spacecraft data file[] L090923112502E0D2F37E71_SC00.fits
Filter expression[DATA_QUAL==1 && LAT_CONFIG==1 && ABS(ROCK_ANGLE)<52]
Apply ROI-based zenith angle cut[yes]
Event data file[] 3c454_ecut.fits
Output event file name[] 3c454_ecut_gti.fits
```

Applies zenith angle cut from gtselect

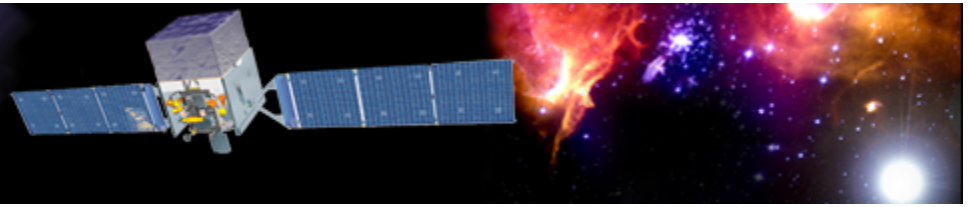


LAT Data Selection - 2

- *Different cuts should be used for different types of data analysis*
  - *Point Source analysis*
    - *For hard spectrum sources, localization analysis may benefit from a higher minimum energy cut due to energy-dependent PSF*
  - *Pulsar Timing analysis*
    - *Requires that spacecraft file span a greater time range than event file*
    - *Data server automatically pads the spacecraft file, unless you use START or END time keys*
  - *GRB analysis (~ few hundred seconds)*
    - *Typically uses "Transient" class photons (evclsmin=1)*
- *The current set of cuts can be reviewed using **gtvcut***

- *Recommended cuts are documented at:*

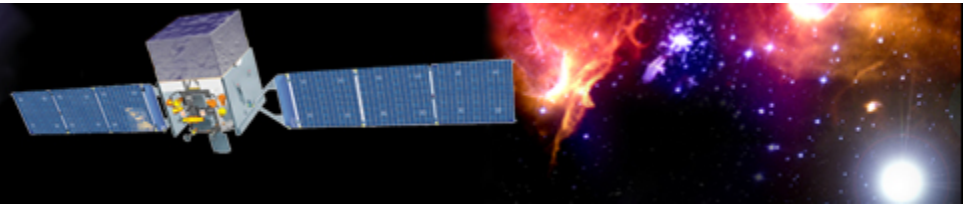
http://fermi.gsfc.nasa.gov/ssc/data/analysis/documentation/Cicerone/Cicerone_Data_Exploration/Data_preparation.html



Binning for Visualization

- ***gtbin*** *can be used to create several useful visualization products*
  - *Raw counts map*
  - *Quick-look light curve*
  - *PHA1 file*
- *Results are in format used by other science tools like* ***XSPEC***
  - *Includes WSC keywords for ease of viewing*
- *Useful to get a rough idea of the data, but do not include:*
  - *Exposure correction*
  - *Instrument responses*

Require Likelihood analysis for valid results



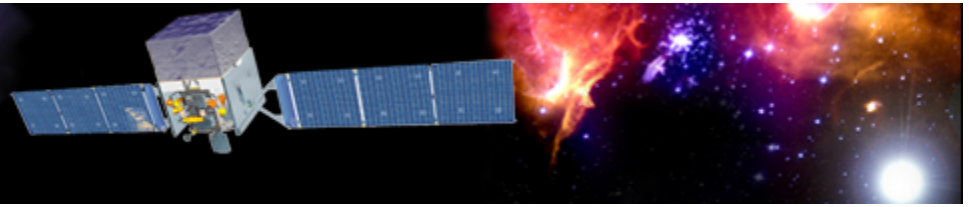
Binning for Visualization

- *Making a counts map*

```
[wcne-128-154-203-60:Workshops/Datasets/3c454] eferrara% gtbin
This is gtbin version ScienceTools-v9r17p0-fssc-20100906
Type of output file (CCUBE|CMAP|LC|PHA1|PHA2) [PHA2] CMAP
Event data file name[] 3c454_ecut_gti.fits
Output file name[] 3c454_ecut_gti_cmap.fits
Spacecraft data file name[NONE] L090923112502E0D2F37E71_SC00.fits
Size of the X axis in pixels[] 300
Size of the Y axis in pixels[] 300
Image scale (in degrees/pixel)[] .1
Coordinate system (CEL - celestial, GAL -galactic) (CEL|GAL) [CEL] CEL
First coordinate of image center in degrees (RA or galactic l)[] 343.490616
Second coordinate of image center in degrees (DEC or galactic b)[] 16.148211
Rotation angle of image axis, in degrees[0.] 0
Projection method e.g. AIT|ARC|CAR|GLS|MER|NCP|SIN|STG|TAN:[AIT] AIT
[wcne-128-154-203-60:Workshops/Datasets/3c454] eferrara%
```

Here, ROI diameter × image scale = size of each axis

To view the entire region, match these values to the header values



Binning for Visualization

- *Making a quick-look lightcurve*

```
[wcne-128-154-203-60:Workshops/Datasets/3c454] eferrara% gtbin
This is gtbin version ScienceTools-v9r17p0-fssc-20100906
Type of output file (CCUBE|CMAP|LC|PHA1|PHA2) [CMAP] LC
Event data file name[3c454_ecut_gti.fits]
Output file name[3c454_ecut_gti_cmap.fits] 3c454_ecut_gti_lightcurve.fits
Spacecraft data file name[L090923112502E0D2F37E71_SC00.fits] L090923112502E0D2F37E71_SC00.fits
Algorithm for defining time bins (FILE|LIN|SNR) [LIN] LIN
Start value for first time bin in MET[0] 266976000
Stop value for last time bin in MET[0] 275369897
Width of linearly uniform time bins in seconds[0] 86400
[wcne-128-154-203-60:Workshops/Datasets/3c454] eferrara%
```

Times do not have to align to full data series

Binning for Visualization

- *Gtbin products are easily viewable in fv or ds9*