

Tenth International Fermi Symposium

9th-15th October 2022



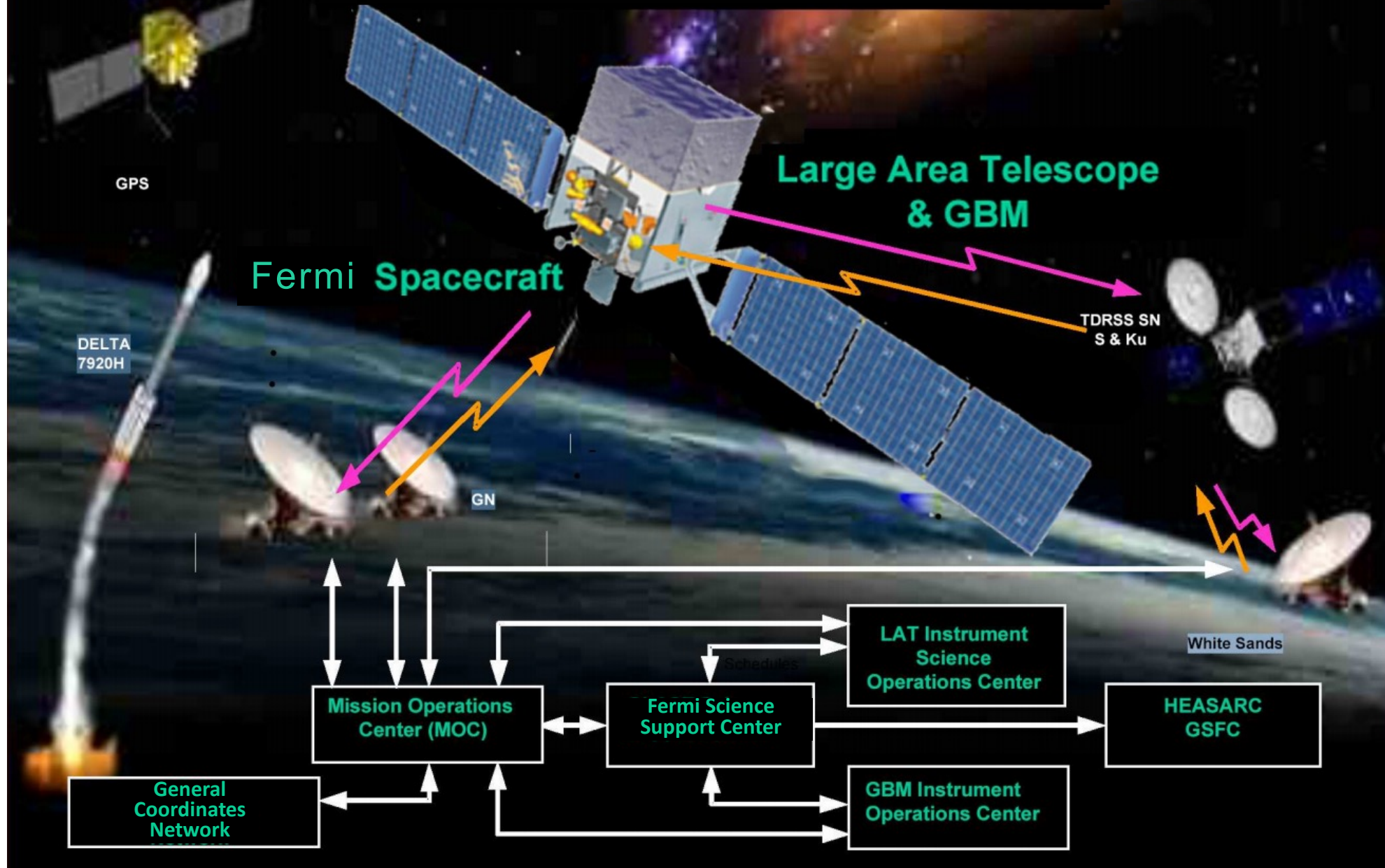
Fermi Mission Status

Judy Racusin

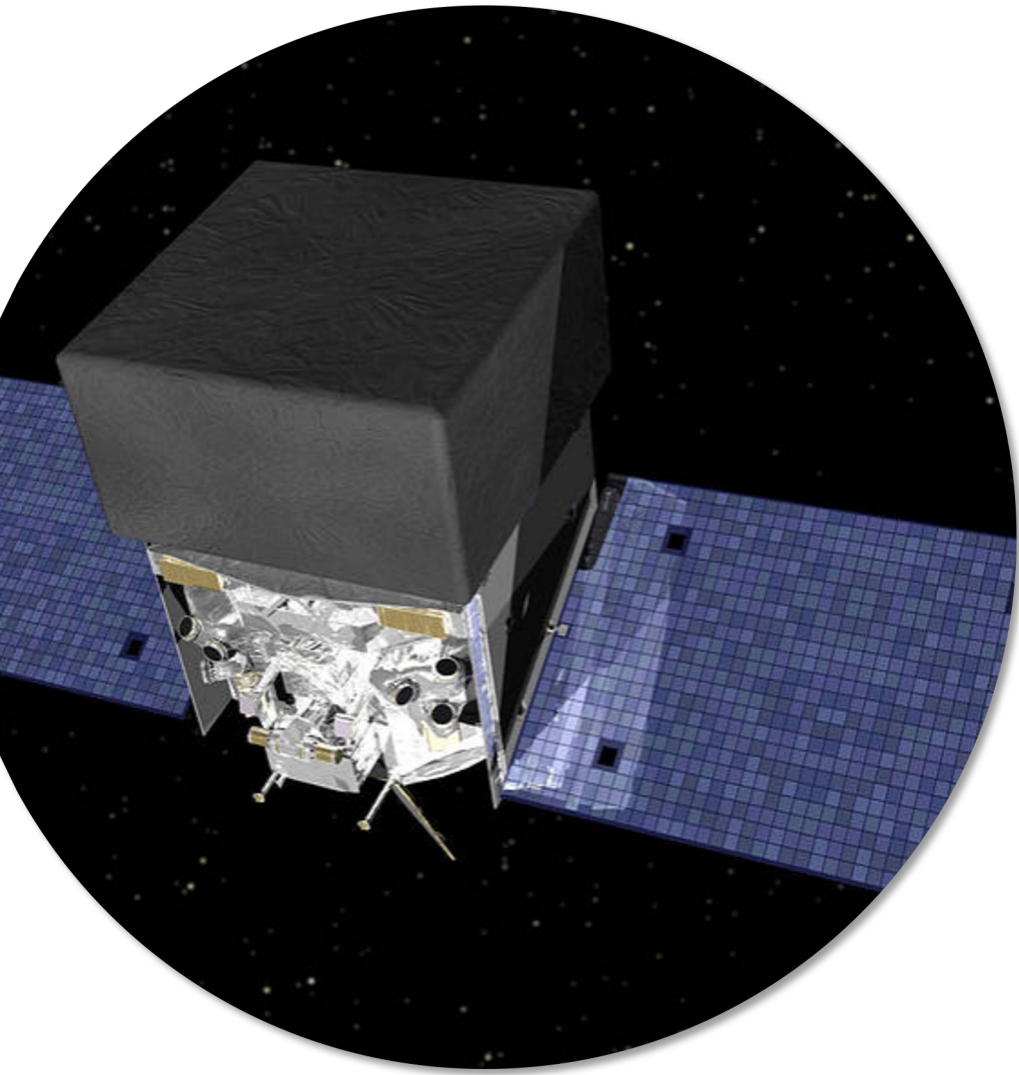
NASA Goddard Space Flight Center
Fermi Deputy Project Scientist

judith.racusin@nasa.gov

Fermi Mission Elements

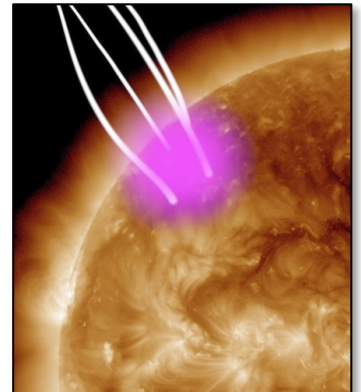
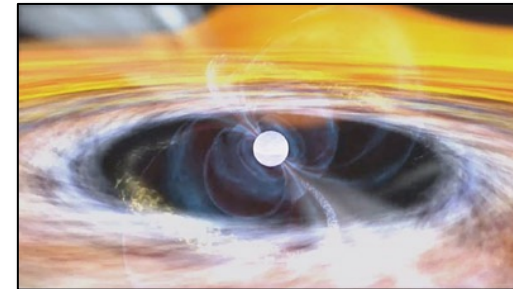
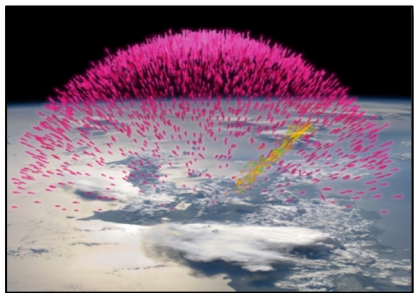
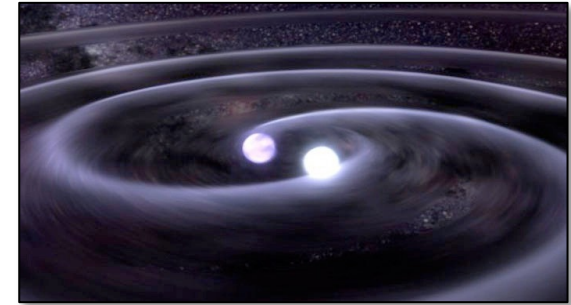
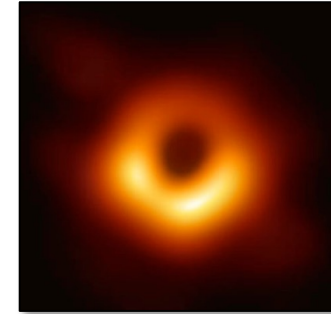
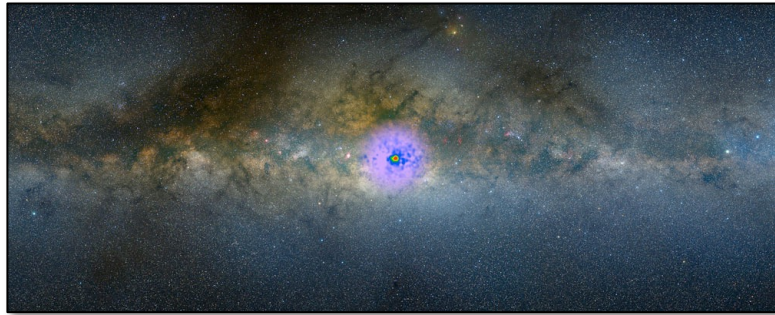
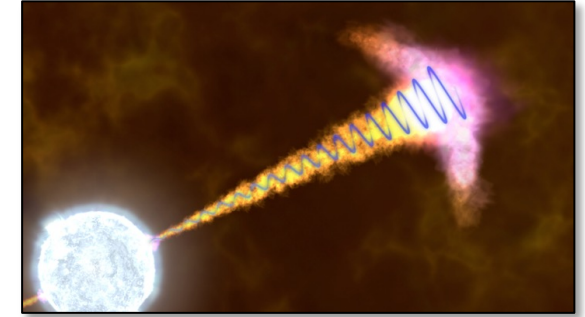
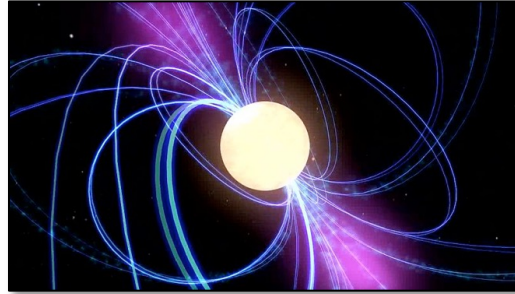
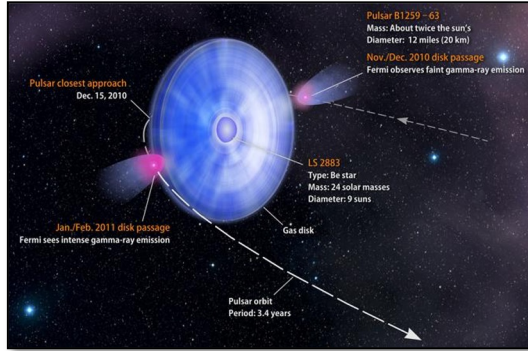


Observatory Status

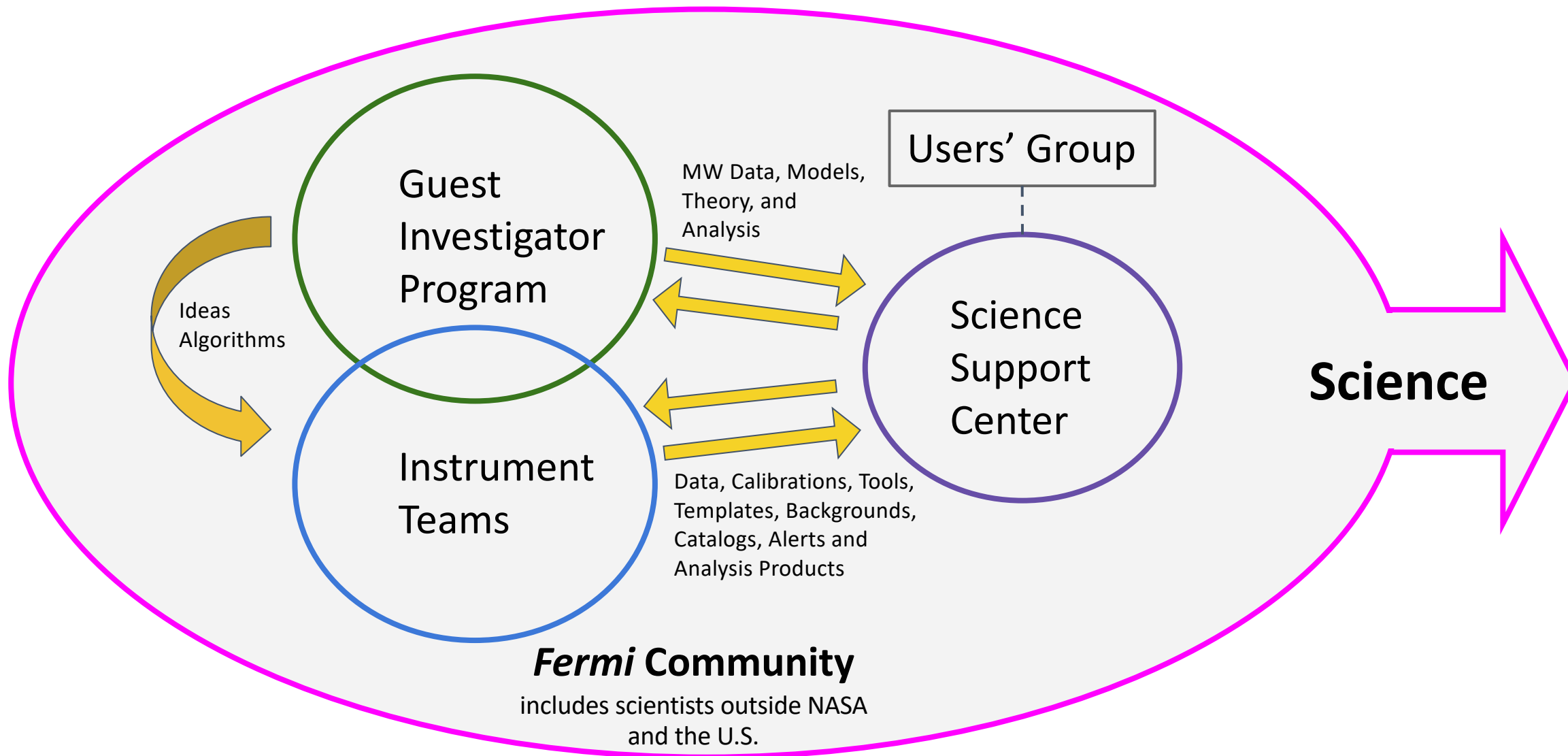


- *Fermi* continues to operate extremely smoothly and to perform at full capability
 - On orbit for >14 years
 - No consumables
 - No degradation of science performance
 - Improved due to software (LAT Pass 8) and configuration changes (GBM Continuous Time-Tagged Event data)
 - LAT & GBM South Atlantic Anomaly regions reduced to improve operational efficiency
- LAT and GBM Instruments operated by two international collaborations
- Mission recently extended by NASA for another 3 years (through 2025) via the Senior Review process

Gamma rays play a unique role in astrophysics



Fermi Community



Fermi Mission Support

- Flight Operations Team (GSFC)
- Instrument Operations
 - LAT (LISOC, SLAC/GSFC)
 - GBM (GIOG, MSFC/UAH)
- Fermi Science Support Center (GSFC)
 - <https://fermi.gsfc.nasa.gov/ssc/>
 - Helpdesk:
fermihelp@milkyway.gsfc.nasa.gov

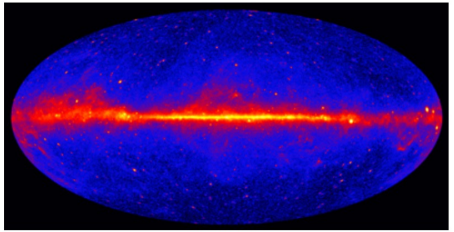
NASA National Aeronautics and Space Administration
Goddard Space Flight Center

Fermi • FSSC • HEASARC
Sciences and Exploration

Fermi Gamma-ray Space Telescope

Home Support Center Observations Data Proposals Library HEASARC Help

The Fermi Science Support Center (FSSC) runs the guest investigator program, creates and maintains the mission time line, provides analysis tools for the scientific community, and archives and serves the Fermi data. This web site is the portal to Fermi for all guest investigators.



This view shows the entire sky at energies greater than 1 GeV based on five years of data from the LAT instrument on NASA's Fermi Gamma-ray Space Telescope. Brighter colors indicate brighter gamma-ray sources.
Image Credit: NASA/DOE/Fermi LAT Collaboration

Look into the "Resources" section for finding schedules, publications, useful links etc. The "Proposals" section is where you will be able to find the relevant information and tools to prepare and submit proposals for guest investigator projects. At "Data" you will be able to access the Fermi databases and find the software to analyse them. Address all questions and requests to the helpdesk in "Help".

Quicklinks

- » Fermi Homepage
- » LAT Analysis Start Page
- » Multiwavelength Observation Reporting Form
- » Fermi User's Group (FUG)
- » Fermi Guest Investigator Program
- » Post-Anomaly Observing Strategy
- » Fermi TOO request
- » LAT Monitored Sources
- » LAT Instrument Performance
- » GBM Instrument Performance

Fermi Observations for MW 671

Mission week 671 starts with a continuation of the asymmetric $-50/+60$ deg. rocking profile from the previous week. On day of year 98 (2021-04-08) at 04:22UT there is a 10-minute freeze observation during which a symmetric ± 50 deg. rocking profile is loaded. This profile continues until the end of the week. Note that positive rock angles are south, and negative angles are north.

» More Timeline Info

Latest News

» Fermi Sky Blog
» Fermi Blog

Feb 17, 2021

Fermi Cycle 14 Proposal Deadline Extended

Owing to the severe weather situation and power outages in Texas and other areas NASA has decided to postpone the Fermi Cycle-14 proposal deadline until March 1, 2021, 16:30 EST. If you have already submitted a proposal you need not resubmit unless you wish to make changes which you may do up to the new deadline. Submission procedures are otherwise unchanged; refer to our [website](#) for details.

Jan 27, 2021

Fermi Cycle 14 Proposer Workshop

The deadline for Fermi Cycle 14 Guest Investigator proposals is coming soon: **Feb 19 at 16:30 EST**. To help you prepare your proposals, the project and science support center will host a [virtual workshop](#) to provide information about updates to the program (for example, preparing proposals for dual anonymous review) and to provide support for new proposers. Please register using [this form](#) by **Feb 1** so that we can send you the details to join the virtual meeting.

Fermi Data Products

Fermi

Gamma-ray Space Telescope

[Home](#)[Support Center](#)[Observations](#)[Data](#)[Proposals](#)[Library](#)[HEASARC](#)[Help](#)

Data

- ▶ [Data Policy](#)
- ▶ [Data Access](#)
 - + [LAT Data](#)
 - + [LAT Catalog](#)
 - + [LAT Data Queries](#)
 - + [LAT Query Results](#)
 - + [LAT Weekly Files](#)
 - + [GBM Data](#)
- ▶ [Data Analysis](#)
- ▶ [Caveats](#)
- ▶ [Newsletters](#)
- ▶ [FAQ](#)

Currently Available Data Products

The Fermi data released to the scientific community is governed by the [data policy](#). The released instrument data for the GBM, along with LAT source lists, can be accessed through the [Browse interface specific to Fermi](#). LAT photon data can be accessed through the [LAT data server](#).

The FITS files can also be downloaded from the Fermi [FTP site](#). The file version number is the 'xx' in the characters before the extension in each filename; you should keep track of the version numbers of files you analyze since the instrument teams may update them.

Note that the LAT and GBM data are accompanied by [caveats](#) about their use.

- LAT Photon and Extended Data
 - [LAT Data Server](#) (updated with P8R3 data 26-Nov-2018)
 - [LAT Low-Energy \(LLE\) Data](#) (Browse table)
 - Products available on the [FTP Site](#) (current processing version of the data).
 - [Weekly Photon Files](#)
 - [Weekly Spacecraft Files](#)
 - [Mission Long Spacecraft File](#)
 - [Weekly 1-second Spacecraft Files](#)
 - [Filtered Weekly Photon Files with Diffuse Response Columns](#)
 - Previous processing versions available on the FTP site
 - [Pass 8 \(P8R2\) Weekly Files](#)
 - [Pass 7 \(V6d\) Weekly Files](#)
 - [Pass 7 \(V6\) Weekly Files](#)
 - [Pass 6 \(V11\) Weekly Files](#)
 - [Pass 6 \(V3\) Weekly Files](#)
 - [ASDC data server](#) (external)
- LAT catalogs and associated products (high-level products only)
 - LAT Source Catalog
 - [LAT 8-year Source Catalog](#) (4FGL)
 - [Preliminary LAT 8-year Source List](#) (FL8Y)
 - [LAT 4-year Source Catalog](#) (3FGL)
 - [LAT 2-year Source Catalog](#) (2FGL)
 - [LAT 1-year Source Catalog](#) (1FGL)
 - [LAT 3-month Bright Source List](#) (0FGL)

Frequently Updated!

- Aperture Photometry Light Curves
 - [Aperture Photometry Light Curves for LAT 4-year Catalog Sources](#) (Updated Weekly)
 - [Flaring Sources in the LAT 4-year Aperture Photometry Light Curves](#) (Updated Weekly)
 - [Aperture Photometry Light Curves for the LAT 2-year Source Catalog](#)
 - [Flaring Sources in the LAT 2-year Aperture Photometry Lightcurves](#)
- LAT High Energy Source Catalog
 - [LAT Third High Energy Source Catalog](#) (3FHL)
 - [LAT Second High-Energy Source Catalog](#) (2FHL)
 - [LAT First High-Energy Source Catalog](#) (1FHL)
- [LAT Monitored Source List Light Curves](#)
- [LAT GRB Catalog](#)
- [Extended Sources in the Galactic Plane](#) (FGES)
- [Second Fermi All-sky Variability Analysis Catalog](#) (2FAV)
- [1st Fermi-LAT SNR Catalog](#)
- [LAT 3-year Catalog of Gamma-ray Pulsars](#)
- Other useful LAT related products
 - [List of LAT GRBs announced via GCN notices](#) (external)
 - [List of LAT Sources announced via ATels](#)
 - [LAT List of Detected Gamma-Ray Pulsars](#) (updated frequently)
 - [LAT Pulsar Ephemerides from Publications](#)
 - [LAT Background Models](#)
 - [List of time gaps in LAT data](#)
- GBM Data
 - [GBM Trigger Catalog](#) (Browse table)
 - [GBM Burst Catalog](#) (Browse table)
 - [GBM Daily Data](#) (Browse table)
 - [GBM Continuous Data](#) (FTP archive)
 - [GBM Terrestrial Gamma-ray Flashes \(TGF\) Catalog](#)
 - [Untriggered GBM Short GRB Candidates](#) (external)
 - [GBM Earth Occultation Light Curves](#) (external)
 - [GBM Pulsar Spin Histories](#) (external)
 - [List of GBM GRBs announced via GCN notices](#) (external)
- Additional Data
 - [Predicted Spacecraft Pointing \(FT2\) Files](#)
 - [Multiwavelength Programs Supporting Fermi](#)
 - [Fermi Solar Flare Observations](#)

Multiwavelength Opportunities & Campaigns

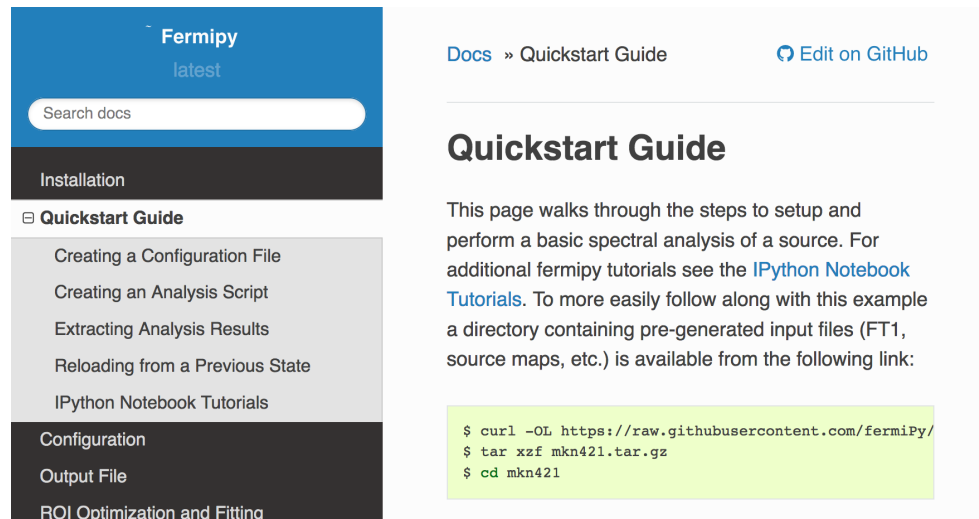
- Fermi Guest Investigator Program
 - <https://fermi.gsfc.nasa.gov/ssc/proposals/>
 - Apply for observation time via Joint Programs with NRAO, NOAO, VERITAS, INTEGRAL, TESS
 - Provides funding for US investigators
- [Fermi LAT Multiwavelength Coordinating Group](#)
 - Campaigns on bright known sources, Pulsar Timing, LAT Monitored Sources
 - [gammamw email list](#) - general announcements to anyone interested in multiwavelength gamma-ray studies
- LAT MW Coordinator
 - Dave Thompson, david.j.thompson@nasa.gov

Software, Data and Catalog Highlights

- [Improved GRB Localizations from Fermi-GBM](#) – July 2022
- [Fermitools 2.2.0](#) – June 2022
 - Removing root dependencies eases installation
- [2nd LAT GRB Catalog](#) Update – April 2022
 - New LAT GRBs since 2018 added
- [LAT Data Server Upgraded](#) – March 2022
 - Faster hardware supports shorter waits and available processing to support additional filters
- [12-year catalog \(4FGL-DR3\)](#) posted publicly – January 2021
 - 6658 sources characterized from 50 MeV to 1 TeV
- [LAT Light Curve Repository](#) – December 2021
 - More than 1500 high quality, continuously updated light curves
- Updated spacecraft position and history files – April 2021
 - Added velocity vector information, improved geodetic calculation, and latest model of Earth's magnetic field
- [First Fermi-LAT Solar Flare catalog](#) – Feb 2021
- Fermitools updated – January 2021
- 4th GBM GRB Catalog – April 2020
- GBM custom pulsation search – March 2020
- [GBM Data Tools](#) released – March 2020
- Planned future updates include new LAT data server filtering options and participation in updated GCN.

Fermipy

- Python framework developed for the FermiTools
- Interfaces to plotting and diagnostic tools
- Pipeline-building tools
- Jupyter Notebook tutorials for baseline LAT data analysis procedures
- Publicly available on github
- <https://fermipy.readthedocs.io/en/latest/>



The screenshot shows the Fermipy documentation website. On the left is a sidebar with a search bar and a table of contents. The main content area displays the 'Quickstart Guide' page, which includes a description of the guide's purpose and a terminal code block for installation.

Fermipy
latest

Search docs

Installation

☐ Quickstart Guide

- Creating a Configuration File
- Creating an Analysis Script
- Extracting Analysis Results
- Reloading from a Previous State
- IPython Notebook Tutorials

Configuration

Output File

ROI Optimization and Fitting

Docs » Quickstart Guide [Edit on GitHub](#)

Quickstart Guide

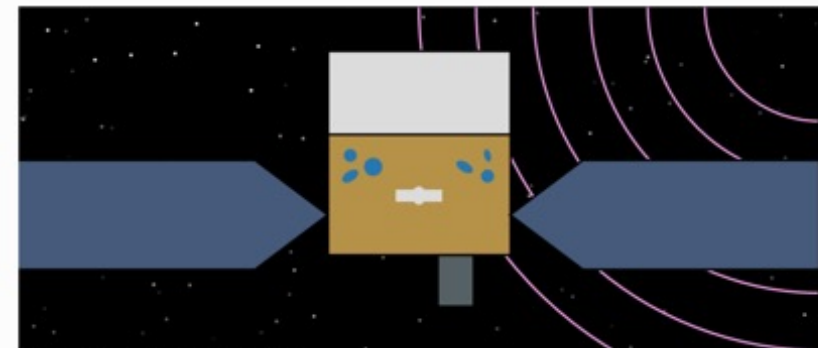
This page walks through the steps to setup and perform a basic spectral analysis of a source. For additional fermipy tutorials see the [IPython Notebook Tutorials](#). To more easily follow along with this example a directory containing pre-generated input files (FT1, source maps, etc.) is available from the following link:

```
$ curl -OL https://raw.githubusercontent.com/fermiPy/  
$ tar xzf mkn421.tar.gz  
$ cd mkn421
```

GBM Data Tools

- Python interface to GBM analysis
- Supports multi-instrument analysis
- <https://fermi.gsfc.nasa.gov/ssc/data/analysis/gbm/>

Welcome to the Fermi GBM Data Tools documentation!



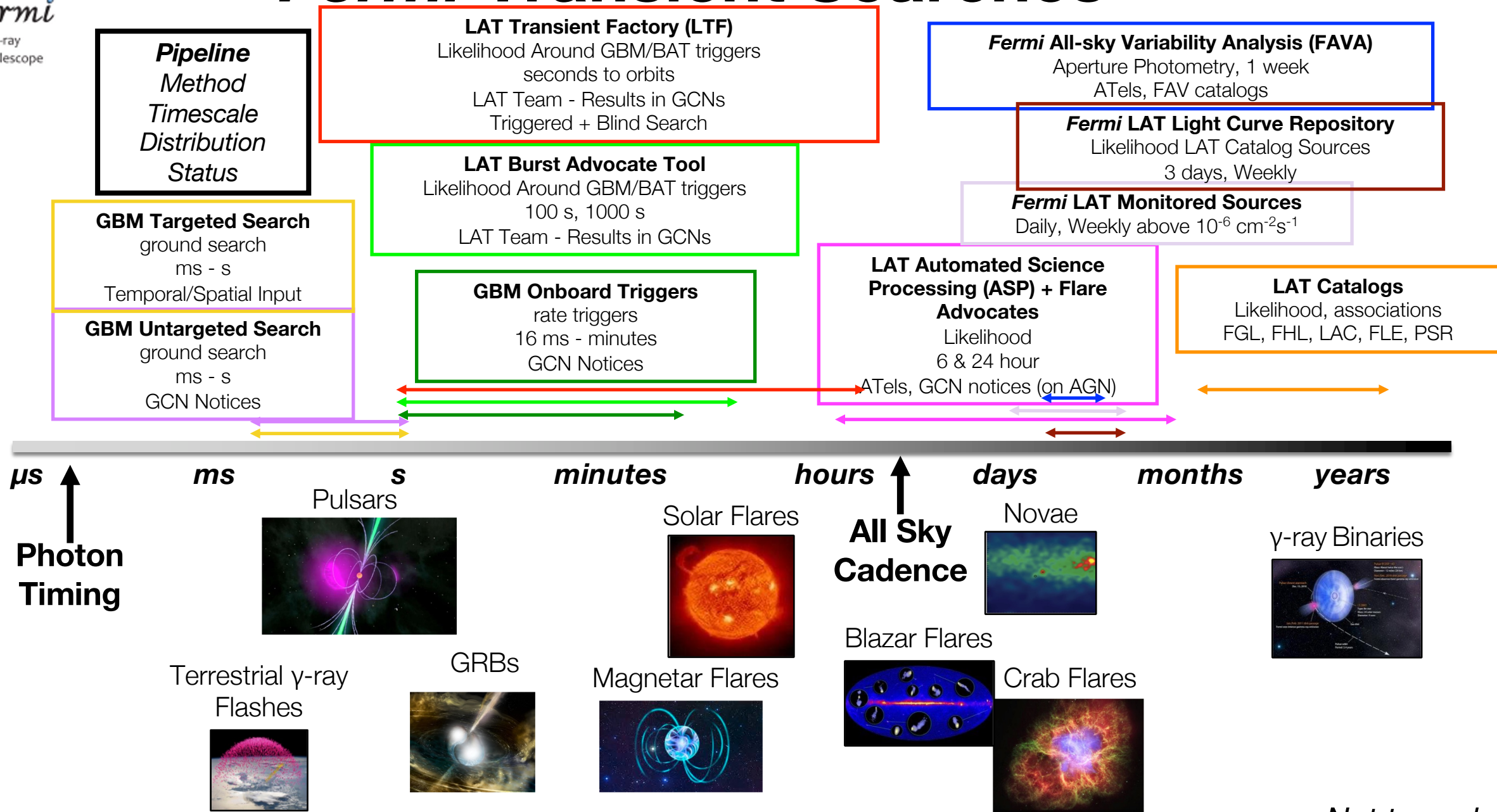
Hello, I'm Fermi. Pleased to meet you!

The Fermi GBM Data Tools is an Application Programming Interface (API) for GBM data. The fundamental purpose of the Data Tools is to allow general users to incorporate GBM analysis into their scripts and workflows without having to sweat very many details. To this end, the Data Tools have a fairly high-level API layer allowing a user to read, reduce, and visualize GBM data with only a few lines of code. For expert users, and users who want fine control over various aspects of their analysis, the Data Tools exposes a lower-level API layer, which can also be used to generalize the GBM Data Tools to data from other like instruments.

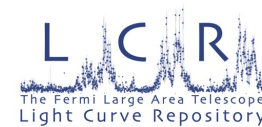


Fermi Transient Searches

Transients Timescale Pipelines



LAT Light Curve Repository



Automated repository of publication quality light curves



Fermi LAT Light Curve Repository (LCR)

Catalog Search

RA: Dec: Radius:

Keyword:

Map Options

Coordinate System:

Celestial Projection:

Coordinate Planes:

☒ Equatorial ☒ Galactic ☐ Supergalactic

Overlays:

☒ Source Info ☒ Grid Lines ☐ Constellations ☐ Milky Way ☒ Sun ☐ Moon

4FGL Marker Size:

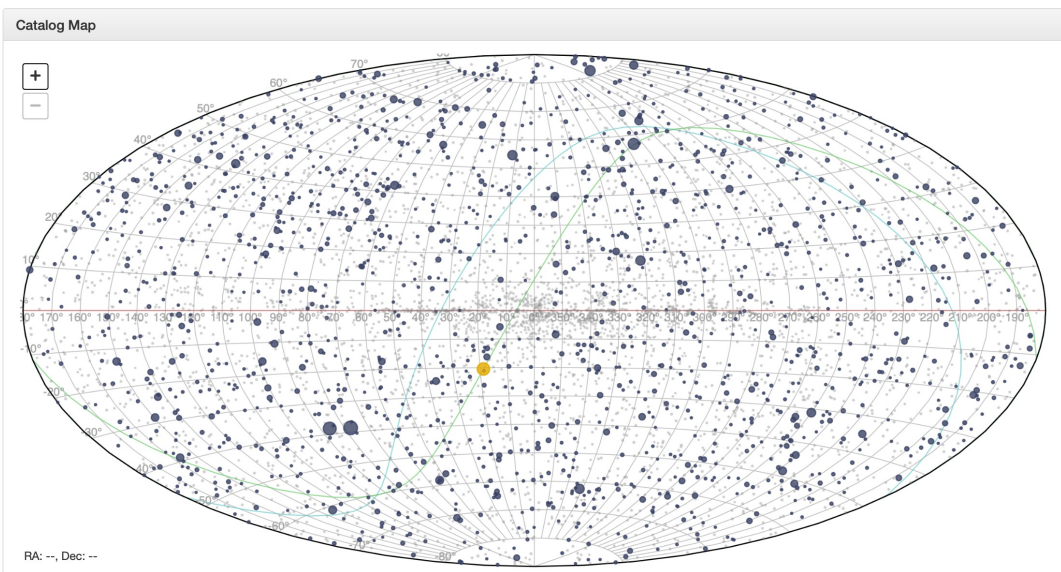
☒ Variability Index ☐ Significance

4FGL Marker Label:

☒ 4FGL Name ☐ Association ☐ 3FGL Assoc ☐ Classification

4FGL Marker Color:

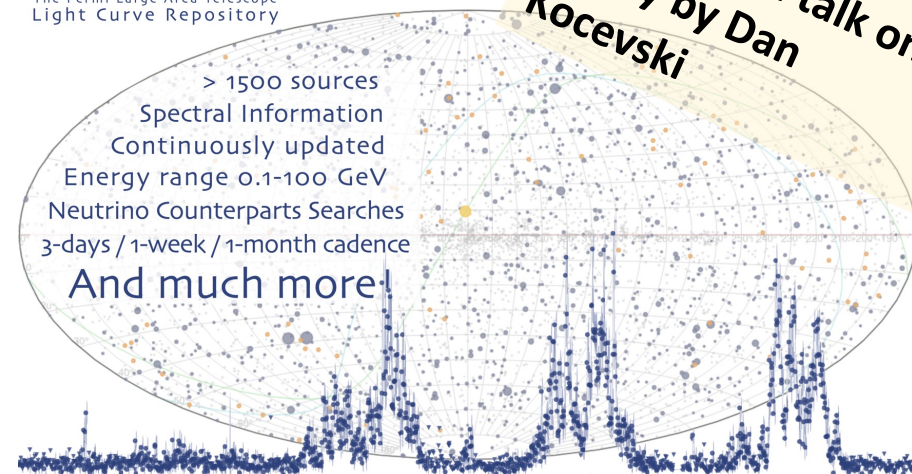
☒ Gray Non-Variabile Sources



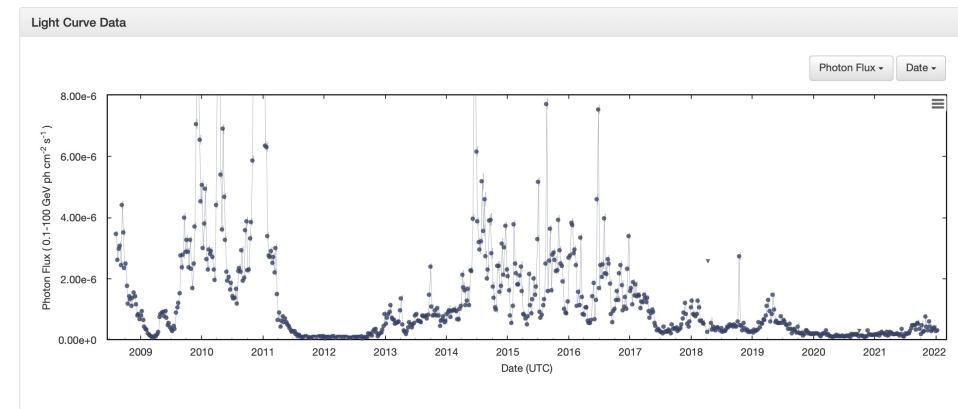
Catalog Sources

4FGL

Source ID	RA	Dec	Gal l	Gal b	Association	Class	Variability Index	Photon Flux 1-100 GeV	Energy Flux 1-100 GeV	Average Significance	Spectrum Type	Spectral Index
4FGL J0000.3-7355	0.098	-73.922	307.709	-42.730			14.023	1.421e-10	1.622e-12	6.905	PowerLaw	2.194
4FGL J0000.5+0743	0.138	7.727	101.656	-53.029			17.717	1.730e-10	2.272e-12	5.389	PowerLaw	2.393
4FGL J0001.2+4741	0.313	47.686	114.250	-14.338	B3 2358+474	bcu	20.019	1.216e-10	1.407e-12	4.092	PowerLaw	2.222
4FGL J0001.2-0747	0.315	-7.797	89.033	-67.305	PMN J0001-0746	bil	33.229	8.232e-10	9.171e-12	23.369	PowerLaw	2.105
4FGL J0001.5+2113	0.382	21.218	107.649	-40.168	TXS 2358+209	fsrq	1564.418	1.359e-9	2.614e-11	44.135	LogParabola	2.548
4FGL J0001.6-4156	0.416	-41.943	334.226	-72.029	2MASS J00013275-4155252	bcu	16.149	3.049e-10	3.913e-12	15.611	PowerLaw	1.756
4FGL J0002.1-6728	0.538	-67.475	310.085	-48.063	2MASS J000215-6728553	bcu	13.470	2.417e-10	2.888e-12	13.141	PowerLaw	1.845



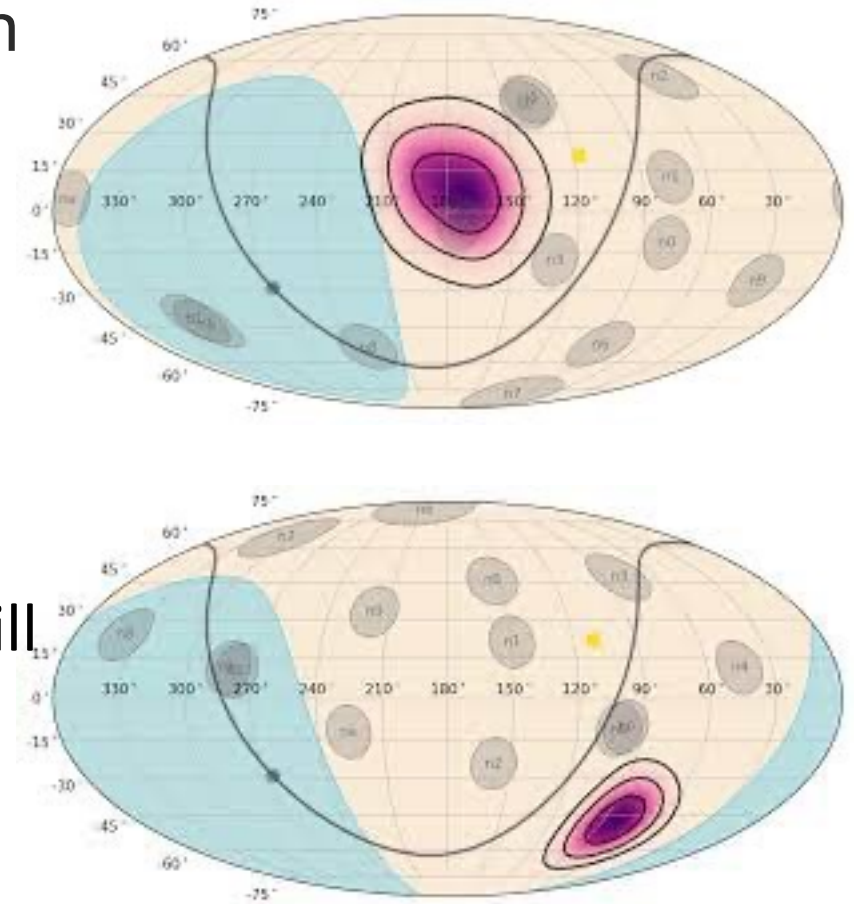
See more in talk on Friday by Dan Kocevski



<https://fermi.gsfc.nasa.gov/ssc/data/access/lat/LightCurveRepository/>

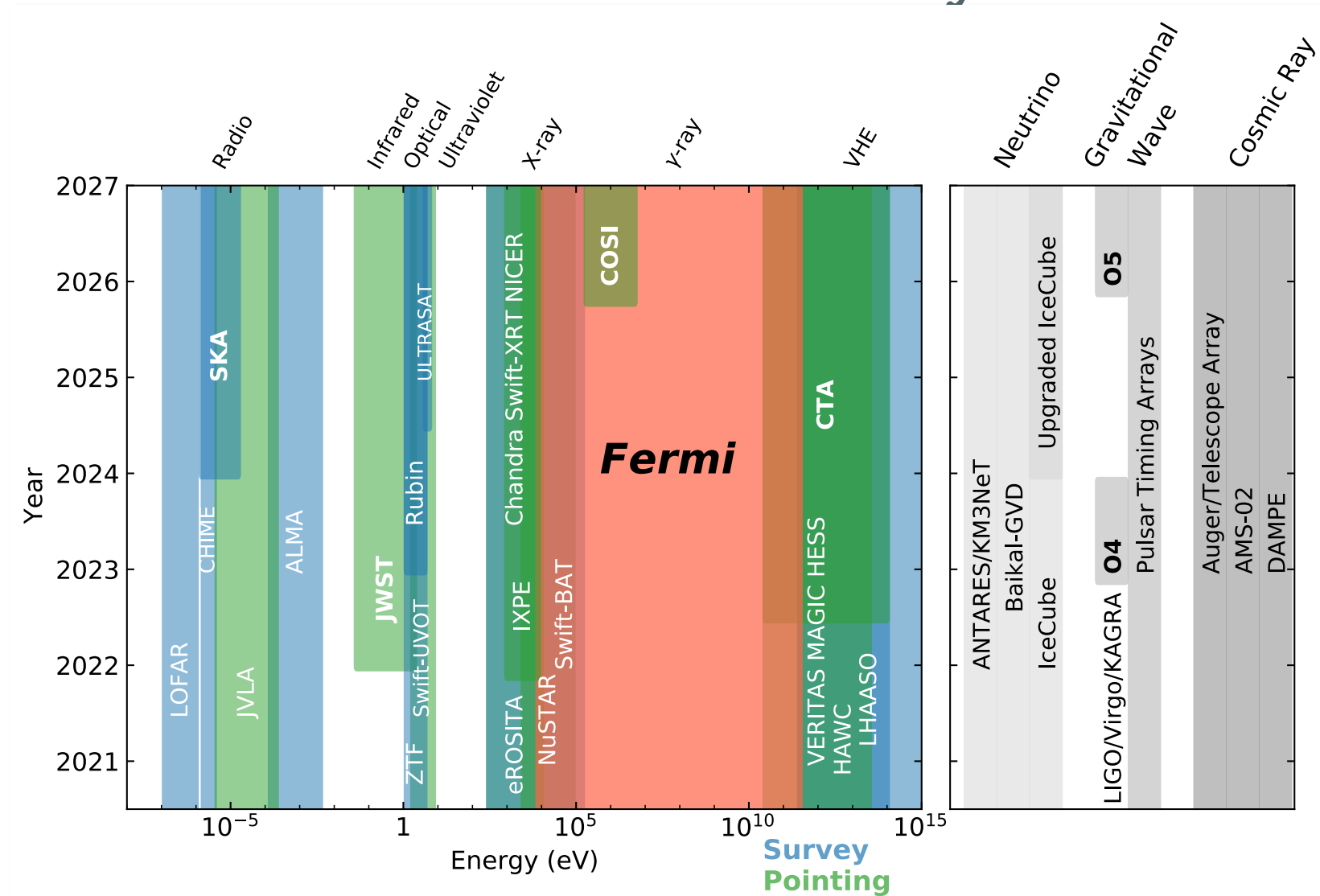
Updated GBM Localizations

- Reprocessed GBM GRBs from July 2008 through July 2019
 - all GRBs detected since are already using new software
- Localizations are more accurate with a lower systematic uncertainty, resulting in a $>2\times$ reduction in the 90% localization area for most GRBs
- HEALPix representations of GRB localizations
- Corresponding response functions and spectral fits will be updated in the forthcoming GBM catalog on the FSSC
- <https://zenodo.org/record/6727152>



Fermi Opportunities over the next 5 years

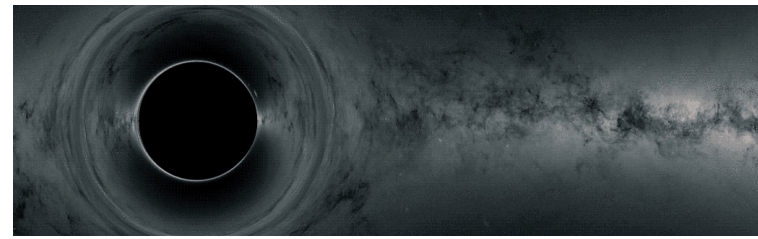
- Senior Review Themes
 - Exploring Multimessenger Sources
 - Capitalizing on the Era of Big Surveys
 - Modeling the High-Energy Universe
- Many more topics



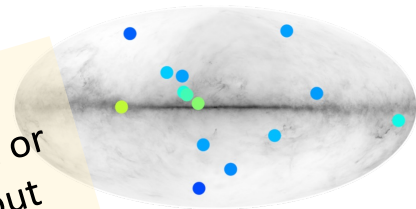
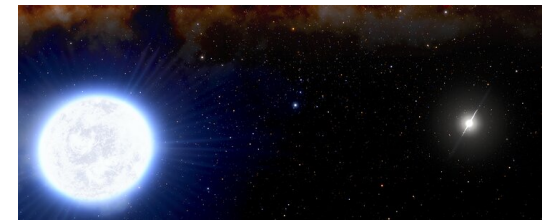
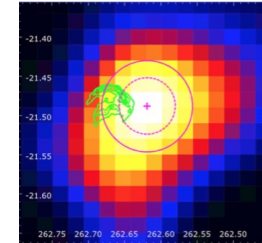
Tools for Enabling Fermi Science

- See Plenary 7: Science Enabling Software
- Over the coming years, Fermi will provide:
 - New GCN alert formats and streams (see talk by me on Friday)
 - LAT LCR time-series analysis
 - Flare Advocate new data products
 - GBM Subthreshold searches, alerts, and potential onboard threshold reduction
 - New LAT Pulsar data products (photon lists with pre-computed spin phases, photon weights)

Fermi Press Releases



- NASA's Fermi Hunts for Gravitational Waves From Monster Black Holes (Apr. 2022)
 - <https://www.nasa.gov/feature/goddard/2022/nasa-s-fermi-hunts-for-gravitational-waves-from-monster-black-holes>
- Gamma light from a nova (Mar 2022)
 - With the H.E.S.S. observatory and the Fermi satellite, researchers track the eruption of RS Ophiuchi
<https://www.mpg.de/18414085/gamma-light-from-a-nova>
- Kepler under the gamma-ray eye (Feb 2022)
 - The Fermi-LAT space telescope reveals the nature of particles accelerated in this historic supernova remnant.
https://irfu.cea.fr/dap/en/Phoceia/Vie_des_labos/Ast/ast.php?t=actu&id_ast=5002
- Cosmic 'Spider' Found to Be Source of Powerful Gamma-Rays (Jan 2022)
 - <https://noirlab.edu/public/news/noirlab2202/>
- NASA's Fermi Spots a Supernova's 'Fizzled' Gamma-ray Burst (Jul 2021)
 - <https://www.nasa.gov/feature/goddard/2021/nasa-s-fermi-spots-a-supernova-s-fizzled-gamma-ray-burst>
- Front-row view reveals exceptional cosmic explosion (Jun 2021)
 - https://www.desy.de/news/news_search/index_eng.html?openDirectAnchor=2080&two_columns=1
- Are there anti-stars around us? Answer from the Fermi satellite (Apr 2021)
 - <https://www.irap.omp.eu/en/2021/04/are-there-anti-stars-around-us-answer-from-the-fermi-satellite/>
- NASA Missions Unmask Magnetar Eruptions in Nearby Galaxies (Jan 2021)
 - <https://www.nasa.gov/feature/goddard/2021/nasa-missions-unmask-magnetar-eruptions-in-nearby-galaxies>
- NASA Missions Help Pinpoint the Source of a Unique X-ray, Radio Burst (Nov 2020)
 - <https://www.nasa.gov/feature/goddard/2020/nasa-missions-help-pinpoint-the-source-of-a-unique-x-ray-radio-burst>
- NASA Missions Explore a 'TIE Fighter' Active Galaxy (Aug 2020)
 - <https://www.nasa.gov/feature/goddard/2020/nasa-missions-explore-a-tie-fighter-active-galaxy>
- NASA Missions Help Reveal the Power of Shock Waves in a Nova Explosion (Apr 2020)
 - <https://www.nasa.gov/feature/goddard/2020/nasa-missions-help-reveal-the-power-of-shock-waves-in-a-nova-explosion>



Your result here!
Contact Judy Racusin or
Dave Thompson about
Fermi press support.

Fermi Graphics, Web Features, and more



Goddard Media Studios

SEARCH GALLERIES HELP SVS

Fermi Gamma-ray Space Telescope

NASA's Fermi Gamma-ray Space Telescope has completed its primary mission, and it will continue to explore the high-energy cosmos in unprecedented detail. These pages gather together media products associated with Fermi news releases starting before its 2008 launch, when it was known as GLAST.

Fermi detects gamma rays, the most powerful form of light, with energies thousands to billions of times greater than the visible spectrum.

The mission has discovered pulsars, proved that supernova remnants can accelerate particles to near the speed of light, monitored eruptions of black holes in distant galaxies, and found giant bubbles linked to the central black hole in our own galaxy.

For more information about the Fermi mission, visit its [NASA webpage](#).

Content Contact: Scott Wiessinger

Featured

News Stories



Simulations Create New Insights Into Pulsars

News Stories

Video, images and other media supporting Fermi Gamma-ray Space Telescope news products.

Featured

News Stories

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Science Topics

Videos

Stills/Graphics

Spacecraft

Presentation

Resources

Early Fermi

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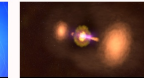
[View All Descriptions](#)



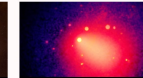
NASA Missions Unveil Magnetar Eruptions in Nearby Galaxies
2021.01.13



NASA Missions Team Up to Study Unique Magnetar Outburst
2020.11.04



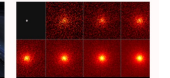
Young Active Galaxy with 'TIE Fighter' Shape
2020.08.25



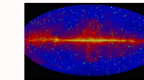
NASA's Fermi Finds Vast 'Halo' Around Nearby Pulsar
2019.12.19



A New Era in Gamma-ray Science
2019.11.20



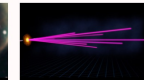
Fermi Sees the Moon in Gamma Rays
2019.08.15



Ten Years of High-Energy Gamma-ray Bursts
2019.06.13



NASA's Fermi Satellite Closes a 'Cannonball' Pulsar
2019.03.19



Tracing the History of Starlight with NASA's Fermi Mission
2018.11.29



NASA's Fermi Mission Shows How Luck Favors the Prepared
2018.11.08



Simulations Create New Insights Into Pulsars
2018.10.10



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Near Earth Gallery



Gamma-ray Bursts and Novae Gallery



Pulsars Gallery



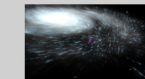
Cosmic Rays Gallery



Milky Way Gallery



Blazars Gallery



Nature of the Universe Gallery

Use in your talks and outreach!

<https://svs.gsfc.nasa.gov/Gallery/Fermi5.html>

Outreach and Social Media

- @NASAUniverse on Twitter & Facebook
- Social media posts using #FermiFriday content, special days, interesting results, promoting press releases, and #FermiPeople
- Fermi @ 15
 - The Fermi Comms team is planning now for Fermi's 15th anniversary - Ideas welcome!
- Fermi Social Media regular contributors: Tiffany Lewis, Dave Thompson, Judy Racusin, GSFC AstroComms staff
- Your suggestions for future social media content are welcome
 - Contact judith.racusin@nasa.gov

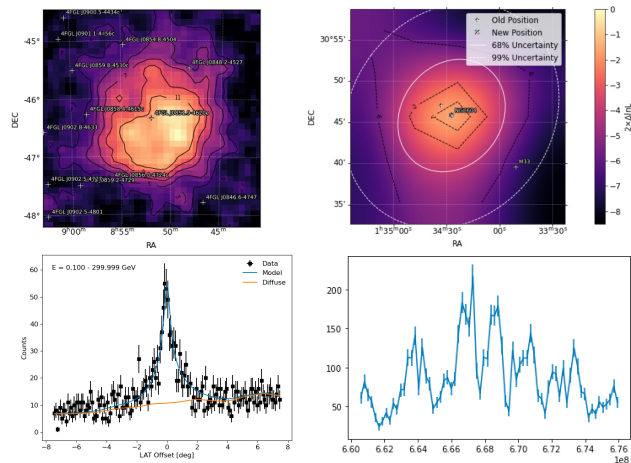




The University of Delaware and the Fermi Mission host the Fermi Summer School every summer in Lewes, Delaware.

**Next Summer School:
May 30-June 9, 2023**

<https://fermi.gsfc.nasa.gov/science/mtgs/summerschool/>



Analysis tutorial sessions



Lectures on gamma-ray and multimessenger astrophysics



Muon detectors reveal cosmic-ray air showers

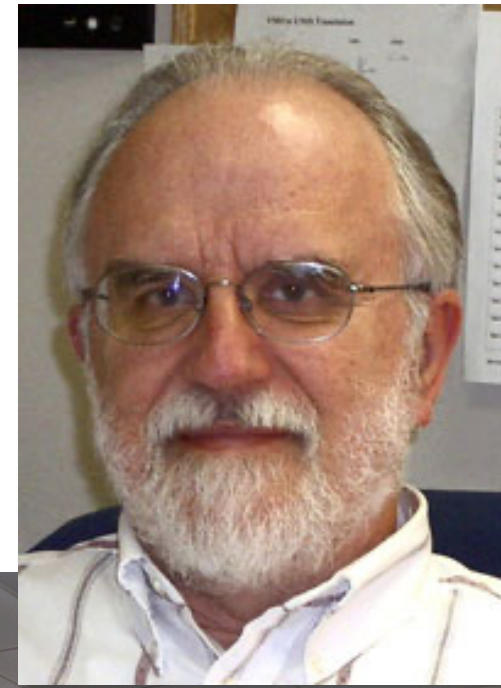
Keeping up to date with Fermi

- Fermi news -General news about the Fermi mission; subscribe at <https://lists.nasa.gov/mailman3/lists/fermi-news.lists.nasa.gov/>
- Website <https://fermi.gsfc.nasa.gov>
- Fermi Users Group (FUG) <https://fermi.gsfc.nasa.gov/ssc/library/fug/>
 - Members: Marcos Santander (chair), Laura Blecha, Paolo Coppi, Justin Linford, Eileen Meyer, Annika Peter, more members to be added soon
- Follow @NASAUniverse for Fermi public outreach on Facebook and Twitter
- Please don't hesitate to reach out to Liz Hays, Judy Racusin, and Dave Thompson with comments about things that are going well and opportunities for improvements to support Fermi science
 - elizabeth.a.hays@nasa.gov
 - judith.racusin@nasa.gov
 - david.j.thompson@nasa.gov

In Memorial – Bill Paciesas

August 27, 1947 - June 12, 2022

- Longtime GBM Team Member and fixture in gamma-ray community
- GBM Principal Investigator: 2009-2015
- GBM instrument operations scientist throughout Fermi mission



NASA Opens GLAST Burst Monitor Instrument Operations Center (2008)

11th International Fermi Symposium

- Early 2024
- Washington, DC area
- Please join us to celebrate 15 years of *Fermi* science!



Tenth International Fermi Symposium

9th-15th October 2022



Thank you for your attention!

Please come talk to me about the Fermi Mission!

Judy Racusin*

*judith.racusin@nasa.gov