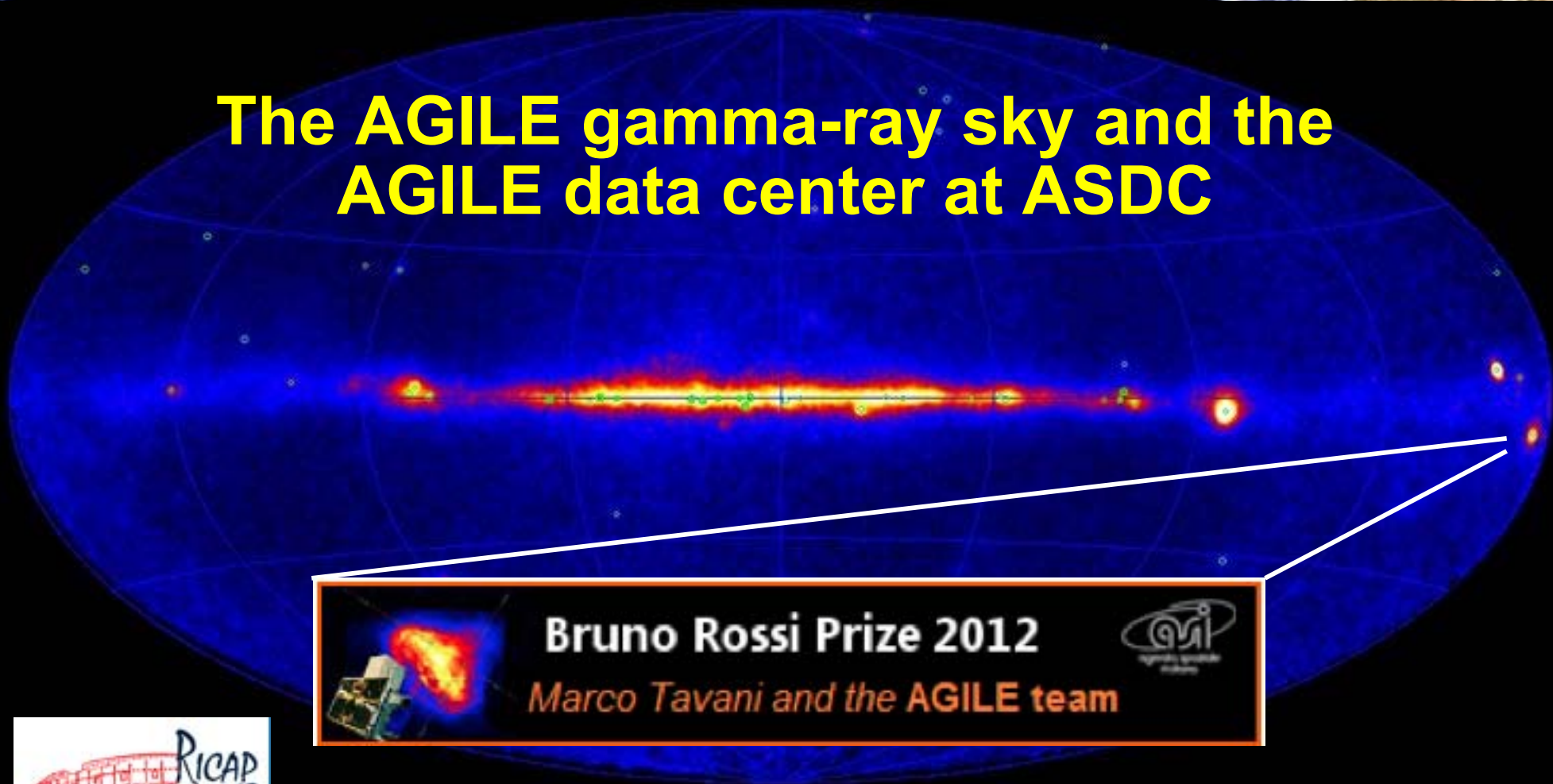




The AGILE gamma-ray sky and the AGILE data center at ASDC



 **Bruno Rossi Prize 2012** 
Marco Tavani and the AGILE team



**Carlotta Pittori - ADC, on behalf
of the AGILE Collaboration**

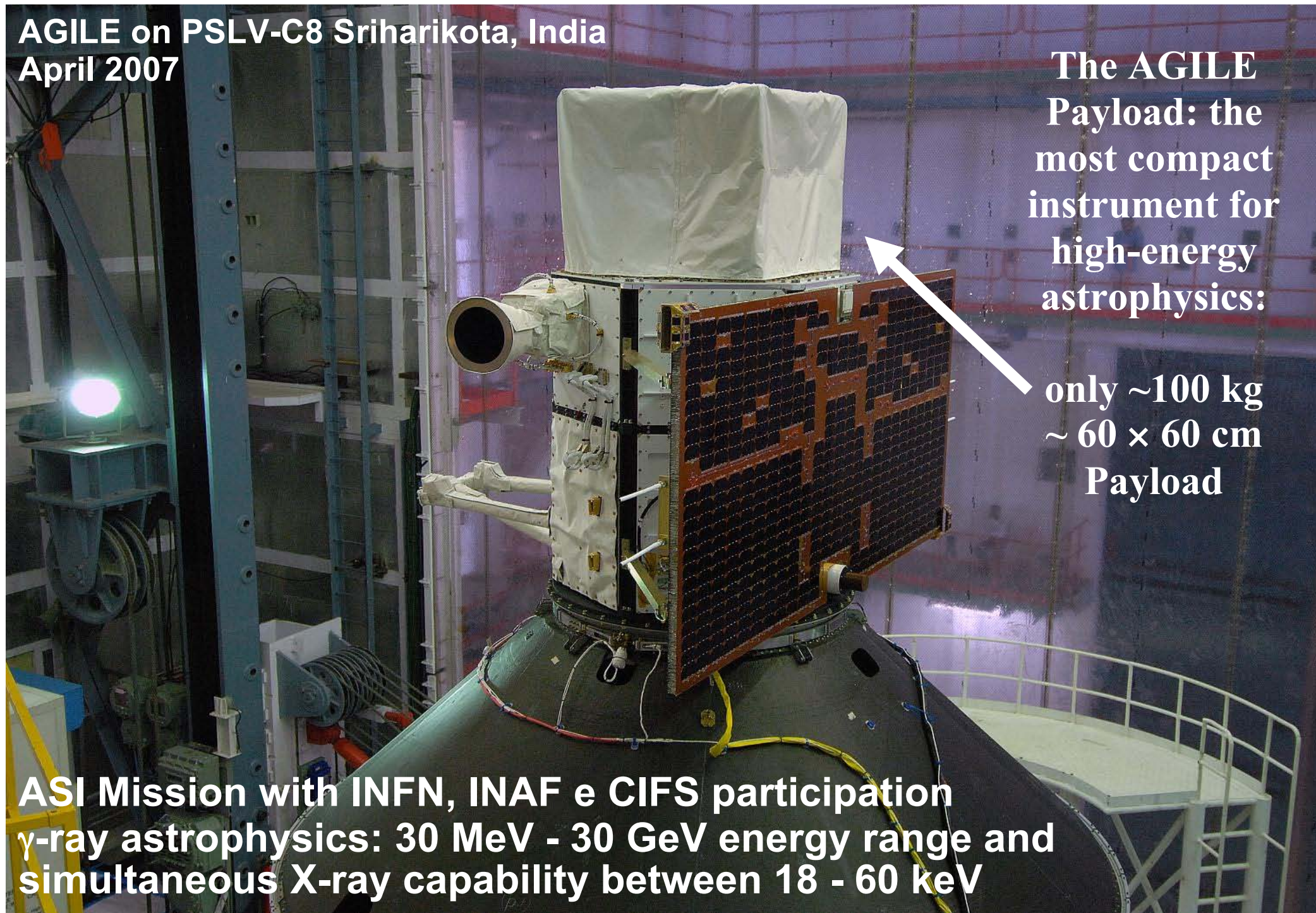
May 22 – 24, 2013

**AGILE on PSLV-C8 Sriharikota, India
April 2007**

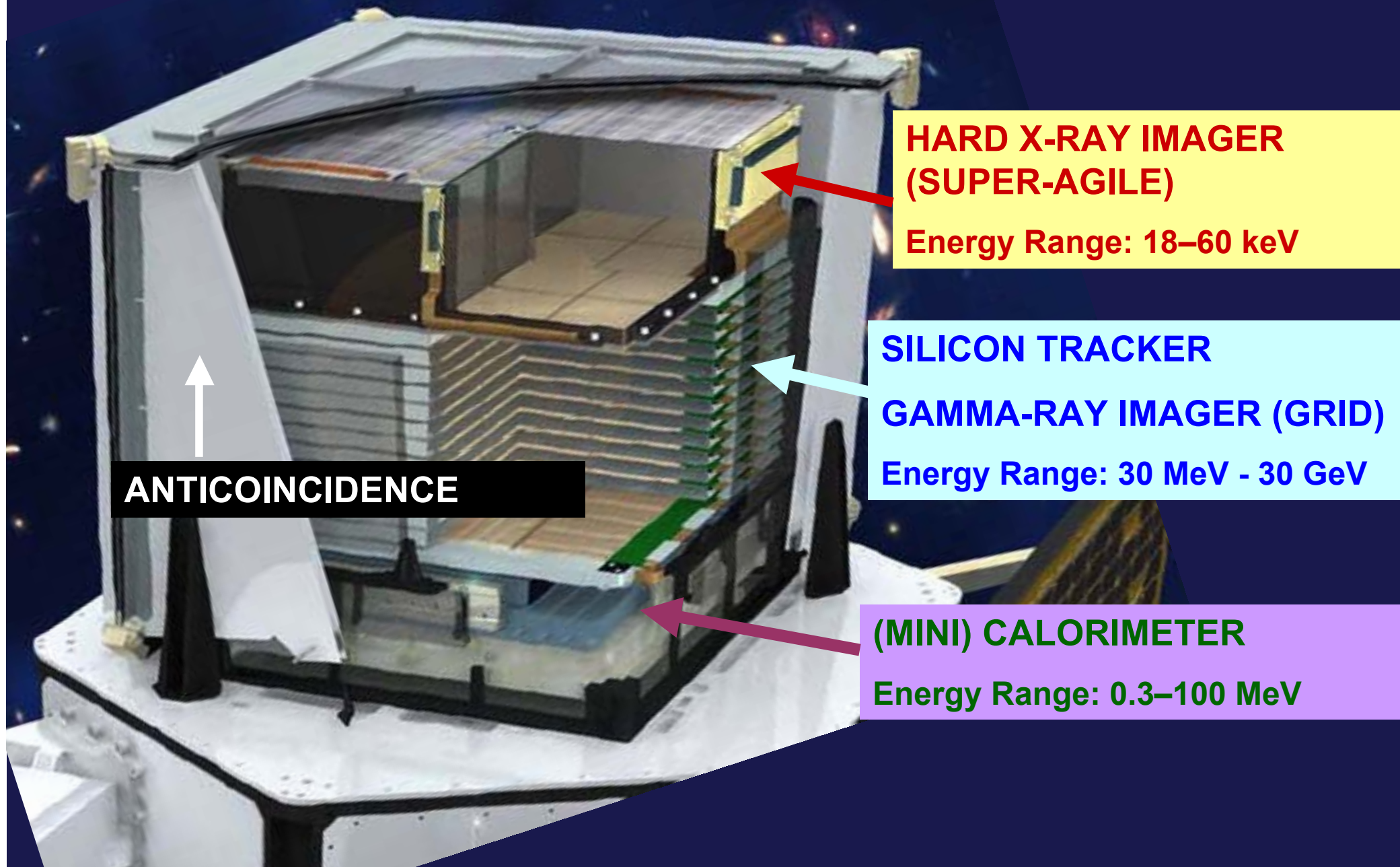
**The AGILE
Payload: the
most compact
instrument for
high-energy
astrophysics:**

**only ~100 kg
~ 60 × 60 cm
Payload**

**ASI Mission with INFN, INAF e CIFS participation
γ-ray astrophysics: 30 MeV - 30 GeV energy range and
simultaneous X-ray capability between 18 - 60 keV**



AGILE: inside the cube...





April 23, 2007: Launch!



Equatorial orbit: 550 Km, $< 3^\circ$ inclination angle

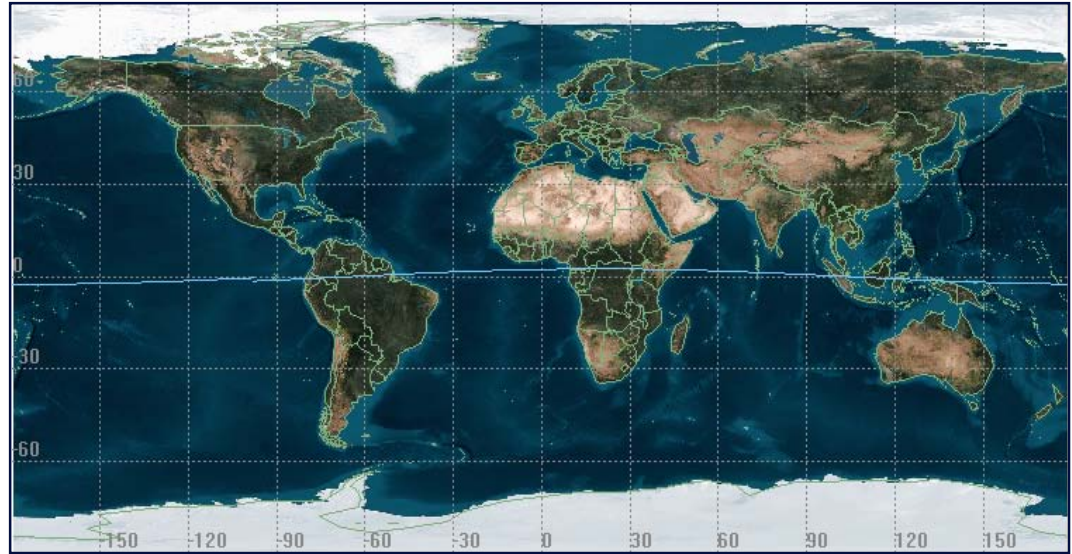
AGILE orbital parameters

Baseline equatorial orbit: 550 Km, 3° inclination

Semi-major axis: 6922.5 km (± 0.1 km)
Requirement: 6928.0 ± 10 km

Inclination angle: 2.48° ($\pm 0.04^\circ$)
Requirement: $< 3^\circ$

Eccentricity: 0.002 (± 0.0015)
Requirement: $< 0.1^\circ$



TPZ orbital decay estimate:

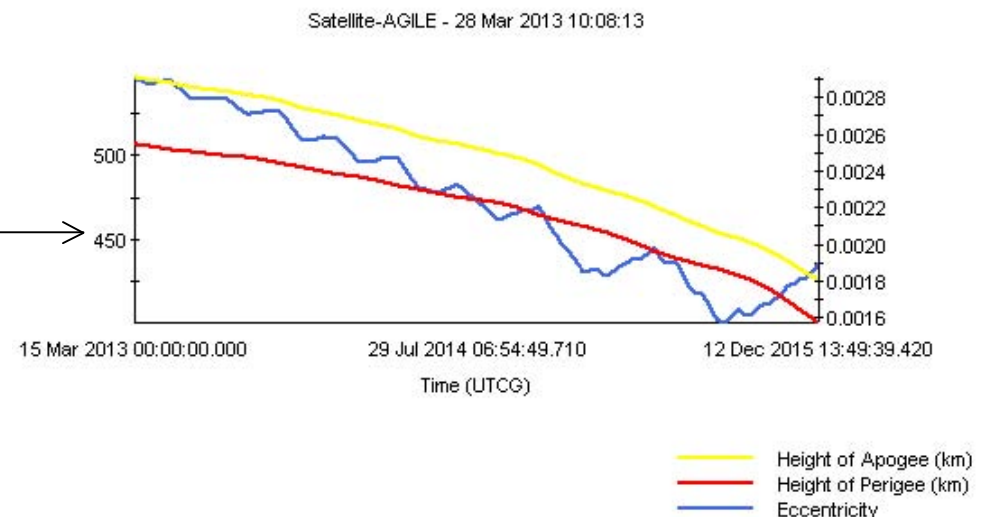
Height < 400 Km on **20/04/2017**

(A/M=0.009 sqm/Kg)

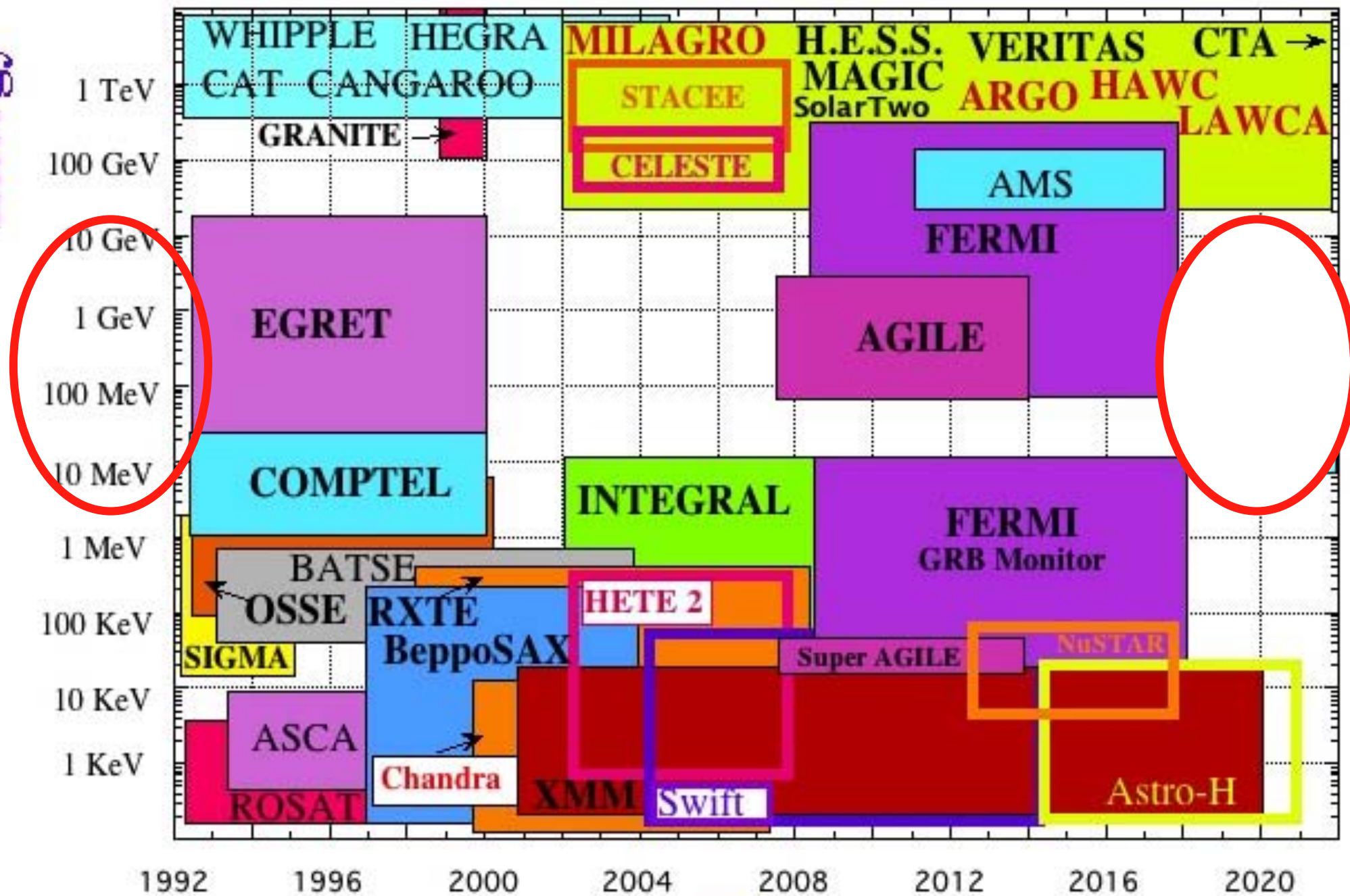
Worst case (A/M=0.012 sqm/Kg): **02/11/2015**

Best case (A/M=0.006 sqm/Kg): 29/04/2023

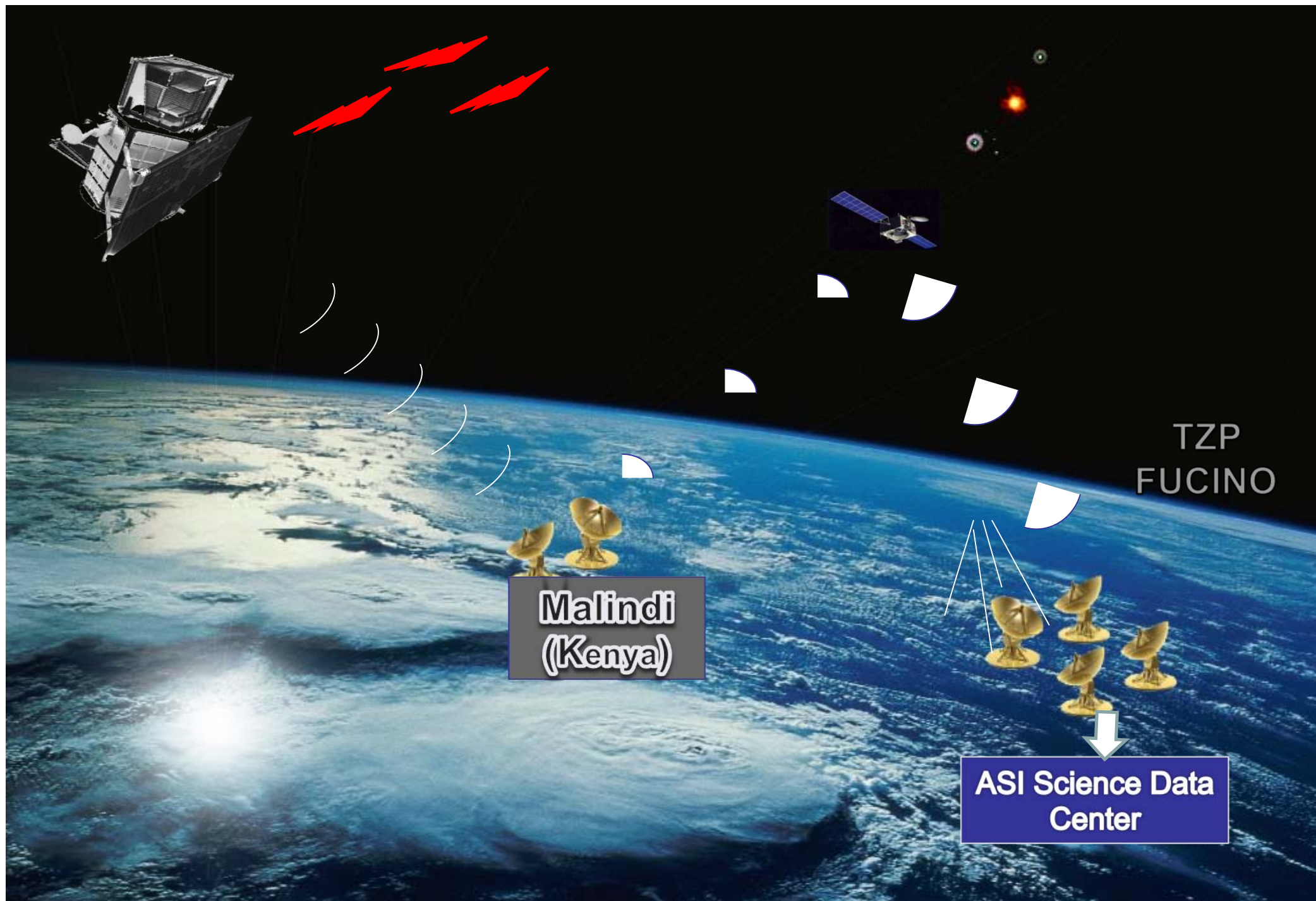
(**March 2013 updated estimate**, using recent solar flux “Schatten” forecasts + 2σ)

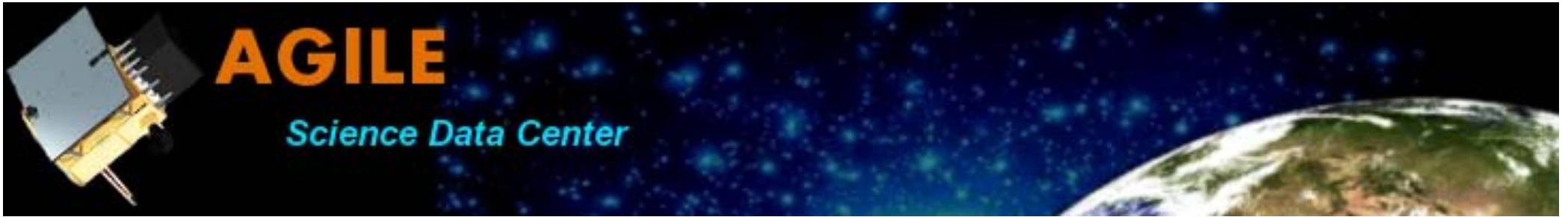


Energy



Year

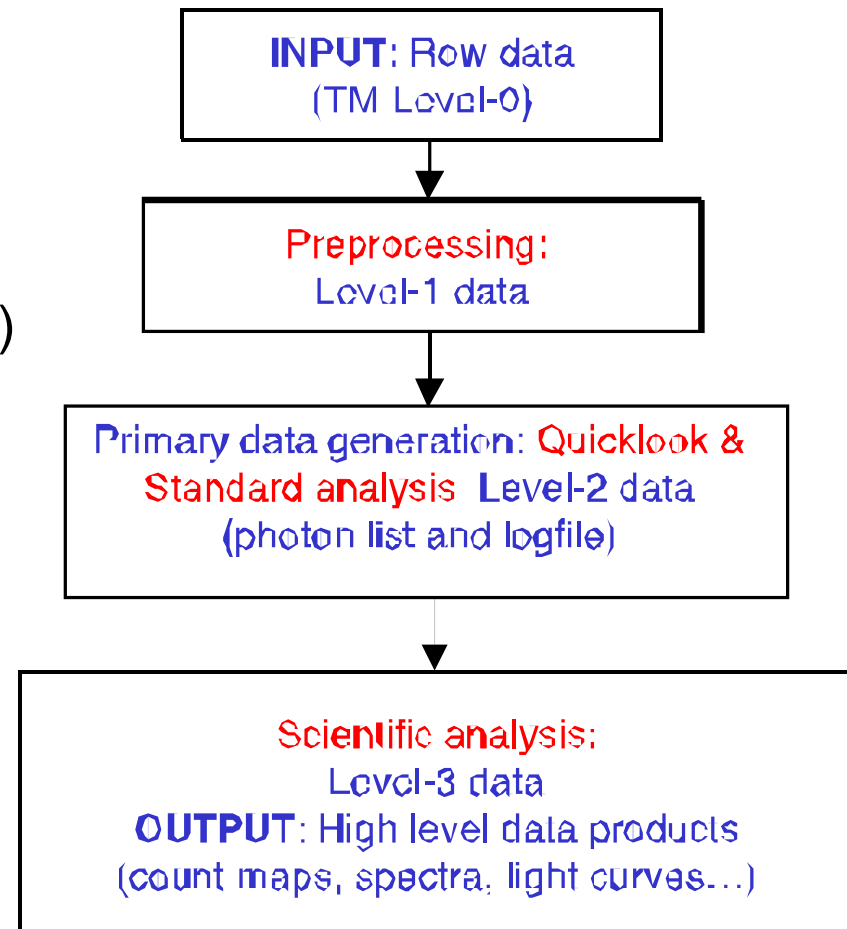




- The ADC, based at ASDC-ESRIN, is in charge of **all the scientific oriented activities related to the analysis and archiving** of AGILE data:

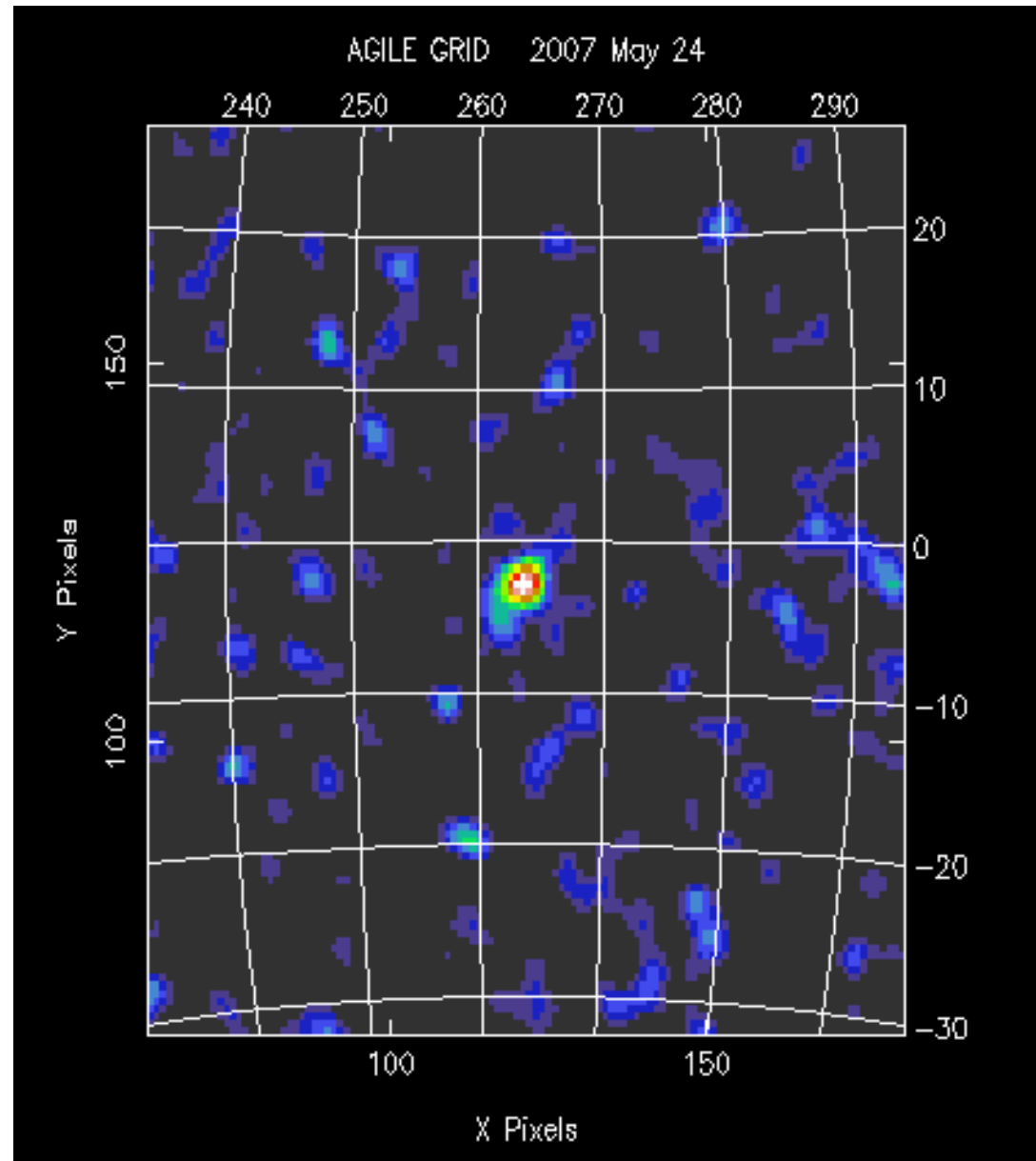
From scientific telemetry (TM) Level-0:

- ✓ Preprocessing → Level-1 data
- ✓ Quick-Look Analysis (transient detection)
- ✓ Standard analysis → Level-2 data (photon list)
- ✓ Scientific analysis (source detection, diffuse gamma-ray background)
- ✓ Archiving and distributing **all scientific AGILE data**

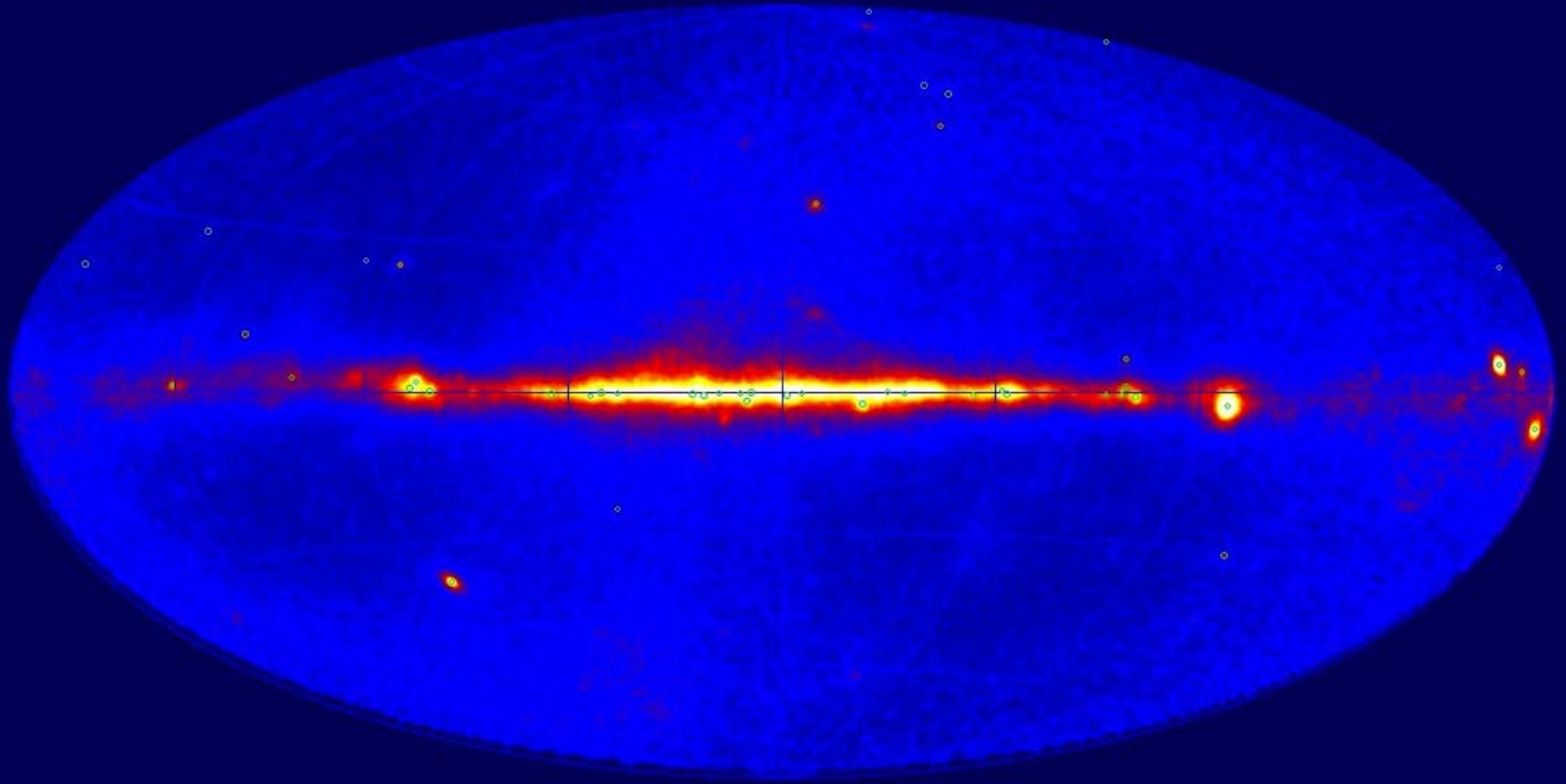


**First AGILE GRID light
ADC 24/5/2007**

Commissioning Phase:
AGILE Vela PSR Count Map
(~ 20000 s)



AGILE Total Intensity Map ($E > 100$ MeV):
Pointing + Spinning (up to July 30, 2011)



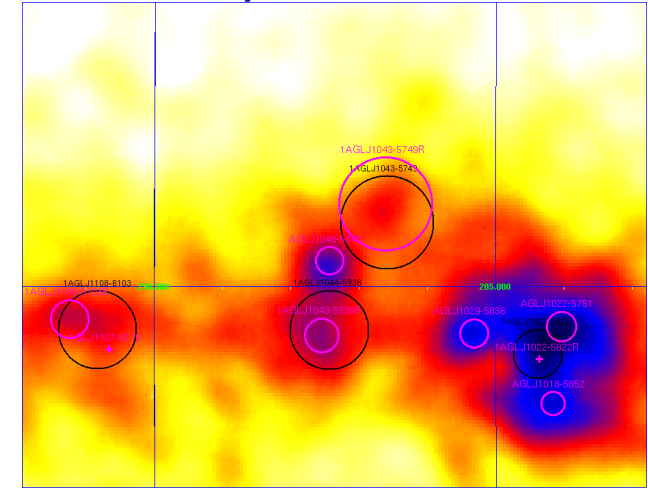
“The First AGILE-GRID Catalog of High Confidence Gamma-Ray Sources”
C. Pittori et al., A&A 506, 2009 (green circles, first year of operations)

WORK IN PROGRESS:

- A revised AGILE bright gamma-ray sources list and its variability study in pointing mode (F. Verrecchia et al., **submitted to A&A**)

Variability study of an improved 1AGL source list (54 sources) on the timescale of the AGILE pointed observations (Observation Blocks)

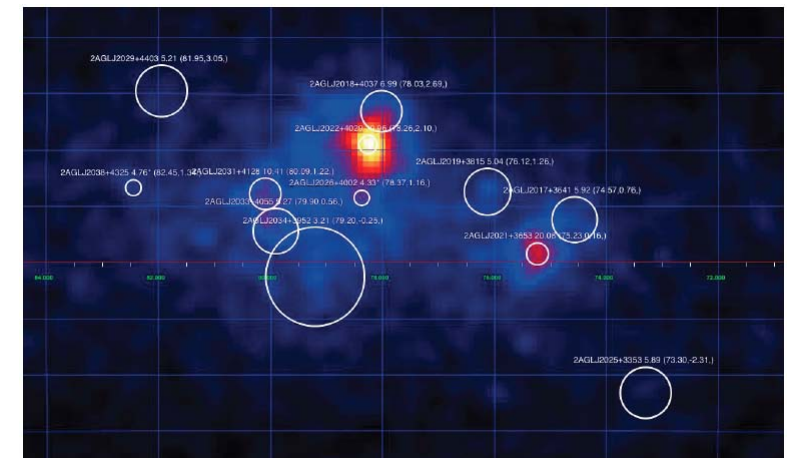
Refined positioning of some 1AGL sources: the Carina region →



- The second AGILE Catalog (A. Bulgarelli et al.)

New AGILE-GRID source catalog over the whole period of AGILE pointed observations (2.3 years), with improved event filter and updated calibrations.

More than 180 sources on the galactic plane only: the Cygnus region →



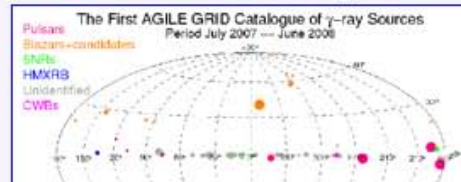
The First AGILE-GRID Catalog of High Confidence Gamma-Ray Sources

C. Pittori, F. Verrecchia, A. Chen, A. Bulgarelli, A. Pellizzoni, A. Giuliani, S. Vercellone, F. Longo, M. Tavani, P. Giommi et al.
A&A 506, 1563-1574 (2009)

Revised version - July 30, 2009.

The First AGILE Catalog includes sources detected by using AGILE-GRID data from July 9, 2007, end of the Satellite Commissioning phase, to June 30, 2008. Users can also download the First AGILE Catalog in FITS format here.
Refined analysis of complex regions of the Galactic plane yielded a new list of 47 high-confidence sources, compared to the 40 sources of the first version. Previous preliminary versions were published on this webpage to allow AGILE A02 guest observers to benefit of the Catalog in the preparation of their proposals.

If the AGILE Catalog data are used in publications, please acknowledge the AGILE Collaboration efforts by the following sentence:
"We acknowledge the use of The First AGILE Catalog of High Confidence Gamma-ray Sources, C. Pittori et al. 2009, A&A 506, 1563-1574 (2009), and on-line version available from the ADC web pages at ASDC."



asdc ASI Science Data Center VO Tools

VD mode: off (turn on) Help

Cone Search

Source Name:

Resolve name:

RA, Dec:

radius: 60 arcmin

Search

Help

Show/Hide columns

Advanced Filtering

Print current view of table

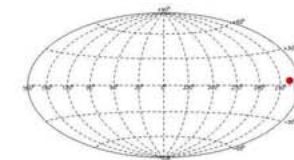
Print complete table

Reset all filters



Entry 1AGL J0634+1748 --- GEMINGA

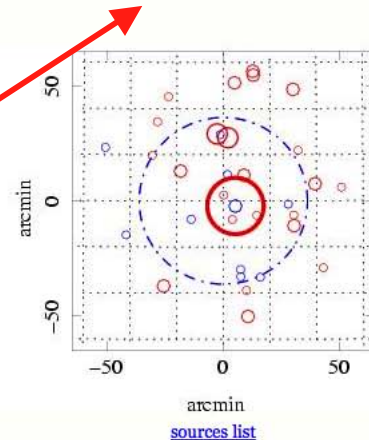
R.A.(J2000) = 06 34 15.9 (98.5662 deg) l=195.14
Dec (J2000) = +17 48 27.8 (17.8077 deg) b=4.36
Galactic nH = 3.50E+21 (cm⁻²)



Error circle EXPLORER

Source Details

Entry number	AGILE
1	ASDC data Explorer 1AGL
2	ASDC data Explorer 1AGL
3	ASDC data Explorer 1AGL
4	ASDC data Explorer 1AGL
5	ASDC data Explorer 1AGL
6	ASDC data Explorer 1AGL
7	ASDC data Explorer 1AGL
8	ASDC data Explorer 1AGL
9	ASDC data Explorer 1AGL
10	ASDC data Explorer 1AGL
11	ASDC data Explorer 1AGL



TUTORIAL HELP

Default catalogs (always selected)

Selectable catalogs:

Default selection [i]

Radio [select] ☐

Infrared [select] ☐

Optical [select] ☐

X-Ray [select] ☐

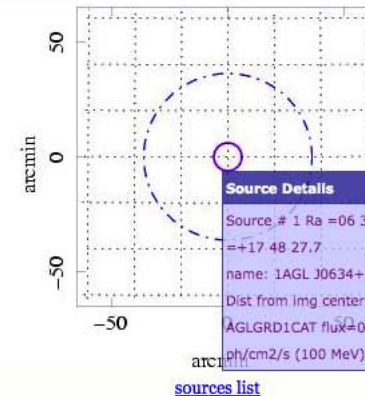
Gamma [select] ☒

Source Catalogs [select] ☐

[Selected catalog List >>]

size (arcmin) 60

Create new image



Source Details

Source # 1 Ra =06 34 16.0 Dec =+17 48 27.7

name: 1AGL J0634+1748

Dist from img center =1.2 arcsecs

AGLGRD1CAT flux=0.0000032 ph/cm2/s (100 MeV)

Position selected for the analysis: R.A.=06 34 15.9 (98.5662 deg) l=195.14
Dec=+17 48 27.8 (17.8077 deg) b=4.36

Reset Position

Galactic nH= 3.50E+21 (cm⁻²)

SED Builder

ASDC interactive catalogs webpages

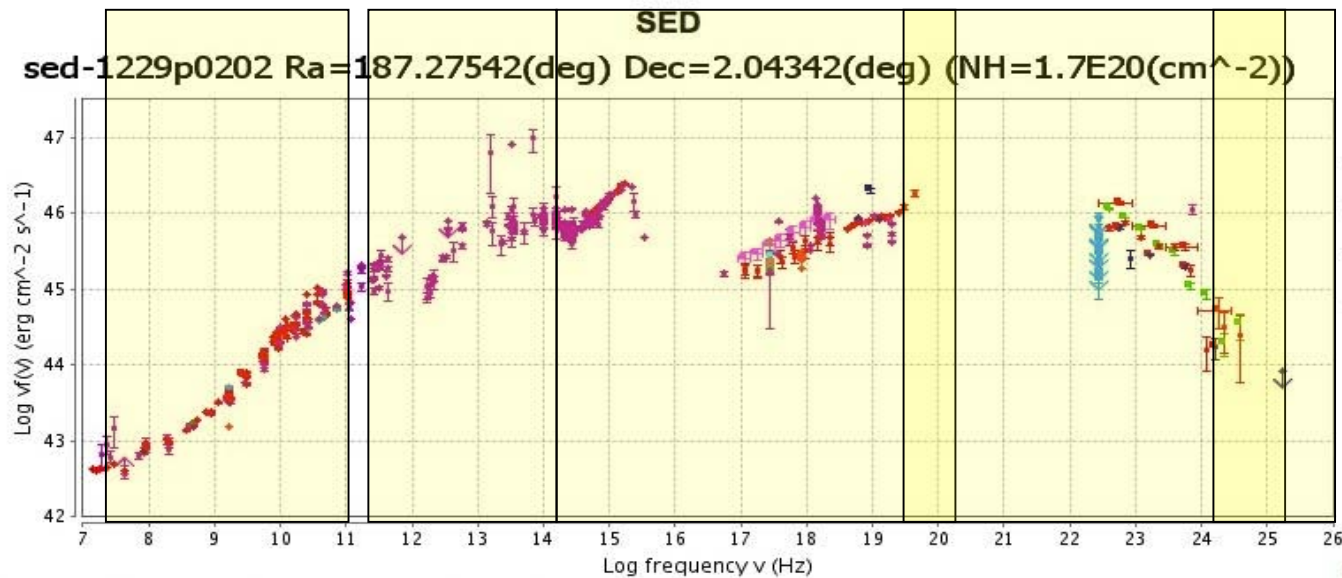
Source Name	RA (J2000)	Dec (J2000)
Pulsar	CTA1	---
RB	LSI+61303	---
ar	Crab	---
BLlac	PKS0537-441	BZBJ0538-4405
R	IC443	---
ar	GEMINGA	---
ar	---	BZUJ0654+4514
ar	---	BZUJ0719+3307
BLlac	S50716+714	BZBJ0721+7120
ar	VelaPSR	---
ified	---	---
B	---	---

The ASDC SED Builder

New SED(t) v2.2: VO tools and TIME domain

Radiotelescopio de Arecibo Planck Swift

AGILE and Fermi/CTA



• KUEHR • PKSCAT90 • DIXON • GB6 • NVSS • FIRST • VLSS • CRATES • PMN • NORTH20CM (flux 20 cm)
 • NORTH20CM (flux 6 cm) • NORTH20CM (flux 80 cm) • Ned • WMAP3 (Freq. 23e9) • WMAP3 (Freq. 33e9)
 • WMAP3 (Freq. 41e9) • WMAP3 (Freq. 61e9) • WMAP3 (Freq. 94e9) • WMAP5 (Freq. 23e9) • WMAP5 (Freq. 33e9)
 • WMAP5 (Freq. 41e9) • WMAP5 (Freq. 61e9) • WMAP5 (Freq. 94e9) • IPCSLEW • IPC • RASS • WGACAT2 • WFCCAT
 • XRTSRC • EGRET3 • BAT39MCAT (15-30keV) • BAT39MCAT (14-150keV) • Fermi1FGL (200 MeV) • Fermi1FGL (600 MeV)
 • Fermi1FGL (2Gev) • Fermi1FGL (6Gev) • Fermi1FGL (60Gev) • IBISSG4CAT (20-40 keV) • IBISSG4CAT (40-100 keV)
 • 3C273_simultaneous • 3C273_BATAjello • 3C273_AGILE • 3C273_simul2 • 3C273_GASP • 3C273_SAGILE • GTLIKE_P6v3
 • RATAN • OVRO_MAX_MIN • 3C273_Claudia_Unfolding_18M • swift_obs00035017300 • Fermi_1yr

Redshift: Frequencies:

Y Axis:

Local Catalogs

	Type
<input checked="" type="checkbox"/>	Radio
<input checked="" type="checkbox"/>	X Ray
<input checked="" type="checkbox"/>	Gamma
<input checked="" type="checkbox"/>	Infrared

External Catalogs

<input checked="" type="checkbox"/>	Name	Search	Options
<input type="checkbox"/>	2Mass		U
<input type="checkbox"/>	USNO B1		U
<input type="checkbox"/>	SDSS7		U
<input checked="" type="checkbox"/>	Ned	3c273	V S U
<input type="checkbox"/>	USNO A2.0		U

User Catalogs

<input checked="" type="checkbox"/>	Name	Options
-------------------------------------	------	---------

Virtual Observatory Standards (*in progress*) and Tool for OPerations on Catalogues And Tables (**Topcat**)

The image displays the TOPCAT software interface, which is used for managing astronomical catalogues and tables. The main window is titled "TOPCAT" and features a toolbar with various icons for file operations, table management, and plotting.

Table List: A list of tables is shown, with "1: aglgrd1cat" selected.

Current Table Properties: This panel displays details for the selected table:

- Location: WebSampConnector:aglgrd1cat
- Name: aglgrd1cat
- Rows: 47
- Columns: 11
- Sort Order:
- Row Subset: All
- Activation Action: (no action)

Spherical Plot: A window titled "Spherical Plot" shows a 3D visualization of the data points on a sphere. The plot includes a grid of lines and red dots representing the data.

Table Properties: Below the spherical plot, there are fields for "Data" and "Row Subsets".

- Data:** Table: 1: aglgrd1cat
- Longitude Axis:** ra (degrees)
- Latitude Axis:** dec (degrees)
- Row Subsets:** ☒ All

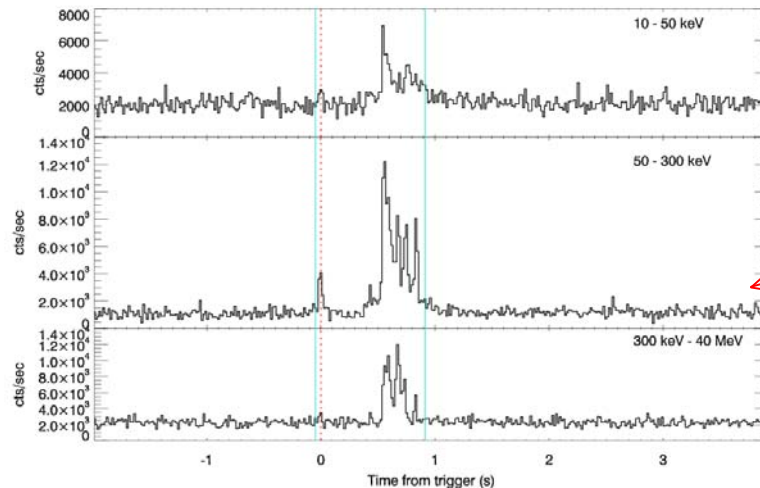
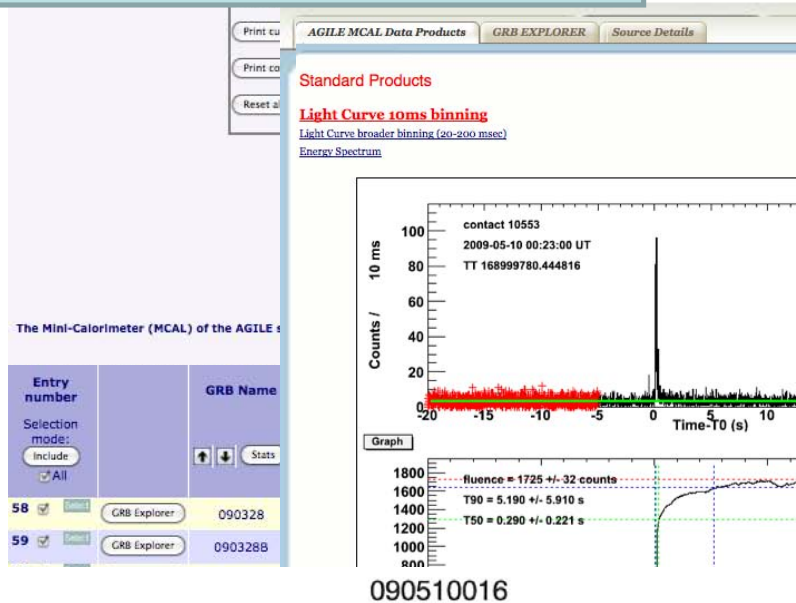
Status: At the bottom, a status bar indicates: Potential: 47 Included: 47 Visible: 47.

Background Information: The background shows a webpage with text about the "First AGILE Catalog" and a sidebar with links like "Help", "Show/hide columns", "Advanced filtering", "Print current view of table", "Print complete table", and "Reset all filters".

ASDC VO Tools Panel: A sidebar on the right contains the "asdc VO Tools" panel, which includes a "VO mode: on (turn off)" button, a "Broadcast catalog" link, and status indicators for "Aladin: stopped (start)" and "Topcat: started".

NEW: MCAL GRB Catalog (M. Galli et al., 2013) ADC interactive webpage

The AGILE MCAL Gar



Swift-XRT light curves of GRB 090510

Last updated after receiving ObsID 00351588001, version 19

Related pages: [Burst Analyser](#) | [Enhanced position](#) | [Spectrum](#) | [GRB Region information](#) | [XRT Catalogue entry](#) | [Download obs data](#) | [GCN Notices](#) | [GCN Circulars](#)

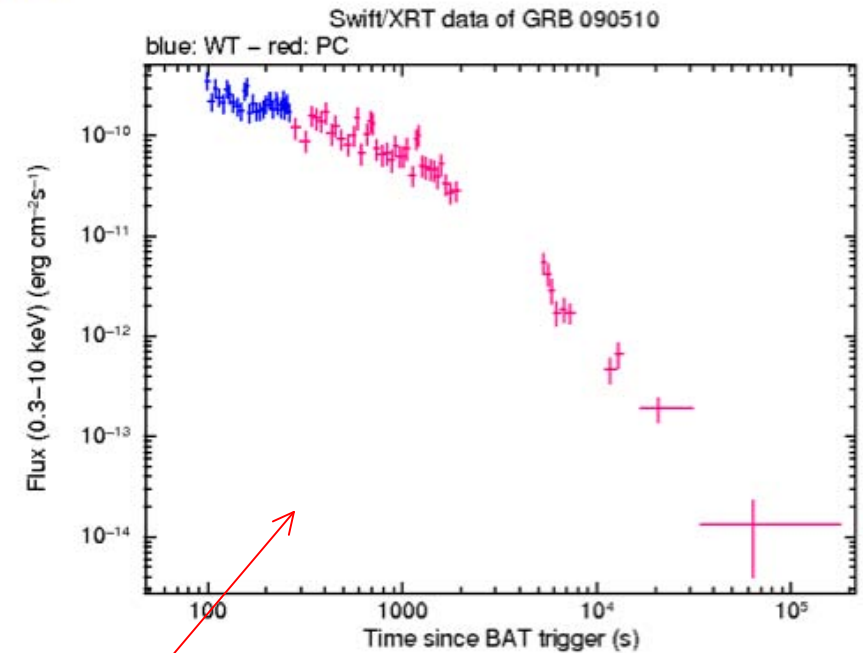
[Rebin this light curve](#) | [About these products.](#)

Flux Light Curve

For this burst, 1 count = 4.0×10^{-11} erg cm⁻² (observed flux) ([Automatic spectrum](#)).

Note that this is an average conversion factor: the true value may evolve with time.

[Rescale fluxed light curve.](#)



Products
Swift-XRT light curve repository at Leicester

Swift-BAT

Quicklook GBM lightcurve

GCN

Blog for Gamma Ray Bursts

Articles

SAO/NASA Astrophysics Data System

GRID

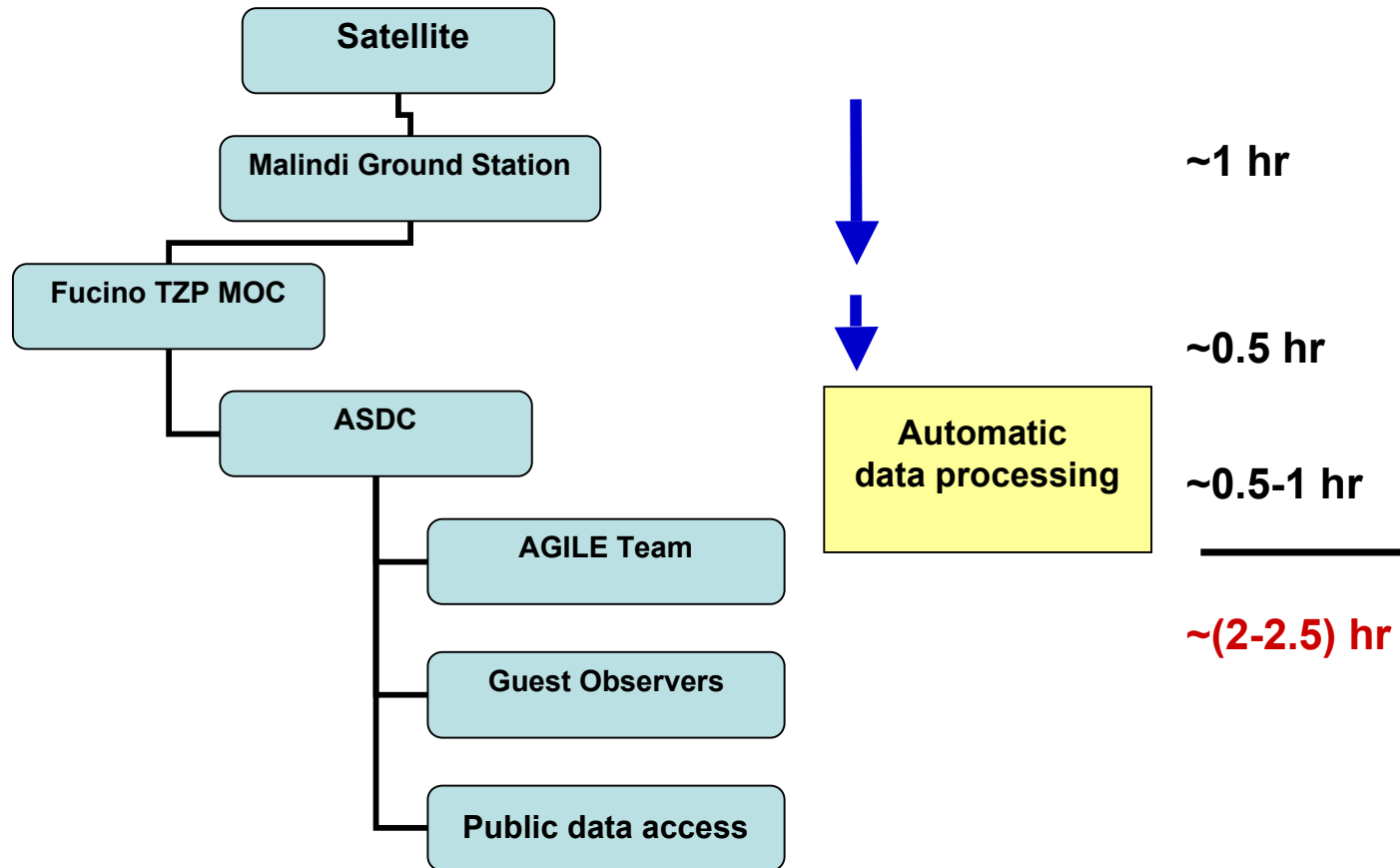
SA

SA

AGILE: 6th year in orbit

- AGILE demonstrates for the first time the covering of $\sim 1/5$ of the entire gamma-ray sky (FoV ~ 2.5 sr) with excellent angular resolution and competitive sensitivity.
- AGILE shows for the first time an optimal performance of its gamma-ray and hard X-ray imagers.
- **> 31280 orbits, May 15, 2013**
- **Pointing observation** mode up to October 18, 2009 and **spinning observation mode** since October 2009.
- **Very good scientific performance, especially at ~ 100 MeV**
- **Guest Observer Program open to the scientific community:**
 - Cycle-1: completed, Dec. 1, 2007 – Nov 30, 2008
 - Cycle-2: completed, Dec. 1, 2008 – Nov 30, 2009
 - Cycle-3: completed, Dec. 1, 2009 – Nov 30, 2010
 - Cycle-4: completed, Dec. 1, 2010 – Nov 30, 2011
 - Cycle-5 and Cycle-6: on-going data taking**

AGILE: “very fast” Ground Segment (with contained costs)

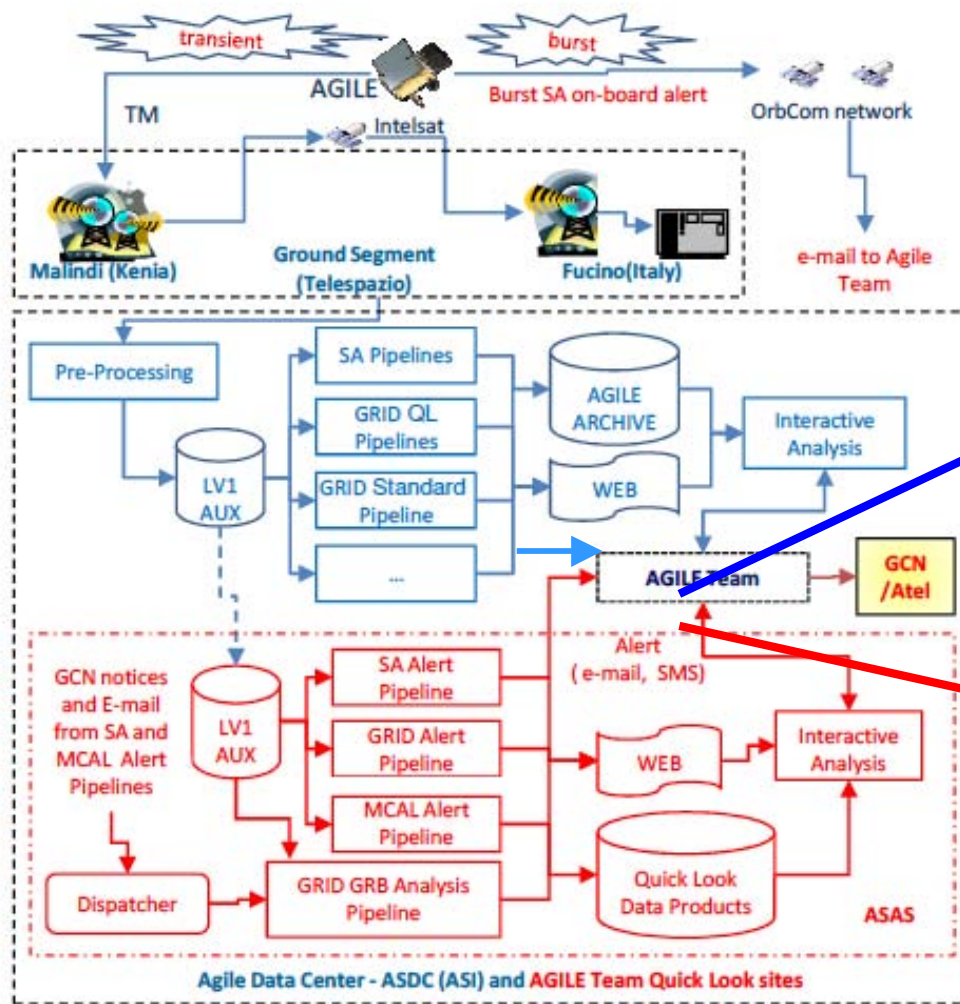


Record for a gamma-ray mission!

AGILE Science Alert System

- The system is distributed among the ADC @ ASDC and the AGILE Team Institutes (Trifoglio, Bulgarelli, Gianotti et al.)
- Automatic Alerts to the AGILE Team are generated within $T_0 + 45 \text{ min (SA)}$ and $T_0 + 100 \text{ min (GRID)}$
- GRID Alerts are sent via email (and sms) both on a contact-by-contact basis and on a daily timescale
- Refined manual analysis on most interesting alerts performed every day (daily monitoring)
- **104 ATel** (48 in pointing + 56 in spinning) and **40 GCN** published up to May, 2013

Selected **alerts** sent via email, sms



(Figure adapted from M. Trifoglio et al.)

label:agile-daily-report

The label "AGILE Daily Report" has been removed from the conversation. [Learn more](#) [Undo](#)

no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report 11/12/2011 (ok) - AGILE Daily Report 11/12/2011 (MJD-55906) ## ## FM Filter ...	10:12 am
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 11/12/2011 (ok) - AGILE Daily Report Global Proc. 11/12/2011 (MJD-559	9:49 am
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Multi2 Results 10/12/2011 noon (ok) - AGILE Daily Report Multi2 Results 10/12/2011 (MJD	Dec 10
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 10/12/2011 noon (ok) - AGILE Daily Report Global Proc. 10/12/2011 noon	Dec 10
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Multi2 Results 10/12/2011 (ok) - AGILE Daily Report Multi2 Results 10/12/2011 (MJD	Dec 10
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report 10/12/2011 (ok) - AGILE Daily Report 10/12/2011 (MJD-55905) ## ## FM Filter ...	Dec 10
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 10/12/2011 (ok) - AGILE Daily Report Global Proc. 10/12/2011 (MJD-555	Dec 10
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 09/12/2011 noon (ok) - AGILE Daily Report Global Proc. 09/12/2011 noon	Dec 9
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Multi2 Results 09/12/2011 (ok) - AGILE Daily Report Multi2 Results 09/12/2011 (MJD	Dec 9
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report 09/12/2011 (ok) - AGILE Daily Report 09/12/2011 (MJD-55904) ## ## FM Filter ...	Dec 9
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 09/12/2011 (ok) - AGILE Daily Report Global Proc. 09/12/2011 (MJD-555	Dec 9
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Multi2 Results 08/12/2011 noon (ok) - AGILE Daily Report Multi2 Results 08/12/2011 (MJD	Dec 8
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 08/12/2011 noon (ok) - AGILE Daily Report Global Proc. 08/12/2011 noon	Dec 8
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Multi2 Results 08/12/2011 (ok) - AGILE Daily Report Multi2 Results 08/12/2011 (MJD	Dec 8
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 08/12/2011 (ok) - AGILE Daily Report Global Proc. 08/12/2011 (MJD-555	Dec 8
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 07/12/2011 noon (ok) - AGILE Daily Report Global Proc. 07/12/2011 noon	Dec 7
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Multi2 Results 07/12/2011 (ok) - AGILE Daily Report Multi2 Results 07/12/2011 (MJD	Dec 7
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report 07/12/2011 (ok) - AGILE Daily Report 07/12/2011 (MJD-55902) ## ## FM Filter ...	Dec 7
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 07/12/2011 (ok) - AGILE Daily Report Global Proc. 07/12/2011 (MJD-555	Dec 7
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 06/12/2011 noon (ok) - AGILE Daily Report Global Proc. 06/12/2011 noon	Dec 6
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Multi2 Results 06/12/2011 (ok) - AGILE Daily Report Multi2 Results 06/12/2011 (MJD	Dec 6

Daily reports on a 48h time scale
(sent twice a day)

Contact-by-contact alerts on a 48h time
scale (sent every ~100 min)

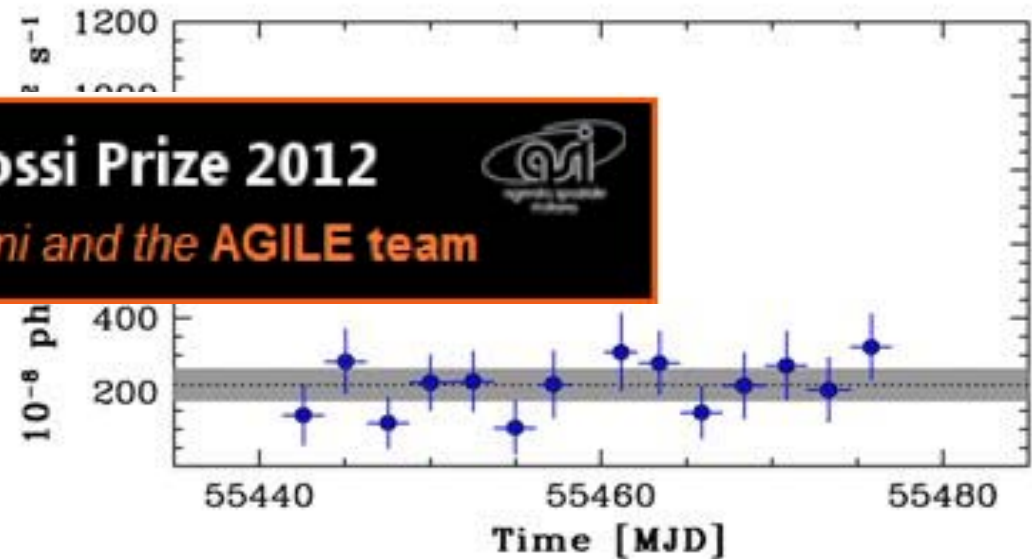
label:grid-alert

Gmail's getting a new look soon. [Learn more](#) [Dismiss](#)

no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report 11/12/2011 (ok) - AGILE Daily Report 11/12/2011 (MJD-55906) ## ## FM Filter ...	10:12 am
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 11/12/2011 (ok) - AGILE Daily Report Global Proc. 11/12/2011 (MJD-559	9:49 am
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Multi2 Results 10/12/2011 noon (ok) - AGILE Daily Report Multi2 Results 10/12/2011 (MJD	Dec 10
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 10/12/2011 noon (ok) - AGILE Daily Report Global Proc. 10/12/2011 noon	Dec 10
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Multi2 Results 10/12/2011 (ok) - AGILE Daily Report Multi2 Results 10/12/2011 (MJD	Dec 10
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report 10/12/2011 (ok) - AGILE Daily Report 10/12/2011 (MJD-55905) ## ## FM Filter ...	Dec 10
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 10/12/2011 (ok) - AGILE Daily Report Global Proc. 10/12/2011 (MJD-555	Dec 10
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 09/12/2011 noon (ok) - AGILE Daily Report Global Proc. 09/12/2011 noon	Dec 9
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Multi2 Results 09/12/2011 (ok) - AGILE Daily Report Multi2 Results 09/12/2011 (MJD	Dec 9
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report 09/12/2011 (ok) - AGILE Daily Report 09/12/2011 (MJD-55904) ## ## FM Filter ...	Dec 9
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 09/12/2011 (ok) - AGILE Daily Report Global Proc. 09/12/2011 (MJD-555	Dec 9
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Multi2 Results 08/12/2011 noon (ok) - AGILE Daily Report Multi2 Results 08/12/2011 (MJD	Dec 8
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 08/12/2011 noon (ok) - AGILE Daily Report Global Proc. 08/12/2011 noon	Dec 8
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Multi2 Results 08/12/2011 (ok) - AGILE Daily Report Multi2 Results 08/12/2011 (MJD	Dec 8
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 08/12/2011 (ok) - AGILE Daily Report Global Proc. 08/12/2011 (MJD-555	Dec 8
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 07/12/2011 noon (ok) - AGILE Daily Report Global Proc. 07/12/2011 noon	Dec 7
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Multi2 Results 07/12/2011 (ok) - AGILE Daily Report Multi2 Results 07/12/2011 (MJD	Dec 7
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report 07/12/2011 (ok) - AGILE Daily Report 07/12/2011 (MJD-55902) ## ## FM Filter ...	Dec 7
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 07/12/2011 (ok) - AGILE Daily Report Global Proc. 07/12/2011 (MJD-555	Dec 7
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Global Proc. 06/12/2011 noon (ok) - AGILE Daily Report Global Proc. 06/12/2011 noon	Dec 6
no_reply	AGILE Daily Report	Index	[gridalert] AGILE Daily Report Multi2 Results 06/12/2011 (ok) - AGILE Daily Report Multi2 Results 06/12/2011 (MJD	Dec 6

The variable Crab Nebula!

FIRST PUBLIC ANNOUNCEMENT
Sept. 22, 2010: AGILE issues the
Astronomer's Telegram n. 2855



Science Express (6 January 2011)

First AGILE catalog of high-confidence gamma-ray sources

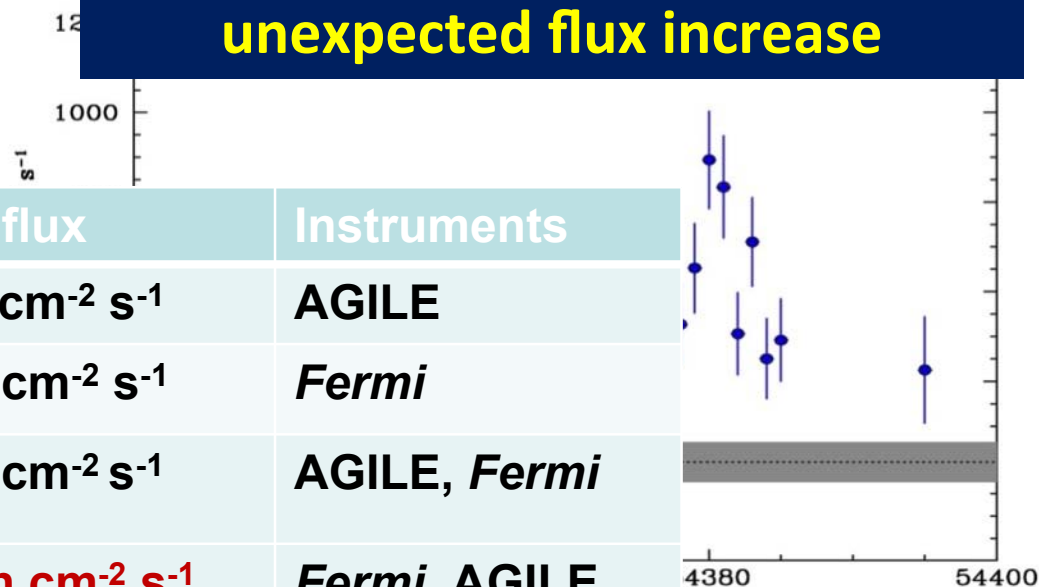
C. Pittori¹, F. Verrecchia¹, A. W. Chen^{2,3}, A. Bulgarelli⁴, A. Pellizzoni⁵, A. Giuliani^{2,3}, S. Vercellone⁶, F. Longo^{7,8}, M. Tavani^{9,10,11,12}, P. Giommi^{1,12}, G. Barbiellini^{7,8,3}, M. Trifoglio³, F. Gianotti³, A. Argan³, A. Antonelli¹³, F. Boffelli¹⁴, P. Caraveo², P. W. Cattaneo¹⁴, V. Cocco¹⁰, S. Colafrancesco^{1,12}, T. Contessio², E. Costa⁹, S. Cutini¹, F. D'Ammando^{9,10}, E. Del Monte⁹, G. De Paris⁹, G. Di Cocco⁴, G. Di Persio⁹, I. Donnarumma⁹, Y. Evangelista⁹, G. Fanari¹, M. Feroci⁹, A. Ferrari^{1,12}, M. Fiorini², F. Fornari², F. Fuschino⁴, T. Froyland^{8,11}, M. Frutti⁹, M. Galli¹⁶, D. Gasparri¹, C. Labanti⁴, I. Lapshov^{9,17}, F. Lazzarotto⁹, F. Liello⁹, P. Lipari^{18,19}, E. Mattaini², M. Marisaldi⁴, M. Mastropietro^{9,21}, A. Mauri¹⁴, F. Mauri¹⁴, S. Mereghetti², E. Morelli⁴, E. Moretti^{7,8}, A. Morselli¹¹, L. Pacciani⁹, F. Perotti², G. Piano^{9,10,11}, P. Picozza^{10,11}, M. Pilia^{22,23}, C. Pontoni^{3,8}, G. Porrovecchio⁹, B. Preger¹, M. Presti^{8,22}, R. Primavera¹, G. Pucella⁹, M. Rapisarda²⁰, A. Rappoldi¹⁴, E. Rossi⁴, A. Rubini⁹, S. Sabatini¹⁰, P. Santolamazza¹, E. Scalise⁹, P. Soffitta⁹, S. Stejlanovic¹, E. Striani¹⁰, F. Tamburelli¹, A. Traci⁴, A. Trois⁹, E. Vallazza⁵, V. Vittorini^{9,22}, A. Zambra^{2,3}, D. Zanello^{18,19}, and L. Salotti¹²

Sect. 6.1 Notes on individual

1AGL J0535+2205 and 1AGL J0634+1748 (Crab and Geminga). These two well known strong γ -ray pulsars, together with the Vela pulsar, were used for in-flight AGILE calibrations. We report the flux values obtained during calibration subperiods. These values agree with pulsed flux values reported in (Pellizzoni et al. 2009). We note, however, that we observed higher flux values, over 1σ from the reported mean flux, for both sources when merging all the data, including shorter (1 day) integration periods during 2007. This point is under investigation.

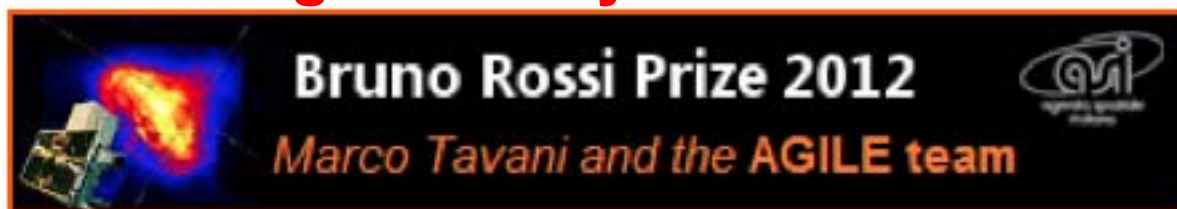
AGILE first detection of a strong gamma-ray flare in Oct. 2007 reported in the First AGILE source catalog as possible short unexpected flux increase

Flare date	Duration	Peak γ -ray flux	Instruments
October 2007	~ 15 days	$\sim 6 \cdot 10^{-6}$ ph cm ⁻² s ⁻¹	AGILE
February 2009	~ 15 days	$\sim 4 \cdot 10^{-6}$ ph cm ⁻² s ⁻¹	Fermi
September 2010	~ 4 days	$\sim 5 \cdot 10^{-6}$ ph cm ⁻² s ⁻¹	AGILE, Fermi
April 2011	~ 2 days	$\sim 30 \cdot 10^{-6}$ ph cm ⁻² s ⁻¹	Fermi, AGILE



March 2013: new γ -ray flaring state detected by Fermi and AGILE

- a big theoretical challenge: the Crab Nebula is not a standard candle in gamma-rays!



AGILE: Gamma-Rays MAIN DISCOVERIES AND SURPRISES!

UNEXPECTED NEWS FROM THE γ -RAY SKY:

**AGILE DISCOVERY OF THE CRAB
NEBULA VARIABILITY IN γ -RAYS**

Tavani et al., Science, 331, 736 (2011)

Fermi confirmation:

**AGILE updates: see Edoardo Striani TALK
“The Crab Nebula: observations and simulations”
on Thu, May 23, Parallel Session E at 15:55**

- **Carina region:** γ -ray detection of the colliding wind massive binary system η -Car with AGILE

Tavani et al., **ApJ**, 698, L142, 2009 (arXiv:0904.2736)

- **Cygnus region microquasars:**

Cyg X-1 updates: see Sabina Sabatini TALK on Thu, May 23, Parallel Session G at 16:45

Cyg X-3 updates: see Giovanni Piano TALK on Thu, May 23, Parallel Session G at 17:00

Tavani et al., **Nature** 462, 620, 2009 (arXiv:0910.5344)

- **Detection of Gamma-Ray Emission from the Vela Pulsar Wind Nebula with AGILE**

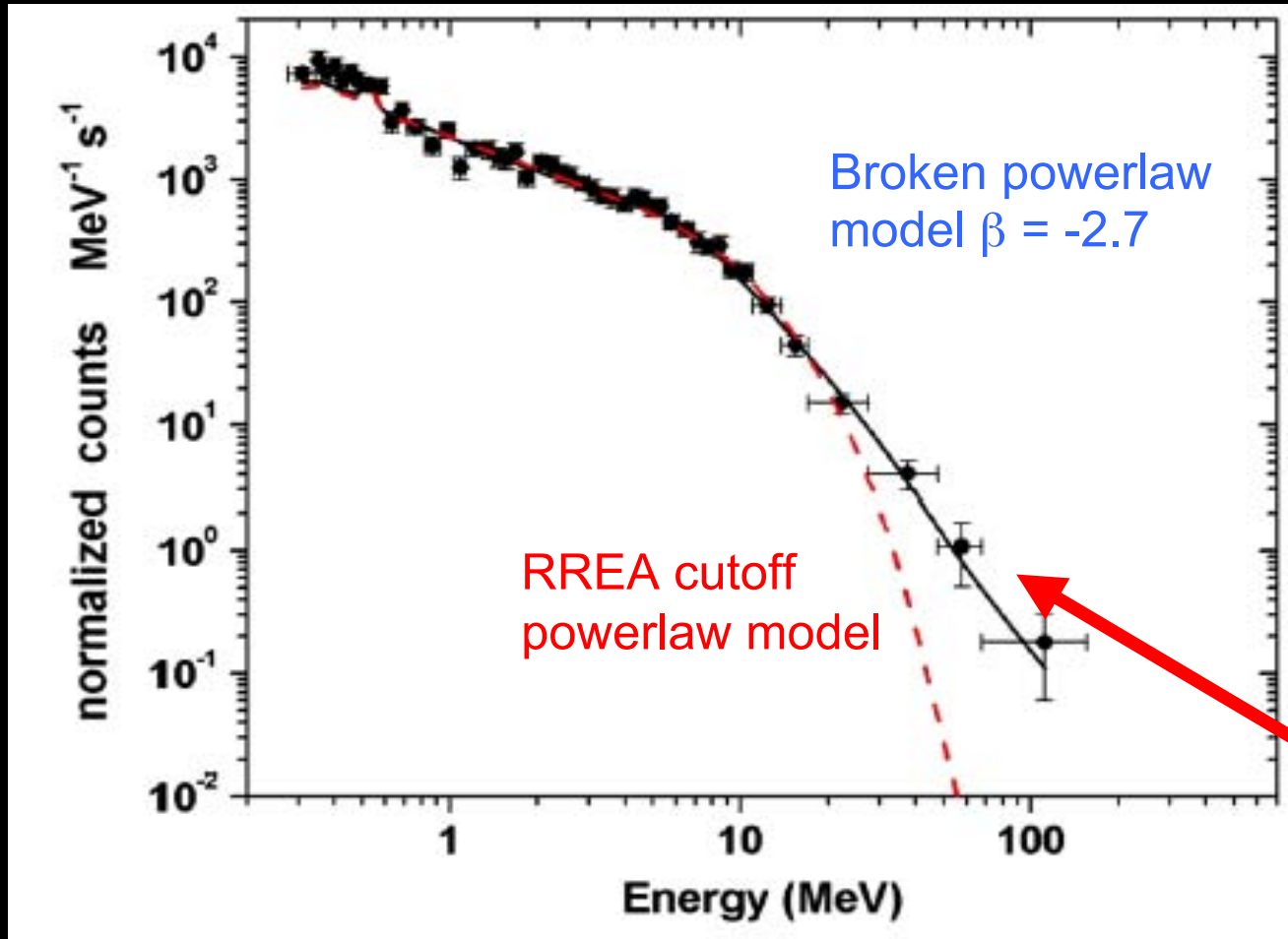
W44 updates: see Martina Cardillo TALK on Wed, May 22, Parallel Session B at 15:15

the **SNR W44**

Giuliani et al., **ApJ**, 742, 2011

TGF Cumulative spectrum

110 TGFs 1806 photons 142 γ $E > 10$ MeV 26 γ $E > 20$ MeV



Significant detection of γ > 40 MeV!!
Unexplained by standard RREA model: challenge for emission models

**AGILE-MCAL
crucial spectral
contribution up
to 100 MeV!!**

Tavani et al., Phys. Rev. Letters 106, 018501 (2011)

Slide adapted from M. Marisaldi, 10th AGILE WS

- Normal lightnings involve a potential difference ~ 500 kVolts
- **Terrestrial Gamma-Ray Flashes (TGF) involve DV > 100 MVolts !**
- Models??: **Relativistic Runaway Electron Avalanche** (RREA) with relativistic feedback (Dwyer 2008). Bremsstrahlung + Compton scattering. *Much theoretical work in progress*
- RHESSI cumulative spectrum compatible with a production altitude of 15-21 km (just above tropical thunderstorms)

AGILE MCAL: an optimal detector for TGF

- MCAL energy range is extended **up to 100 MeV**
- Efficient trigger at **ms and sub-ms time scale** (the TGF time scale)
- AGILE **equatorial orbit** at 2.5° inclination is optimal for mapping the equatorial region, where most of the events take place
- A real-time monitoring and alert system can be implemented for correlation with other meteo resources (work in progress)

Malindi Ground station problems impact on AGILE telemetry download

Due to ASI's Malindi ground station technical problems, the acquisition of telemetry data from the AGILE satellite has been significantly reduced since December 21, 2012.

All AGILE payload functions are nominal, and normal operations will be resumed as soon as the Malindi antenna system problems are solved.

Agile Services

Data Coverage
Monitoring

Monitoring

M EVT
Time
Histogram

2013-05-11

2013-05-12

2013-05-13

2013-05-14

2013-05-15

2013-05-16

2013-05-17

2013-05-18

2013-05-19

2013-05-20

2013-05-21

2013-05-22

2013-05-23

2013-05-24

2013-05-25

2013-05-26

2013-05-27

2013-05-28

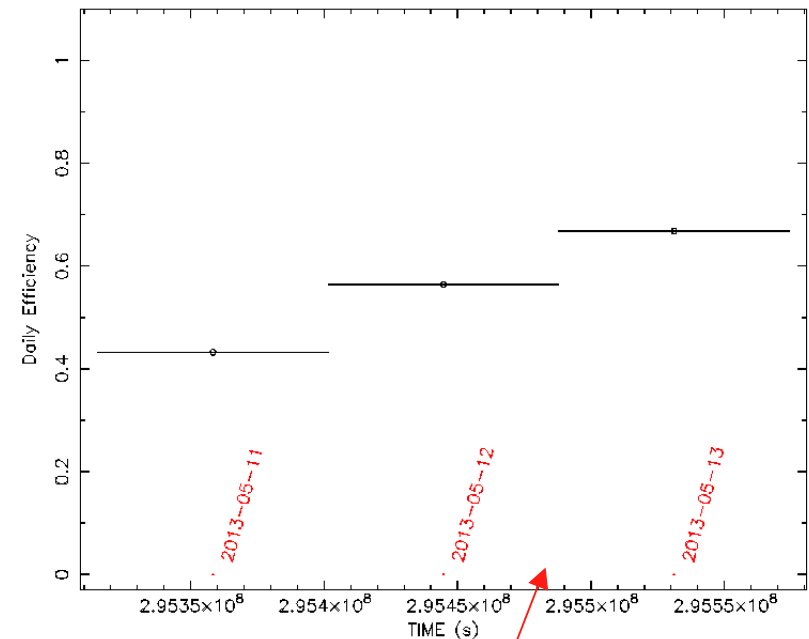
2013-05-29

2013-05-30

2013-05-31

Daily Efficiency(only for holes>1000.s)

Date Interval: 2013-05-10 04:30:01 -- 2013-05-14 06:00:01



14-May-2013 11:37

[Report](#)

OK

[Report](#)

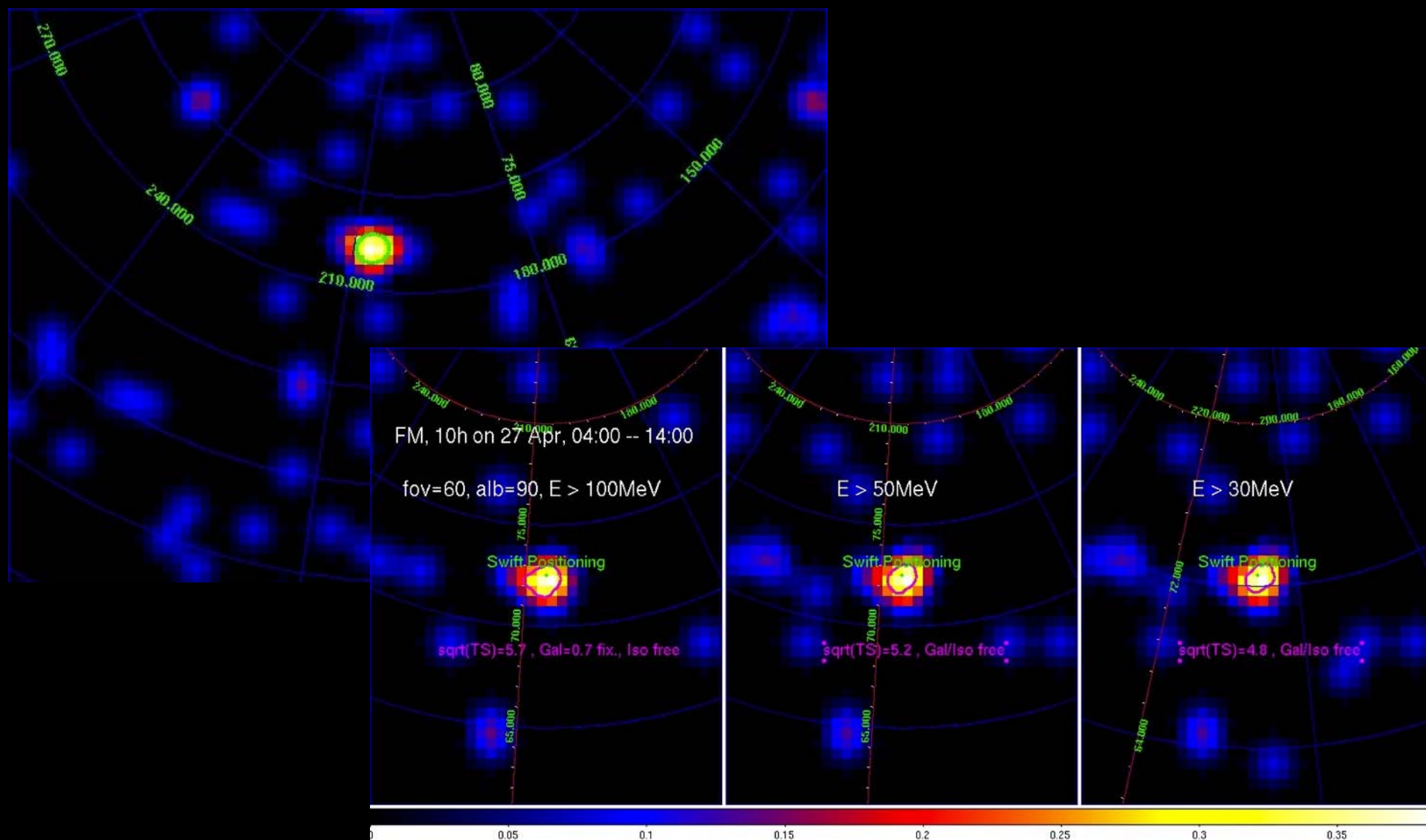
OK

[Report](#)

OK

WAIT

Despite recent low Malindi downlink efficiency, AGILE detected
GRB 130427A: the most energetic gamma-ray burst yet!



Int
developed

Available parameters

☒ OB Number ☒ OB Name ☒ RA_PNT ☒
☒ ERR_RAP ☒ DEC_PNT ☒ ERR_DECP ☒
☒ RA_SUN (degrees) ☒ ERR_RAS ☒
☒ DEC_SUN (degrees) ☒ ERR_DECS ☒ GRID
☒ Data Retrieval ☒ GRID Interactive Archive
☒ OB start date ☒ OB end date ☒ Processing
☒ version ☒ Mean OB Exposure (cm² s) ☒
☒ Related SuperAGILE Entries ☒ Notes

GO

Entry number		OB Number	OB Name
Selection mode:			
Inclusive			
1 Select	ASDC Data Explorer	4900	Cygnus Field 1

AGILE Imaging Tool @ ASDC

Image parameters:

Source Name Search ?

RA 252.2 Dec 50.5 ?

LII 77.49 BII 39.83 ?

Image radius (deg) 60.00 ?

Emin 100 ?

Emax 50000 ?

Catalog Overlay ?

Radio Infrared X-Ray Gamma

NVSS
SUMSS
FIRST
GB6

Run Reset to default

Ximage smoothing parameters:

Smoothing filter wave ?

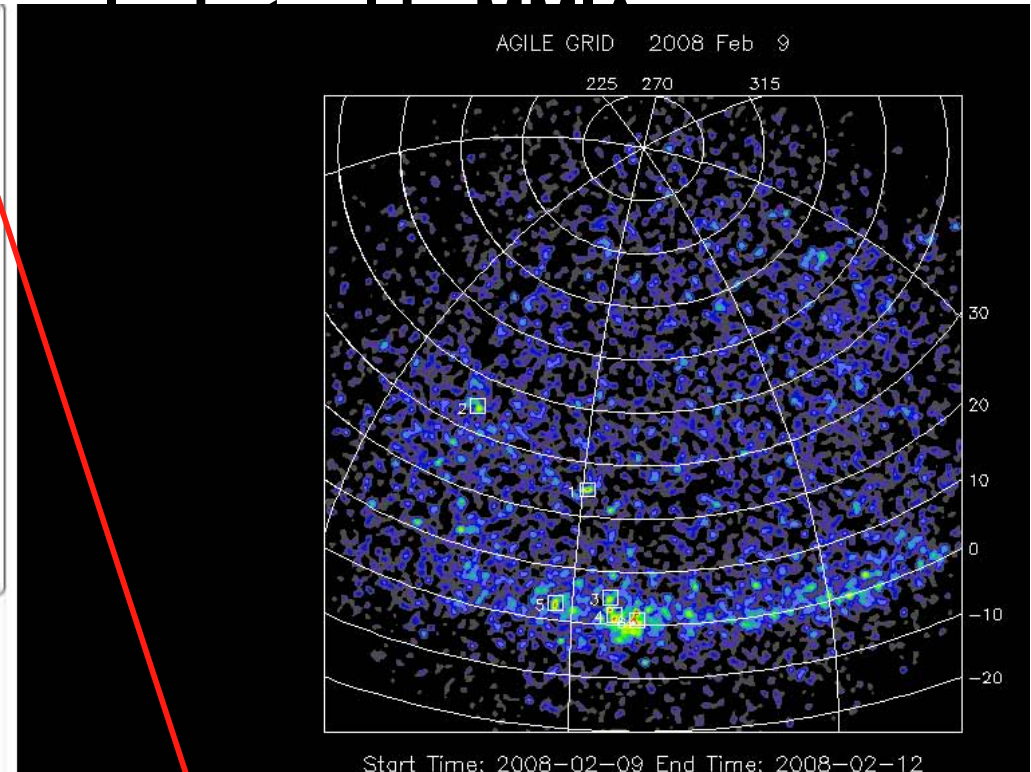
sigma 3. ?

back 4 ?

Ximage display parameters:

Color scaling linear ?

Minimum level displayed 1 ?



Ximage sw package adapted to gamma-rays

Allows web users to have a **preview** of the AGILE public data fields and perform an interactive **preliminary analysis** around a chosen sky position.

7 Select	ASDC Data Explorer	5210	TOO MKN 421	16 48 48.0	+50 30 00.0	-	-	Public access	On-line Analysis	2008-02-09 09:00:00	2008-02-12 12:00:00	5703449	ToO
8 Select	ASDC Data Explorer	5220	South Gal Pole Resumed	04 27 12.0	-35 48 00.0	-	-	Public access	On-line Analysis	2008-02-12 12:00:00	2008-02-14 12:00:00	3398061	Baseline

Warning: use imaging tool only as a preview of the AGILE γ -ray field.
To perform your own scientific analysis, please **download data**
and use the official public AGILE software available at:
<http://agile.asdc.asi.it/public/> following the AGILE Software User Manual






Index of /public/AGILE_SW_5.0_SourceCode

Icon	<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
[DIR]	<u>Parent Directory</u>		-	
[]	<u>AGILE-IFC-OP-009 Build-21.pdf</u>	22-Nov-2011 18:24	928K	
[]	<u>BUILD GRID 5.0.tgz</u>	22-Nov-2011 16:56	121M	
[TXT]	<u>SoftwareReleaseNote 5.0.txt</u>	25-Nov-2011 16:01	16K	
[TXT]	<u>readme 5.0.txt</u>	22-Nov-2011 16:57	5.2K	
[]	<u>test dataset 5.0.tgz</u>	22-Nov-2011 16:57	346M	

Apache Server at agile.asdc.asi.it Port 80


**NEW: web interface for interactive on-line
ML analysis on AGILE on legacy (LV3) data
archive under construction!! Stay tuned!**

11th AGILE Science Workshop: on-line presentations from <http://www.asdc.asi.it/11thagilemeeting/>



11th AGILE Science Workshop:
"Gamma-rays and Galactic Cosmic Rays", May 16-17, 2013
ASI Headquarters, Via del Politecnico, Rome

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[Registration](#)
[Participants](#)
[Announcement](#)
[Program and online presentations](#)
[Location](#)
[Contacts](#)



FINAL PROGRAM

Gamma-Rays and Galactic Cosmic Rays

May 16-17, 2013, aula "Cassini", ASI Headquarters (Tor Vergata)

[Download program in pdf](#)

May 16, 2013

- * 14.30 - 14.40: Welcome (N. Mandolesi, E. Flamini, B. Negri)
- * 14.40 - 15.00: Microquasars (S. Sabatini) [Slides:](#)
- * 15.00 - 15.20: Cygnus X-3, hadrons, neutrinos (N. Sahakyan) [Slides:](#)
- * 15.20 - 15.40: Updating on the Crab Nebula (E. Striani) [Slides:](#)
- * 15.40 - 16.00: HST imaging of the Crab Nebula during the 2013 March gamma-ray flare (A. De Luca) [Slides:](#)
- * 16:00 - 16:20: Hydrodynamics of the Crab Nebula jet (A. Ferrari) [Slides:](#)
- * Coffee Break
- * 16.40 - 17.00: Molecular clouds observations with NANTEN2-NASCO project and gamma-ray SNRs (S. Yoshiike) [Slides:](#)
- * 17.00 - 17.20: Data and modelling of the SNR W44 (M. Cardillo) [Slides:](#)
- * 17.20 - 17.40: New results from the SNR Gamma-Cygni (G. Piano)
- * 17.40 - 18.00: Reviewing AGILE results on blazars (I. Donnarumma) [Slides:](#)
- * 18.00 - 18.20: Modelling the brightest event of 3C 454.3 (V. Vittorini) [Slides:](#)

May 17, 2013

- * 09.30 - 10.00: Supervising Remnants: molecular clouds and gamma-rays (A. Chianelli) [Slides:](#)

BACKUP SLIDES

Table 3: AGILE Scientific Performance

Gamma-ray Imaging Detector (GRID)		
Energy Range	30 MeV – 50 GeV	
Field of view	~ 3 sr	
Sensitivity at 100 MeV ($\text{ph cm}^{-2} \text{ s}^{-1} \text{ MeV}^{-1}$)	6×10^{-9}	(5σ in 10^6 s)
Sensitivity at 1 GeV ($\text{ph cm}^{-2} \text{ s}^{-1} \text{ MeV}^{-1}$)	4×10^{-11}	(5σ in 10^6 s)
Angular Resolution at 1 GeV	36 arcmin	(68% cont. radius)
Source Location Accuracy	~ 5 – 20 arcmin	S/N ~ 10
Energy Resolution	$\Delta E/E \sim 1$	at 300 MeV
Absolute Time Resolution	$\sim 1 \mu\text{s}$	
Deadtime	$\sim 200 \mu\text{s}$	
Hard X-ray Imaging Detector (Super-AGILE)		
Energy Range	10 – 40 keV	
Field of view	$107^\circ \times 68^\circ$	FW at Zero Sens.
Sensitivity (at 15 keV)	~ 5 mCrab	(5σ in 1 day)
Angular Resolution (pixel size)	~ 6 arcmin	
Source Location Accuracy	~ 2 – 3 arcmin	S/N ~ 10
Energy Resolution	$\Delta E < 4$ keV	
Absolute Time Resolution	$\sim 4 \mu\text{s}$	
Deadtime (for each of the 16 readout units)	$\sim 4 \mu\text{s}$	
Mini-Calorimeter		
Energy Range	0.3 – 200 MeV	
Energy Resolution	~ 1 MeV	above 1 MeV
Absolute Time Resolution	$\sim 3 \mu\text{s}$	
Deadtime (for each of the 30 CsI bars)	$\sim 20 \mu\text{s}$	

WORK IN PROGRESS

Systematic search for GeV counterparts of TeV sources

LONGO, F. , LUCARELLI, F., PITTORI, C., RAPPOLDI, A., VERRECCHIA, F.

- Automated search for $E > 100$ MeV sources spatially correlated with known TeV sources, using GRID Pointing data (2.3 yrs) (ADC public data archive).
- Data analysis criteria: multi-source Maximum Likelihood (ML) analysis around the TeV position
- Input catalogue: revised source list built from the TeVCat catalogue (see TGevCat Catalogue @ ASDC).

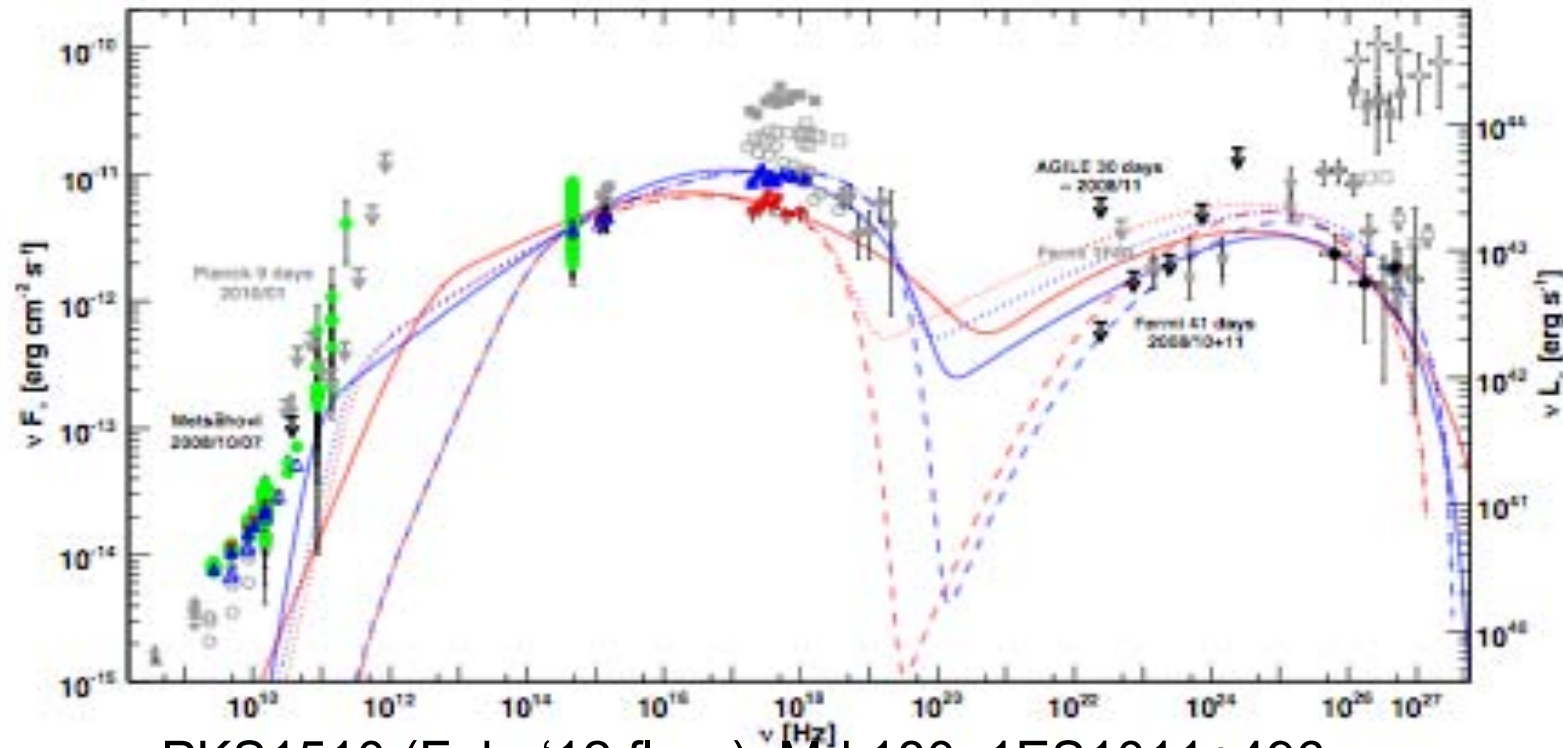
Source Class	TeV Catalog	Detections $\sqrt{TS} > 4$
AGN (HBL, LBL, ...)	45	10
Starburst	2	--
PWN	24	8
SNR	14	5
XRB	3	1
UNID	25	6
Other Galactic	3	1

- ~30% of TeV sources show counterparts in AGILE first 2.3yrs data.
- Few GRID detections (1-2 HBL, few Galactic) not in 2FGL Cat.
- Upgrade is ongoing (latest calib. matrices (I0023) and updated TeV input list).

Rappoldi et al. (2009), Lucarelli et al. (2011)

MWL campaigns on TeV sources

- 1ES2344+514 (Rugamer et al., arXiv:1211.2608v1)



More to come: PKS1510 (Feb. '12 flare), Mrk180, 1ES1011+496.

GRID Level 3 Archive (1-day integration EXP, COUNTS and GAS maps) helps to investigate flaring activity over > 5 years of data in a very short computing time.