



# Gamma-ray Bursts with AGILE

F.Longo  
University of Trieste and INFN  
on behalf of the AGILE team

Scineghe2014 – June 5, 2014



# Gamma-ray Astrophysics with AGILE (not only GRBs)

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Review on AGILE results from AGILE Science workshops

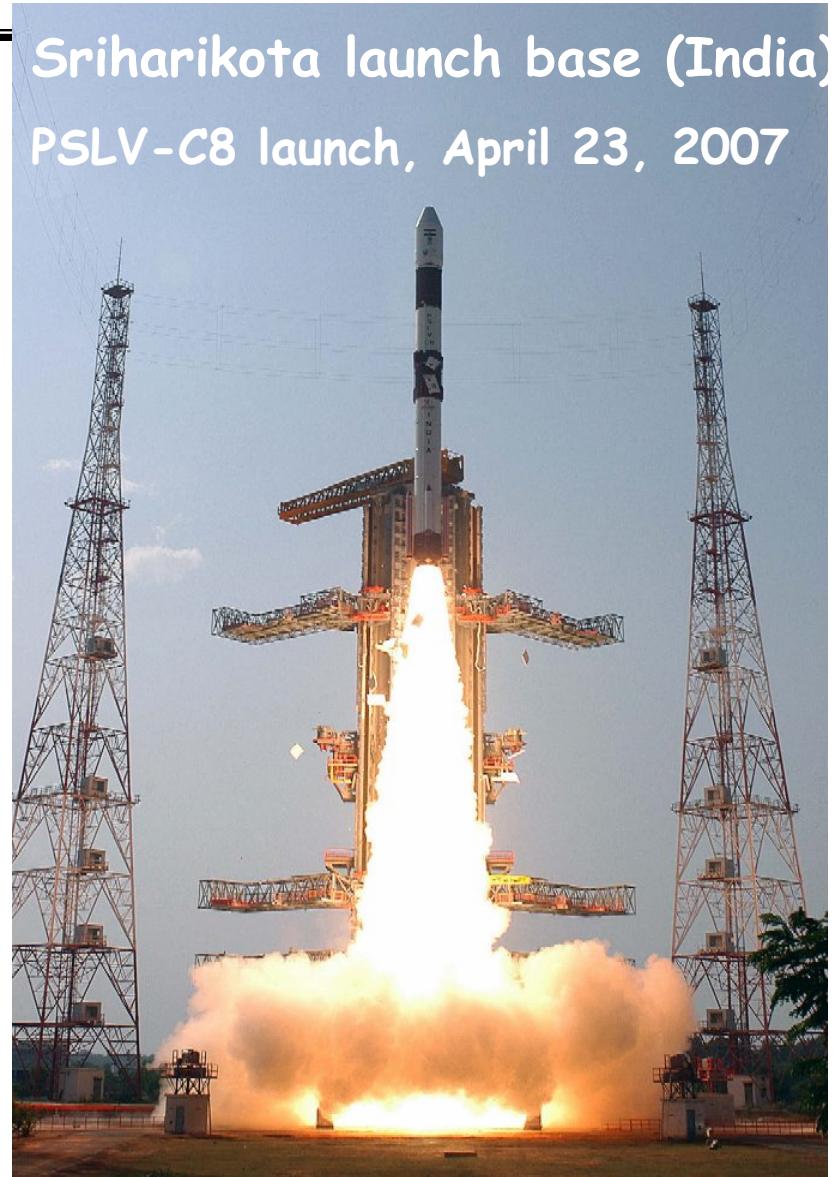


# The AGILE launch

2600 days in orbit!



Sriharikota launch base (India)  
PSLV-C8 launch, April 23, 2007



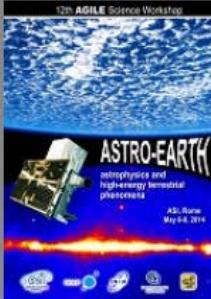


# The 12<sup>th</sup> AGILE workshop

Logos of participating organizations: ASDC (ASI Science Data Center), ASI (Agenzia Spaziale Italiana), INFN (Istituto Nazionale di Fisica Nucleare), INAF (Istituto Nazionale di Astrofisica), and CNR (Consiglio Nazionale delle Ricerche).

12th AGILE Science Workshop  
"ASTRO-EARTH: astrophysics and high-energy terrestrial phenomena"  
May 8 and 9, 2014  
ASI Headquarters, Via del Politecnico, Rome

**Home Page**  
**Organization**  
**Registration**  
**Participants**  
**Announcement**  
**Program and online presentations**  
**Location**  
**Contacts**





<http://www.asdc.asi.it/12thagilemeeting/>



# Outline

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- The EGRET legacy to AGILE
  - Main scientific objectives
  - The “strange case” of GRBs
- The AGILE mission
  - The AGILE detectors
  - The AGILE ground segment and Data processing
  - key AGILE results
- Gamma-ray Bursts with AGILE
  - Main characteristics of the AGILE/GRID detected GRBs
  - GRB with AGILE/MCAL
  - Gamma-ray Bursts in the AGILE/Fermi era



# The EGRET legacy

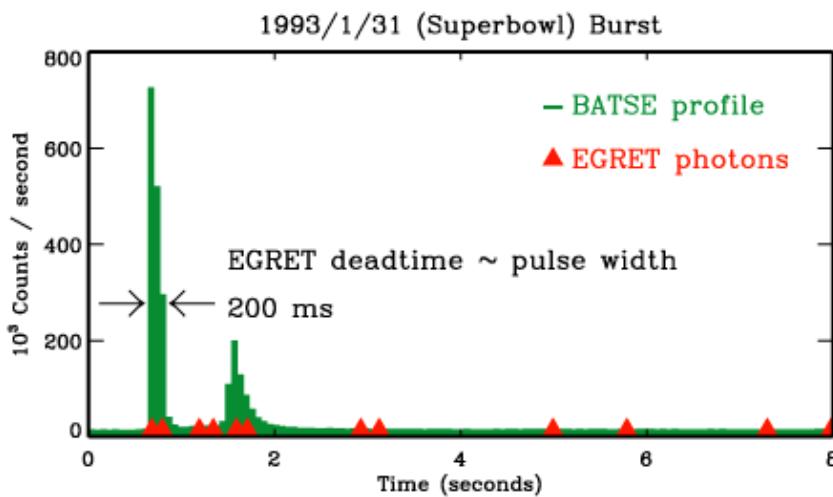
- **Simultaneous MWL coverage**
  - **AGN physics**
- **Continuous exposure and optimal timing**
  - **PSR physics**
- **Arcminute localization**
  - **Unidentified sources physics**
- **Better Energy resolution**
  - **Dark Matter searches**
- **Low Energy extension**
  - **Supernova Remnants searches**
- **Optimal timing and broad band fast detectors**
  - **Gamma-ray Bursts**



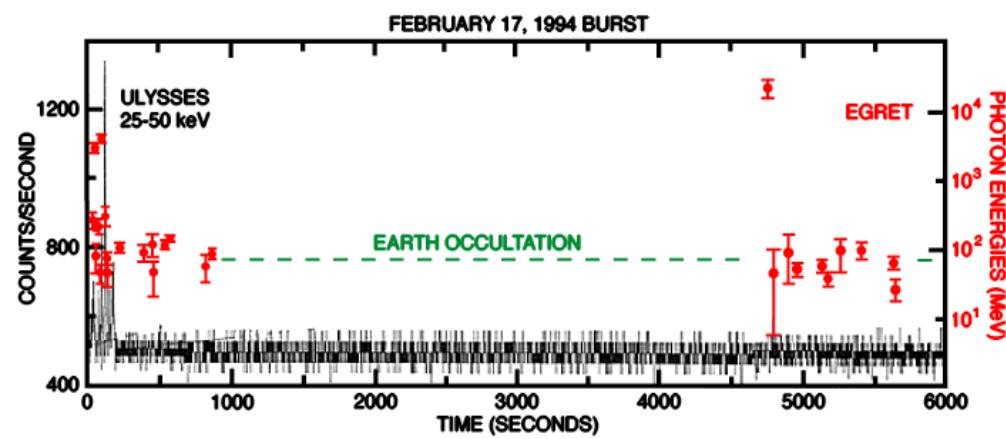
# The EGRET legacy

- Need fast timing for gamma-ray detection (improving EGRET deadtime, 100 msec → 100 microsec or less).

## Prompt Emission (GRB 930131)



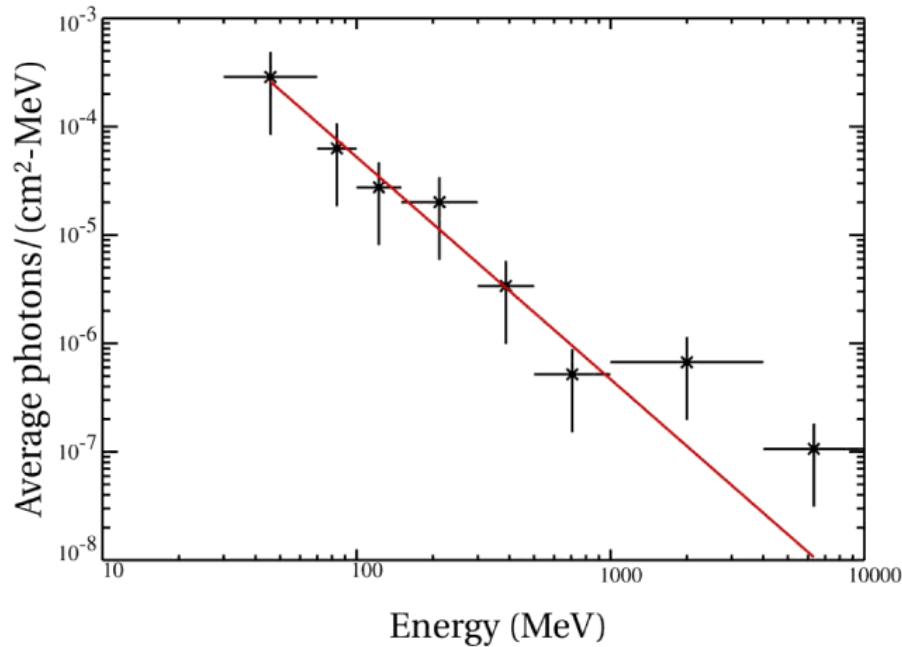
## Delayed Emission (GRB 940217)



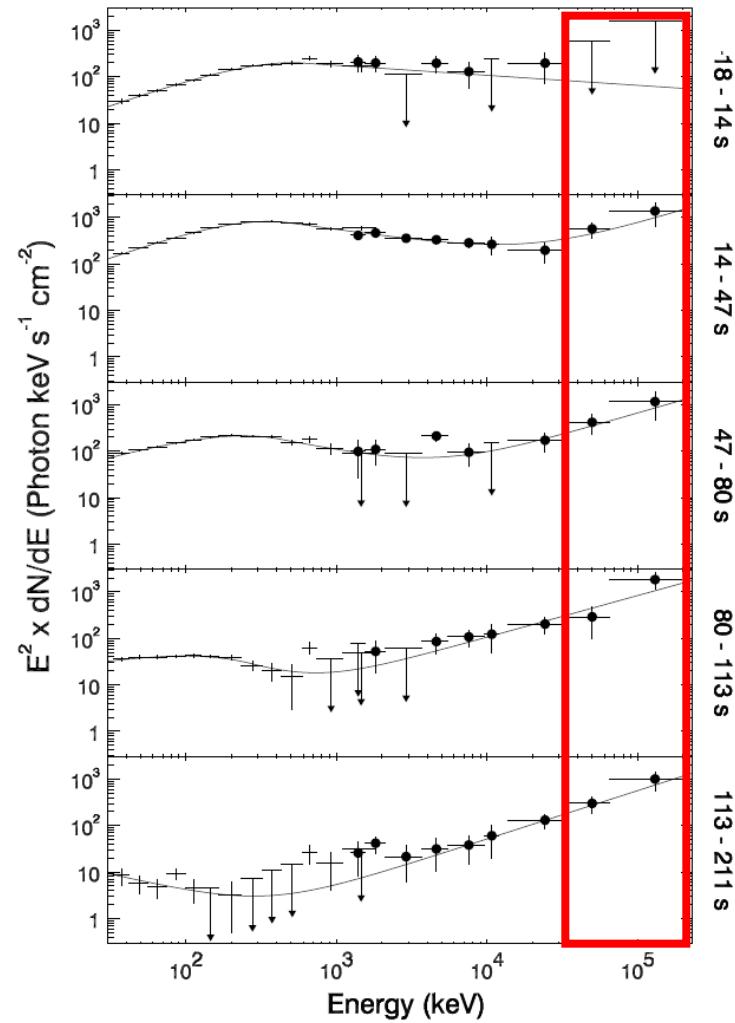


# The EGRET heritage on GRBs

Spectral extra component (GRB 941017)



Dingus et al. (1998)



(Gonzalez et al 2004)



# High Energy emission from GRB (?)

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- Extended emission?
- Prompt emission?
- Spectral Components?
- Ubiquity of HE emission?



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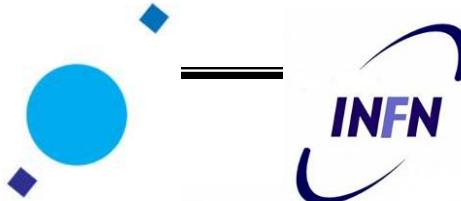
# AGILE



# AGILE



INAF



CARLO GAVAZZI



OERLIKON  
CONTRAVES



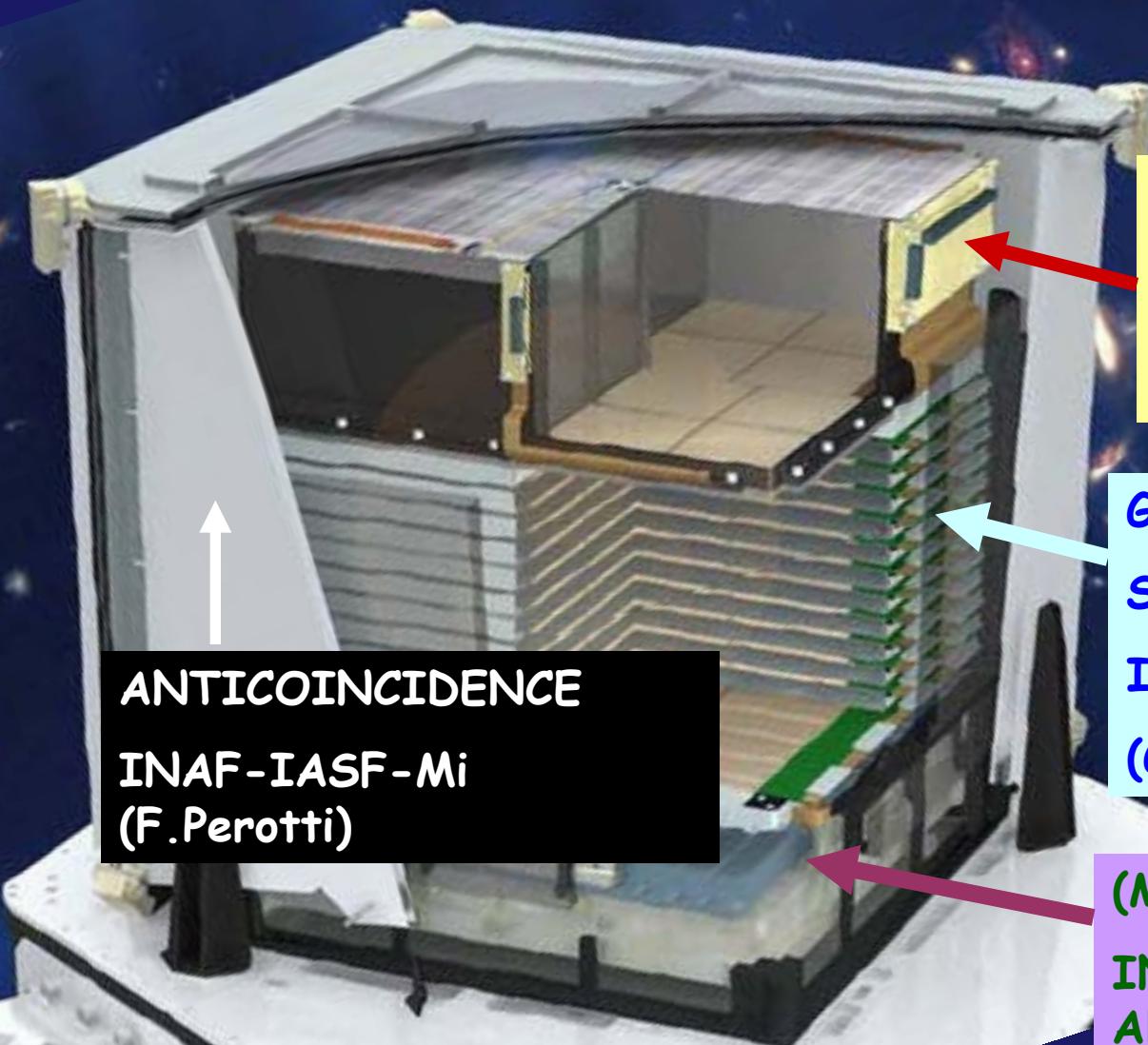
Galileo Avionica



ENEA



AGILE: inside the cube...



ANTICOINCIDENCE

INAF-IASF-Mi  
(F.Perotti)

HARD X-RAY IMAGER  
(SUPER-AGILE)

INAF-IASF-Rm  
(E.Costa, M. Feroci)

GAMMA-RAY IMAGER  
SILICON TRACKER

INFN-Trieste

(G.Barbiellini, M. Prest)

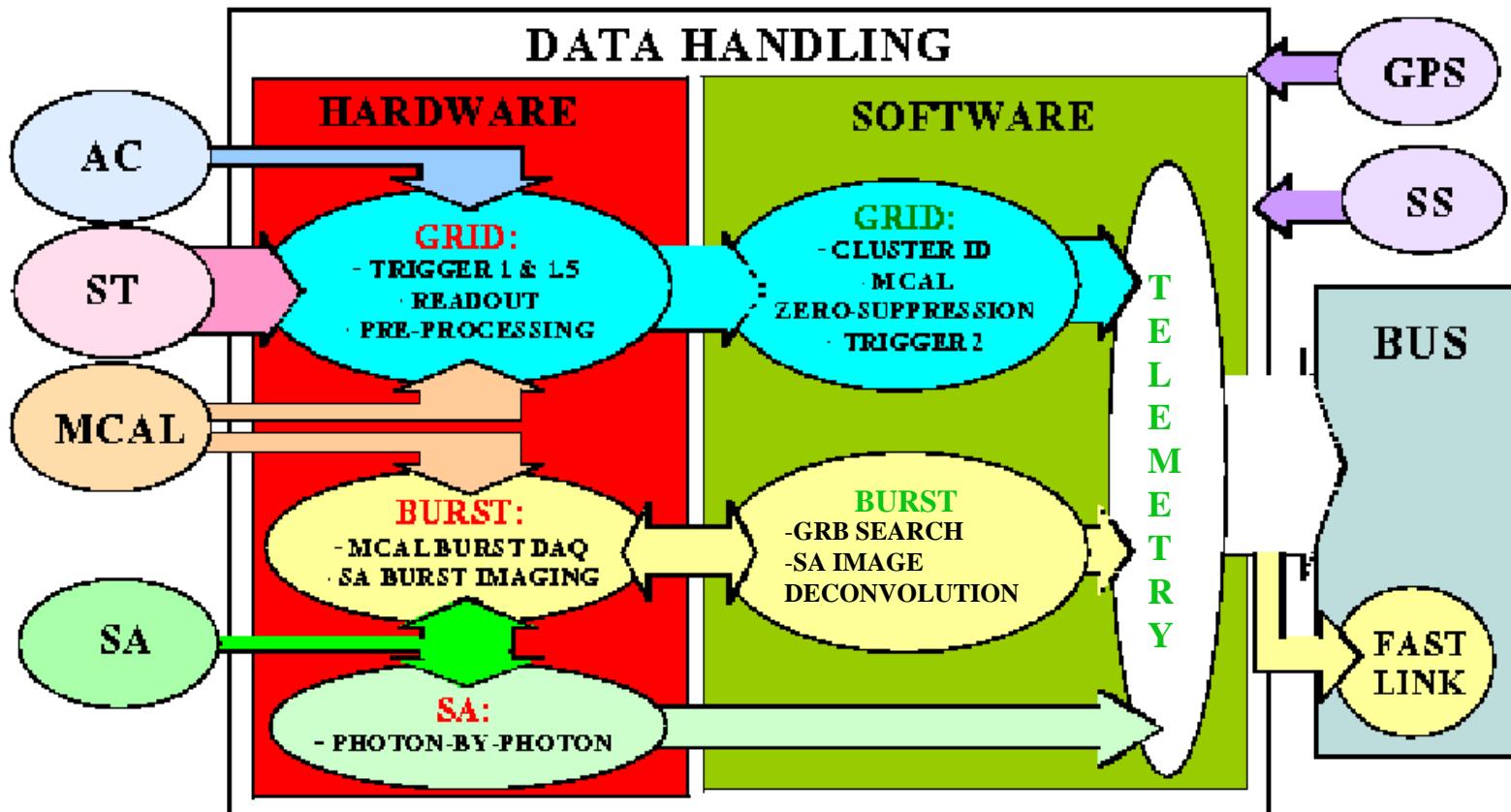
(MINI) CALORIMETER

INAF-IASF-Bo, Thales-  
Alenia Space (LABEN)

(G. Di Cocco, C. Labanti)

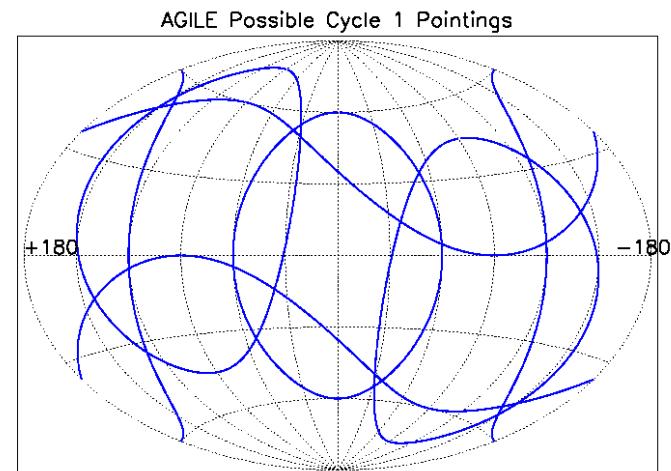
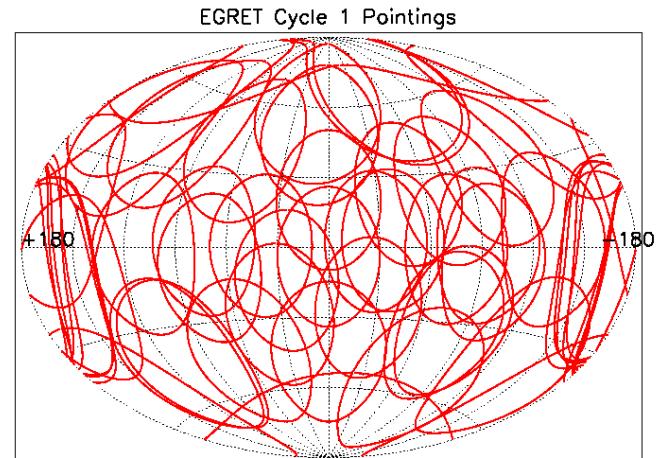
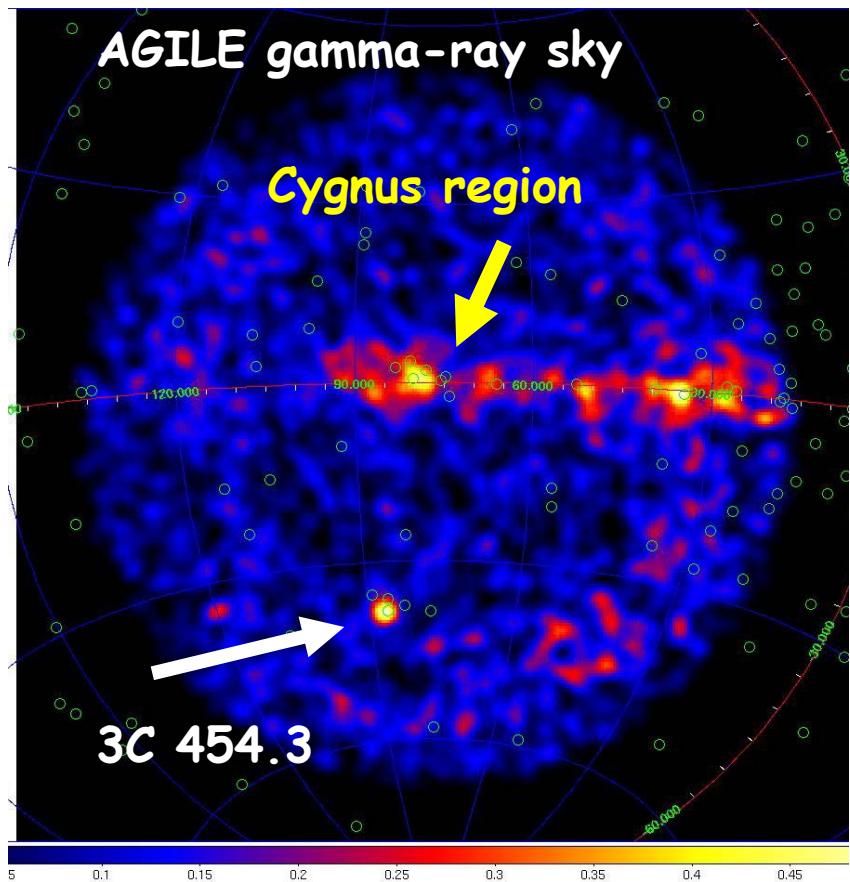


# On Board AGILE Trigger



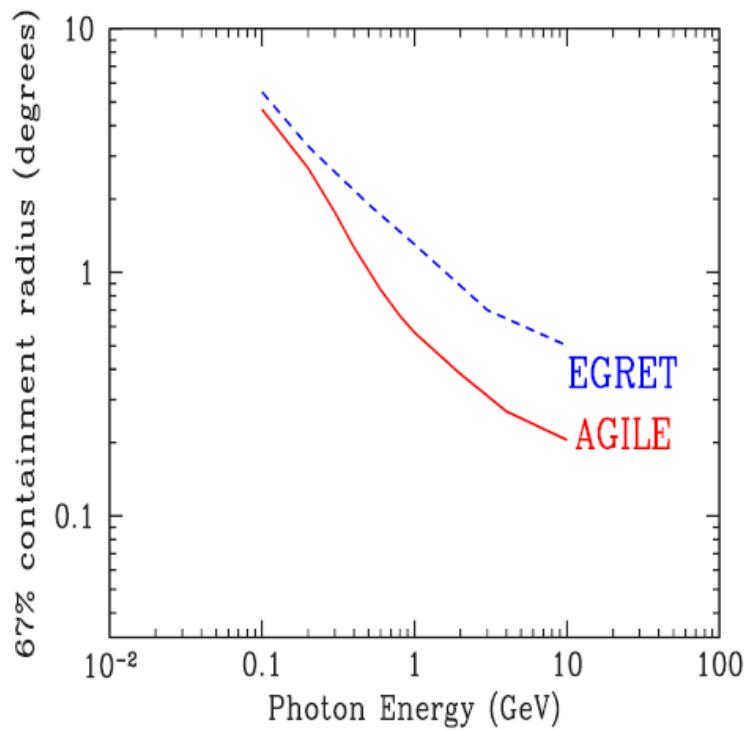
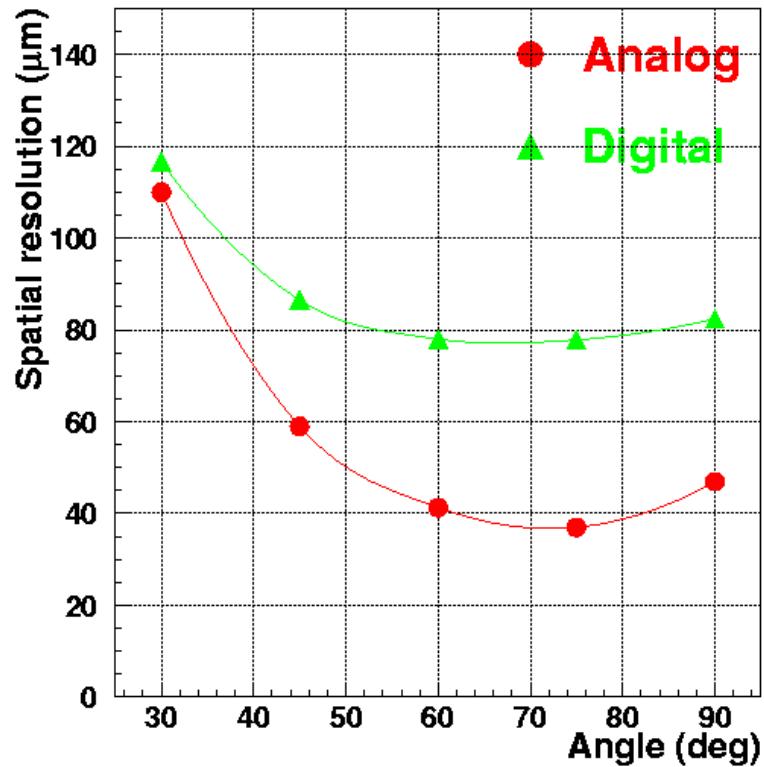


# Si Self Trigger and FoV





# Analog readout and PSF





# AGILE two lifes

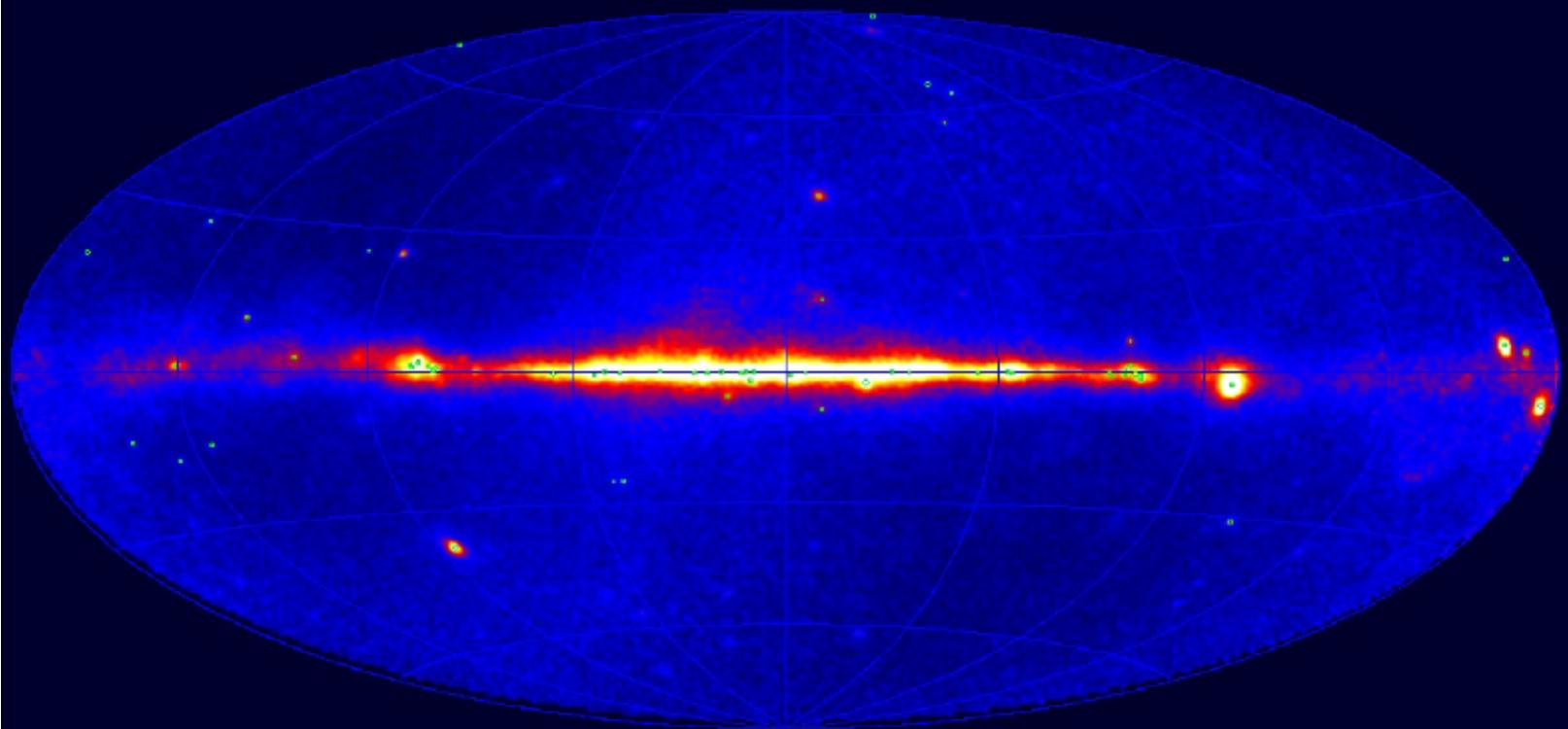
	pointing- AGILE	spinning- AGILE
<b>time period</b>	Jul.07 – Oct.09	Nov. 2010 -
<b>attitude</b>	fixed	variable (spinning, 1°/sec)
<b>sky coverage</b>	1/5	~ 70%
<b>source livetime fraction</b>	~ 0.5	~ 0.2
<b>1-day exposure (30 degree off-axis, 100 MeV)</b>	~ $2 \cdot 10^7$ (cm <sup>2</sup> sec)	(0.5-1) $10^7$ (cm <sup>2</sup> sec)



# The AGILE sky

**AGILE Total Intensity Map ( $E > 100$  MeV)**

Pointing + Spinning (up to Dec 25, 2012)

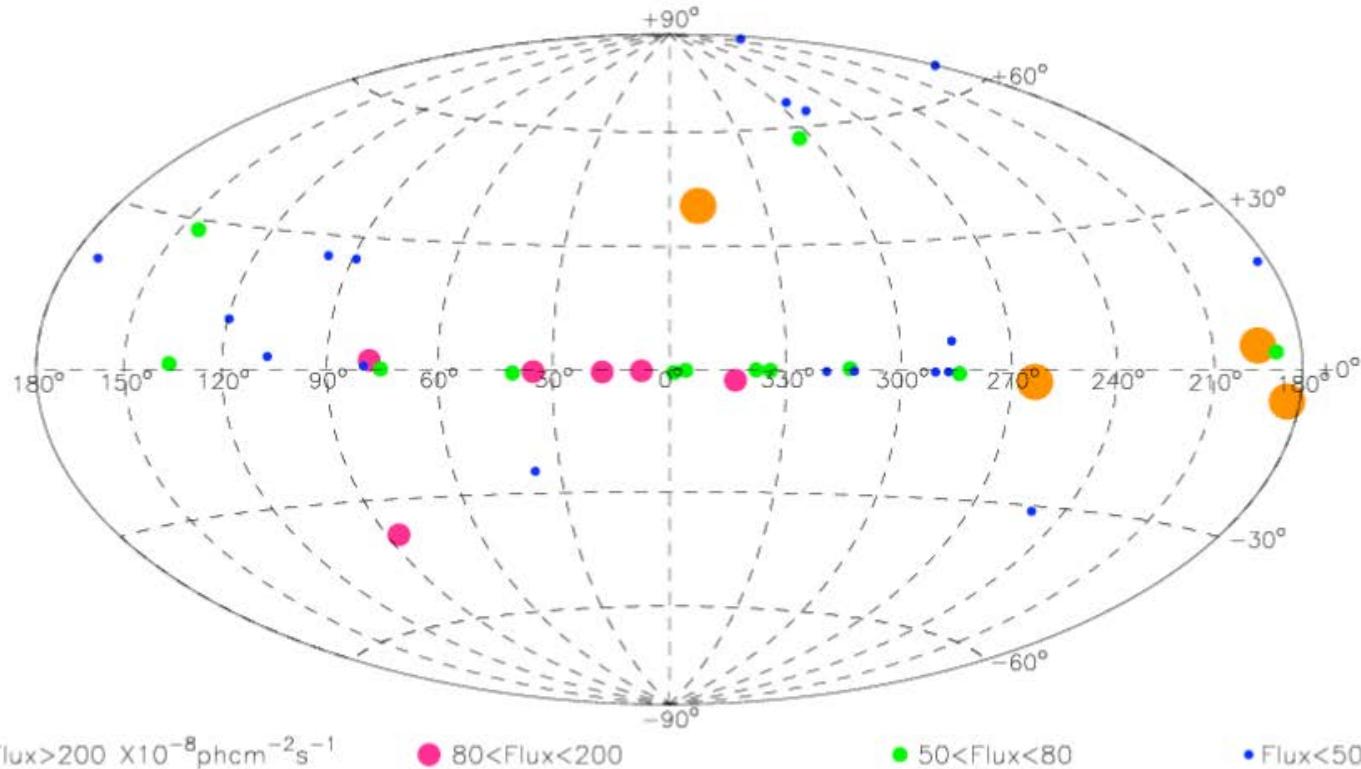


**“The First AGILE-GRID Catalog of High Confidence Gamma-Ray Sources”**  
C. Pittori et al., A&A 506, 2009 (green circles, first year of operations)



# AGILE sources

AGILE GRID First Source Catalogue  
Period July 2007 -- June 2008



Pittori et al. 2009



# AGILE sources

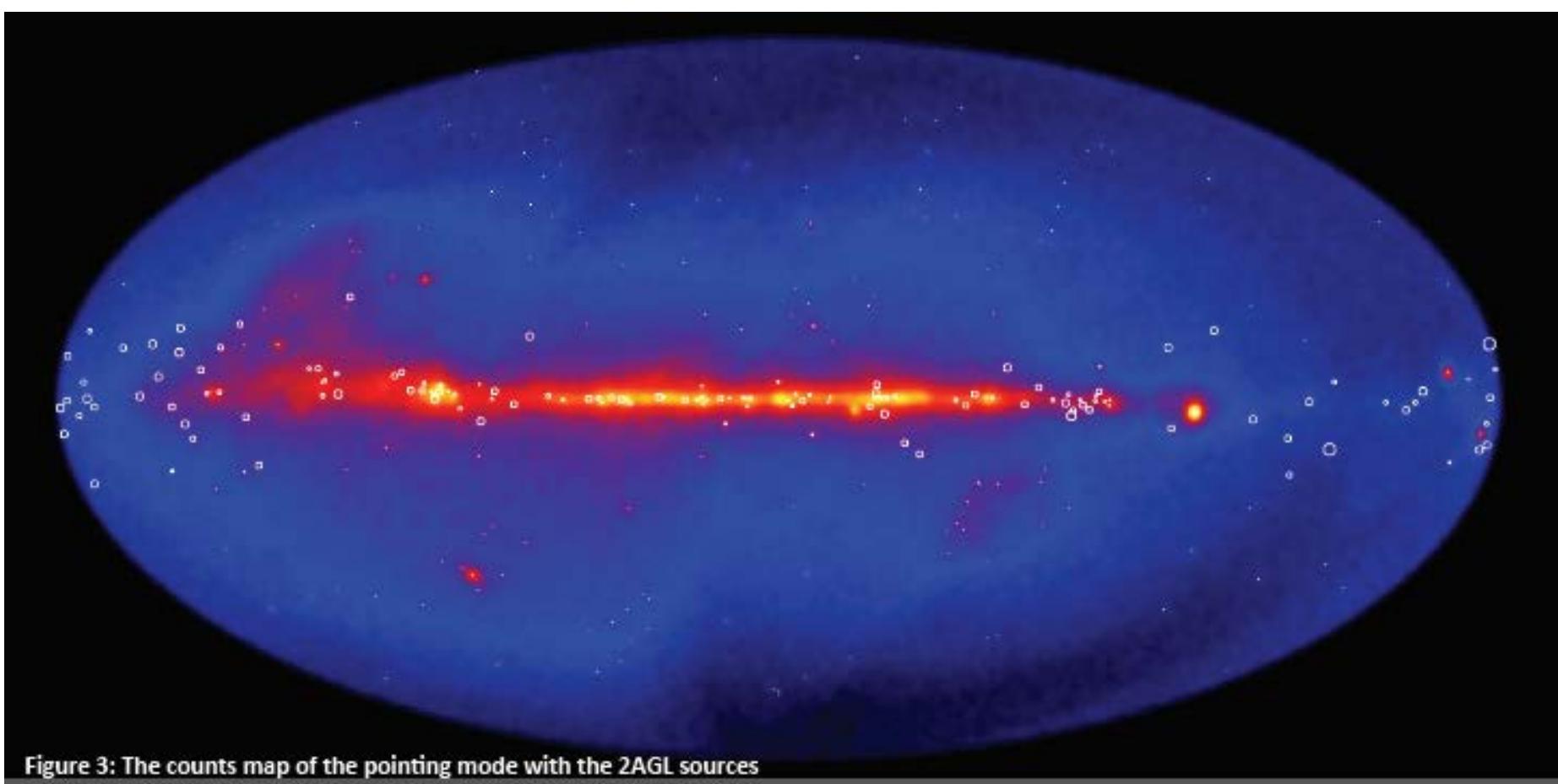


Figure 3: The counts map of the pointing mode with the 2AGL sources

Bulgarelli et al. in preparation

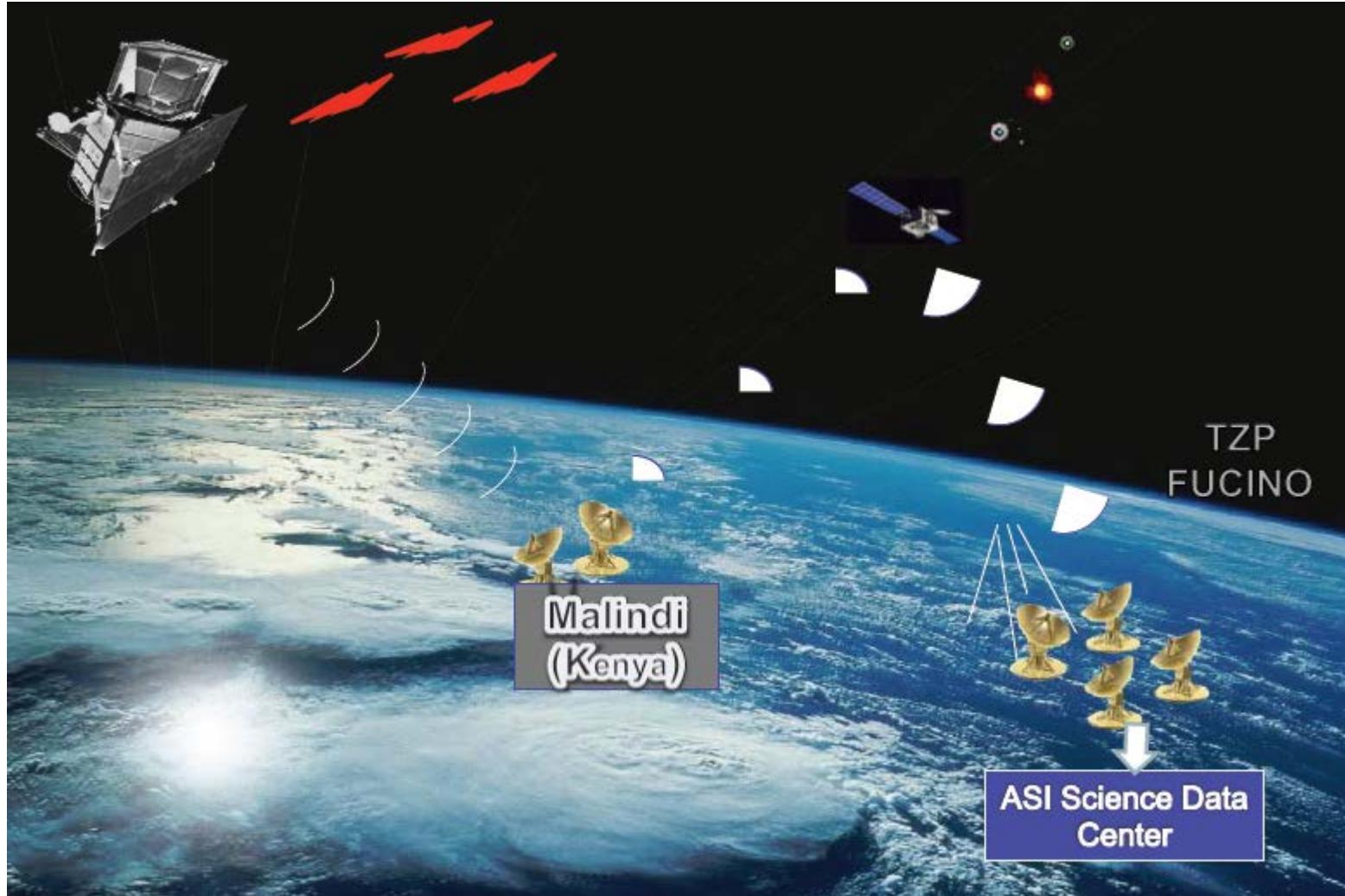


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# The AGILE ground segment



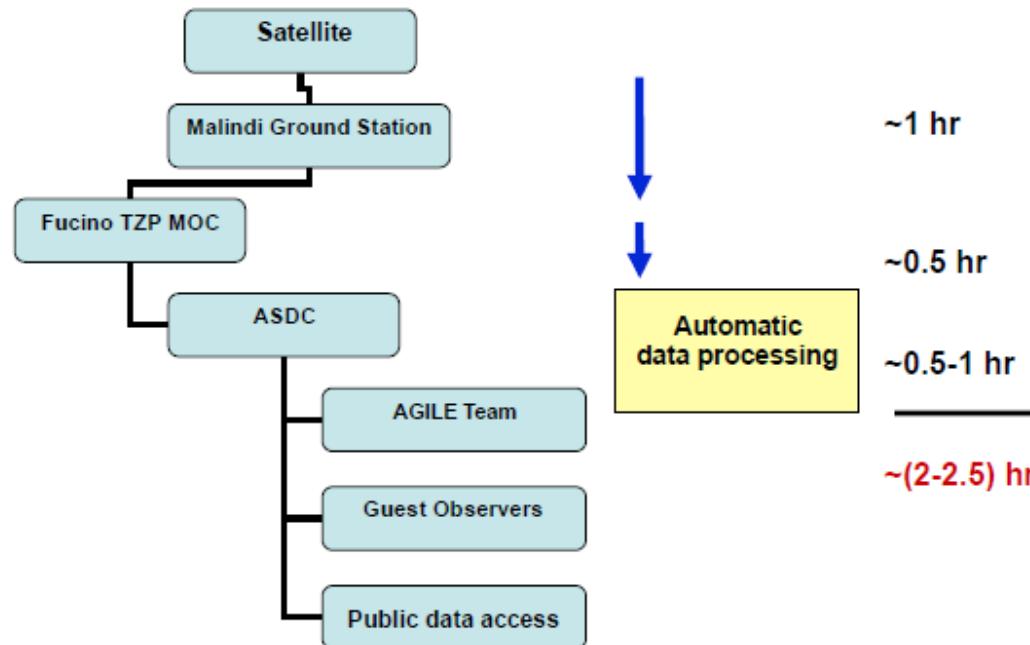
# AGILE ground segment





# AGILE ground segment

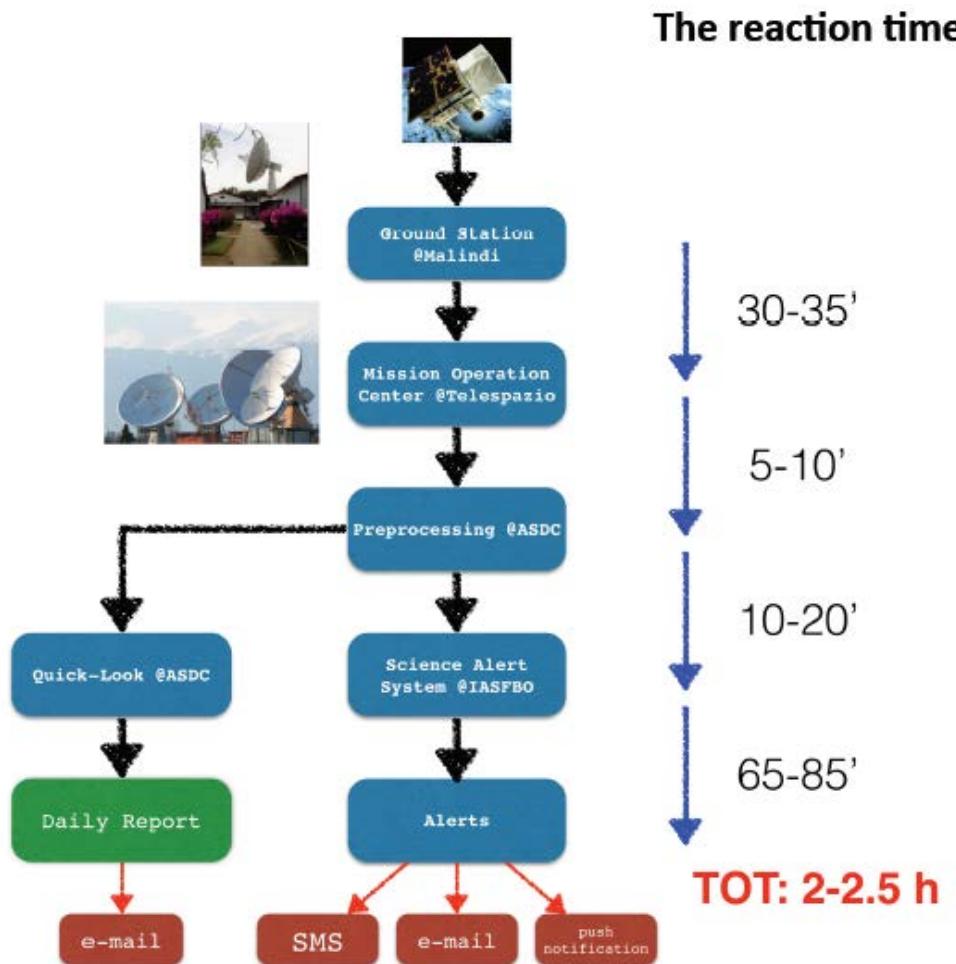
**AGILE: “very fast” Ground Segment  
(with contained costs)**



Record for a gamma-ray mission!



# AGILE alert system





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# Key AGILE results

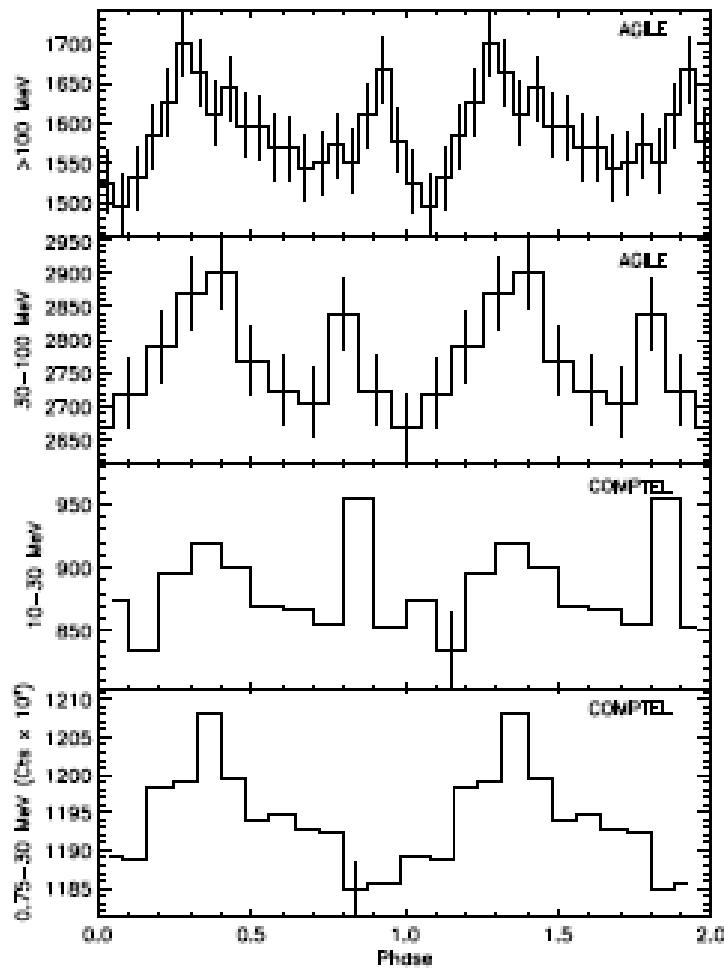


# AGILE key results

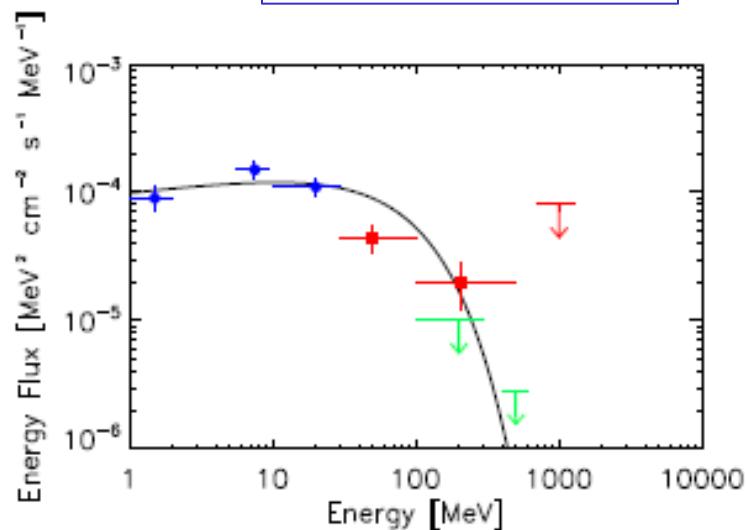
- **Galactic Science**
  - **Pulsars and PWN**
    - PSR timing algorithm → new gamma-ray PSRs and image of PWNs
  - **Supernova Remnants**
    - Low Energy spectra of SNR → CR acceleration
    - Imaging of SNR
  - **Gamma-ray binaries – Galactic Transients**
    - Cygnus X1, Cygnus X3
    - The Variable Crab Nebula
- **Extragalactic Science**
  - Huge Flares of Blazars
  - GRB extra component
- **Terrestrial Gamma-ray Flashes**



# Low Energy Pulsars



PSR B1509-58

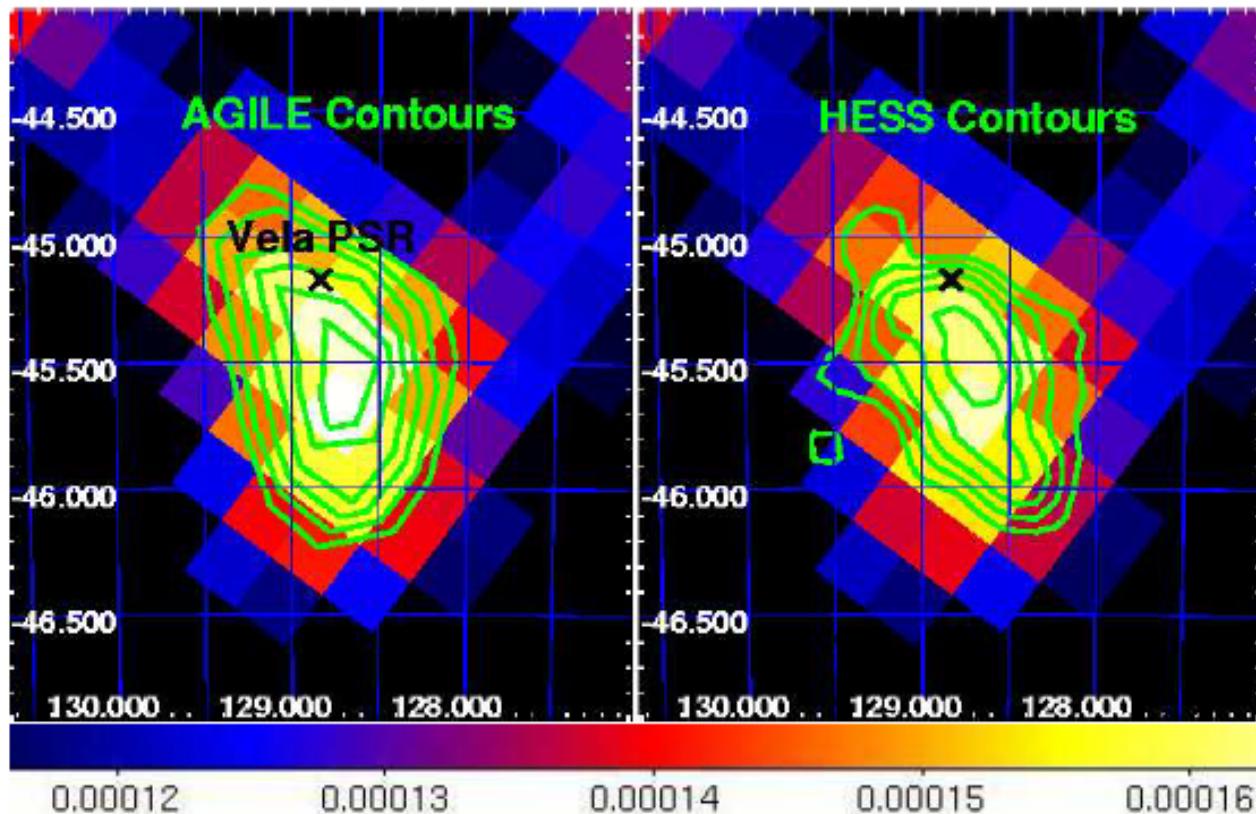


Pilia et al. 2011



# Pulsar Wind Nebulae

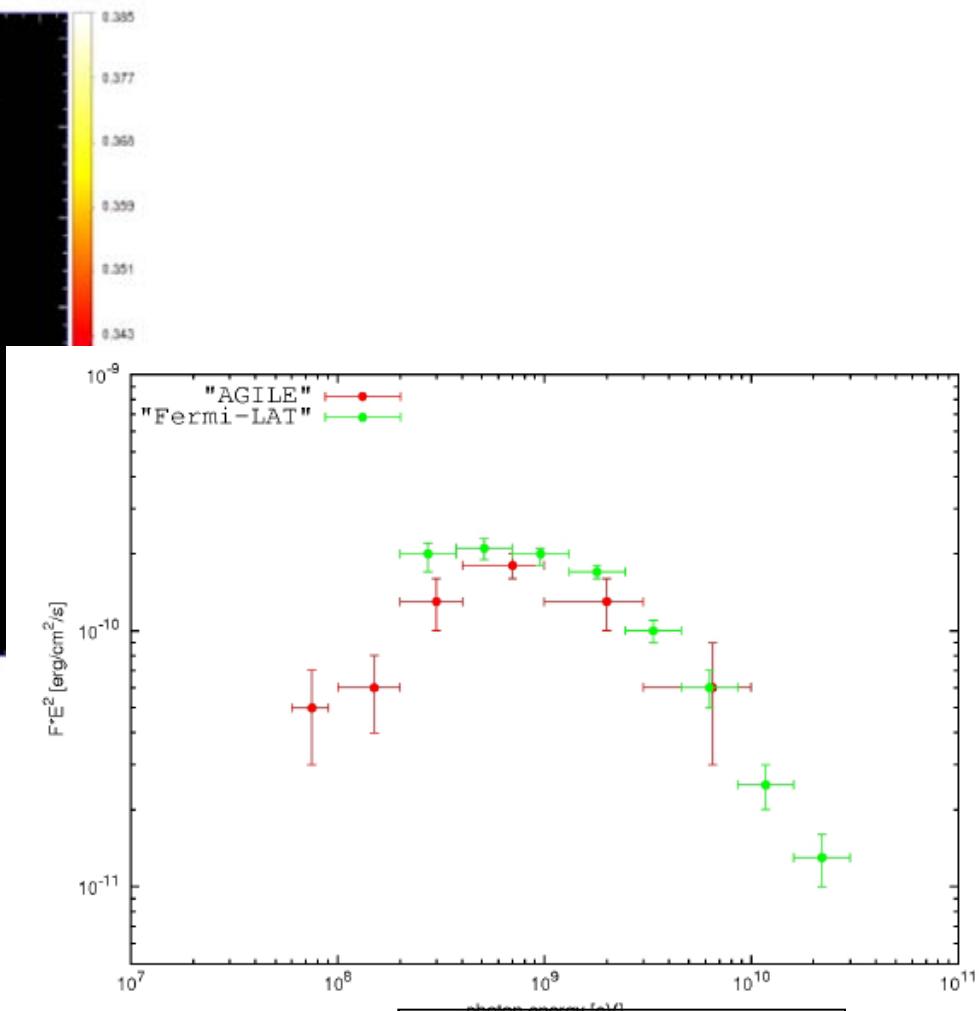
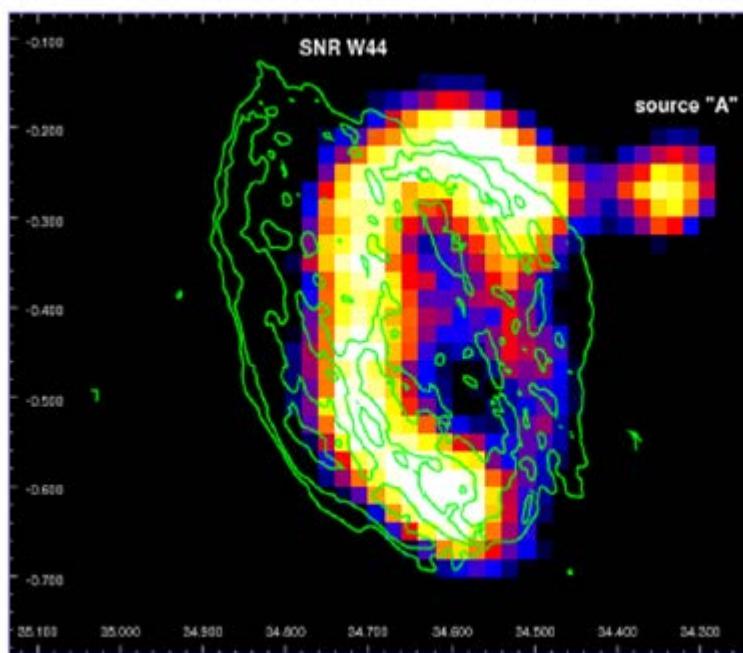
Pellizzoni et al. 2010



Vela X PWN



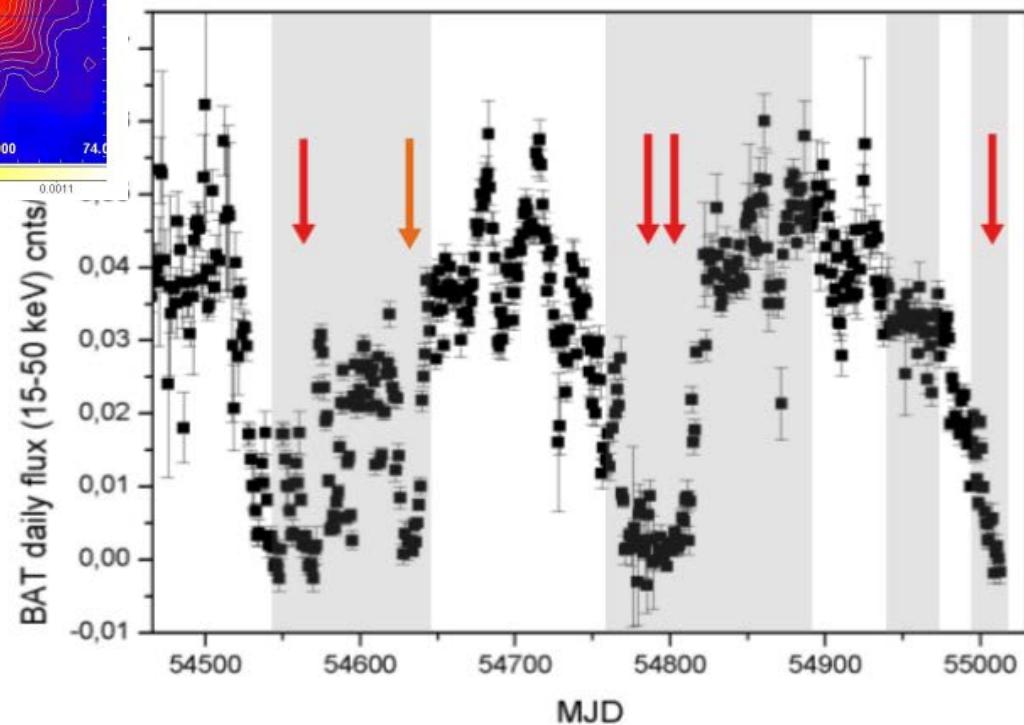
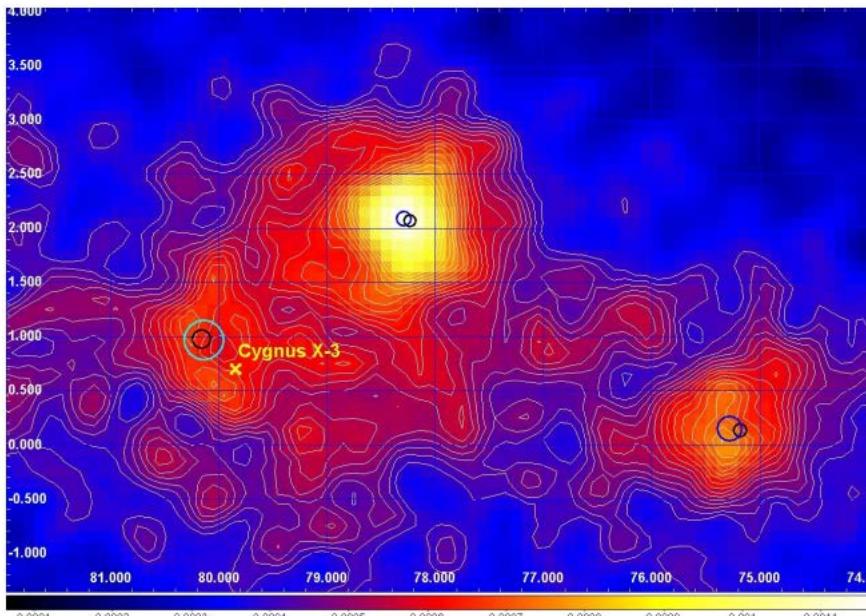
# Supernova Remnants W44



Giuliani et al. 2011



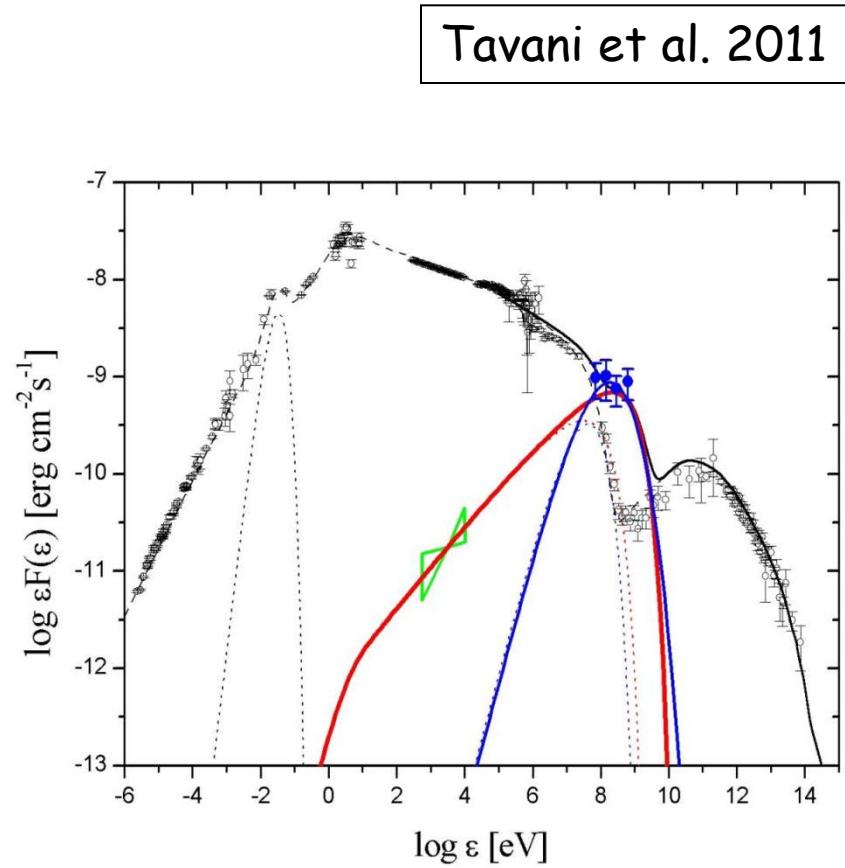
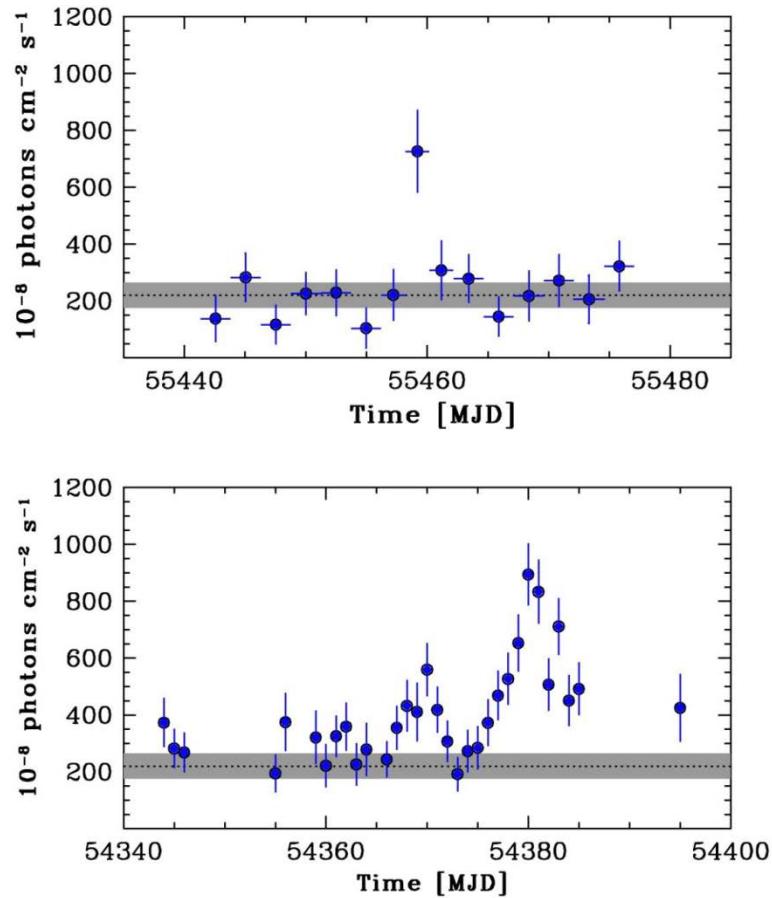
# Galactic Transients: Cygnus X3



Tavani et al. 2009



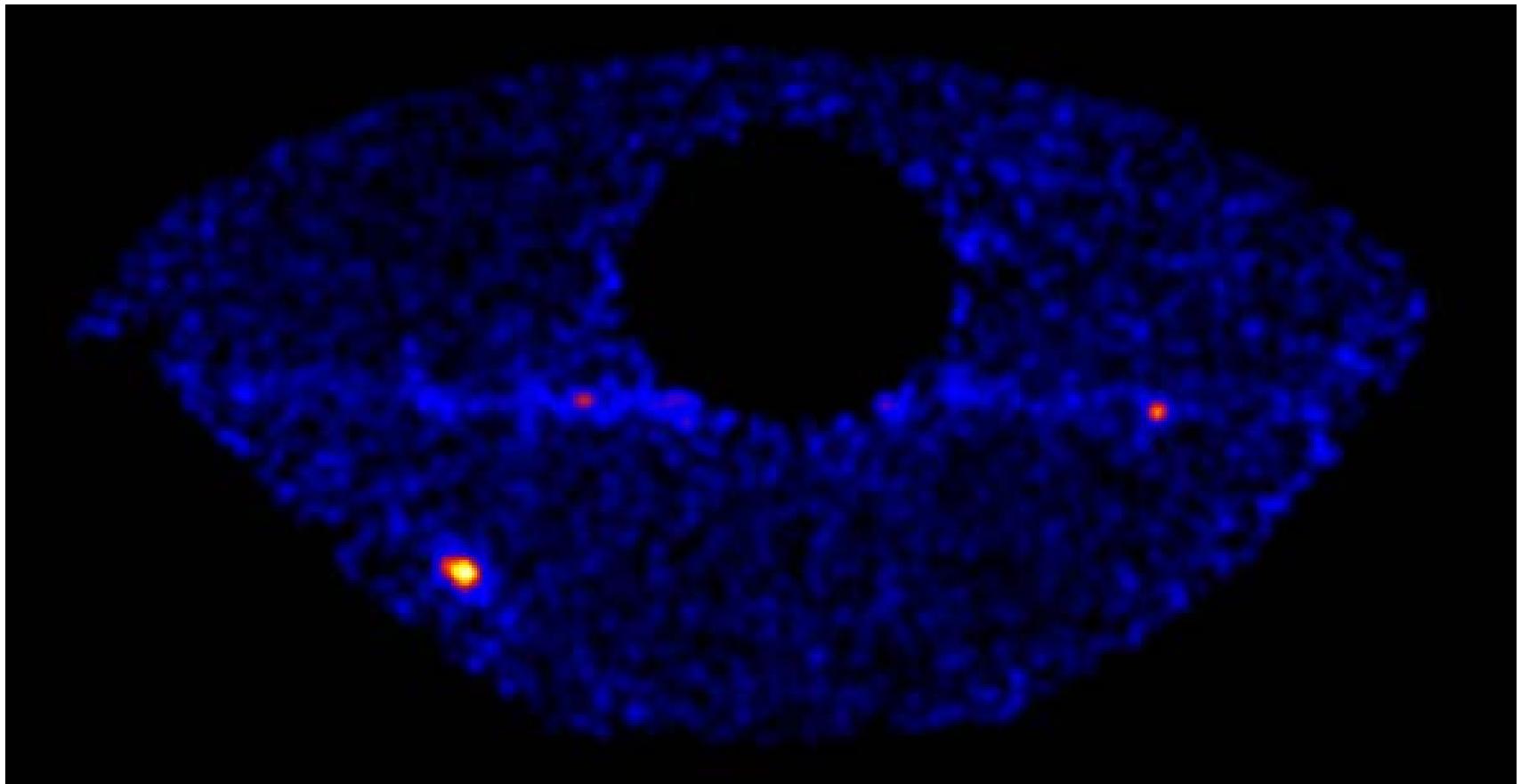
# Galactic Transients: The Flaring Crab





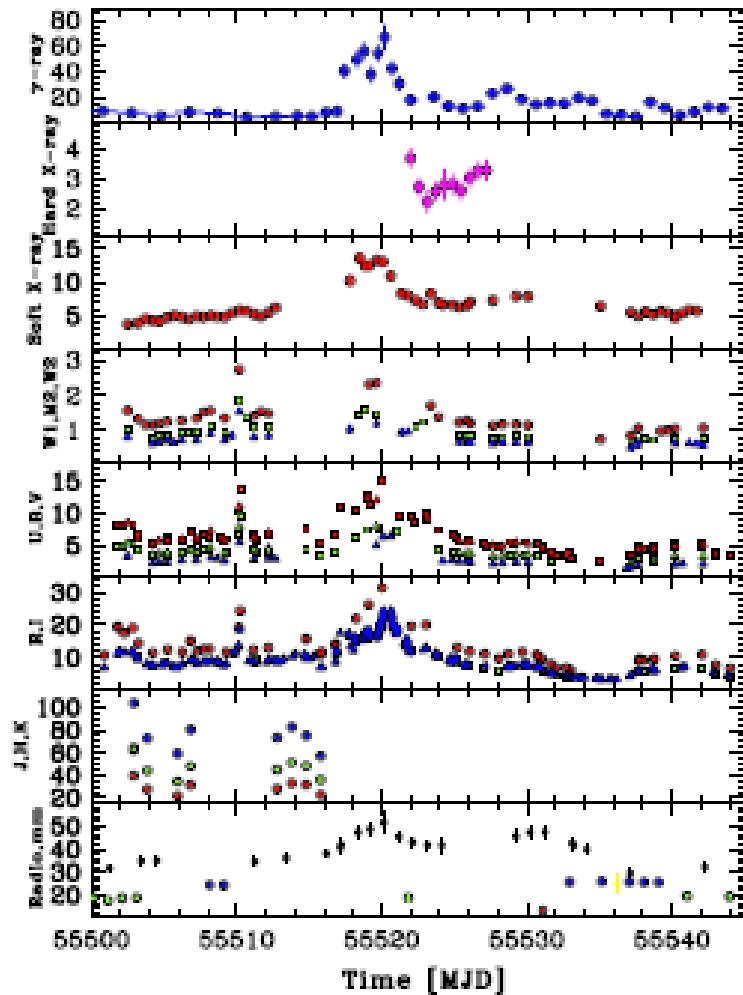
# The Flaring 3C454.3

Vercellone et al. 2010

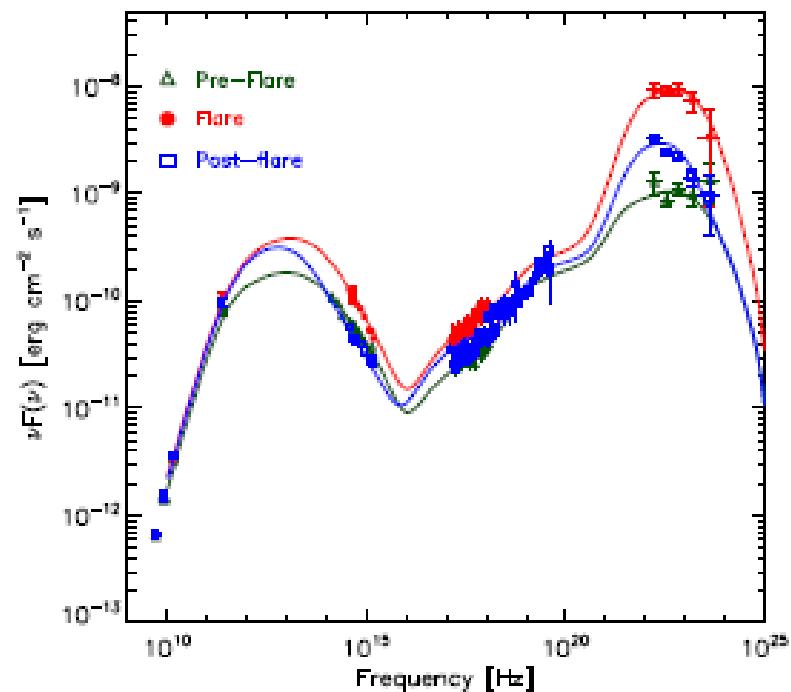




# Blazar 3C454.3

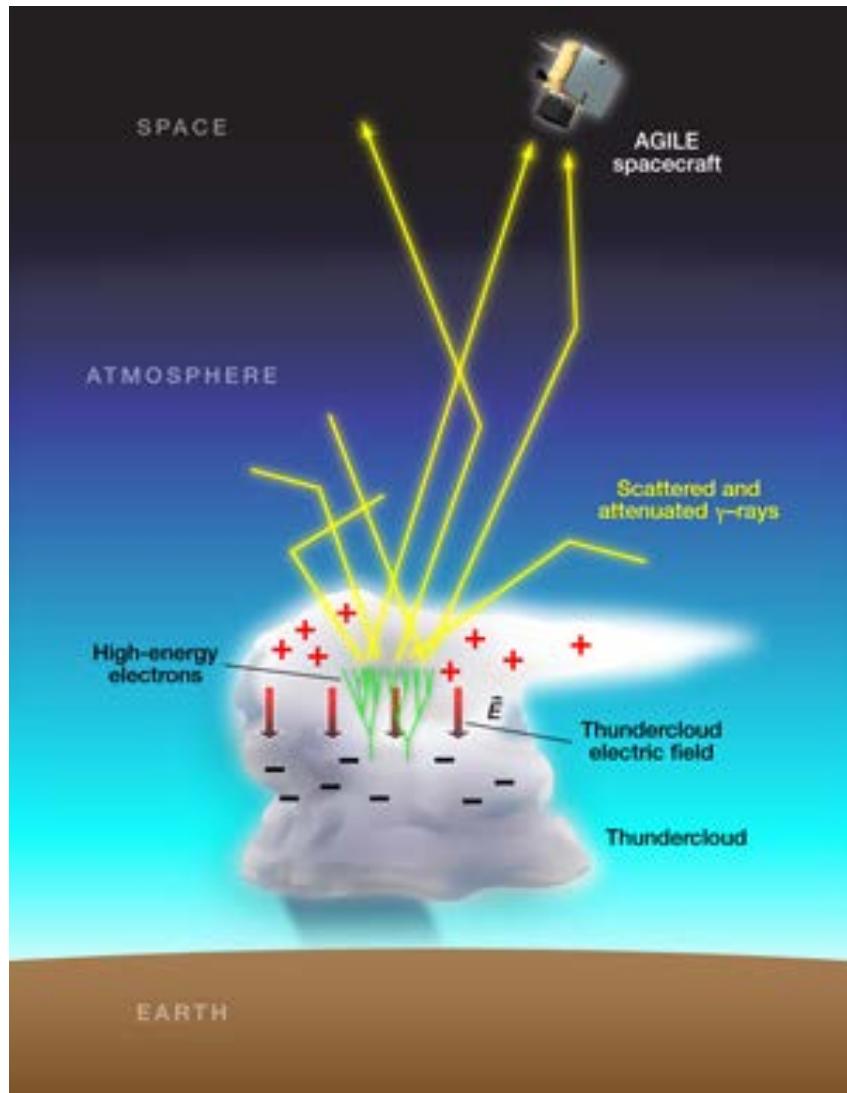


Vercellone et al. 2011

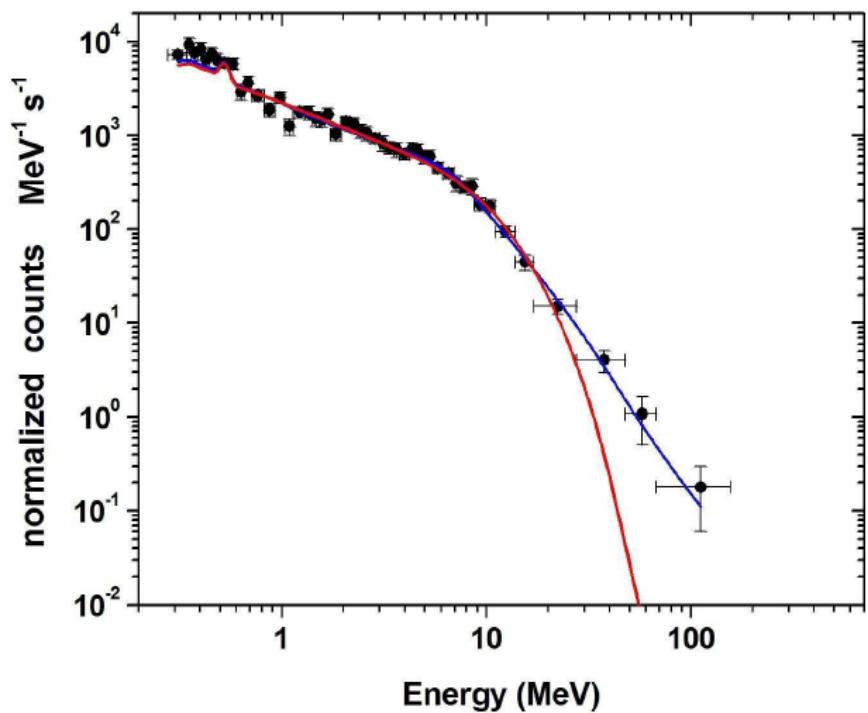




# Terrestrial Gamma Ray Flashes



Marisaldi et al. 2010





# Terrestrial Gamma-ray Flashes

## The First AGILE TGF catalog

AGU PUBLICATIONS



Journal of Geophysical Research: Space Physics

### RESEARCH ARTICLE

10.1002/2013JA019301

#### Key Points:

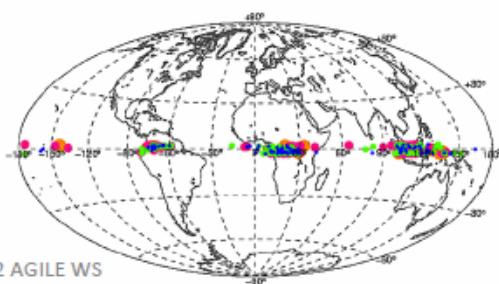
- Terrestrial gamma ray flashes detected by the AGILE satellite are described
- The data set properties provide independent confirmation for key TGF properties

### Properties of terrestrial gamma ray flashes detected by AGILE MCAL below 30 MeV

M. Marisaldi<sup>1,2</sup>, F. Fuschino<sup>1</sup>, M. Tavani<sup>1,4</sup>, S. Dietrich<sup>5</sup>, C. Price<sup>6</sup>, M. Galli<sup>7</sup>, C. Pittori<sup>8,9</sup>, F. Verrecchia<sup>8,9</sup>, S. Mereghetti<sup>10</sup>, P. W. Cattaneo<sup>11</sup>, S. Colafrancesco<sup>8,12</sup>, A. Argan<sup>13</sup>, C. Labanti<sup>1</sup>, F. Longo<sup>14,15</sup>, E. Del Monte<sup>3</sup>, G. Barbarelli<sup>14,15</sup>, A. Giuliani<sup>10</sup>, A. Bulgarelli<sup>1</sup>, R. Campana<sup>1</sup>, A. Chen<sup>10,12</sup>, F. Gianotti<sup>1</sup>, P. Giommi<sup>9</sup>, F. Lazzarotto<sup>3</sup>, A. Morselli<sup>16</sup>, M. Rapisarda<sup>17</sup>, A. Rappoldi<sup>11</sup>, M. Trifoglio<sup>1</sup>, A. Trois<sup>14</sup>, and S. Vercellone<sup>19</sup>

### Properties of Terrestrial Gamma-Ray Flashes detected by AGILE MCAL below 30 MeV

TGF (E <30 MeV) observed from March 2009 to July 2012



M. Marisaldi - 12 AGILE WS

15

9 May 2014

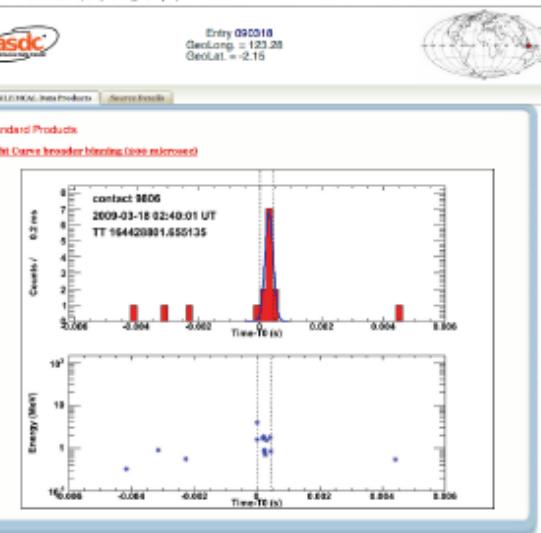


# Terrestrial Gamma-ray Flashes

## An interactive tool for the TGF community

Available at the ASI Science Data Center (ASDC) website: [www.asdc.asi.it/mcaltgfcat](http://www.asdc.asi.it/mcaltgfcat)

Entry number Selection mode: <input checked="" type="checkbox"/> All	TGF ID	GeeLon	GeoLat	Date (UTC)	Trigger Time TO (MET in s)	TO_micro (μs)	T50 (ms)	Raw Counts	HR	ML Counts+/-Err	Notes
	<input type="button" value="↑"/>	<input type="button" value="↓"/>	<input type="button" value="Reset"/>	<input type="button" value="↑"/>	<input type="button" value="↓"/>	<input type="button" value="Reset"/>	<input type="button" value="↑"/>	<input type="button" value="↓"/>	<input type="button" value="Reset"/>	<input type="button" value="↑"/>	<input type="button" value="↓"/>
1 <input checked="" type="checkbox"/> Select	TGF LC 090302.71821	17.42	-1.64	2009-03-02T17:14:14	163098854	254076	0.103	12	1.4	10.8+/-3.3	---
2 <input checked="" type="checkbox"/> Select	TGF LC 090308.40378	110.96	-2.33	2009-03-08T09:41:27	163590087	958609	0.48	17	1.4	19.9+/-4.8	---
3 <input checked="" type="checkbox"/> Select	TGF LC 090308.61530	106.13	-1.46	2009-03-08T14:46:02	163608362	205006	0.154	10	2.3	10.7+/-3.3	---
4 <input checked="" type="checkbox"/> Select	TGF LC 090309.25894	136.68	-1.93	2009-03-09T06:12:53	163663973	166566	0.208	~	~	~	The ASDC TGF Data Explorer
5 <input checked="" type="checkbox"/> Select	TGF LC 090309.37239	-6.65	1.89	2009-03-09T08:56:15	163673775	205677	0.2				<a href="http://www.asdc.asi.it/explorer_TGF.php">www.asdc.asi.it/explorer_TGF.php</a>
6 <input checked="" type="checkbox"/> Select	TGF LC 090309.37239	-6.65	1.89	2009-03-09T08:56:15	163673775	207136	0.2				
7 <input checked="" type="checkbox"/> Select	TGF LC 090315.25166	-8.08	1.73	2009-03-15T06:02:24	164181744	994547	0.1				
8 <input checked="" type="checkbox"/> Select	TGF LC 090315.51739	28.88	-2.43	2009-03-15T13:01:03	164205863	83205	0.2				
9 <input checked="" type="checkbox"/> Select	TGF LC 090318.11112	123.28	-2.15	2009-03-18T02:40:01	164428801	655135	0.1				
10 <input checked="" type="checkbox"/> Select	TGF LC 090320.97835	-65.7	1.17	2009-03-20T23:28:50	164676530	559745	0.5				
11 <input checked="" type="checkbox"/> Select	TGF LC 090321.13434	7.48	0.89	2009-03-21T03:13:27	164690007	624520	0.2				
12 <input checked="" type="checkbox"/> Select	TGF LC 090323.70296	100.89	2.16	2009-03-23T16:52:16	164911934	749444	0.1				
13 <input checked="" type="checkbox"/> Select	TGF LC 090326.75312	121.85	-0.17	2009-03-26T18:04:30	165175470	924223	0.4				
14 <input checked="" type="checkbox"/> Select	TGF LC 090330.00988	112.88	-2.23	2009-03-30T00:14:14	165456854	92700	0.1				
15 <input checked="" type="checkbox"/> Select	TGF LC 090403.32898	102.52	2.4	2009-04-03T07:53:44	165830024	913614	0.1				
16 <input checked="" type="checkbox"/> Select	TGF LC 090403.47055	102.34	1.93	2009-04-03T11:17:45	165842265	218162	0.2				
17 <input checked="" type="checkbox"/> Select	TGF LC 090403.54289	109.32	0.75	2009-04-03T13:01:46	165848506	649177	0.2				
18 <input checked="" type="checkbox"/> Select	TGF LC 090403.86059	-75.86	2.46	2009-04-03T20:39:15	165875955	460826	0.2				
19 <input checked="" type="checkbox"/> Select	TGF LC 090404.46177	99.27	1.87	2009-04-04T11:04:57	165927897	969787	0.2				
20 <input checked="" type="checkbox"/> Select	TGF LC 090414.64481	9.89	-0.61	2009-04-14T15:28:32	166807712	294310	0.42	10	1	11.3+/-3.5	---





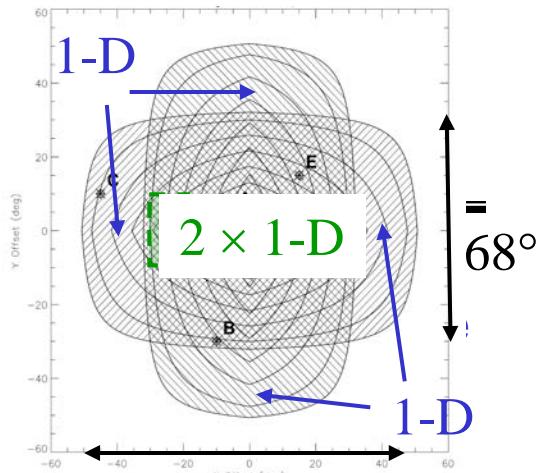
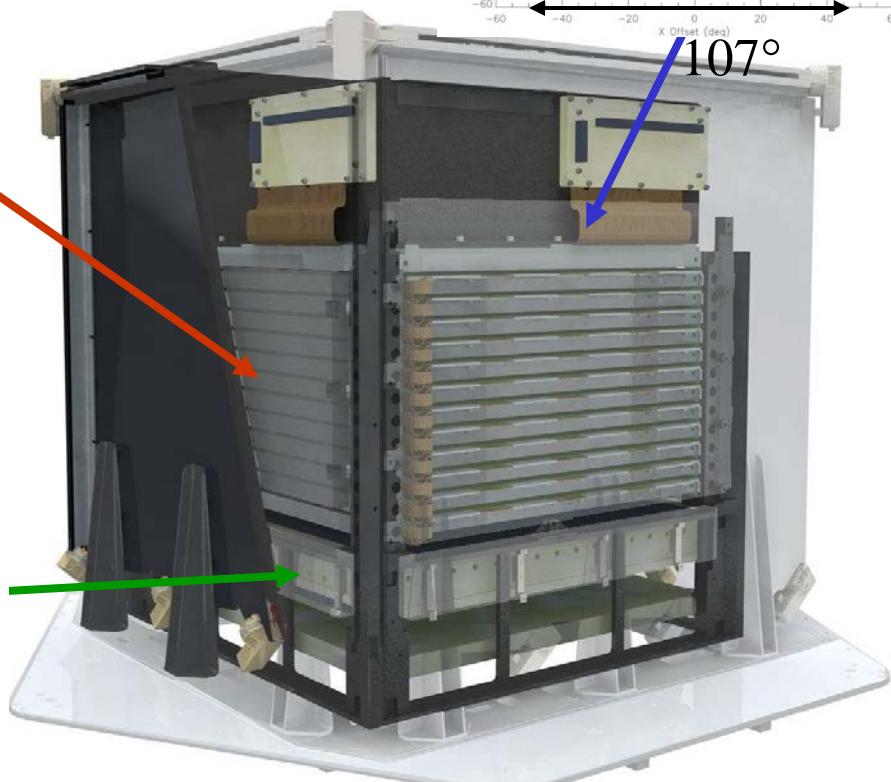
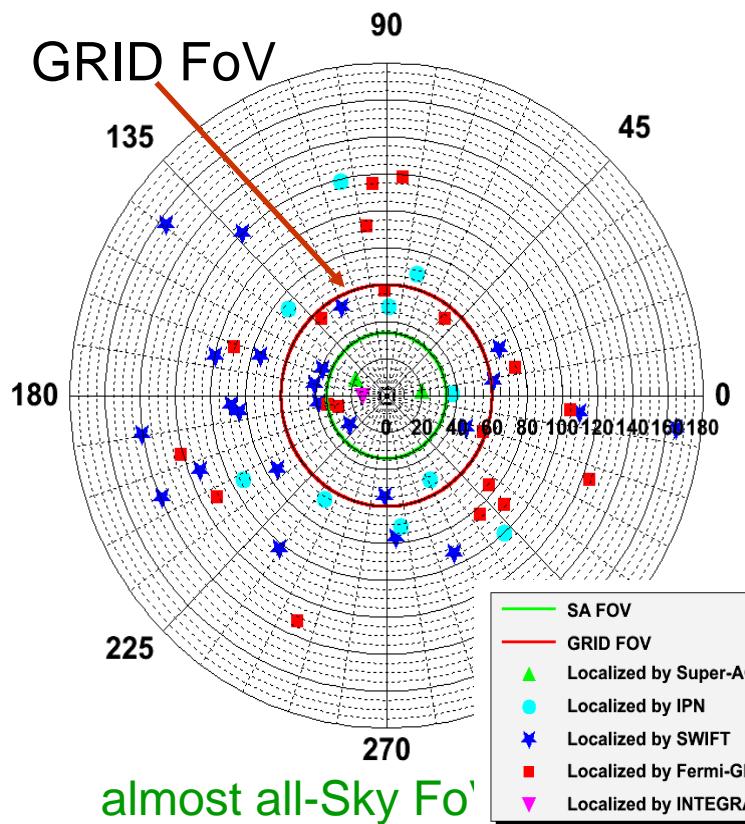
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# AGILE and GRBs



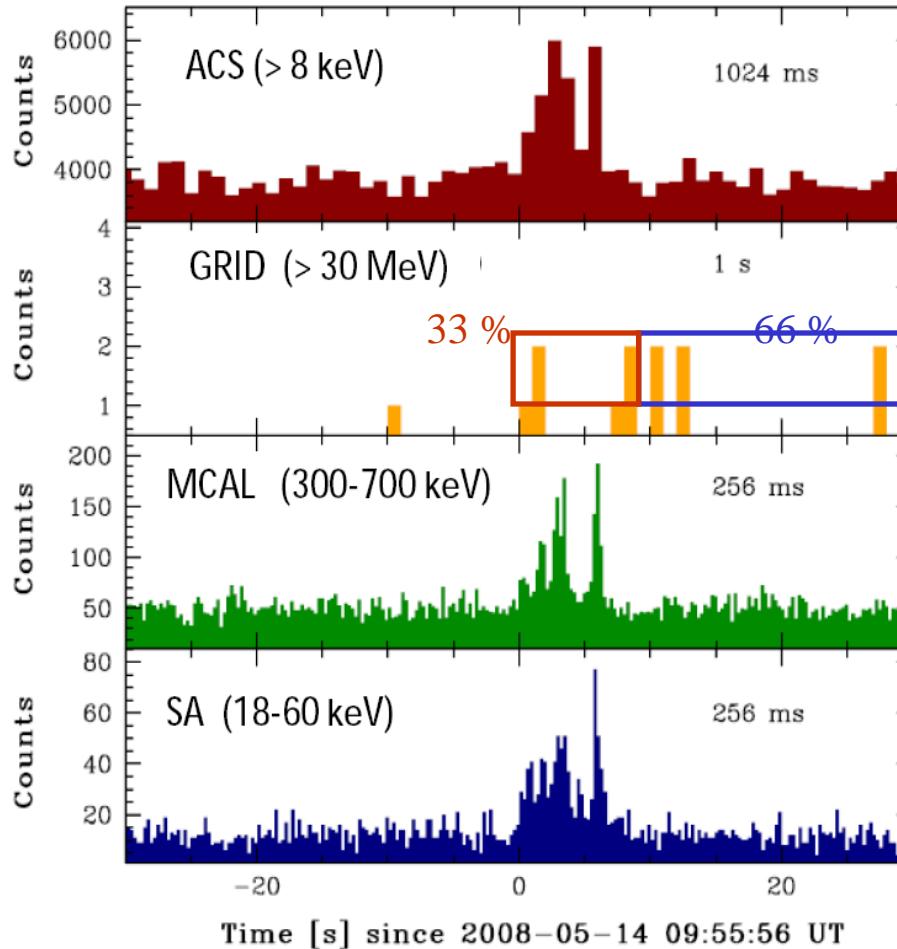
# AGILE and GRB

Gamma Ray Imaging Detector  
Silicon tracking detector  
30 MeV – 50 GeV





# Gamma-ray extended emission in GRB 080514B

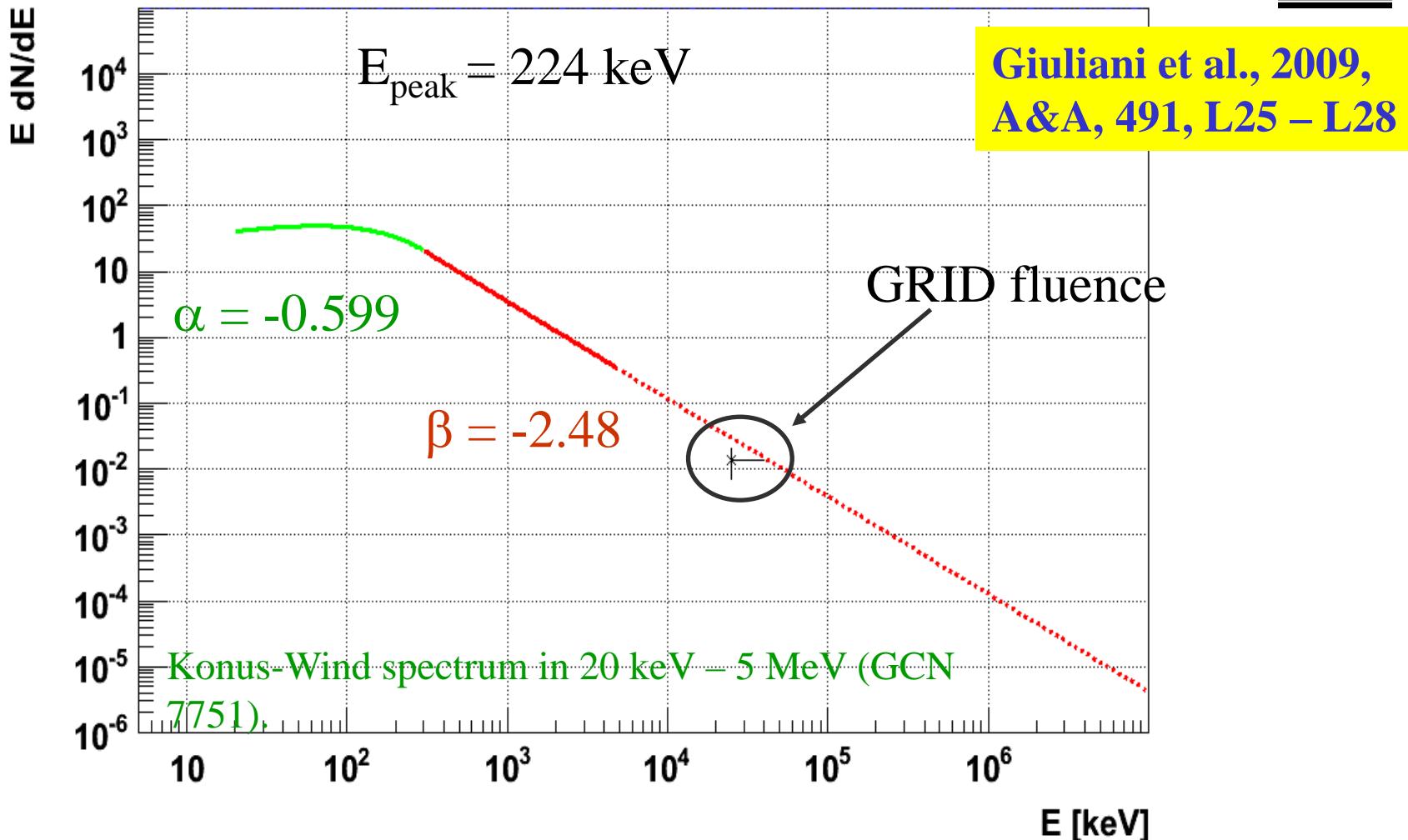


Giuliani et al., 2009,  
A&A, 491, L25 – L28

GRB 080514B is the first GeV-bright GRB after EGRET and it is also associated to an afterglow and a photometric redshift measure of 1.8 (A. Rossi et al., 2009, A&A).



# A single spectral model for the whole spectrum of GRB 080514B



The same Band model fits the spectrum from 20 keV up to 50 MeV.

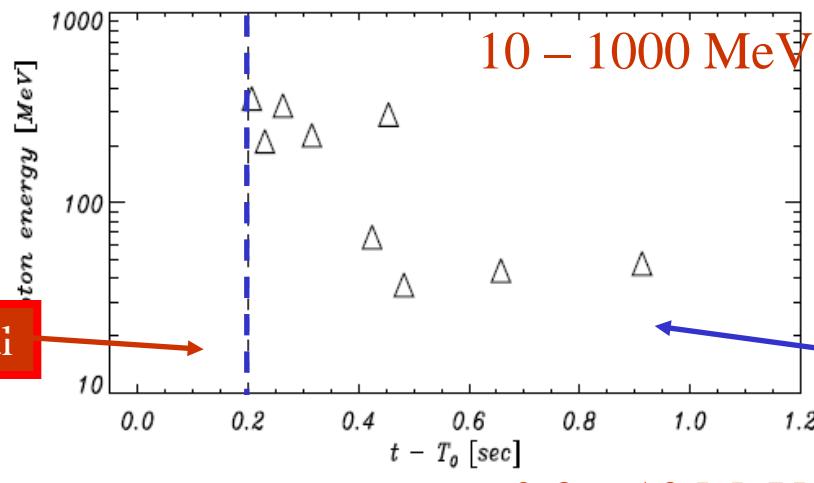


# GRB 090510: the delayed emission

Giuliani et al. 2010,  
ApJ, 708, L84 – L88

prompt emission interval

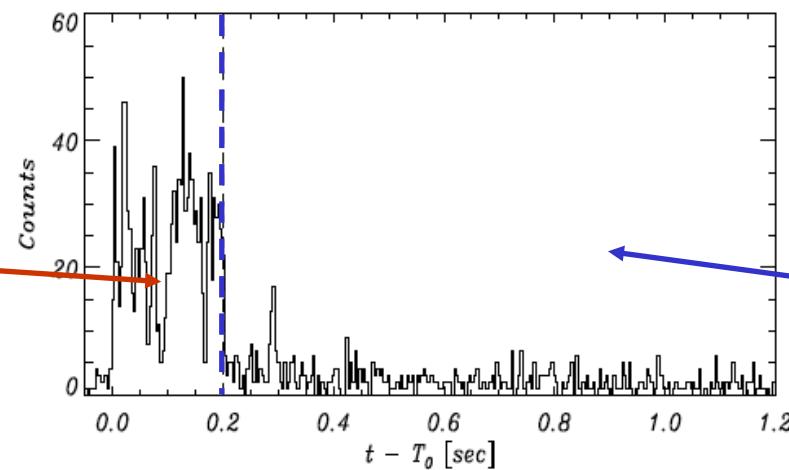
delayed emission interval



10 – 1000 MeV

prompt emission interval

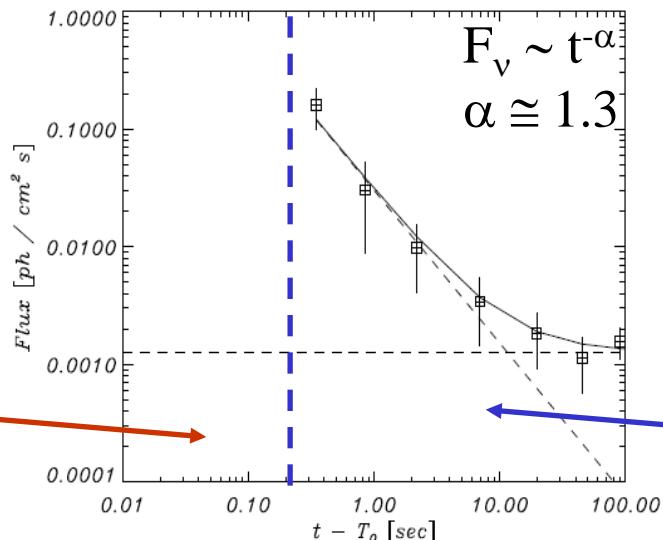
delayed emission interval



GRB 090510 has been localized by Swift and detected also by Fermi/LAT (Ackermann et al. 2010) and AGILE (Giuliani et al. 2010). The redshift is 0.903 (De Pasquale et al. 2010).



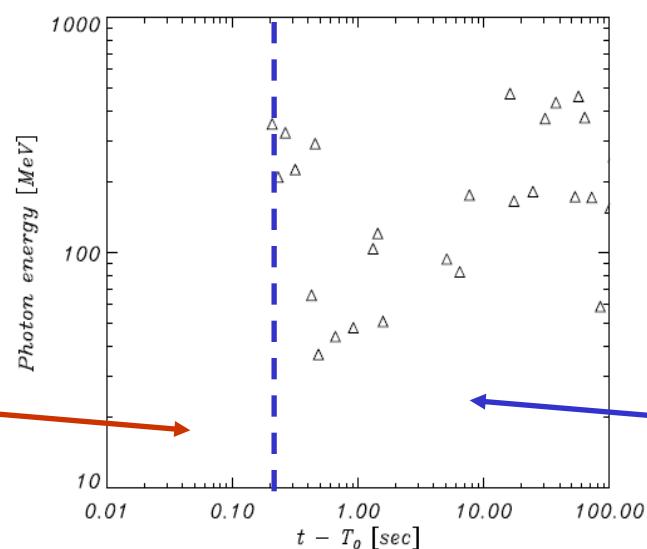
# GRB 090510: the delayed emission



prompt emission interval

Giuliani et al. 2010,  
ApJ, 708, L84 – L88

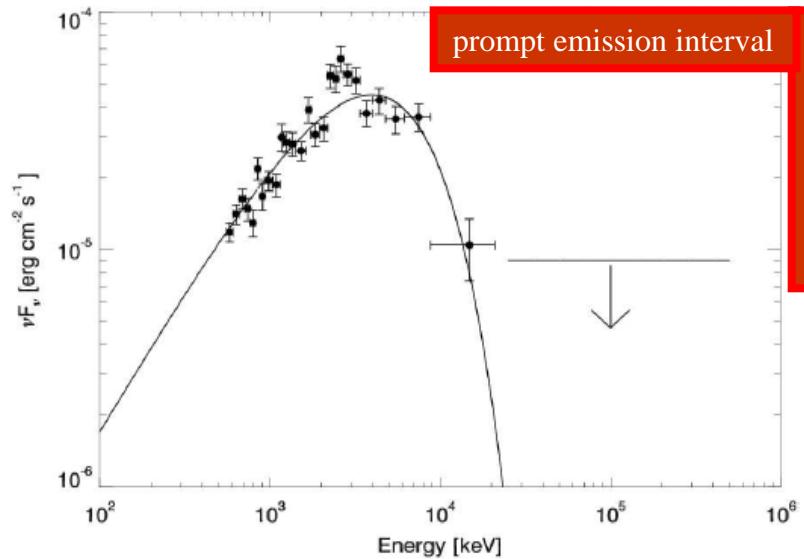
delayed emission interval



prompt emission interval

delayed emission interval

# GRB 090510: spectral evolution in a short GRB



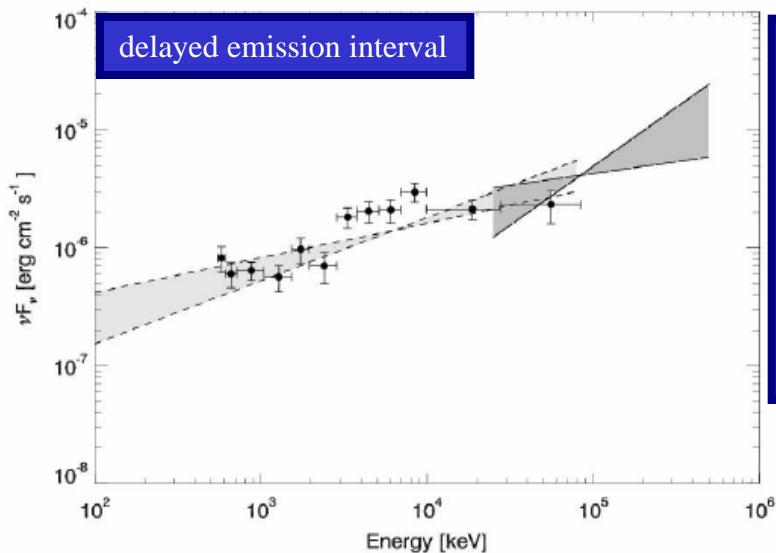
Powerlaw with cutoff

$$\alpha_1 = 0.6 \pm 0.3$$

$$E_c = 2.8 \pm 0.9 \text{ MeV}$$

$$1.8 \times 10^{-5} \text{ erg/cm}^2 (0.5 - 10 \text{ MeV})$$

Giuliani et al. 2010,  
ApJ, 708, L84 – L88



Powerlaw without cutoff

$$\alpha_2 = 1.6 \pm 0.1$$

$$3.1 \times 10^{-6} \text{ erg/cm}^2 (0.5 - 10 \text{ MeV})$$

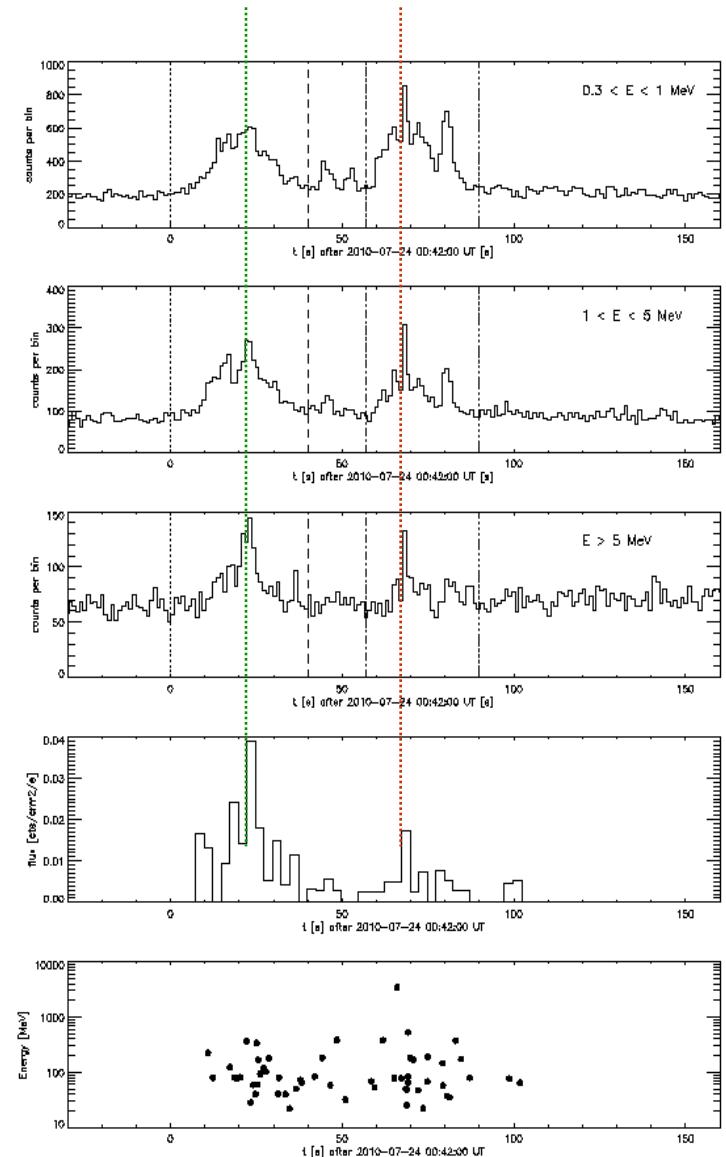
$$\alpha_3 = 1.4 \pm 0.4$$

$$2.9 \times 10^{-5} \text{ erg/cm}^2 (25 - 500 \text{ MeV})$$



# GRB 100724B: simultaneous onset of GeV and MeV

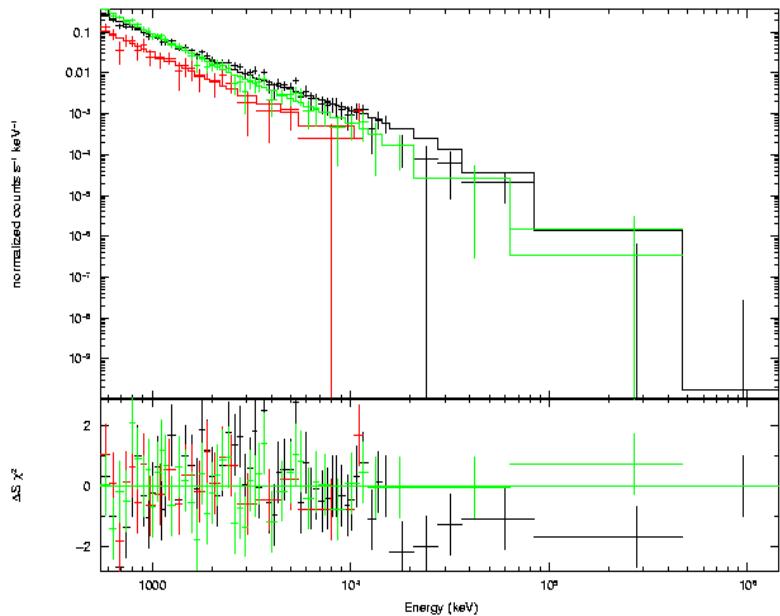
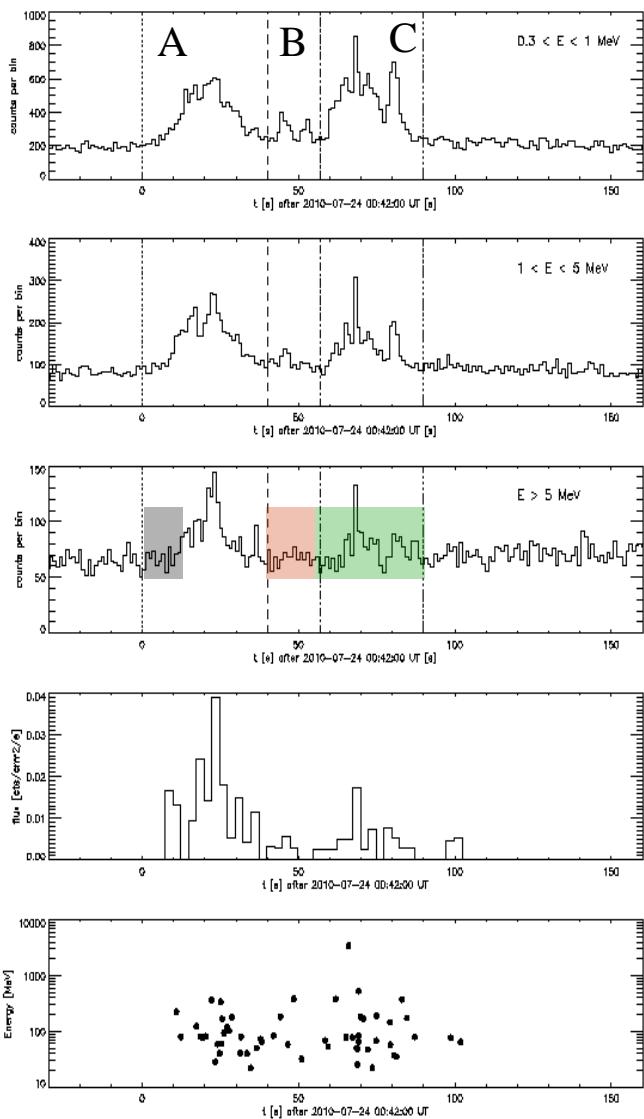
- No time lag is found between the MeV and GeV emission. The two main bumps in the lightcurve show a remarkably similar shape at MeV and GeV.
- Due to the spinning operative mode, GRB 100724B remained within the AGILE/GRID FoV between  $t_0+6\text{ s}$  and  $t_0+125\text{ s}$ .
- The GRB is not detected during the next “transit” in the FoV ( $t_0 + 410\text{ s}$ ,  $t_0 + 529\text{ s}$ ).
- SuperAGILE was not collecting data for telemetry sharing reasons.



**Del Monte et al.  
A&A, 535, 120, (2011)**



# GRB 100724B: spectral evolution



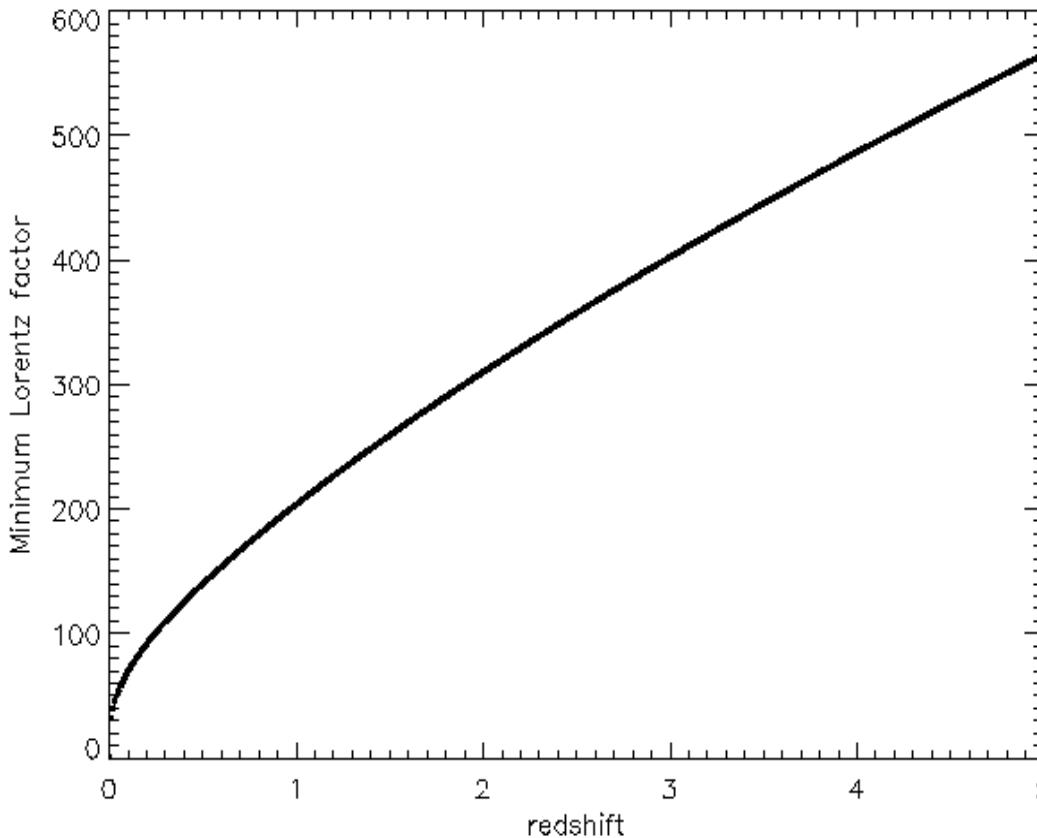
**Del Monte et al., A&A, 535, A120 (2011)**

- |                                |                                      |
|--------------------------------|--------------------------------------|
| A: $t_0$ , $t_0 + 40$ s;       | photon index = $2.01 \pm 0.04$       |
| B: $t_0 + 40$ s, $t_0 + 57$ s; | photon index = $2.19 (+0.26, -0.19)$ |
| C: $t_0 + 57$ s, $t_0 + 90$ s; | photon index = $2.35 (+0.08, -0.07)$ |

A variation at  $4.2\sigma$  is found in the spectral indices.



# GRB 100724B: minimum bulk Lorentz factor



Del Monte et al.,  
A&A, 535, A120 (2011)

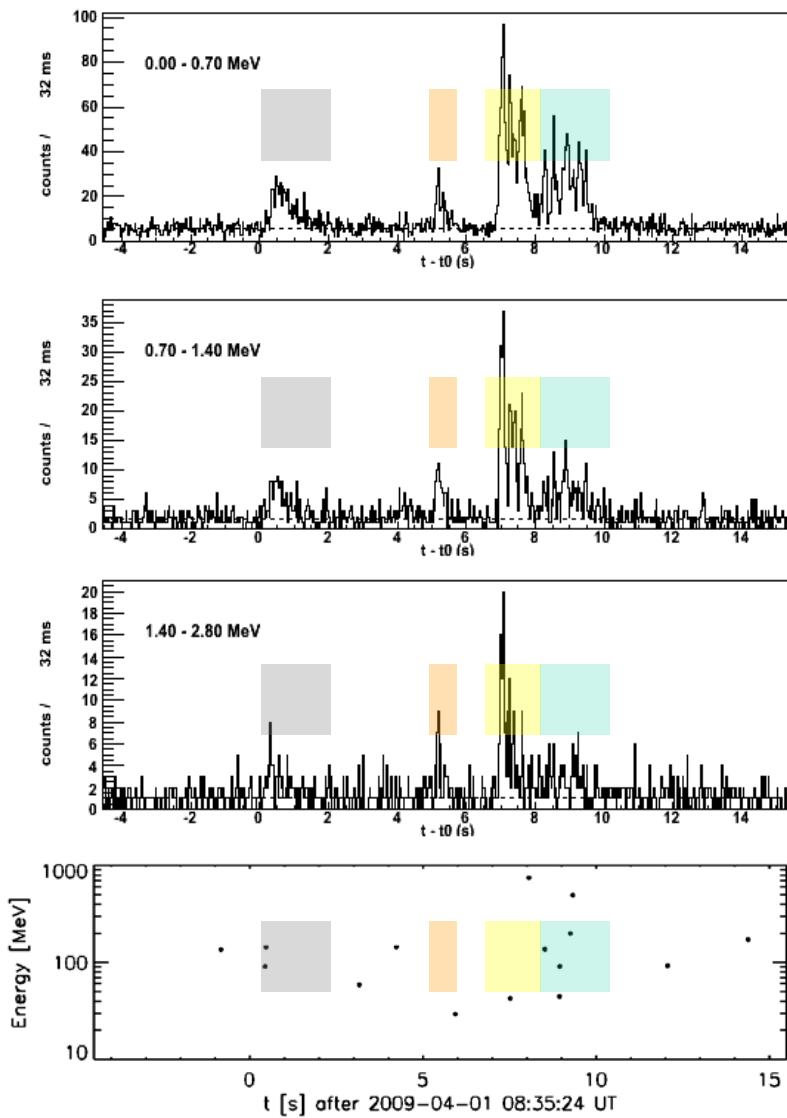
Following the method used for GRB 080916C (Abdo et al 2009)

$$\Gamma_{\min} = \Gamma_{\min}(z, \Delta t, E_{\max}, \beta).$$

The estimated Lorentz factor is similar to other GeV-bright GRBs (e. g. GRB 080916C, GRB 090902B and GRB 090510).



# GRB 090401B: prompt emission

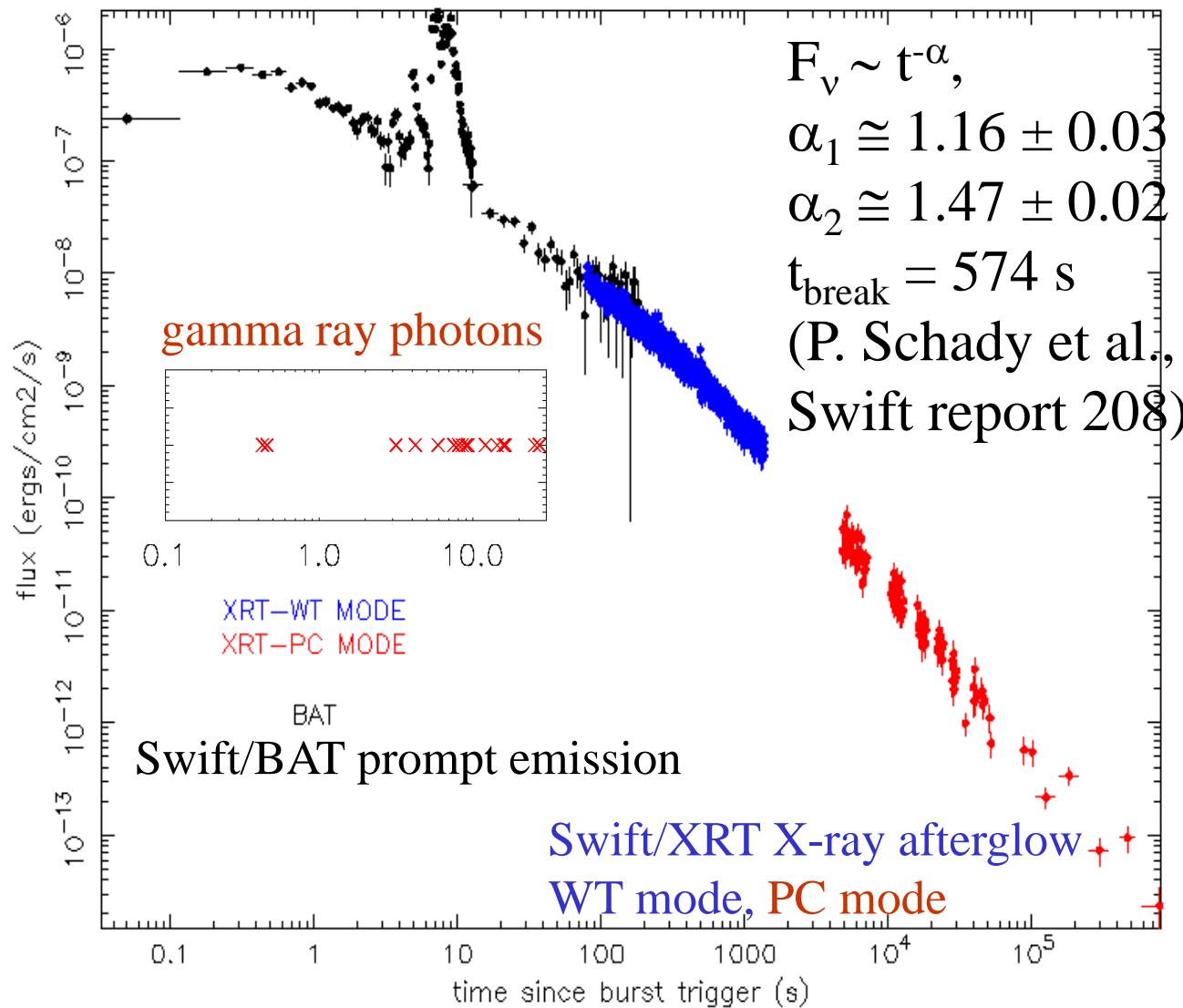


68 % of the gamma ray photons are emitted during prompt;

32 % of the gamma ray photons are in the extended emission



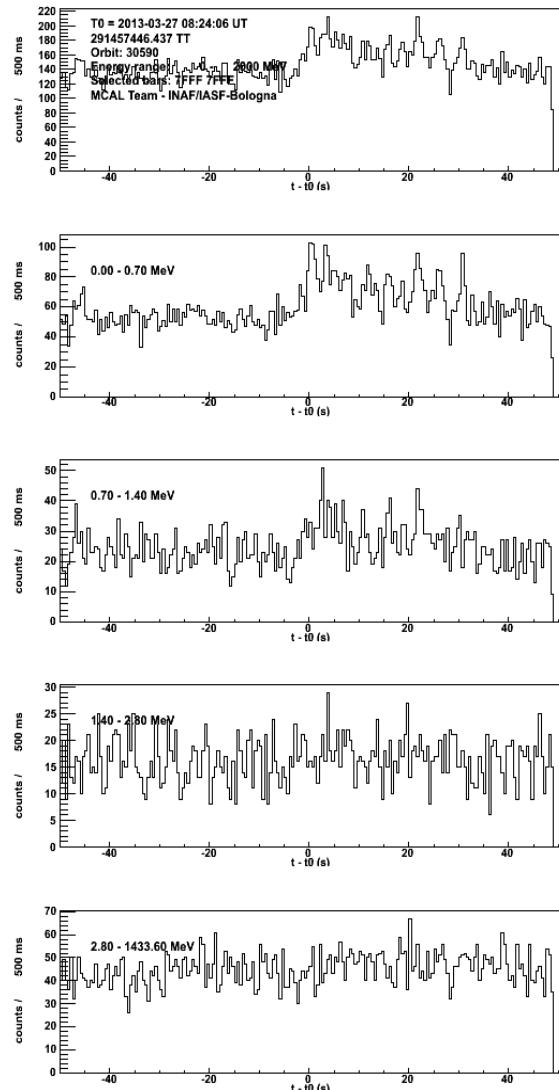
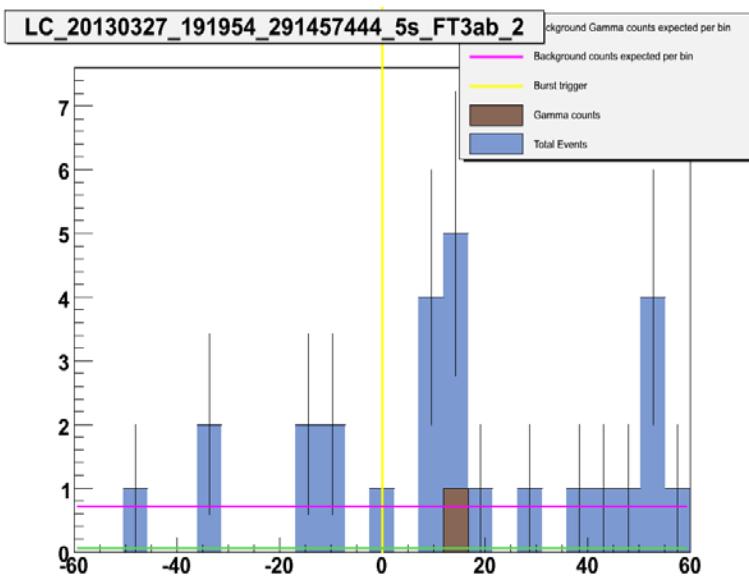
# GRB 090401B: a complete coverage of the afterglow





# GRB 130327B

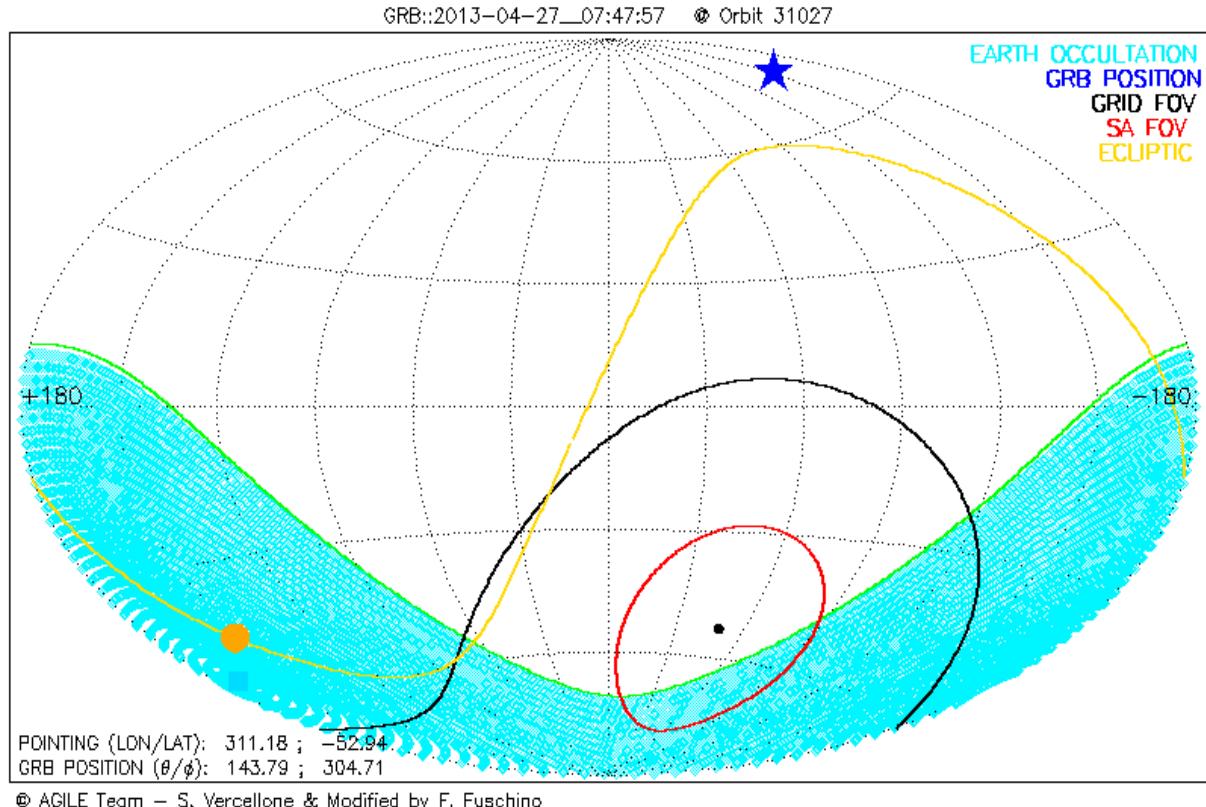
- GRB detected by AGILE GRID (GCN 14344) and Fermi/LAT (GCN 14347)
- Correlated emission at High energy and Low Energy (GCN 14347)
- No XRT detection (GCN 14398) → no redshift known





# GRB 130427A

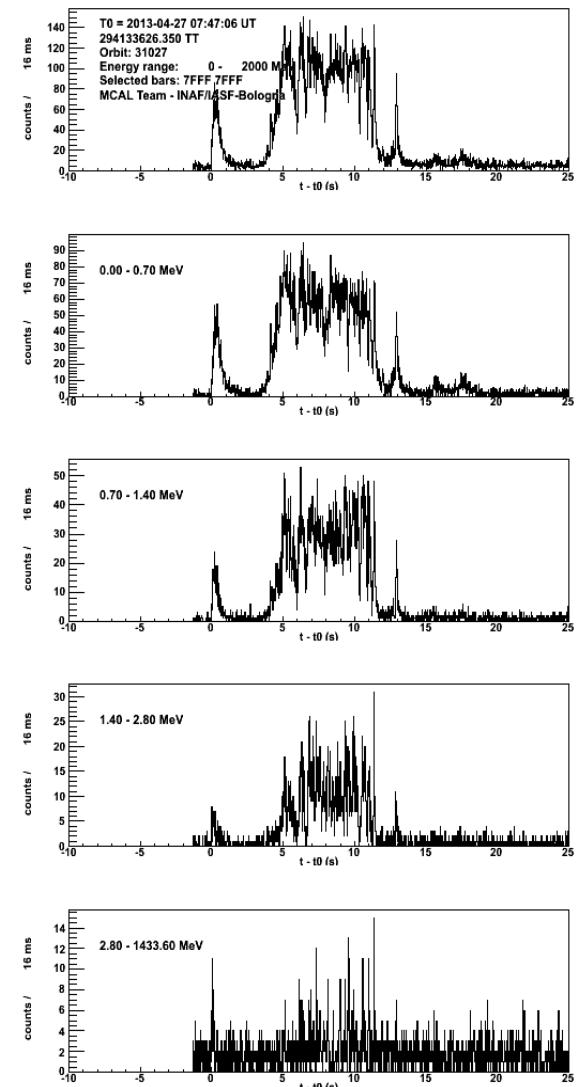
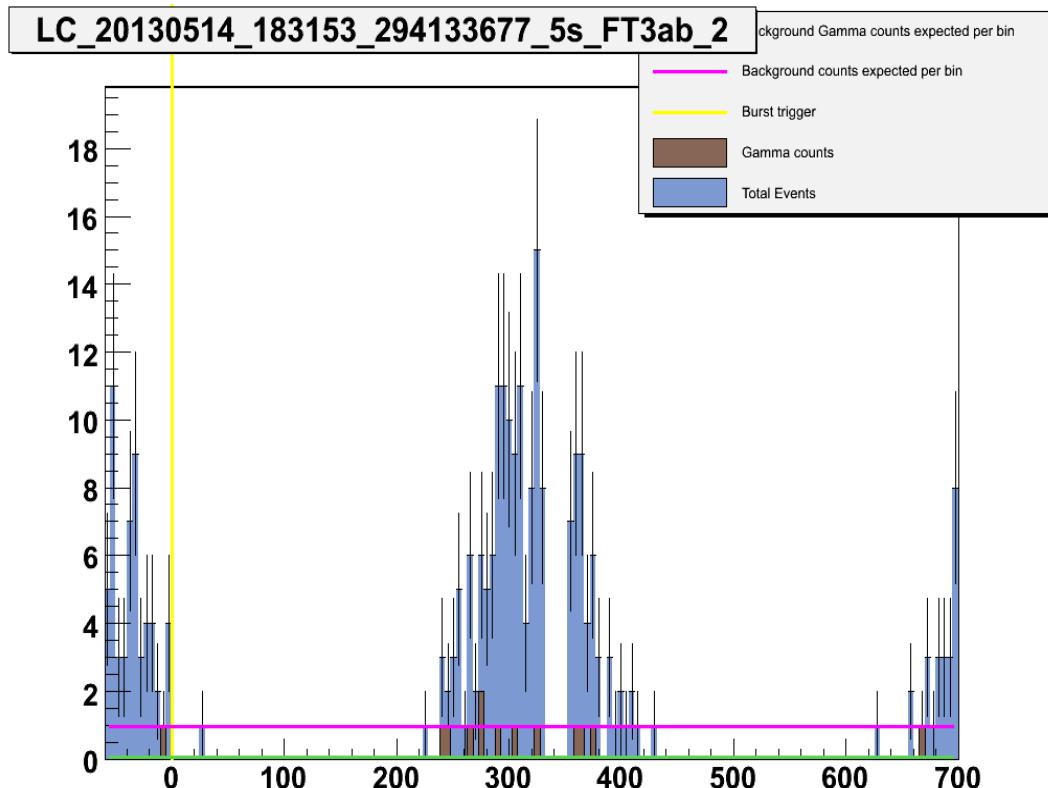
- **Outside of the FoV for the first 500 s**
- **Detected by the automated flaring source pipeline**
- **First detection by Likelihood of the extended emission**





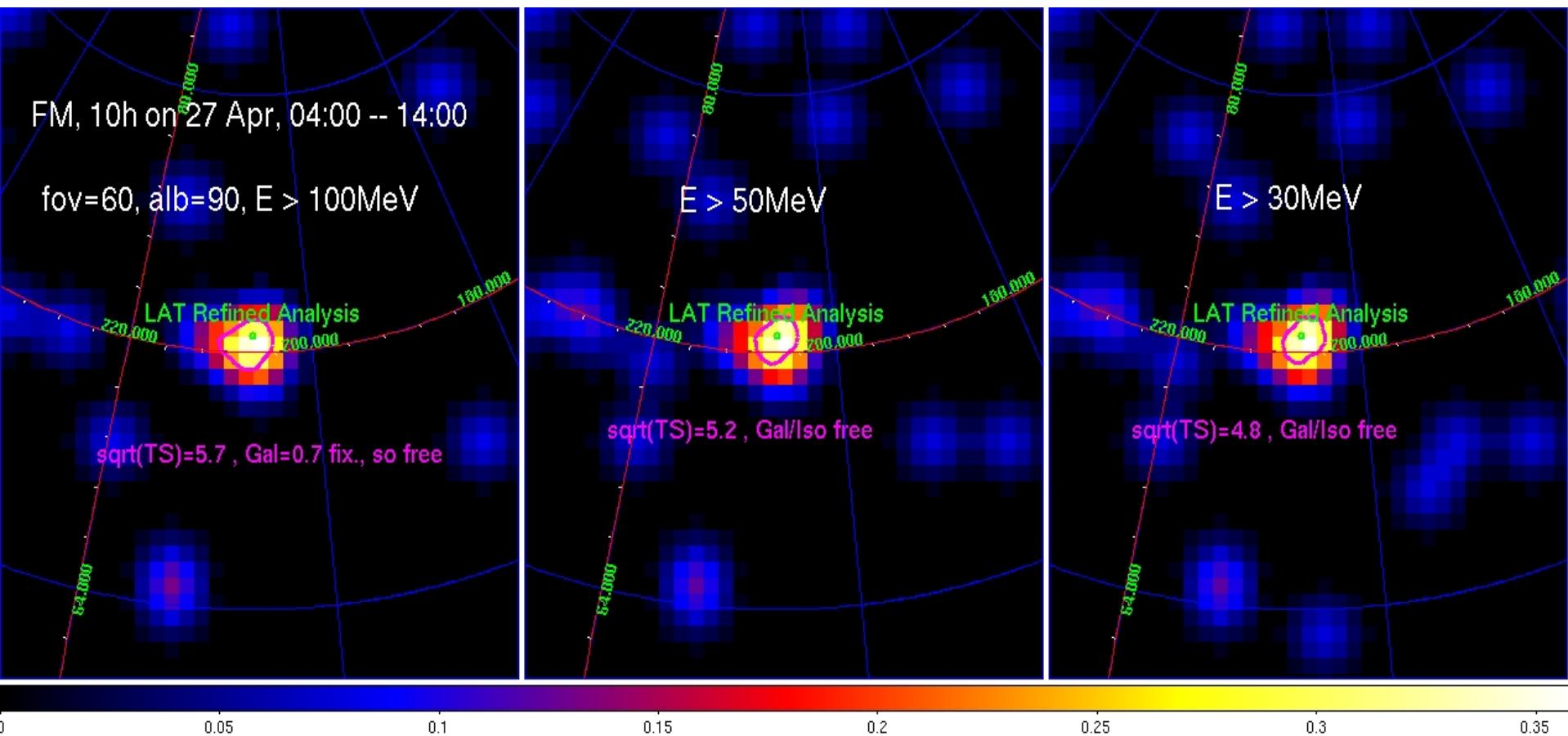
# GRB 130427A

- Outside of the GRID FoV for the first ~ 200 s
- Strong prompt detection by MCAL



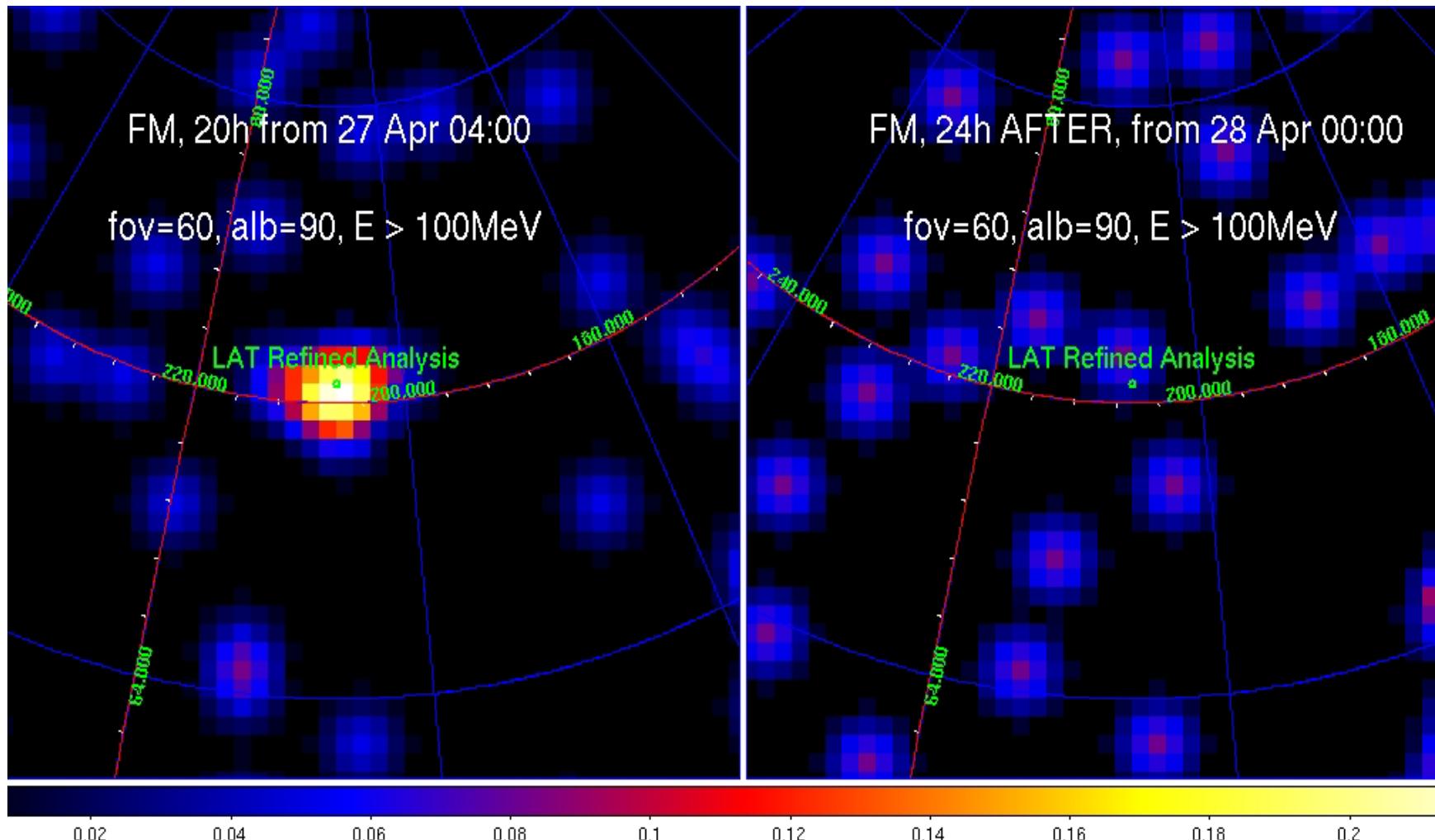


# GRB 130427A





# GRB 130427A





# GRB at HE in the AGILE/Fermi era

---

## *GRBs observed by AGILE and Fermi*

From an observational point of view, there is not a “standard” behavior

### *In the Light Curve :*

- Extended emission
- Delayed onset
- $L \sim t^{-a}$
- Prompt emission
- Superlong Bursts

### *In the spectrum :*

- Extra component



# GRB at HE in the AGILE/Fermi era

## *In the Light Curve :*

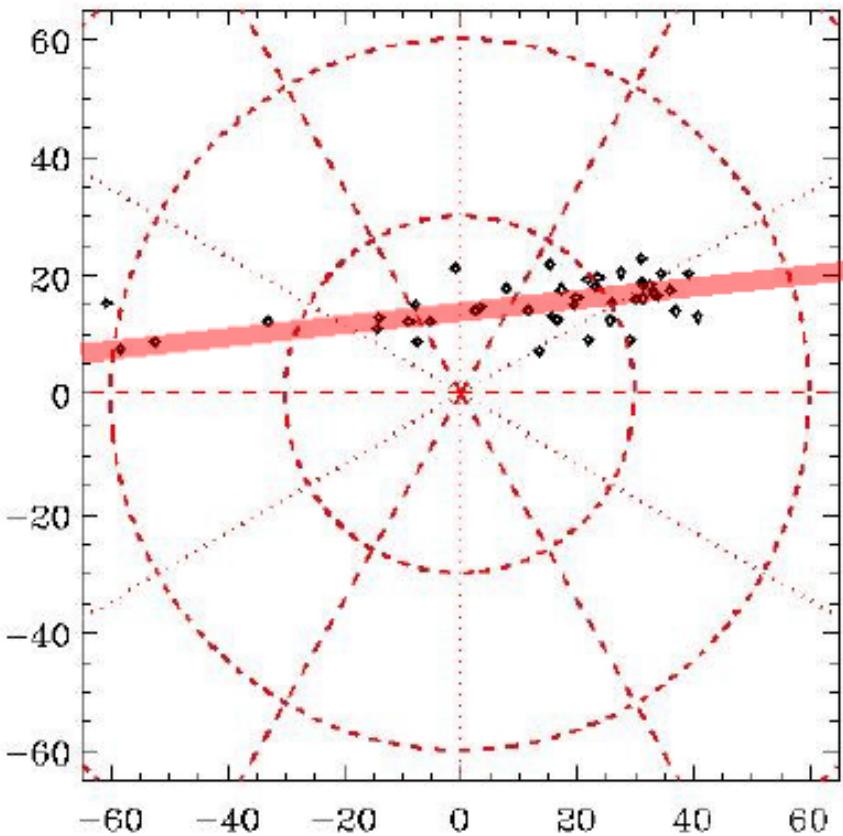
	080514B	090401B	090510	100724B	130327B	130427A	131108A
- Extended emission ,.....	X	X	X			X	X
- Delayed onset .....			X				
- $L \sim t^{-a}$ .....			X				X
- Prompt emission .....				X	X		
- Superlong Bursts .....						X	

## *In the spectrum :*

- Extra component .....		X					X
-------------------------	--	---	--	--	--	--	---



# GRB 131108A



At  $T_0 = 20:41:55$  UTC the GRB was in the GRID FOV, at an off-axis angle of 40

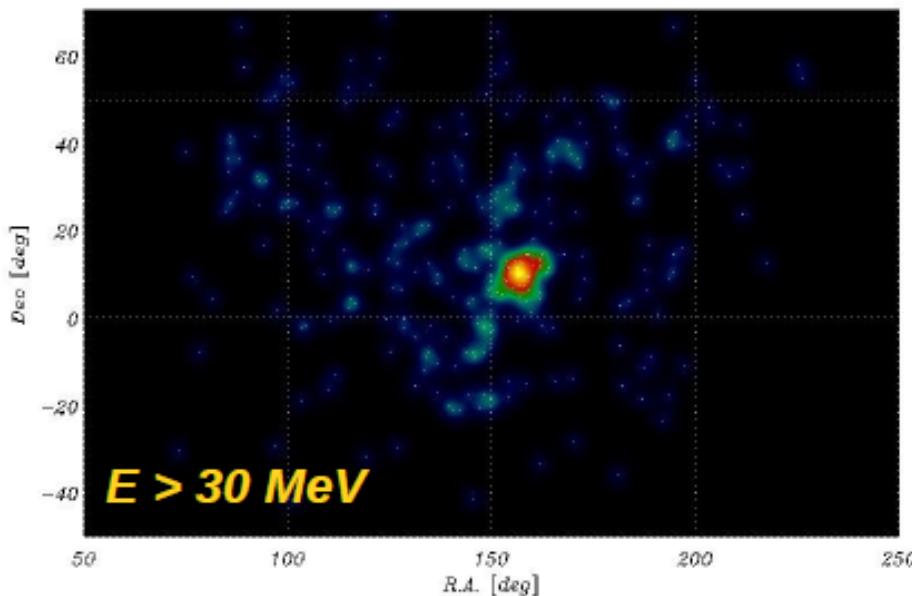
It crossed the FOV during the following 110 s.

In the following rotations of the satellite, the GRB region was observed with the GRID several time

Detected by both GRID and MCAL



# GRB 131108A

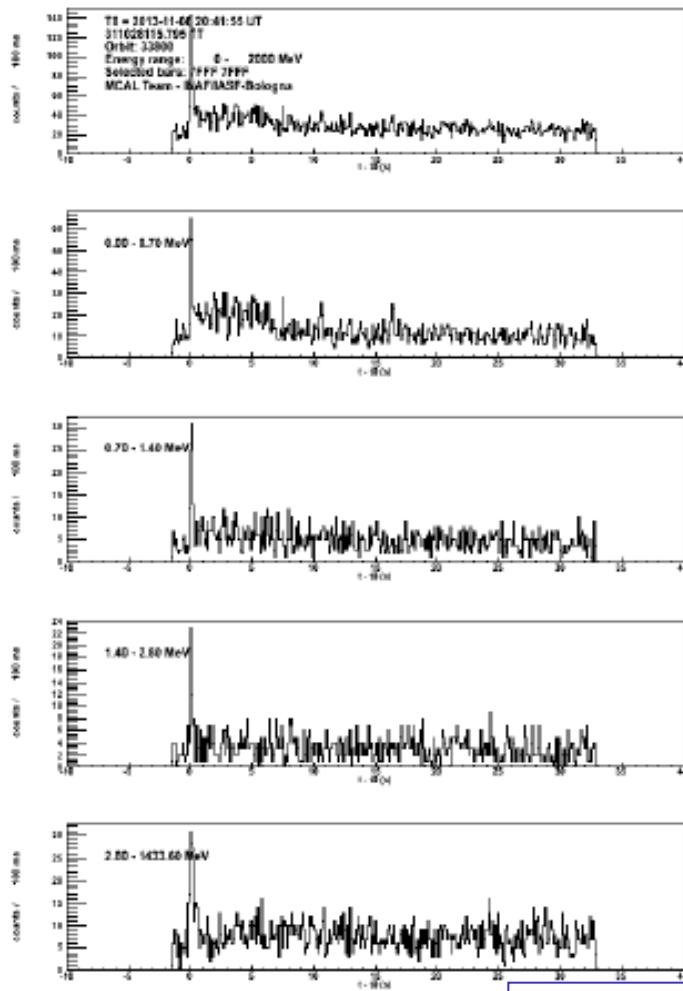


- Bright and distant
- During the first 80 seconds after T0 the GRID instrument detected 66 photons compatible with the GRB, most of which below 100 MeV
- Fluence of  $2.56 \pm 0.32 \times 10^{-5}$  erg / cm<sup>2</sup> in the energy band 30 MeV - 1 GeV.
- Redshift 2.4 (GCN 15470)

Giuliani et al. in preparation



# GRB 131108A



## MCAL Light Curve :

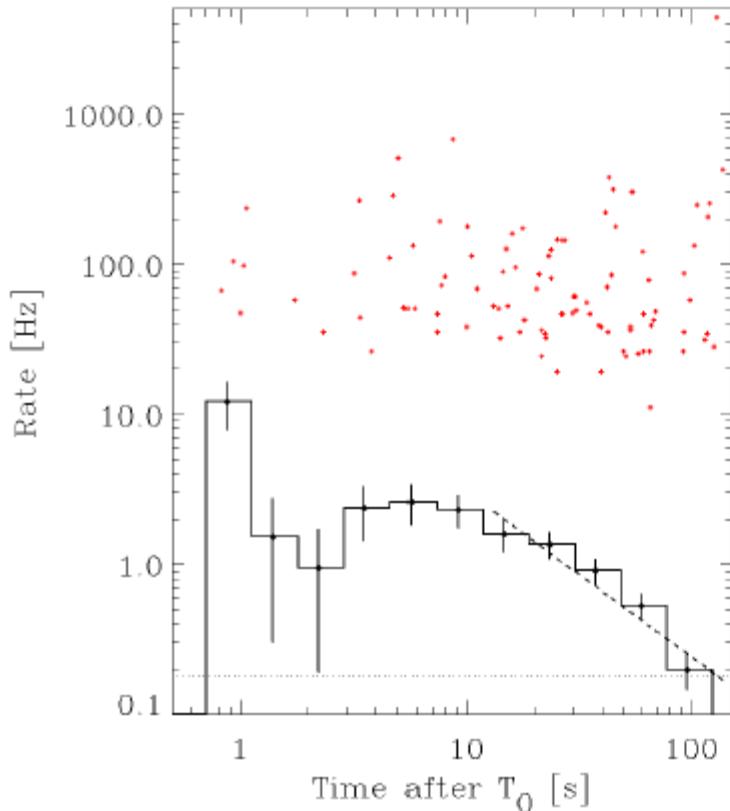
Bright initial peak detected from 300 keV to few MeV (width 0.1 s)

Above the background up to 20-25 seconds

Giuliani et al. in preparation



# GRB 131108A



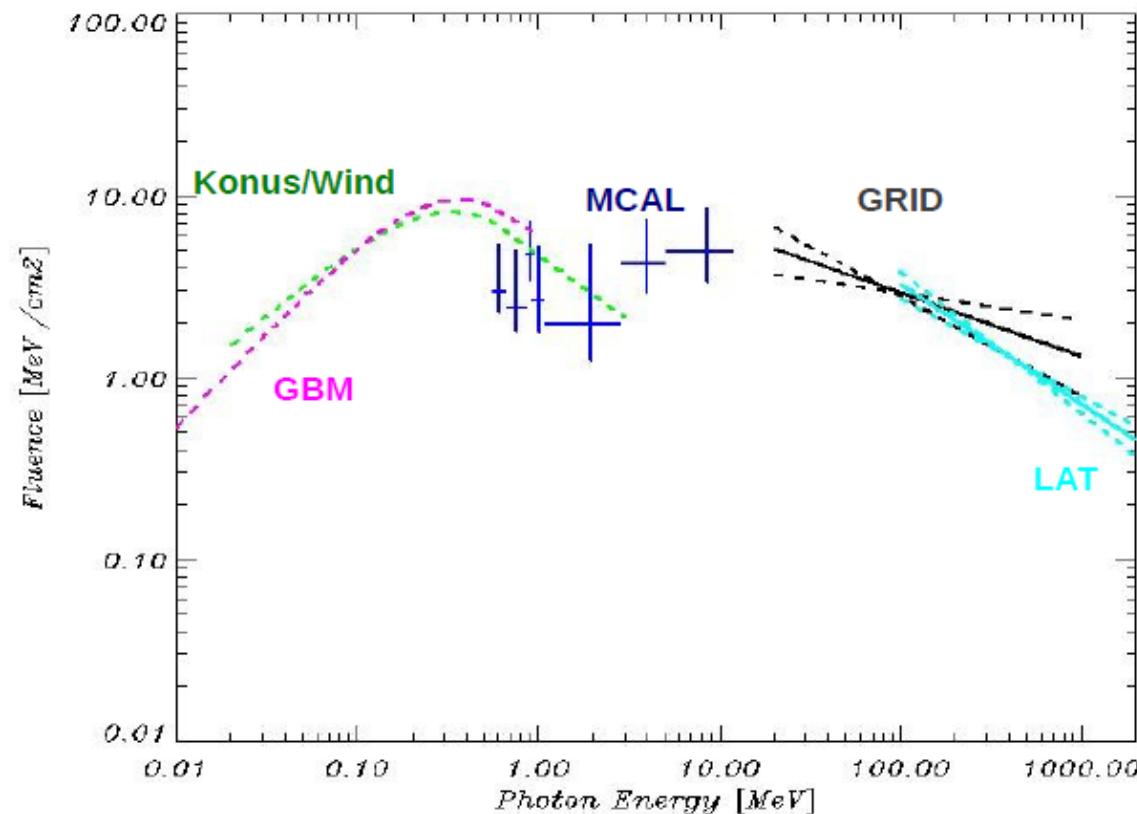
## GRID Light Curve :

- The selected events have arrival directions within 20° from the position of GRB131108A .
- After an initial bright peak, the signal remains compatible with a constant rate for about 20-30 s
- The time bins after  $T_0 + 20$  s can be roughly fitted by a function of  $t^{-a}$  with  $a = 1.1$ .



# GRB 131108A

## Spectral Energy Distribution



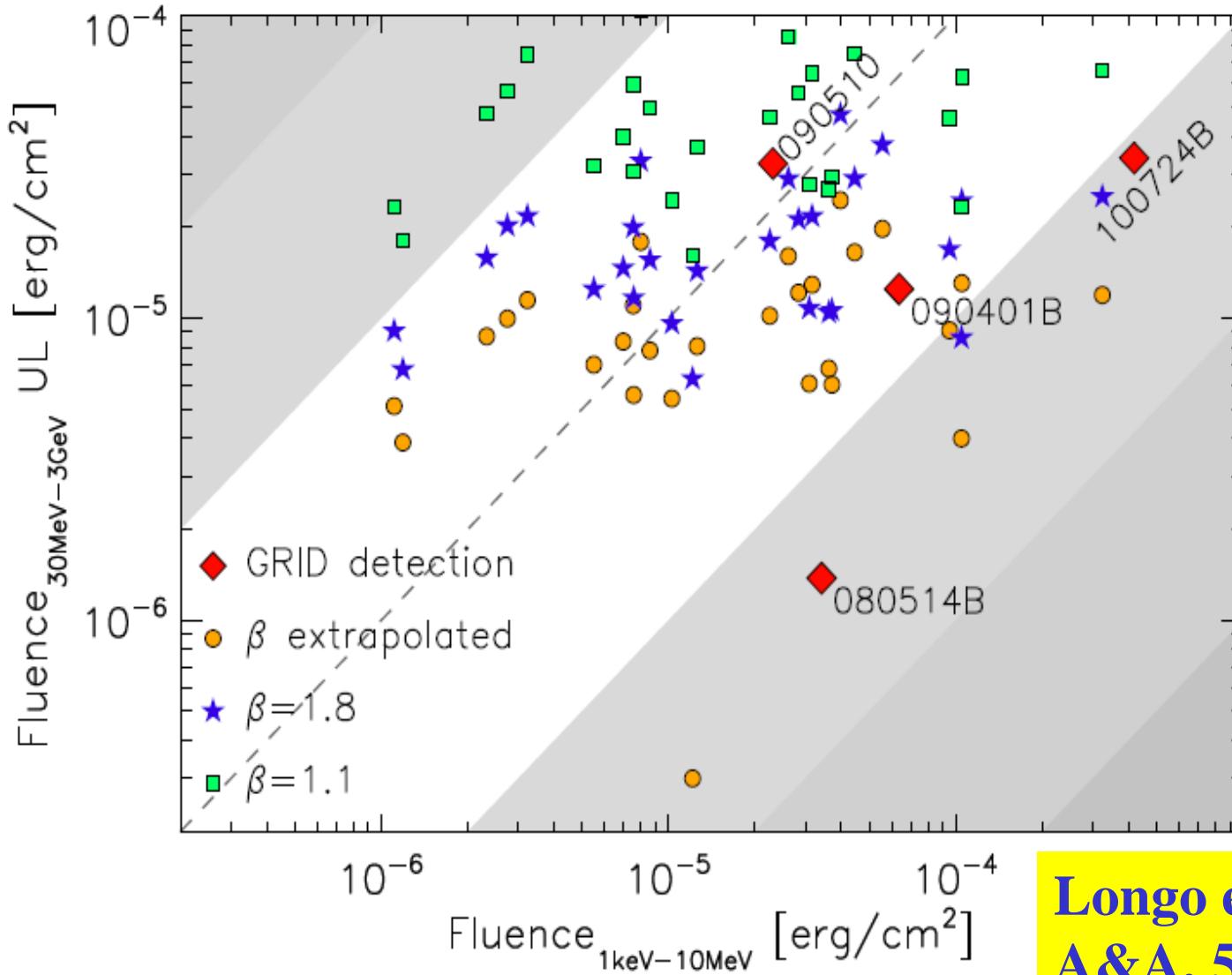


# Upper limits in gamma-rays: the results

- The Upper Limits are estimated with a Bayesian approach for a sample of 68 undetected GRBs from July 2007 until October 2009 with position inside the GRID FoV;
- 40 GRBs have spectral information (from Konus-Wind, Suzaku/WAM and Fermi/GBM), that is used to convert counts into flux;
- In six cases the Upper Limit is stringent with respect to the extrapolation of the GRB spectrum at lower energy;
- The corresponding 3 sigma upper limit is  $\sim 0.03 \text{ ph cm}^{-2} \text{ s}^{-1} \Rightarrow \sim 10^{-7} \text{ erg cm}^{-2} \text{ s}^{-1}$ ;
- A likelihood search of gamma-ray delayed components (up to 3600 s after trigger) for the same events does not give positive results;
- The detection rate of GRBs by AGILE/GRID is discussed and it is found that AGILE observes on average the same population as EGRET.



# GeV emitting GRBs as high fluence events

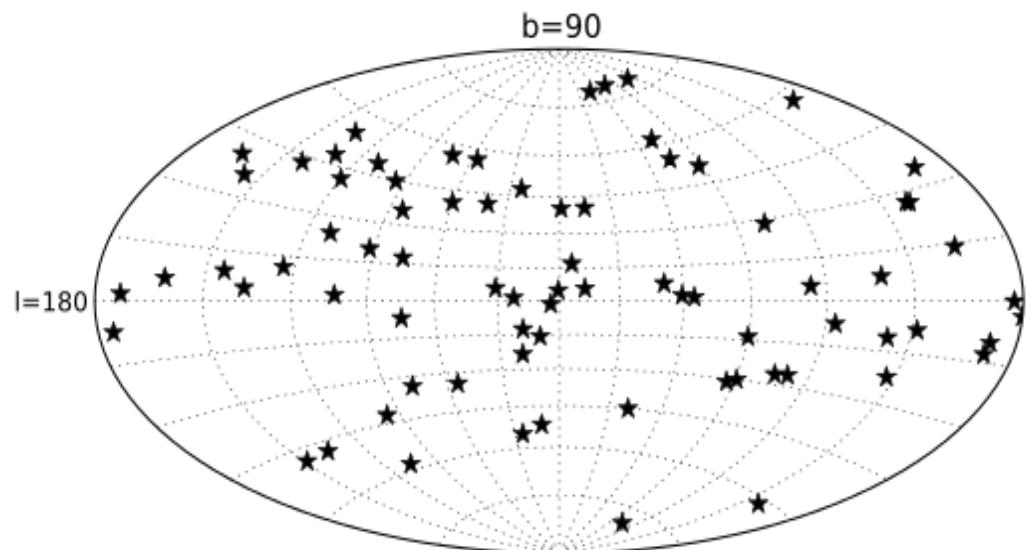


Longo et al. 2012,  
A&A, 547. id.A95



# MCAL GRB catalog

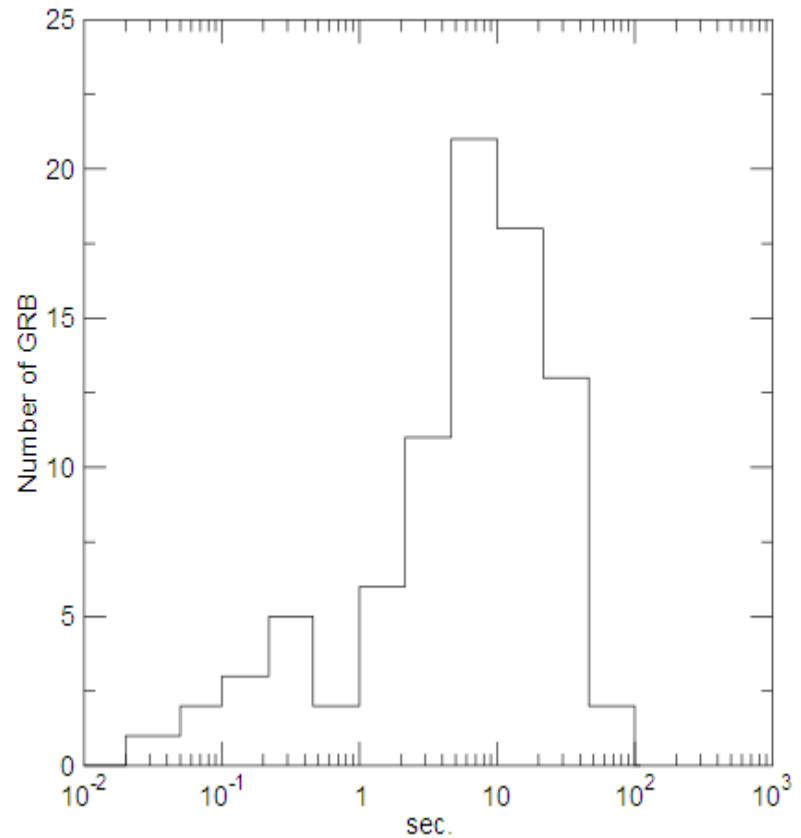
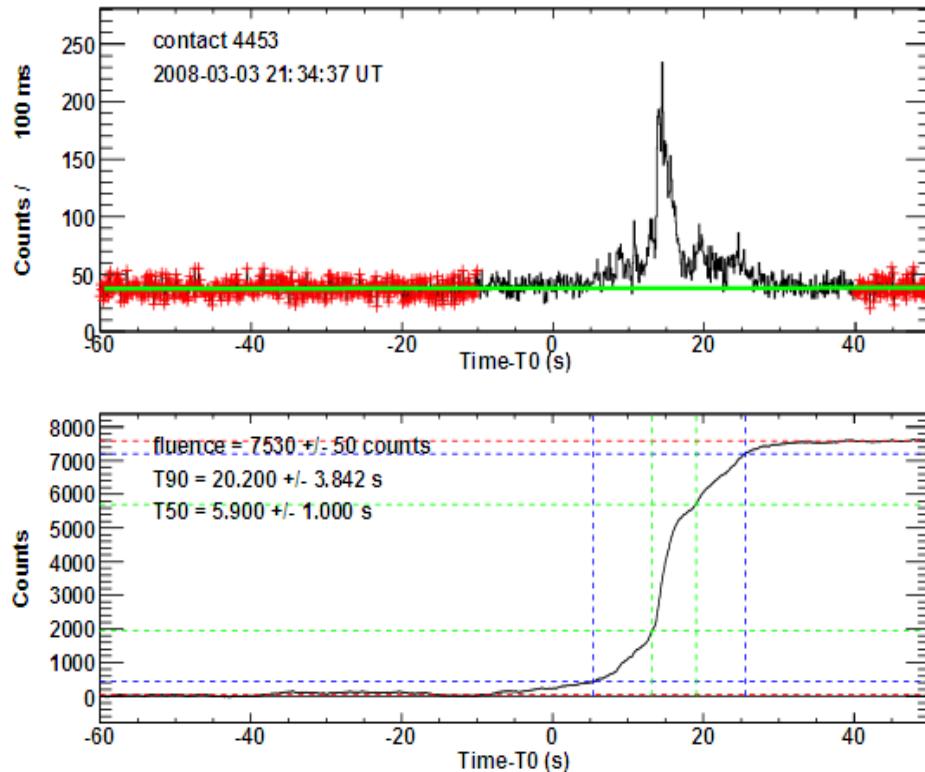
- Contains the data of the 85 hard gamma-ray bursts observed by the MCAL (April 2007 - October 2009)
- Timing data for 84 and spectral data for 21 bursts



Galli et al. 2013,  
A&A, 553, id.A33



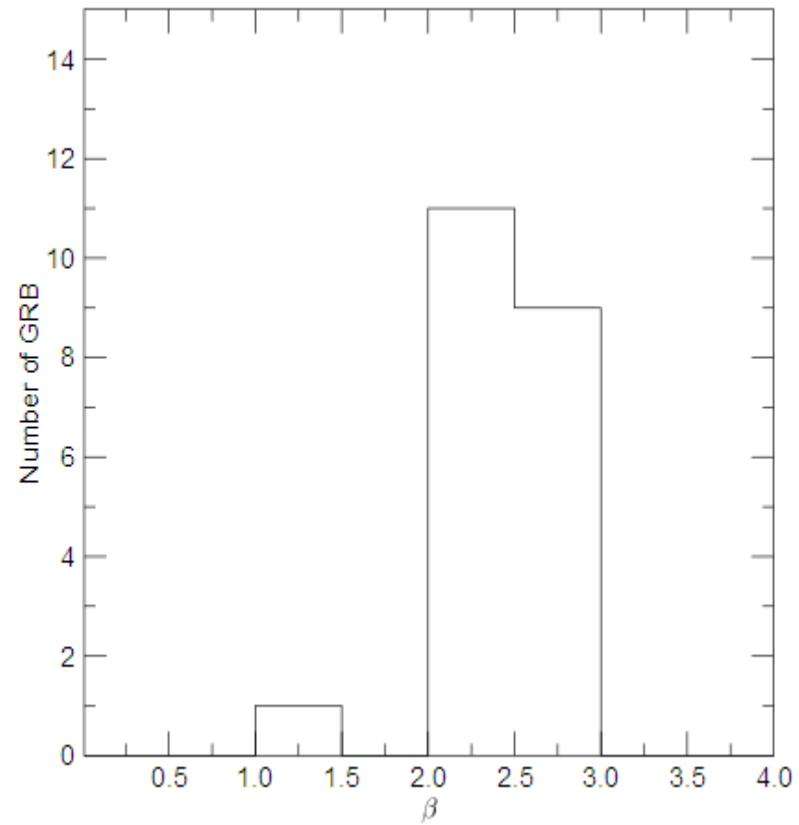
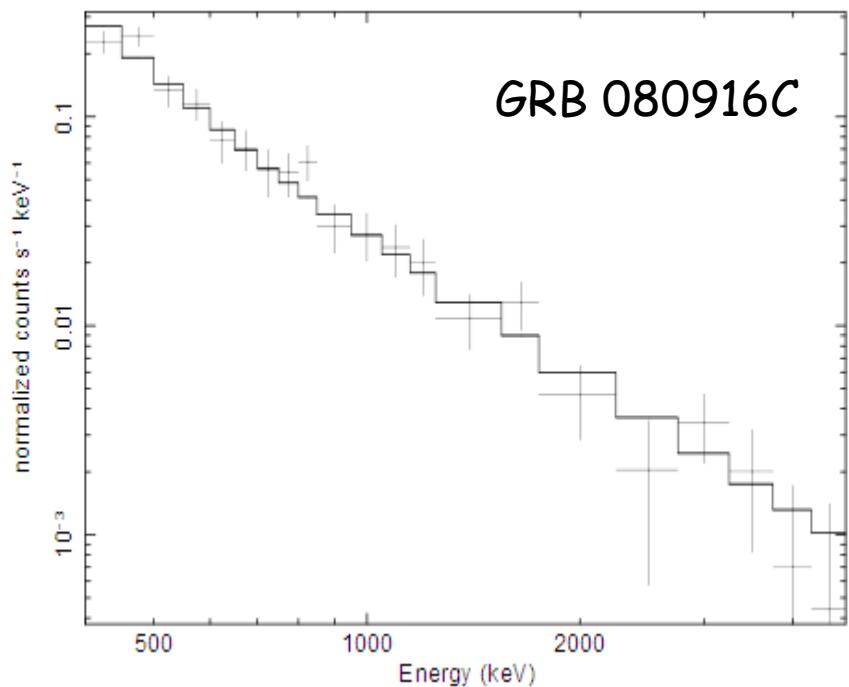
# MCAL GRB catalog – timing analysis



Galli et al. 2013,  
A&A, 553, id.A33



# MCAL GRB catalog – spectral analysis



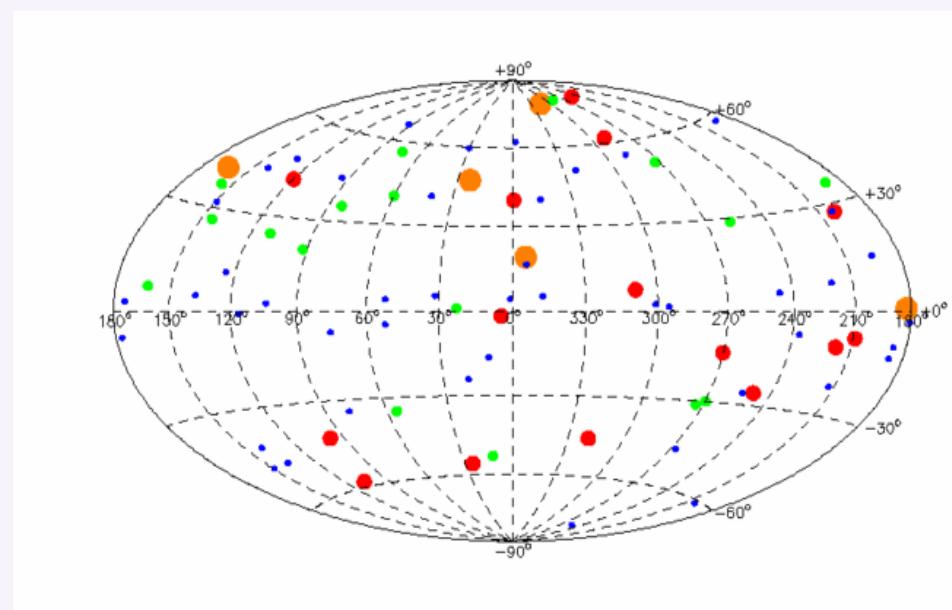
Galli et al. 2013,  
A&A, Volume 553, id.A33



# MCAL GRB catalog

## The AGILE MCAL Gamma-ray Burst Catalog

GRB observed from April 2007 to October 2009  
(AGILE Pointing Mode)



<http://www.asdc.asi.it/mcalgrbcatalog/>



# AGILE and GRBs

- Only a small subsample of GRBs emits in gamma rays: the overall detection rate (AGILE + Fermi) is ~10 events per year (consistent with the expectations of Band et al. 2009);
- GeV emitting are the brightest GRBs ( $\sim 10^{-5}$  erg/cm<sup>2</sup> at keV – MeV) and have high minimum Lorentz factor (600 – 1000);
- Both classes of long (e. g. GRB 080514B, GRB 090401B, GRB 100724B, GRB 130327B, 130427A, 131108A) and short (e. g. GRB 090510) are detected in the gamma energy band.
- Some events have a single spectrum (e. g. GRB 080514B; GRB 100724B) other have additional spectral components (e. g. GRB 090510, 131108A);
- Gamma-ray emitting GRBs seem to be characterised by high fluence and high Lorentz factor. It is still debated if gamma-rays are produced in internal (prompt) or external (afterglow) shocks.
- AGILE detected all the major characteristics of HE GRB (delayed emission, extended emission, power-law extracomponent)



# High Energy emission from GRB in the AGILE/Fermi era

- **Extended emission**
  - **Extra long GRBs**
- **Prompt emission**
  - **Delayed onset ?**
- **Spectral Components**
  - **Extra components**
  - **Multiple components**
- **Ubiquity of HE emission**
  - **Upper Limits in the > 100 MeV regime**
- **Population of HE emitting GRBs?**
  - **Mission in the 10 MeV – 1 GeV crucial**



# Conclusions

- **AGILE crucial contributions to testing particle acceleration theories, plasma instabilities in the Universe and on the Earth !**
  - Big surprise: discovery of gamma-ray flares from the Crab Nebula: 2012 Bruno Rossi Prize
  - Origin of cosmic rays, SNR W44, first direct evidence of neutral pion emission
  - Relativistic jets in microquasars and blazars
  - Gamma-ray emission up to 100 MeV from Terrestrial Gamma-Ray Flashes
  - Extra components in GRBs



# Where to find data?

<http://agile.asdc.asi.it/>

## Welcome to the AGILE Data Center Home Page at ASDC

These pages provide updated information and services in support to the general scientific community for the mission AGILE, which is a small Scientific Mission of the Italian Space Agency (ASI) with participation of INFN, IASF/INAF and CIFS.

AGILE is devoted to gamma-ray astrophysics and it is a first and unique combination of a gamma-ray (AGILE-GRID) and a hard X-ray (SuperAGILE) instrument, for the simultaneous detection and imaging of photons in the 30 MeV - 50 GeV and in the 18 - 60 keV energy ranges.

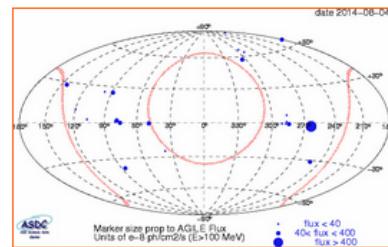
The AGILE Mission Board (AMB) has executive power overseeing all the scientific matters of the AGILE Mission and is composed of:

- AGILE Principal Investigator: Marco Tavani, INAF/IASF Rome (Chair)
- ASI Project Scientist: Paolo Giommi, ASDC
- ASI Mission Director: Giovanni Valentini, ASI
- Former ASI Mission Director: Luca Salotti, ASI (up to September 20, 2010)
- AGILE Co-Principal Investigator: Guido Barbarelli, INFN Trieste
- ASI representative: Elisabetta Tommasi di Vignano
- Former ASI representative: Sergio Colafrancesco (up to June, 2010)

As specified in the [Announcement of Opportunity Cycle-4](#), it is not possible to propose for ToO observations in response to AGILE Announcement of Opportunity.

## AGILE current spinning sky view

(Click here for previous pointing details)



[Click here to access to AGILE Spinning FOV plotter](#)

## AGILE Events

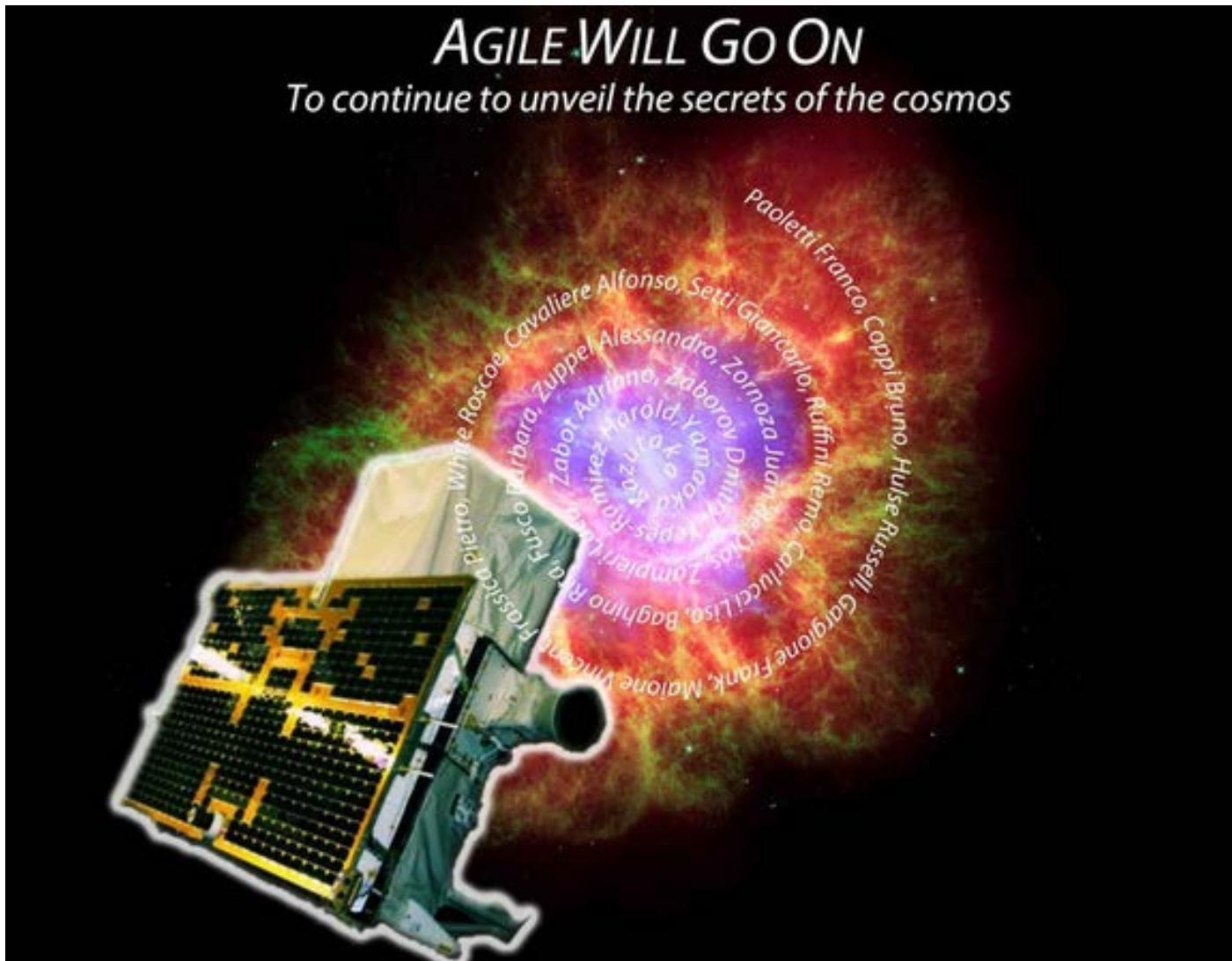




# The future of AGILE

AGILE WILL GO ON

*To continue to unveil the secrets of the cosmos*





# AGILE

**RECENT DETECTIONS**

AGILE detects enhanced gamma-ray activity of the Blazar 3C 454.3 ATel # 6182

Confirmation by AGILE of increased gamma-ray emission from the blazar 3C 279 ATel # 5682

After a gamma-ray flare, AGILE detects the Crab Nebula returning to the normal flux level ATel # 5506

AGILE detection of increasing gamma-ray emission from the blazar PKS 1510-089 following an optical/near-infrared flare ATel # 5422

AGILE confirmation of the increasing gamma-ray activity from 4C +38.41 (BZQ J1635+3808) ATel # 5234

Home    AGILE Team    AGILE in ASI    AGILE Data Center    Contacts    AT reserved

Time elapsed since the AGILE launch on April 23, 2007 at 10:00 GMT

Days	Hours	Mins	Secs
2599:23:35:37			

Last Science Workshop: May 8-9, 2014

<http://agile.rm.iasf.cnr.it/>

F.Longo et al. -- 71