

Welcome



Fermi Data Analysis Workshop

Chris Shrader,
Fermi Science support Center
NASA/GSFC

Workshop Objectives

- Today we'll cover *Fermi* analysis basics:
 - Data content, selection cuts, caveats
 - Analysis methodologies, synopsis of tools
 - ML method → point source analysis
 - Light curve & pulsar analysis
- Emphasis on hands on analysis
 - roving support staff
- Feedback & discussion
- GI Program: Guidelines for Proposer

Agenda, Staff



9:00 - 9:30	Registration, Setup
9:30 - 9:40	Overview, Workshop Objectives
9:40 - 10:00	Data Selection, Exploration
10:00 - 10:20	Hands on Session 1
10:20 - 10:35	Point Source Analysis
10:35 - 10:45	Using the Catalog for Analysis
10:45 - 11:15	Hands on Session 2
11:15 - 11:30	Q&A, Review
11:30 - 12:15	Hands on Session 2 (con.)
12:15 - 13:30	Lunch Break
13:30 - 13:45	Advanced Likelihood Topics
13:45 - 14:45	Hands on Session 3
14:45 - 15:00	Light Curve Analysis
15:00 - 15:45	Hands on Session 4
15:45 - 16:00	Summary, Feedback
16:00 - 16:30	GI Program and Q&A
16:30	Adjourn

Prerequisites



- Science Tools Installation – hopefully done prior, but we can help as needed
 - Workshop web page is useful resource
- Sample datasets on workshop web page
 - – can substitute alternative data selections, but be cognizant of run-time, S/N issues
- Access to Fermi SSC web site
 - Data analysis documentation sets
 - Threads, Cicerone, Reference (‘fhelp’) docs

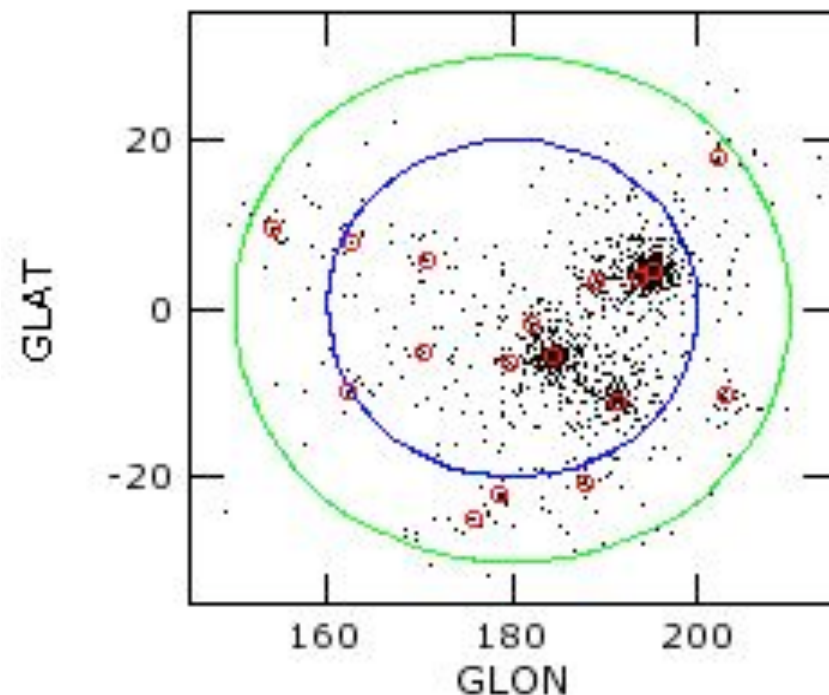
What's different about Fermi data analysis?

- Structured sky backgrounds
- Energy-dependent point spread function
- Instrument response function(s) IRFs
 - Multiple dependencies: instrument design, event reconstruction, background & quality selections
- Wide field of view, continuously variable aspect

Energy Dependent PSF

- Sources must be fit simultaneously.
 - Broad and energy-dependent PSFs: $\sigma_{68} < 3.5^\circ$ for 100 MeV (on axis) and $< 0.1^\circ$ for 10 GeV
 - Emission from nearby point sources overlap.
 - Intrinsic source spectrum affects the degree of source confusion.
 - “Source region” must be significantly larger than the “region-of-interest” (ROI).

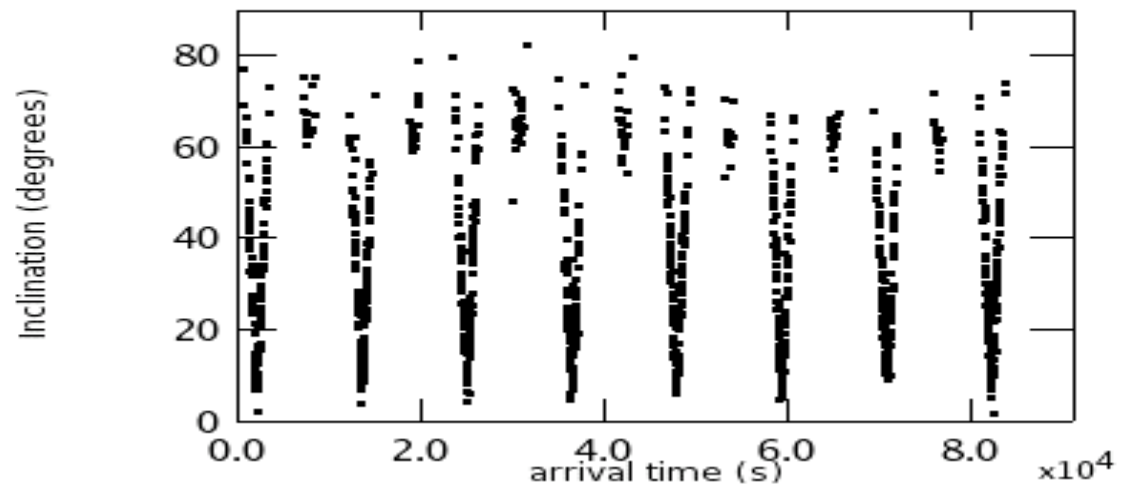
- Anticenter region:



Continuously Varying Aspect

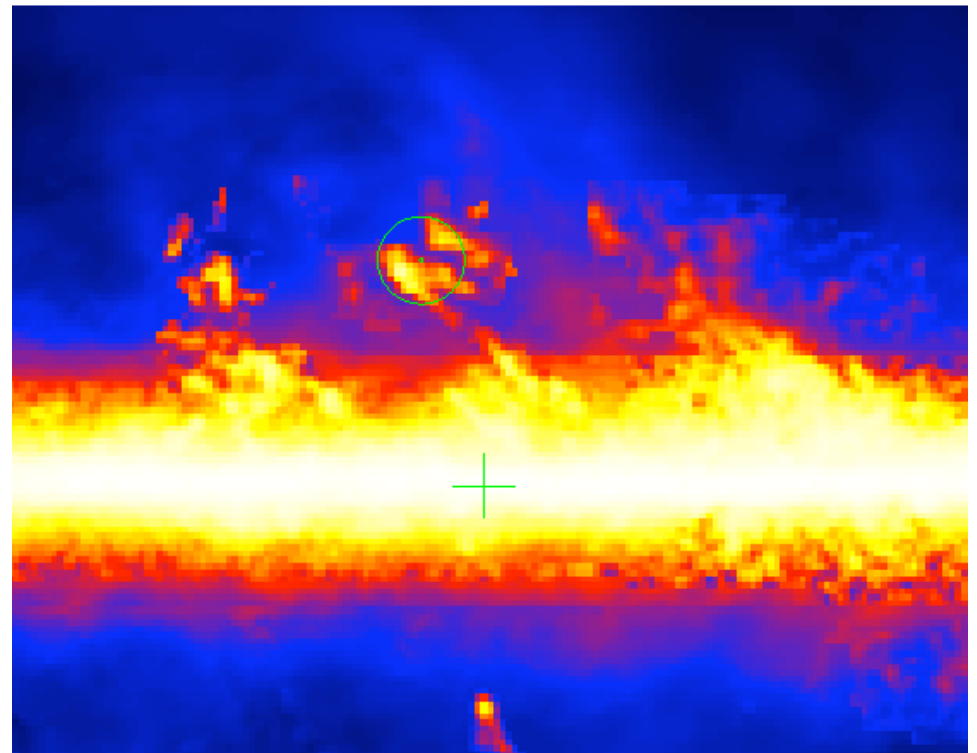


- Each event effectively has its own response function:
 - Large FOV, ~ 2.4 sr
 - Strong variation of response as a function of photon incident angle, $A_{\text{eff}} \propto \cos \theta$
 - Scanning mode of operation: 95 min orbit \Rightarrow continuous aspect changes of $4^\circ/\text{min}$.



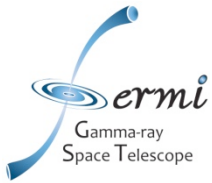
Diffuse Emission

- Emission results from cosmic ray interactions with interstellar gas.
- Models rely on HI & CO observations for the gas distribution
- These observations reveal structures on angular scales similar to the PSF
- Also, extragalactic (ie full-sky isotropic) background



Useful Information

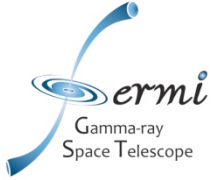
- Web URLs:
 - http://fermi.gsfc.nasa.gov/workshops/da2010_aas/ Workshop web site
 - <http://fermi.gsfc.nasa.gov/ssc/> FSSC home
 - <http://fermi.gsfc.nasa.gov/ssc/data/access/> Data access
 - <http://fermi.gsfc.nasa.gov/ssc/data/analysis/> Data analysis page
 - <http://fermi.gsfc.nasa.gov/cgi-bin/ssc/faq/glastfaq.cgi> FAQs



Cycle-3 Timeline



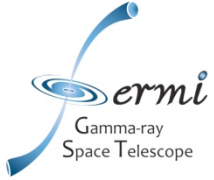
Announcement (as part of ROSES 2008)	September, 2009
Release online proposal aids & documentation	November 5, 2009
Notices of Intent (optional)	November 16, 2009
Proposals Due	February 5, 2010
Proposal Peer Review	April, 2010
Stage-II (budget proposal) solicitation	May 2010
Budget deadline, processing & grants administration	June-July 2010
Fermi Cycle 3 Begins	Mid August, 2010



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Let's get started ...




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Extra Slides

Important resource: FSSC data analysis web page


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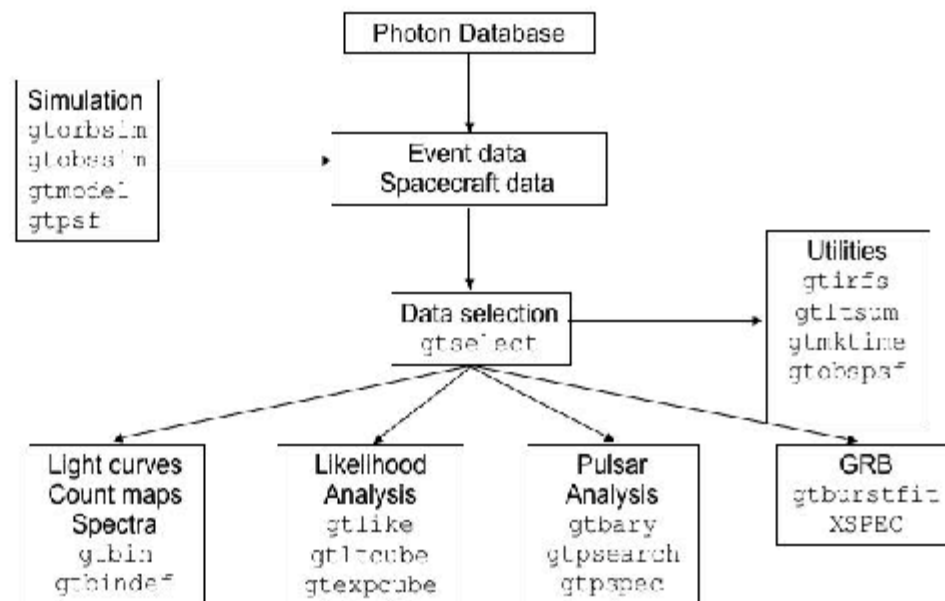
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Data

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

Overview: LAT Data Analysis Tools

Through a collaborative effort between the Fermi Science Support Center and the LAT instrument team a suite of instrument specific science analysis tools has been developed for public release. This software will be distributed and maintained by the FSSC. It has been designed within the framework of the HEADAS FTOOLS methodology, to ensure cross-mission compatibilities wherever possible and to minimize the learning curve for users of other high-energy astrophysics mission data sets. The general analysis flow is illustrated in this graphic:






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Sample data
sets posted
online:

Vela Pulsar,
3C 454.3

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Fermi Data Analysis Workshop - Downloads

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- [3c453](#)
- [Vela](#)

Science Tools Download Page:

Hopefully this
has already
been done(?)
but if not, refer
to this page for
supported
platforms,
installation
instructions



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Installing the Femi 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-2.3.4.so
```

where the 2.3.4 is the libc version.

We have binary distributions for:

- Scientific Linux 4.4 32 bit libc 2.3.4
- Scientific Linux 5 32 bit libc 2.5
- Scientific Linux 4 64 bit libc 2.3.4
- Scientific Linux 5 64 bit libc 2.5
- MAC OS X 10.4 powerpc