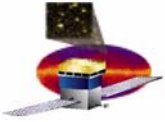


# Science group Activities

---

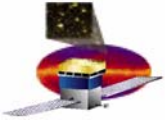
- Overview of science groups
- Organising ourselves
  - Papers
  - Conferences (presentations and proceedings)
  - Multiwavelength proposals.
- Working together
  - Science Goals
  - Science/Source simulations
  - Analysis Development
  - Quantitatively understanding how the LAT will address scientific questions



# Science Groups Overview

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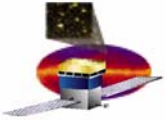
- There are 9 LAT science working groups
  - Blazars and other AGN
    - Paolo Giommi, Benoit Lott
  - Calibration and Analysis
    - Bill Atwood, Steve Ritz
  - Catalog
    - Seth Digel, Isabelle Grenier
  - Dark Matter and new physics
    - Elliott Bloom, Aldo Morselli
  - Diffuse (Galactic and Extragalactic)
    - Seth Digel, Isabelle Grenier
  - Gamma-ray Bursts
    - Jay Norris, Nicola Omodei
  - Pulsars, SNRs and Plerions
    - Roger Romani, Dave Thompson
  - Sources in the Solar system
    - Gerry Share
  - Unidentified Sources, population studies and other galaxies
    - Patrizia Caraveo, Olaf Reimer



# Organisation

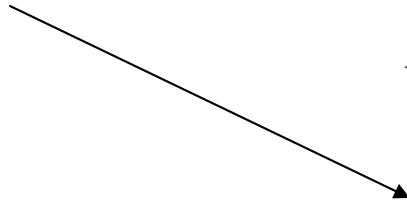
---

- **Science group coordinators meet each month (on the first Friday of each month typically).**
- **The agenda, presentations and minutes from each meeting are available to all collaborators.**
  - **Multiwavelength report**
  - **Status of papers**
  - **Upcoming conferences**
  - **Discussion of post DC2 simulation and analysis plans**
  - **Automated Science Processing**
  - **Coordination of collaboration and science group F2F meetings.**
- **Intent is that all the topics discussed at the coordinators meetings are also discussed (in more detail) in the meetings of the individual science groups.**



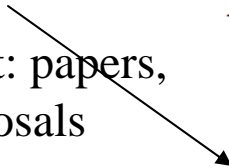
# Main Science Groups Confluence Page

Individual group pages

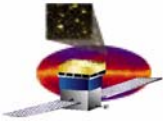


Links of general interest to all the Science groups.

3 of particular interest: papers, conferences and proposals



The screenshot shows a web browser window titled "Home - GLAST LAT Science Groups - SLAC Confluence". The address bar shows the URL "https://confluence.slac.stanford.edu/c". The page content includes a header "GLAST LAT Science Groups" and a sub-header "The Groups". Below this, there is a list of individual group confluence areas: Blazars and Other AGNs, Calibration and Analysis Methods, Catalogs, Dark Matter and New Physics, Diffuse and Molecular Clouds, Gamma Ray Bursts, Pulsars, SNRs, and Plerions, Sources in the Solar System, and Unidentified Sources, Population Studies, and Other Galaxies. A second section titled "Common Efforts" provides links to confluence pages of general interest to all groups, including: GLAST LAT Calendar, Individual group meeting coordination, Draft conference contributions, List of conferences/attendees, Papers, Multiwavelength proposal opportunities, Multiwavelength coordinating group, large, common MC data sets; other misc, and a forum for Performance Plots.



# Conference Organisation

Conference Contribution DRAFTS GLAST LAT Science Groups - SLAC Confluence

Getting Started Latest Headlines

Dashboard > GLAST LAT Science Groups > ... > Common Efforts > Conference Contribution DRAFTS

GLAST LAT Science Groups Welcome Julie McEnery | History | Profile | Log Out

## Conference Contribution DRAFTS

View Edit Attachments (0) Info Browse Space Add Page Add News

Added by Steve Ritz, last edited by Olaf Raimor on Jun 12, 2006 (view change)  
Labels: (None) EDIT

This page is intended for posting drafts of talks and posters for specific conferences. It should be particularly helpful when there are multiple LA1 contributors to a conference.

The final versions will be posted elsewhere, on a public page.

One child page (below) for each conference.

Children Hide Children View in hierarchy Add Child Page

- 2005, April 27-29, Paris, Towards a Network of Atmospheric Cherenkov Detectors VII (GLAST LAT Science Groups)
- 2006 April 22, Dallas APS (GLAST LAT Science Groups)
- 2006 July 4-7, Barcelona - the Multi-Messenger Approach to High-Energy Gamma-Ray Sources (GLAST LAT Science Groups)
- 2006, June 5-9, Venice, Swift and GRBs (GLAST LAT Science Groups)
- 2006, May 14-19, Bad Honnef, Neutron Stars and Pulsars (GLAST LAT Science Groups)
- 2006, Oct 4-7, San Francisco, HEAD (GLAST LAT Science Groups)
- 2006, October 9-11, College Park, Astrophysics Conference in Maryland (GLAST LAT Science Groups)
- 2006, Sept 18-20, London UK, Swift Meeting (GLAST LAT Science Groups)
- Challenges of Relativistic Jets, Cracow, June 25 - July 1 2006 (GLAST LAT Science Groups)

Add Comment

Powered by Atlassian Confluence, Ltd # Enterprise Wiki. (Version: 2.1.3 Build: #408 Jan 23, 2006) - Bug/feature request - Contact Administrators

Done confluence.slac.stanford.edu

A place to share abstracts/presentations to gather comments and coordinate contributions

## 2006 HEAD meeting (21 abstracts)

2006, Oct 4-7, San Francisco, HEAD - GLAST LAT Science Groups - SLAC Confluence

Getting Started Latest Headlines

Dashboard > GLAST LAT Science Groups > ... > Common Efforts > Conference Contribution DRAFTS

GLAST LAT Science Groups Welcome Julie McEnery | History | Profile | Log Out

## 2006, Oct 4-7, San Francisco, HEAD

View Edit Attachments (0) Info Browse Space Add Page Add News

Added by Julie McEnery, last edited by Roger W. Romani on Jul 26, 2006 (view change)  
Labels: (None) EDIT

### 1) Prospects for Observations of Microquasars with GLAST - draft

R. Dubois, SLAC The Gamma-ray Large Area Space Telescope (GLAST) is a next generation high energy gamma-ray observatory due for launch in Fall 2007. The primary instrument is the Large Area Telescope (LAT), which will measure gamma-ray flux and spectra from 20 MeV to > 300 GeV and is a successor to the highly successful EGRET experiment on CGRO. The LAT will have better angular resolution, greater effective area, wider field of view and broader energy coverage than any previous experiment in this energy range. This poster will present performance estimates with particular emphasis on how these apply to studies of microquasars. The LAT's scanning mode will provide unprecedented uniformity of sky coverage and permit measurements of light curves for any source. We will show results from recent detailed simulations that illustrate the potential of the LAT to observe microquasar variability and spectra, including source sensitivity and ability to detect orbit modulation.

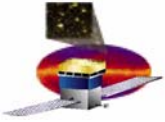
### 2) Prospects for Pulsar Studies with the GLAST Large Area Telescope

Alice K. Harding (NASA Goddard) for the GLAST LAT Pulsar, PWN and SNR group

The Large Area Telescope (LAT) on the Gamma-ray Large Area Space Telescope (GLAST) will have unprecedented sensitivity and energy resolution for gamma-rays in the range of 30 MeV to 200 GeV. GLAST is therefore expected to provide major advances in the understanding of high-energy emission from rotation-powered pulsars. As the only presently known galactic GeV source class, pulsars will be one of the most important sources for study with GLAST. The main science goals of the LAT for pulsars include an increase in the number of detected radio-loud and radio-quiet gamma-ray pulsars, including millisecond pulsars, giving much better statistics for elucidating population characteristics, measurement of the high energy spectrum and the shape of spectral cutoffs and determining pulse profiles for a variety of pulsars of different age. Further, measurement of phase-resolved spectra and energy dependent pulse profiles of the brighter pulsars should allow detailed tests of magnetospheric particle acceleration and radiation mechanisms, by comparing data with theoretical models that have been developed. Additionally, the LAT will have the sensitivity to allow blind

Done confluence.slac.stanford.edu

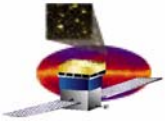
Meeting links contain abstracts, presenting authors, presentation (slides/poster) and proceedings.



## Conferences cont.

---

- **Coordinating LAT presence at conferences is important.**
- **One of the roles of the science groups is to identify relevant topic specific conferences and to identify analyses/studies from within the groups that are worthy of presentation.**
- **Conference presentations are generally discussed/distributed within the science group.**
- **Upcoming conferences are discussed each month in the science group coordinators meetings.**
- **The speakers bureau (chaired by Ronaldo Bellazzini) has oversight of and coordinates all LAT presentations.**
  - **They are informed of plans/suggestions for upcoming conferences.**
  - **Maintain a speakers bureau webpage containing guidelines, archives of final talks etc.**



# Papers

Papers generally have a confluence page of their own, within the relevant science group.

The confluence “labels” feature pulls them all together to make a complete list.

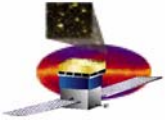
Recent (or currently) active papers on this page include: LAT instrument, ACD, elog and GRB theory.

links placed here to pages/information of general interest to assist with papers.

The screenshot shows a web browser window with the address bar displaying <https://confluence.slac.stanford.edu/disq>. The page title is "Papers - GLAST LAT Science Groups - SLAC Confluence". The main heading is "GLAST LAT Science Group Papers". Below this, there are several sections of papers:

- GLAST LAT publication plan** (with an external link icon)
- General Papers**
  - [The Large Area Telescope on the GLAST Mission](#) (GLAST LAT Science Groups) Labels: [generalpap](#)
- Blazars and other AGN group papers**
  - [Comprehensive papers on Blazar Observation](#) (GLAST LAT Science Groups) Labels: [aqnpap](#), [inpreppap](#), [cat1pap](#)
  - [Detection or upper limits on radio galaxies](#) (GLAST LAT Science Groups) Labels: [aqnpap](#), [inpreppap](#), [cat1pap](#)
  - [Detection or upper limits on radio-quiet galaxies](#) (GLAST LAT Science Groups) Labels: [aqnpap](#), [inpreppap](#), [cat1pap](#)
  - [Measurement of EBL 1](#) (GLAST LAT Science Groups) Labels: [aqnpap](#), [inpreppap](#), [cat1pap](#)
- Calibration and Analysis Methods group papers**
  - [ACD Subsystem Paper](#) (GLAST LAT Science Groups) Labels: [anapap](#), [inpreppap](#)
  - [CAL Subsystem Paper](#) (GLAST LAT Science Groups) Labels: [anapap](#), [inpreppap](#)
  - [TKR Subsystem Paper](#) (GLAST LAT Science Groups) Labels: [anapap](#), [inpreppap](#)

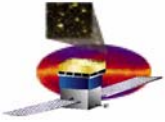
An arrow points from the text "links placed here to pages/information of general interest to assist with papers." to the "GLAST LAT publication plan" link.



## Papers cont.

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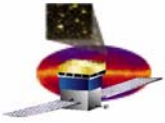
- In some cases, papers by LAT collaborators that are relevant to the LAT are discussed in the science groups.
  - This is to be encouraged.
- Likely to be an increasing number of LAT science papers as we approach launch.
  - “official” updated response functions will soon be available.
  - We are doing astrophysics simulations of increasing detail, to quantitatively understand what the LAT will say about gamma-ray sources and source classes.
  - We need to make sure that the process of writing a LAT paper is a happy rewarding one for authors.
- Groups are also working on defining papers to be written shortly (<1 year) after launch.



# Multiwavelength planning

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- **Most of the groups have extensively discussed their multiwavelength needs and desires.**
  - **The results of these discussions were sent to the multiwavelength coordinator.**
  - **Descriptions of these discussions can generally be found on each groups confluence page.**
- **Multiwavelength observing proposals have been discussed in several groups and a few proposals (to Swift and Suzaku) have been submitted to support LAT observations.**
  - **The upcoming proposal cycle is of particular importance as in many cases it will be the first opportunity to propose for multiwavelength data which overlaps with LAT observations.**



# Multiwavelength Proposals

The multiwavelength coordinating group (Dave Thompson) have provided lists of upcoming proposal opportunities and archives of submitted proposals

Multiwavelength Proposal Opportunities – GLAST LAT Multiwavelength Coordinating Group – SLAC Confluence

https://confluence.slac.stanford.edu/display/GLAMCOG/Multiwavelength+Prc

Getting Started Latest Headlines

Welcome Julie McEnery | [History](#) | [Profile](#) | [Log Out](#)

## Multiwavelength Proposal Opportunities

View Edit Attachments (2) Info

Browse Space Add Page Add News

Added by [David J. Thompson](#), last edited by [David J. Thompson](#) on Aug 22, 2006 (view change)

Labels: (None) EDIT

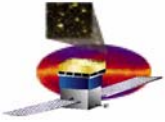
### Some Known Proposal Opportunities

Facility and Cycle	Proposal Deadline	When Observations Scheduled	Notes
Swift Cycle 3	28 July, 2006 - PASSED	April, 2007 - April, 2008	TOO Proposals only. Blazar TOO proposal submitted
NRAO Large Proposals	<b>2 Oct., 2006</b>		VLA, VLBA, GBT <a href="#">Announcement (p. 3)</a> Includes VIPS and MOJAVE blazar studies
XMM AO-6	<b>6 Oct., 2006</b>	May 2007 - April 2008	<a href="#">Announcement</a>
INTEGRAL Key Programme - AO5	<b>17 Nov., 2006</b>	Aug. 2007 - Aug. 2008	Large Requests, see <a href="#">Announcement</a>
Suzaku Cycle 2	1 Dec. 2006	April, 2007 - April, 2008	Notice of Intent (NOI) due 15 Sept., 2006 <a href="#">Announcement</a>
RXTE Cycle 12 (last?)	26 Jan., 2007	Summer, 2007 - February, 2009	NOI due 27 Nov., 2006
Spitzer Cycle 4	14 Feb. 2007	July, 2007 - June, 2008	One cycle after this before cryogen runs out
Chandra Cycle 9	March, 2007	Dec. 2007 - Dec. 2008	Coordinated Observation Programs?
NRAO Regular Programs	1 Feb., 1 June, 1 Oct.	Trimester after proposal cycle ends	
NOAO Regular Programs	30 Sept., 31 March	Feb.-July, Aug.-Jan.	
NOAO Survey Programs	15 March		
ESO	30 Sept., 31 March	Starts 6 months after proposal due	
ATNF	15 June, 15 Dec.?	Starts 3 months after proposal due	

### Submitted LAT Team Proposals

- Suzaku proposal for PKS 1510-089 and BL Lac. The [proposal](#) for the observation, whose principal investigator is Greg Madejski, was submitted on Jan. 6,

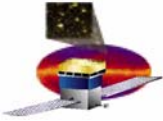
confluence.slac.stanford.edu



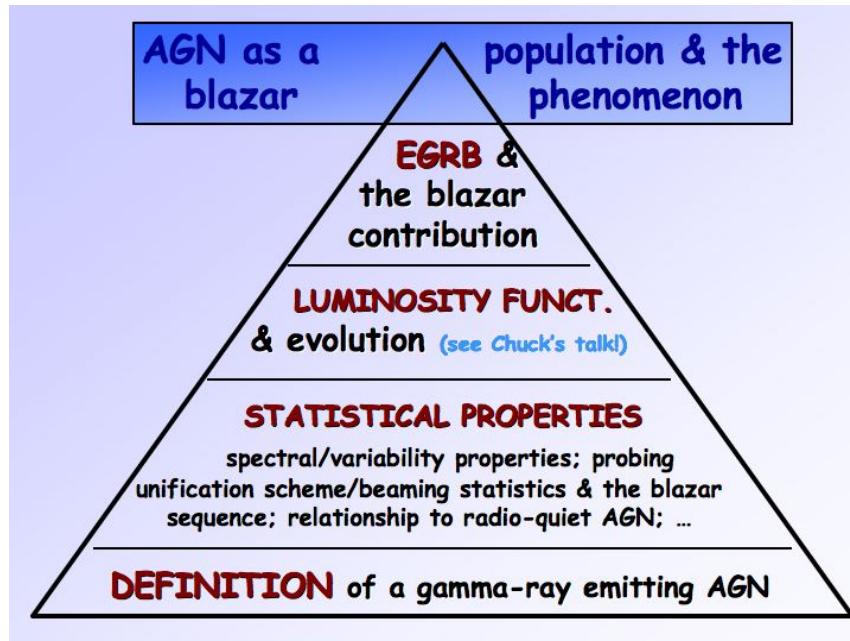
# Group Activities

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- The groups themselves have several means of communication
  - Most groups meet ~biweekly (via VRVS/telecon)
  - Email lists
  - Confluence pages (group editable webpages)
- Group activities and discussions include:
  - Science goals
  - Analysis methods development
  - Source simulations
  - Contributions to the LAT instrument paper
  - Development of papers
  - Multiwavelength planning
- Significant differences in the nature of each groups activities
  - Some are more technical (C&A, Catalog)
  - Some have a very broad mandate (Unids and population studies)

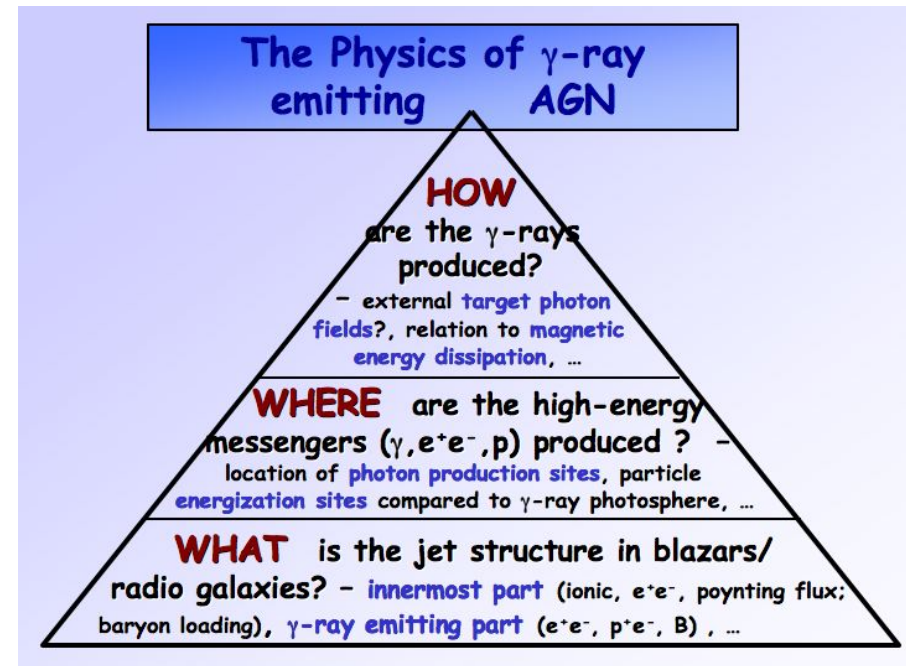


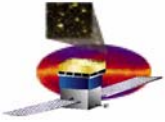
# Science Goals



Some slides from the AGN science goals talk presented by Anita Reimer at the Aug 2006 LAT collaboration meeting.

Most of the groups have discussed the science goals of their group, and what observations and analysis is required to address them.





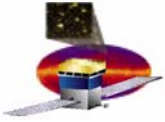
# Science Goals

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In many cases the discussions were inspired (or at least intensified) by a need to compile shory science sections for the LAT instrument paper.

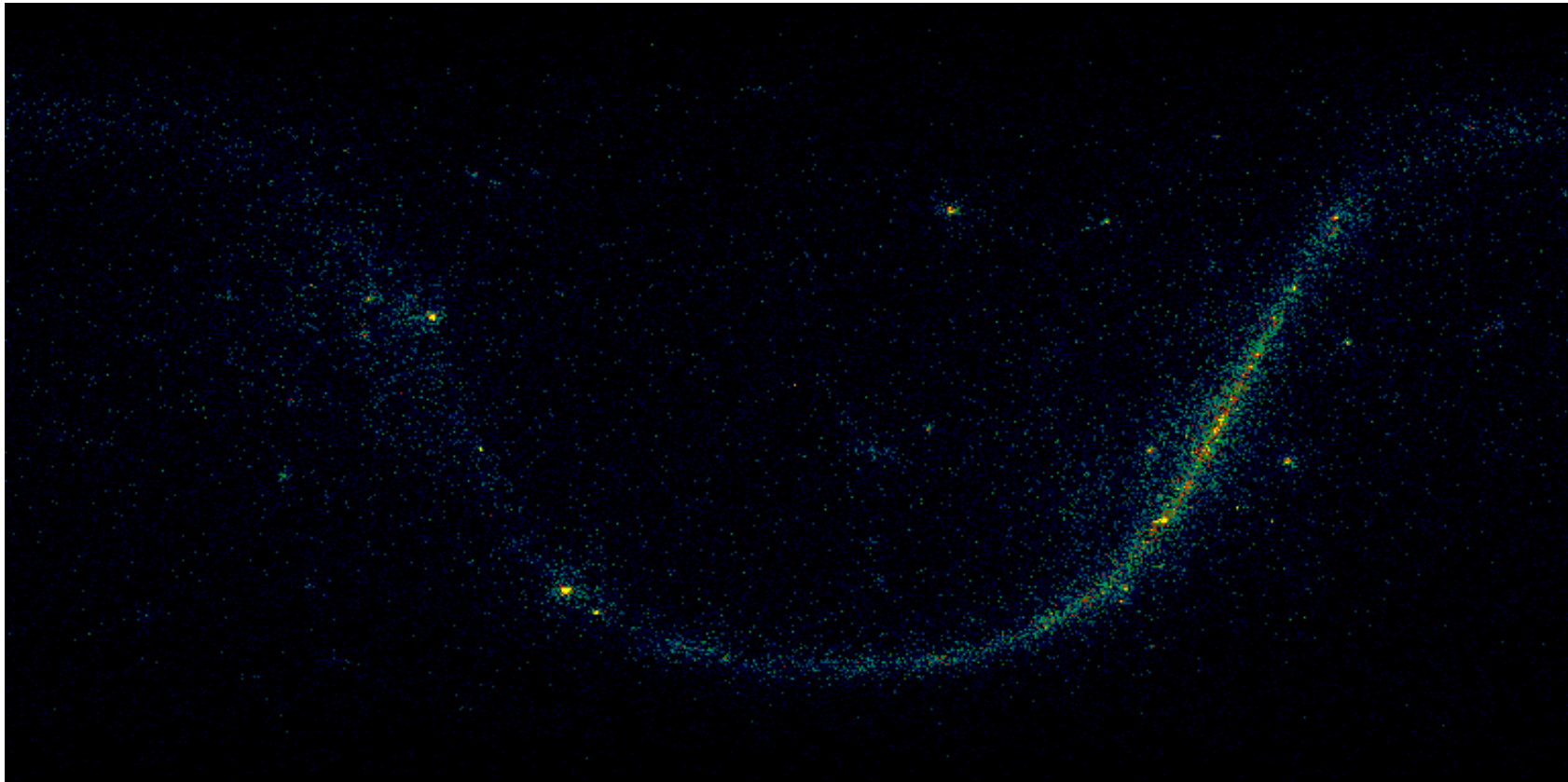
Key Questions from Unids group (from their LAT paper contribution)

- (1) Are there more classes of gamma-ray emitters than PSR and AGN in the GeV domain? If so, which are those?*
- (2) Do we detect population(s) of gamma-ray sources which may contribute significantly to the extragalactic diffuse gamma-ray background?*
- (3) Is our understanding of the production and propagation of cosmic rays in our Milky Way compatible with those in other normal Galaxies, or environments at evolutionary different activity states like starburst galaxies?*
- (4) To what extent is the GeV sky variable? What are the characteristic variability time scales in different source populations? Do distinctive/repetitive variability pattern exists? To what account we are confronted with transient or even serendipitously discovered variability phenomena?*
- (5) Can we pinpoint the nature of the gamma-ray emission from the Galactic Center?*
- (6) Are there unique phenomena exclusive/peculiar to the GeV sky?*

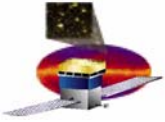


# Astrophysics Simulations

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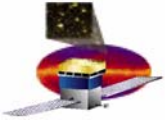
- **The Data Challenge 2 sky (movie by Jerry Bonnelli)**



## DC2 - what was it and what did we do?

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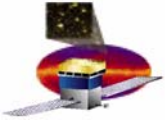
- 55 days of simulated GLAST data
- What did we do?
  - Update instrument simulation
  - Revamp event classification analysis and IRFs
  - Develop data servers and refine event formats
  - Develop science analysis software and documentation
  - Develop a ~complete astrophysical sky model (kept a secret)
  - DC2 kickoff meeting (3 days in March 2006, data released)
  - Participants study the simulated data to try and learn about the simulated sky.
  - DC2 closeout (3 days in May 2006, sky model revealed)
  - People are still using the DC2 data to study/develop analysis methods.
- Each one of these bullets represent a large amount of work by many people.



# DC2 - Sky Simulations

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- **Main component of the sky model were produced by small working groups from across the collaboration**
  - **AGN - Jim Chiang, Paolo Giommi (populations), Gino Tosti (lightcurves)**
  - **Pulsars - Populations (Alice Harding), Implementation of periodic/spectral properties (Max Razzano)**
  - **Galactic Sources - SNR (Omar Tibolla, Seth Digel), populations (Diego Torres, Seth Digel, Olaf Reimer)**
  - **GRB - Prompt emission (Nicola Omodei, Jay Norris), Afterglows (Nicola Omodei, Julie McEnery)**
  - **Dark matter - Ping Wang, Larry Wai, Eric Nuss**
  - **Diffuse Galactic emission - Seth Digel, Igor Moskalenko +**
- **Almost all the software to generate these sources is now available to the whole collaboration**
  - **Allows anyone to pursue more detailed studies**
- **Source simulations are now being pursued more systematically and in greater detail in most of the science groups.**



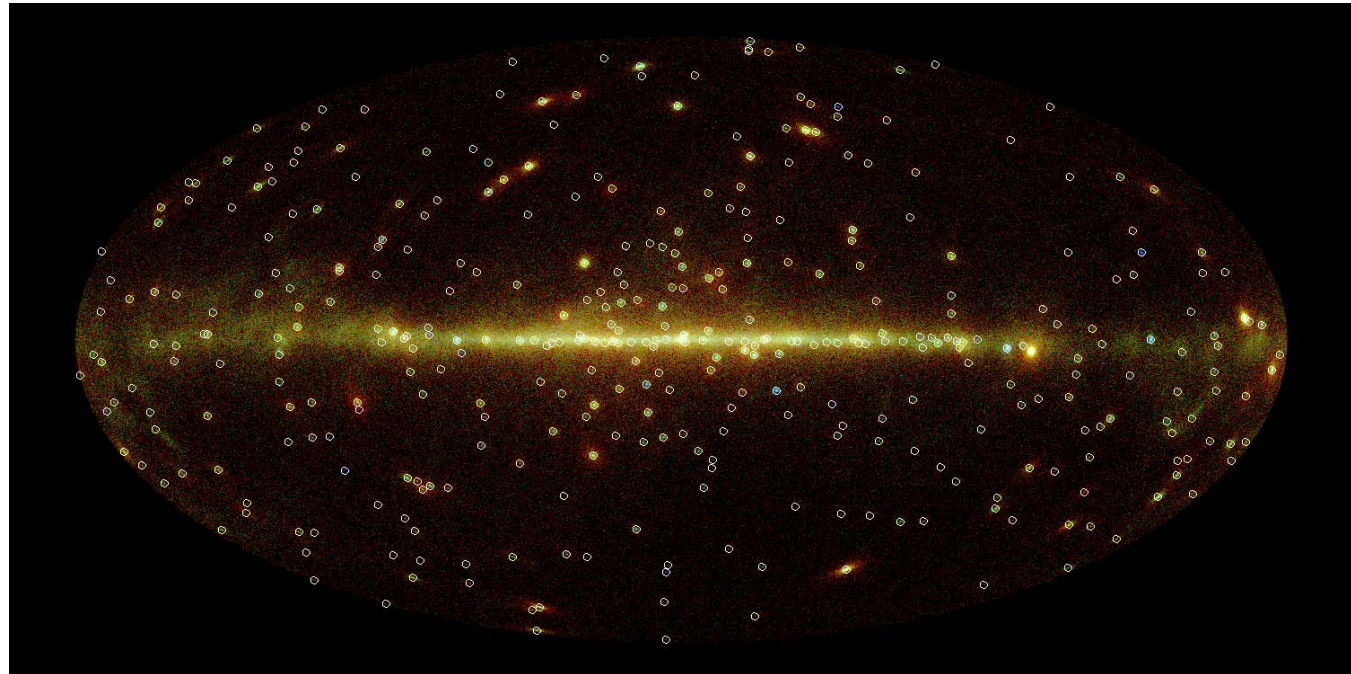
# DC2 Catalog

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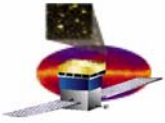
Catalog analysis pipeline developed by Jean Ballet and collaborators, runs a source detection algorithm and then runs more detailed analysis on each source to produce a table of the basic gamma-ray properties of each source.

Released at the beginning of DC2, provides a starting point for more detailed analyses.

380  
sources



Verifies that the automated pipeline processing from low-level data to source characterization.



# More on Catalogs

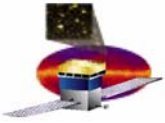
Cross reference the catalog sources against other catalogs to produce identifications.

Displays the catalog data in an interactive way and links in data from other wavelengths.

The screenshot shows a web browser window titled "The GLAST DC2 Catalog at ASDC - Mozilla". The address bar shows "http://www.asdc.asi.it/glast/dc2cat/". The page content includes a navigation menu with buttons for "BL Lacs", "FSRQs", "Radio Galaxies", "Pulsars", and "Unidentified". A red text overlay says "Work in progress! this page is subject to frequent updates". Below this is a "GO" button and a table of catalog entries.

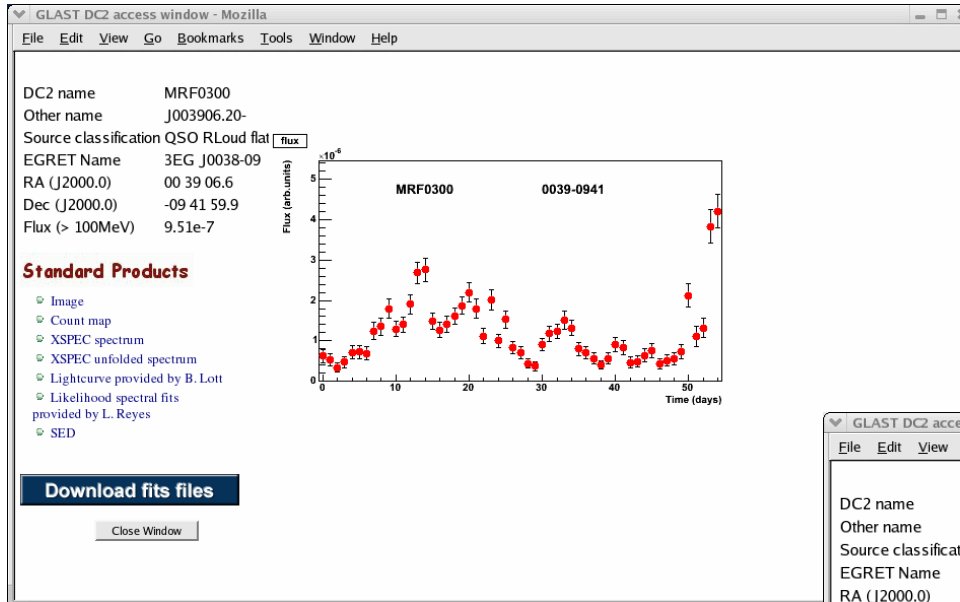
Entry number			DC2 name	RA (J2000.0) hh mm ss.d	Dec (J2000.0) dd mm ss.d	Gamma flux (ph/cm <sup>2</sup> /s E>100 MeV)	Source classification Browse Classif	Other source names	Egret name	Redshift	
1	<a href="#">Select</a>	<a href="#">Entry details</a>	<a href="#">DC2 data access</a>	MRF0021	00 10 44.5	+73 10 26.4	2.51e-7	SNR	CTA1,SNR119	3EG J0010+73	0
2	<a href="#">Select</a>	<a href="#">Entry details</a>	<a href="#">DC2 data access</a>	MRF0324	00 04 58.8	-52 27 00.0	1.29e-7	Unid. radio source	-----	-----	0
3	<a href="#">Select</a>	<a href="#">Entry details</a>	<a href="#">DC2 data access</a>	MRF0301	00 10 39.6	+02 47 27.5	9.62e-8	Unid. radio source	-----	-----	0
4	<a href="#">Select</a>	<a href="#">Entry details</a>	<a href="#">DC2 data access</a>	MRF0357	00 32 13.9	+38 35 20.3	9.39e-8	Unid. radio source	-----	-----	0
5	<a href="#">Select</a>	<a href="#">Entry details</a>	<a href="#">DC2 data access</a>	MRF0300	00 39 06.6	-09 41 59.9	9.51e-7	QSO RLoud flat radio sp.	J003906.20-	3EG J0038-09	2.101
6	<a href="#">Select</a>	<a href="#">Entry details</a>	<a href="#">DC2 data access</a>	MRF0433	00 42 17.3	-00 17 34.7	1.04e-7	Unid. radio source	-----	-----	0
7	<a href="#">Select</a>	<a href="#">Entry details</a>	<a href="#">DC2 data access</a>	MRF0308	00 44 09.6	+07 08 20.4	6.31e-8	Unid. radio source	-----	-----	0
8	<a href="#">Select</a>	<a href="#">Entry details</a>	<a href="#">DC2 data access</a>	MRF0298	00 47 25.6	-25 21 18.0	3.67e-8	Starburst galaxy	NGC253	-----	0.001

Produced by ASDC group – Giommi and collaborators



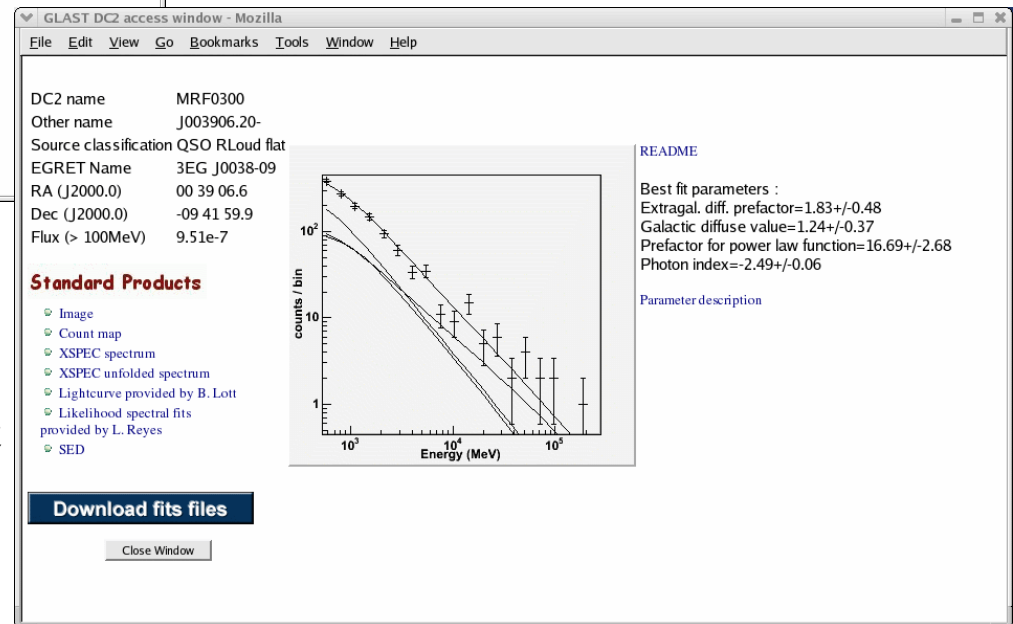
# Lightcurves and Spectra

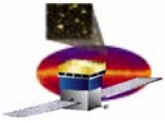
From the catalog at ASDC, there are links from each source to DC2 data products



“Quicklook” lightcurves produced by Benoit Lott.

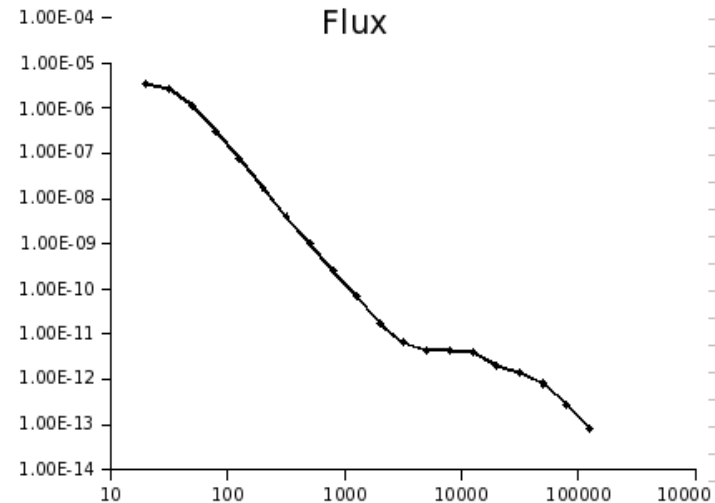
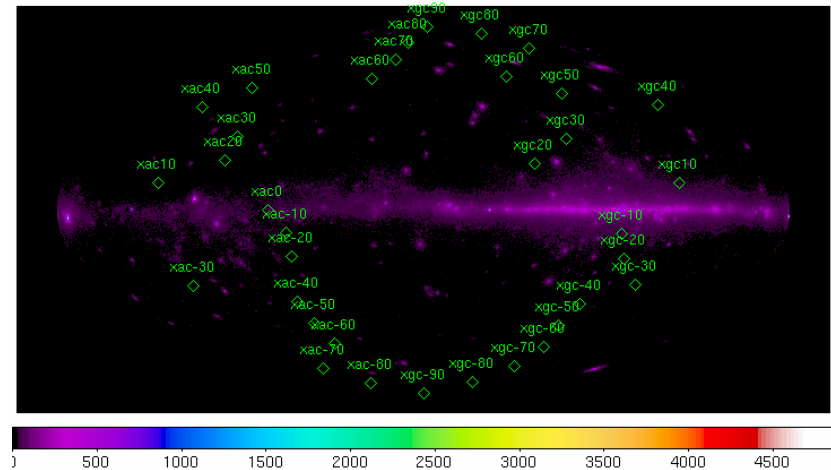
Spectral fits for each source were produced by Luis Reyes. These are simple power-law fits, but provide a plot which can guide users to different models if needed.

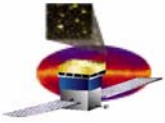




# Diffuse sources

- **Goal: Study flux and spectral properties of the extragalactic background. This will include a study of the effect of residual background, contribution from galactic diffuse and resolving the point sources.**
- **Riccardo Rando performed an analysis of the extragalactic diffuse spectrum. He produced a mapcube fits file which described the residual background which was subsequently used by several people in source analyses.**



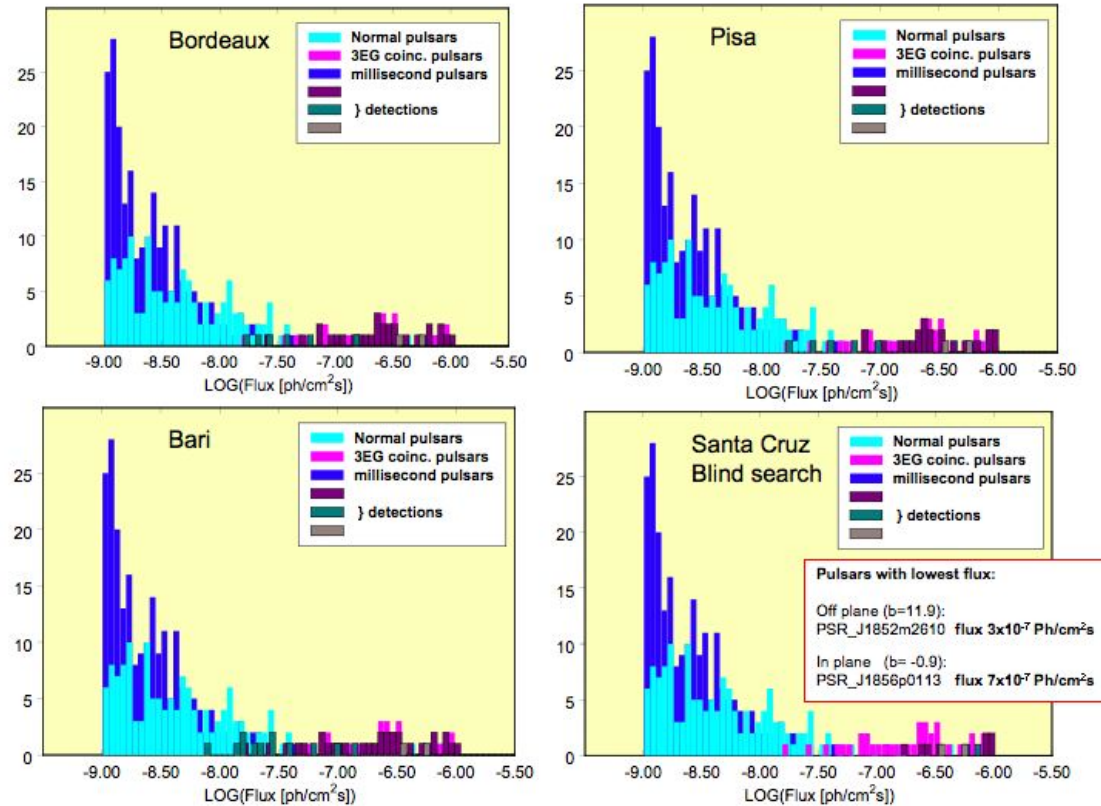


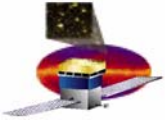
# Continuing to use the DC2 data

Several independent pulsar analyses were performed during DC2

Comparing the results of these analyses to the true DC2 sky gives a picture of the pulsed sensitivity for both blind searches and those using pulsar ephemerides under realistic conditions.

Comparison of 4 independent pulsar analyses shown by Alice Harding at the LAT collaboration meeting

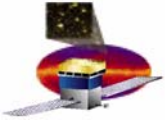




# Science Simulations and Analysis

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- The “successor” to DC2 will involve much more direct participation from the sciencegroups.
  - Each science group is likely to plan its own sequence of source simulations, these will be coordinated as much as possible to maximise the usefulness of each dataset.
    - Planning (and in many cases executing) the astrophysical simulation studies lies within the science groups
  - Systematic studies of high level science analyses.
    - Performance plots
    - Understand how different realisations of the sky affect science goals, e.g. blazar luminosity function(s) for EBL studies, Galactic diffuse model for Galactic population studies etc
  - Provide inputs to the sky models for the service challenges.



# Multiwavelength planning

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- **Most groups have extensively discussed their multiwavelength needs and have written documents or webpages to describe the science cases driving these needs.**

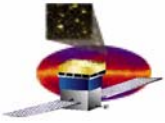
## Planning for GRB multiwavelength observations



Slide shown by Nicola Omodei at the LAT collaboration meeting summarising the GRB group discussions

- Gamma-Ray Burst science requiring multi-wavelength observation:
  - <https://confluence.slac.stanford.edu/download/attachments/2157/GRBs-multi-lambda-science.pdf>
- Importance of NIR cameras (I, z, J,H, K)
  - 60% detection Rate for Swift
  - Relatively wide fov (30 arcmin)
- Synergy with TeV observatories
  - Observatories with low energy threshold (50 GeV)
  - Fast movement for rapid repositioning
  - Jointly study of the cosmological cut-off
- Major facilities already aware:
  - Swift, Liverpool, REM, VERITAS, MAGIC, HESS, Milagro, as well as the other GCN connected facilities...
  - Coordination of Swift and GLAST pointings when possible, XRT follow-up of GLAST position

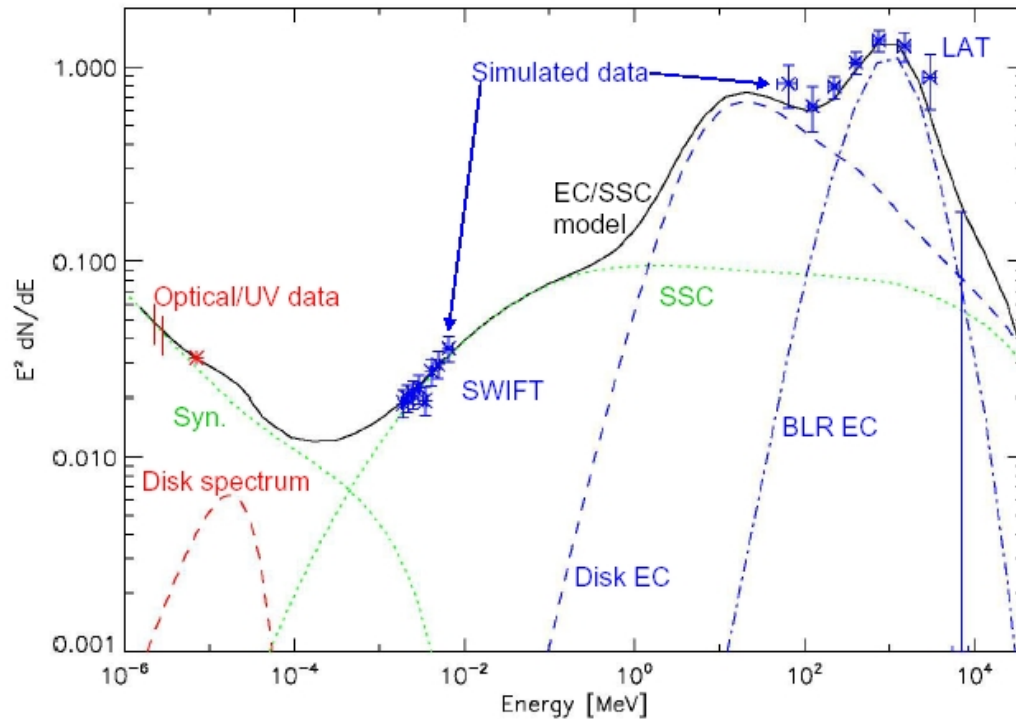
GRB science group activity report

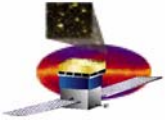


# Multiwavelength planning

- The science groups have discussed and worked together on multiwavelength observing proposals (to Swift and Suzaku so far)

SED of 3C279 illustrating how GLAST and Swift data could be used together to understand blazar emission mechanisms (plot made by Jennifer Carson for 2006 Swift ToO proposal).





# Summary

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- All the science groups are active and have broad participation from across the collaboration.
- Activity of all the groups is likely to increase over the next few months.
  - More people actively participating (transitioning from instrument commissioning/beamtest)
  - Multiwavelength planning and proposal writing needs to kick into high gear -- the next few months are important!
  - Many groups compiled a list of papers that could be written pre-launch, there is ~1 year left to get these done.
  - Lots of detailed source simulations and analysis
    - Infrastructure to support these studies is mature and is getting better.