



Galactic Gamma-ray Sources with AGILE

ASTRO-Siesta, INAF-IASF Sezione di Milano,
July 3, 2008

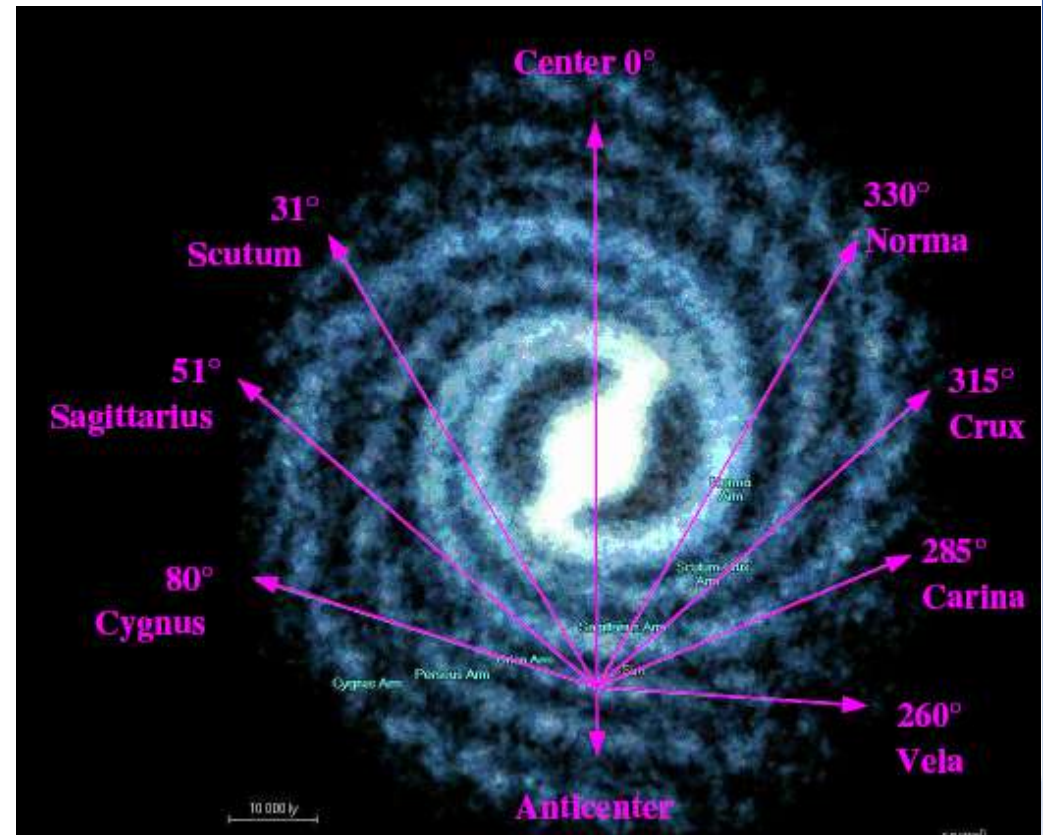
Andrew Chen

on behalf of the AGILE Galactic
Working Groups

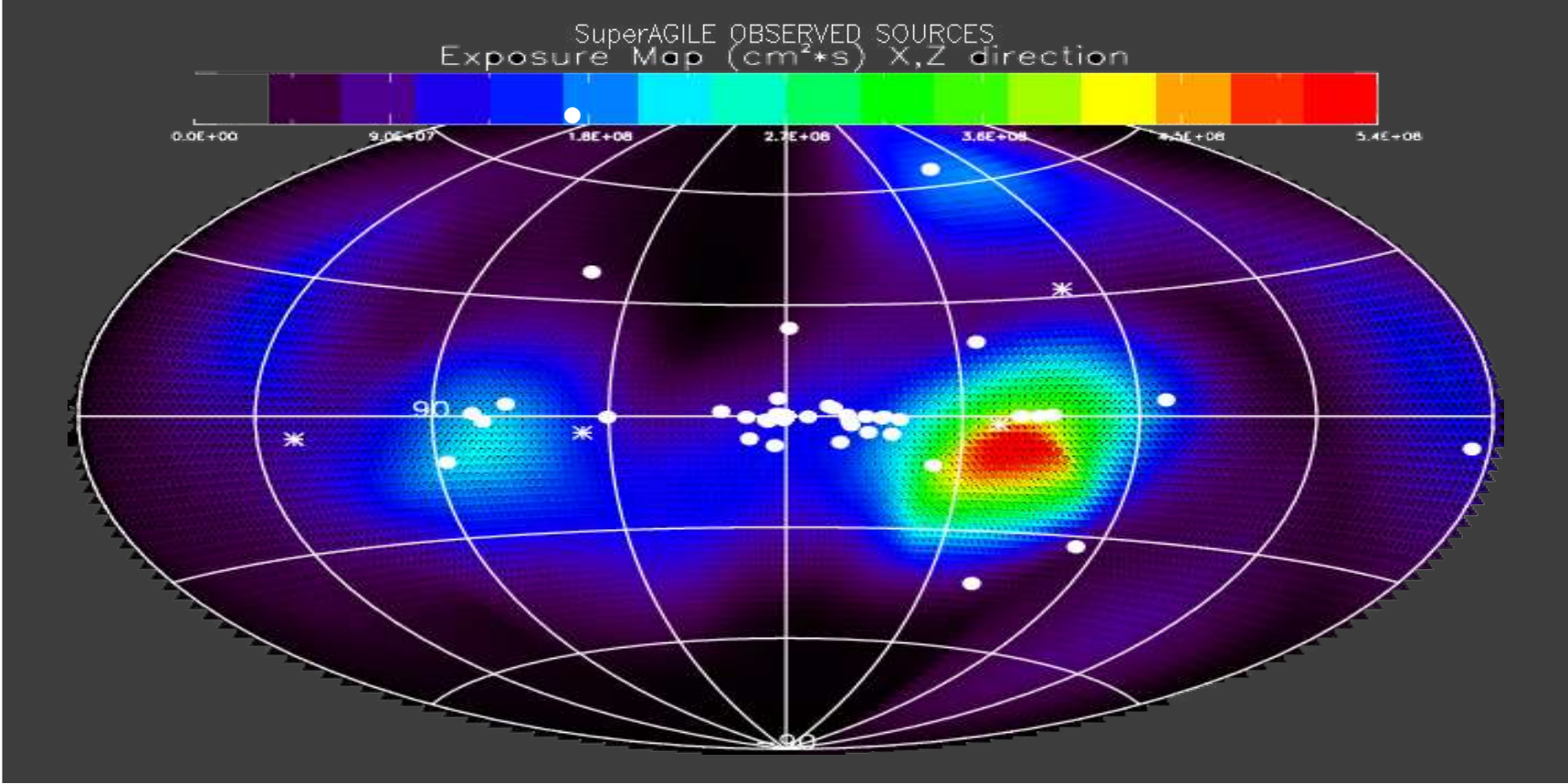
CIFS / INAF-IASF Sezione di Milano

Outline

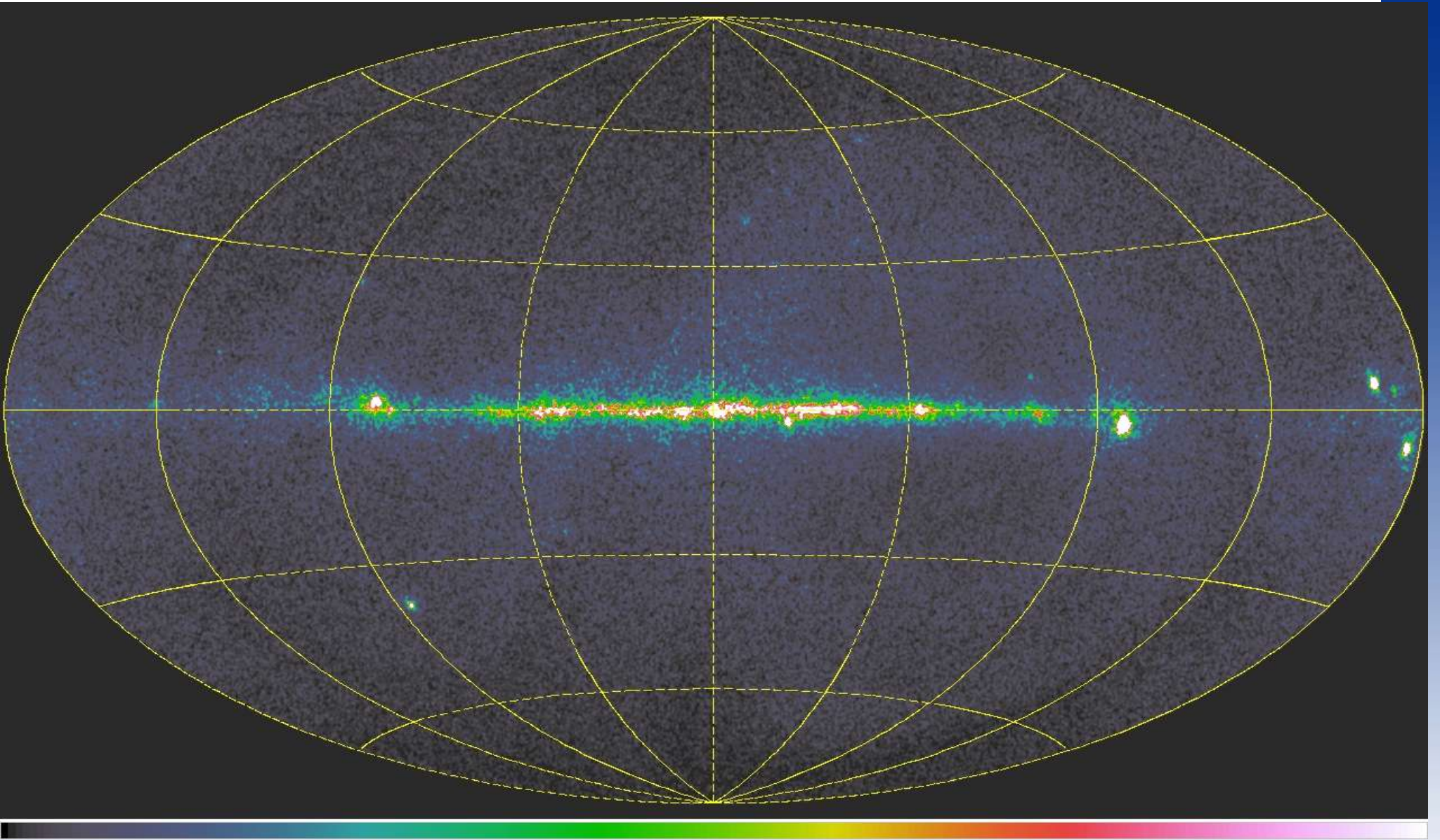
- Cygnus Region
 - Cyg X-3 et al
 - Nov. Transient
- Galactic Center
- GRS 1915+105
- Crux & Carina
 - GX 301-2
- Anticenter Region
 - SNR IC 443
 - Molecular Clouds
 - LSI +61°303
- Interstellar Diffuse Emission



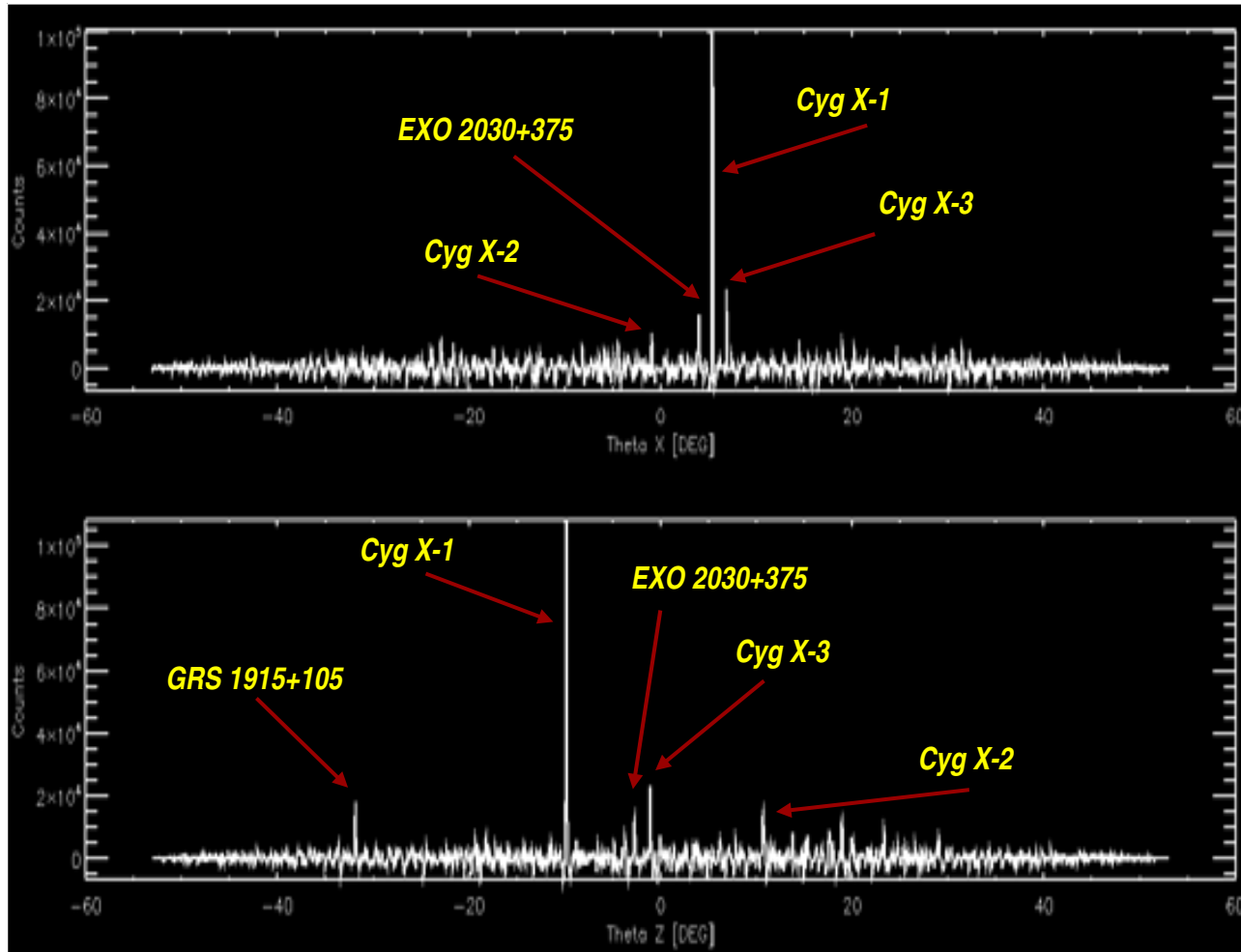
SuperAGILE sky-map



Gamma-ray sky after one year as seen by AGILE



Cygnus - SuperAGILE



Cygnus X-3

15 - 18 April 2008

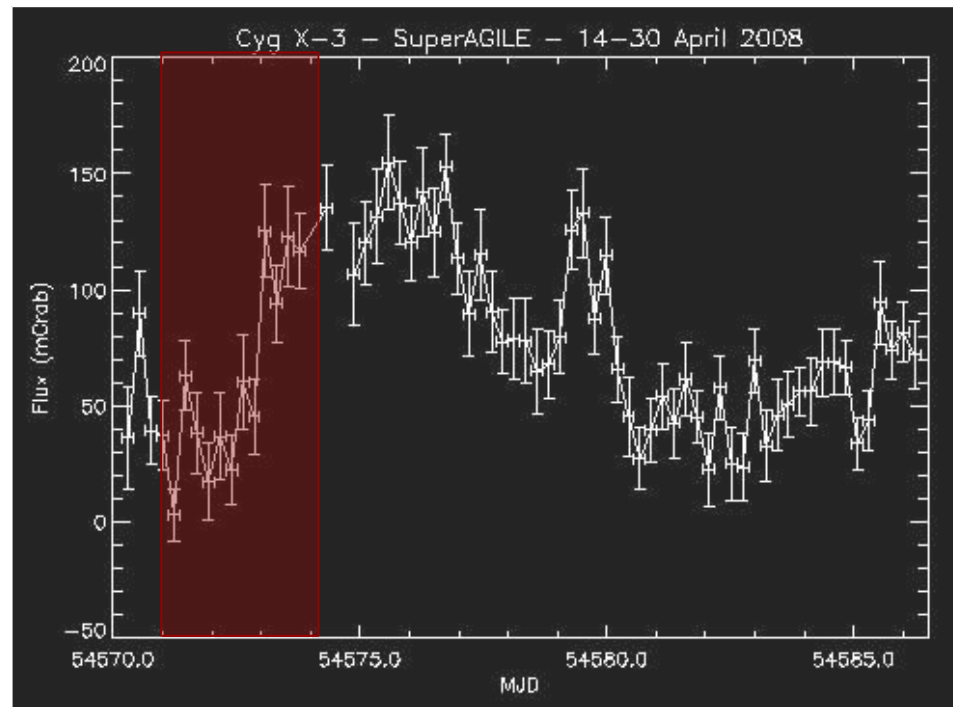
Giant radio flare of Cygnus X-3 detected by RATAN-600 radio telescope

Radio flux increasing of a factor $\sim 10^3$, from ~ 10 mJy to ~ 10 Jy

S.A.Trushkin et al., ATel #1483

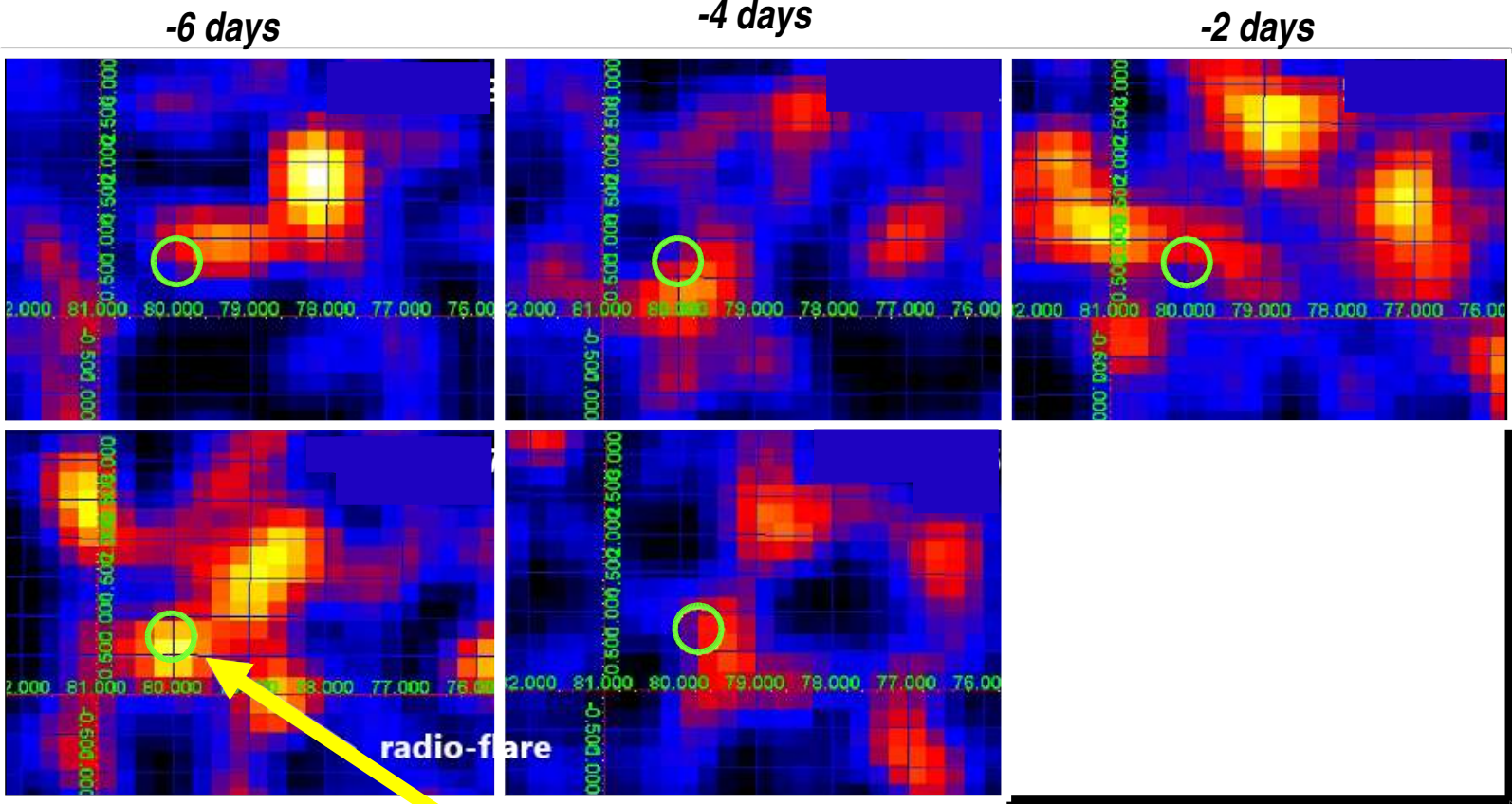
10 Jy is typical flux for plasmoids emission !

In the same period SuperAGILE
revealed an X-ray flare



Cygnus X-3

GRID Images (50 MeV – 50 GeV) around day 18 April 2008



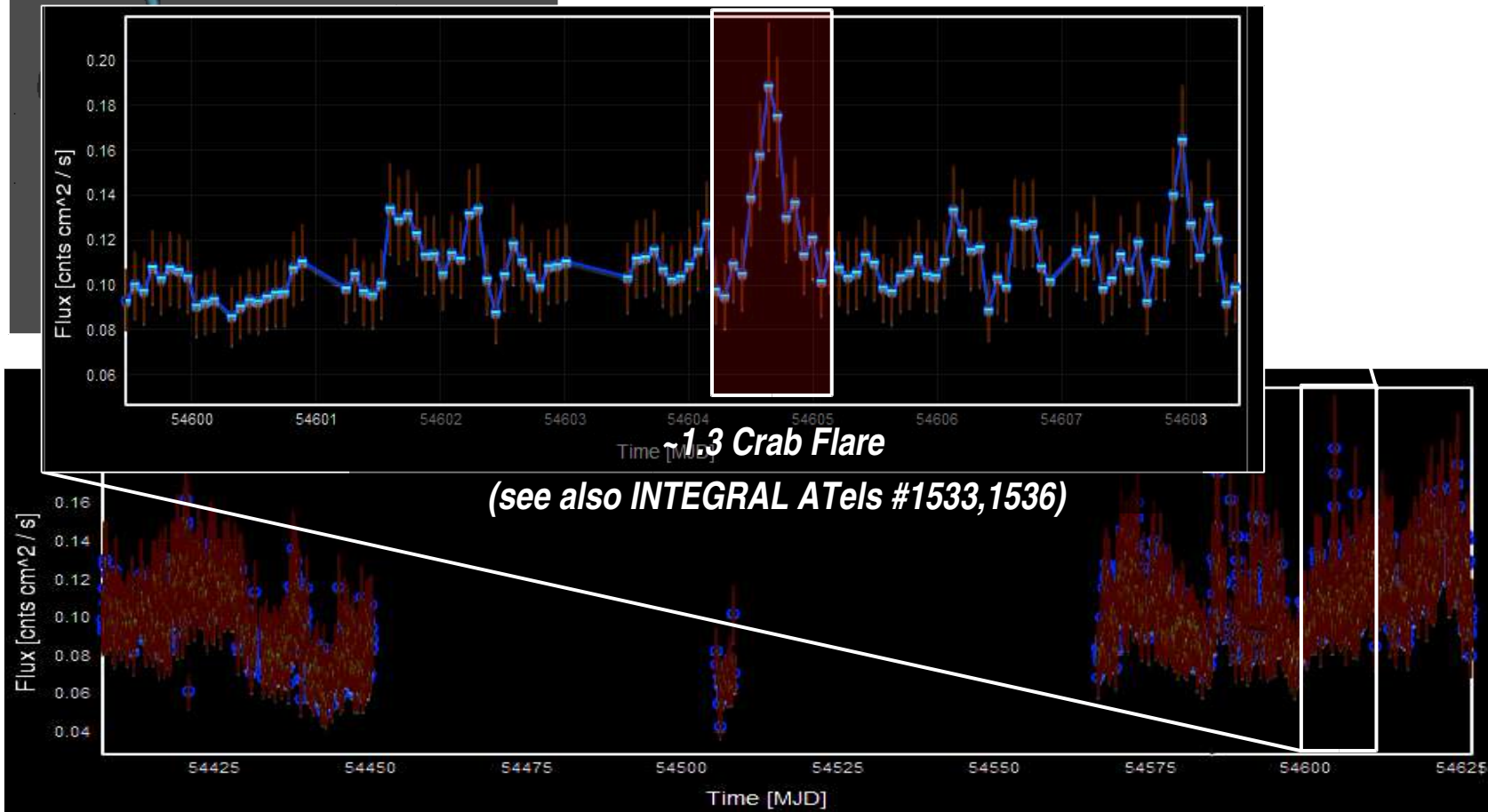
18 April 2008

Cyg X-1

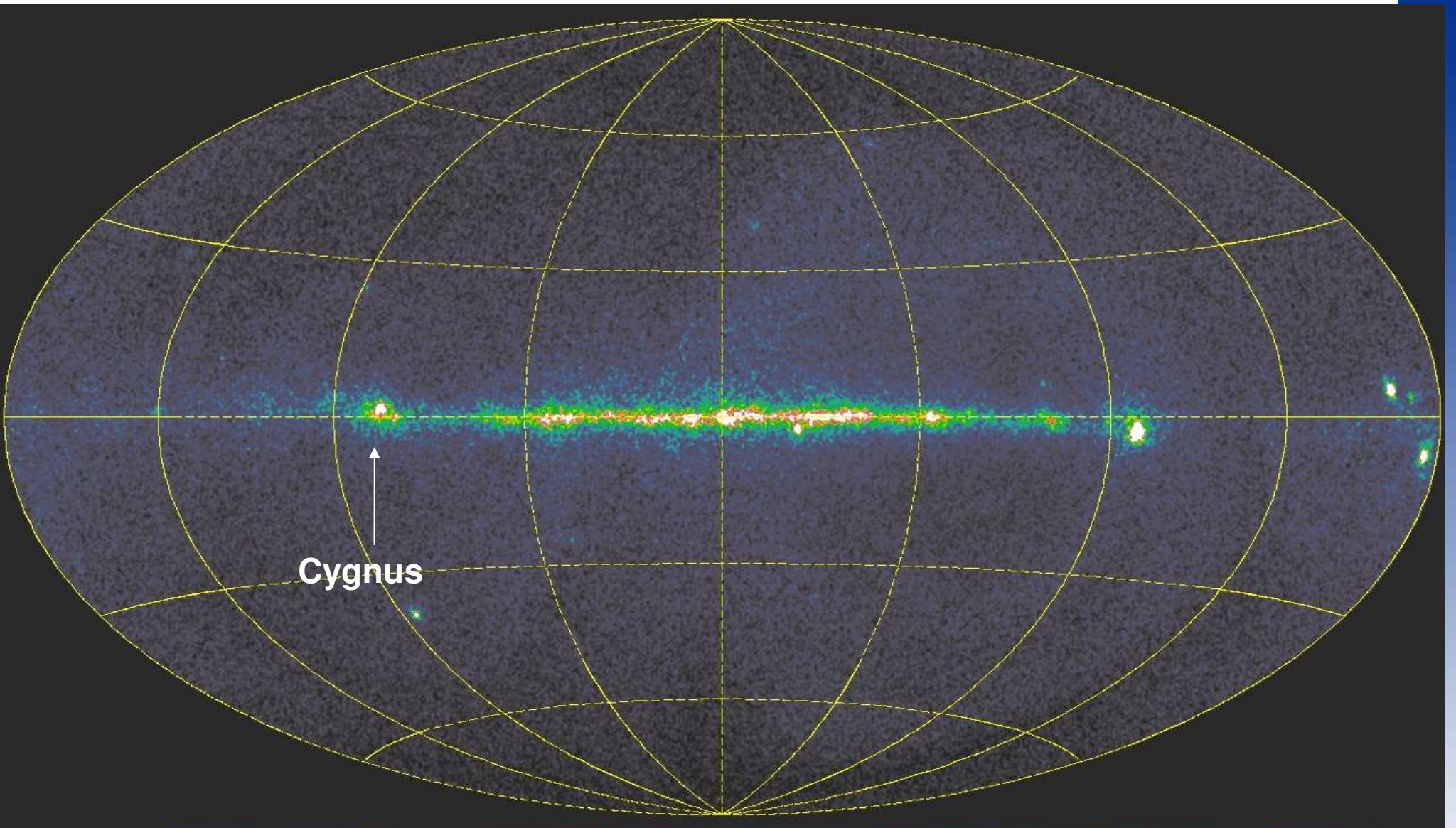


Likely the longest continuous hard X-ray monitoring of Cyg X-1

Total Observation Time: ~ 4.5 Ms (1196 Orbits)

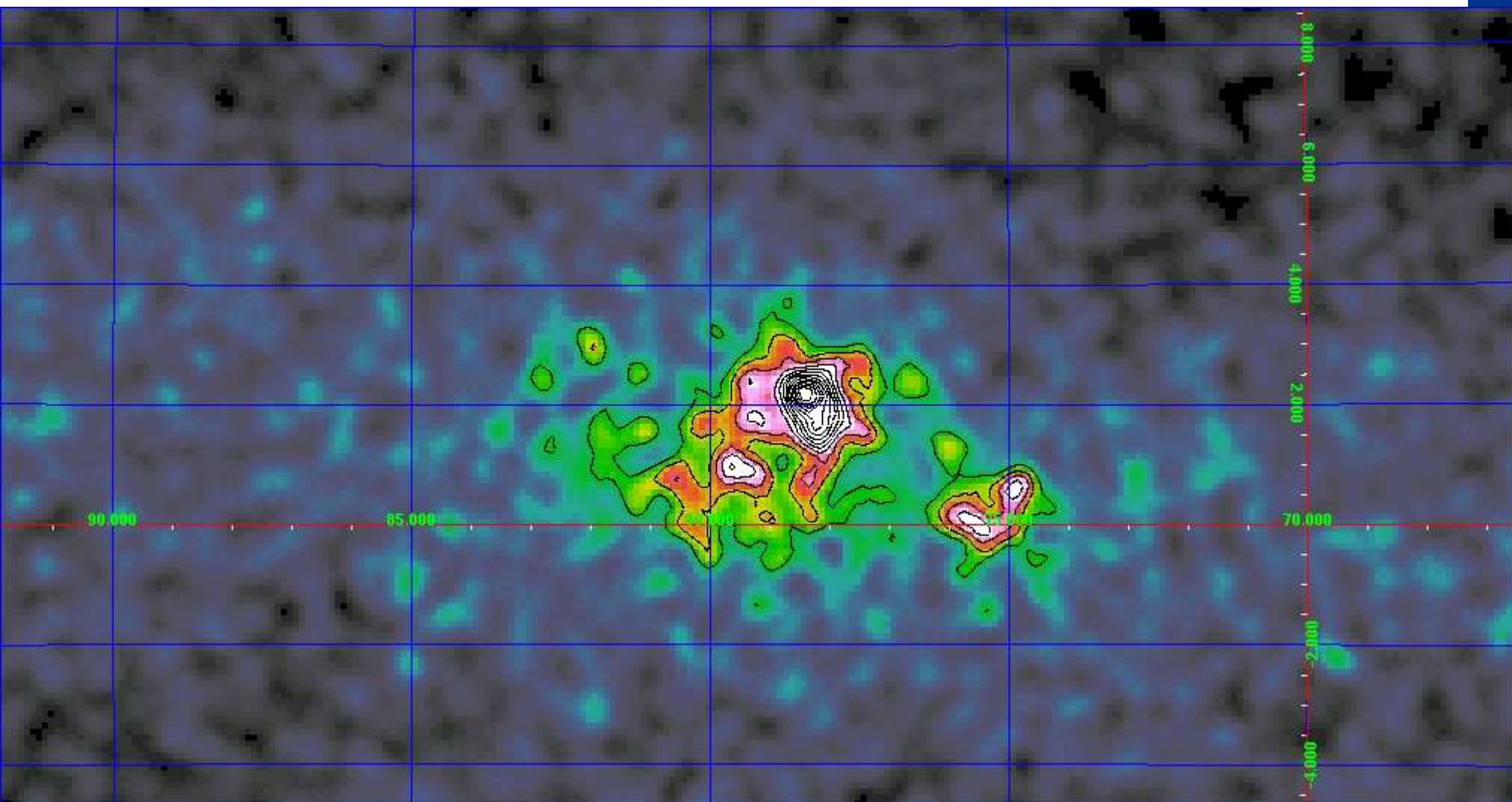


Cygnus region



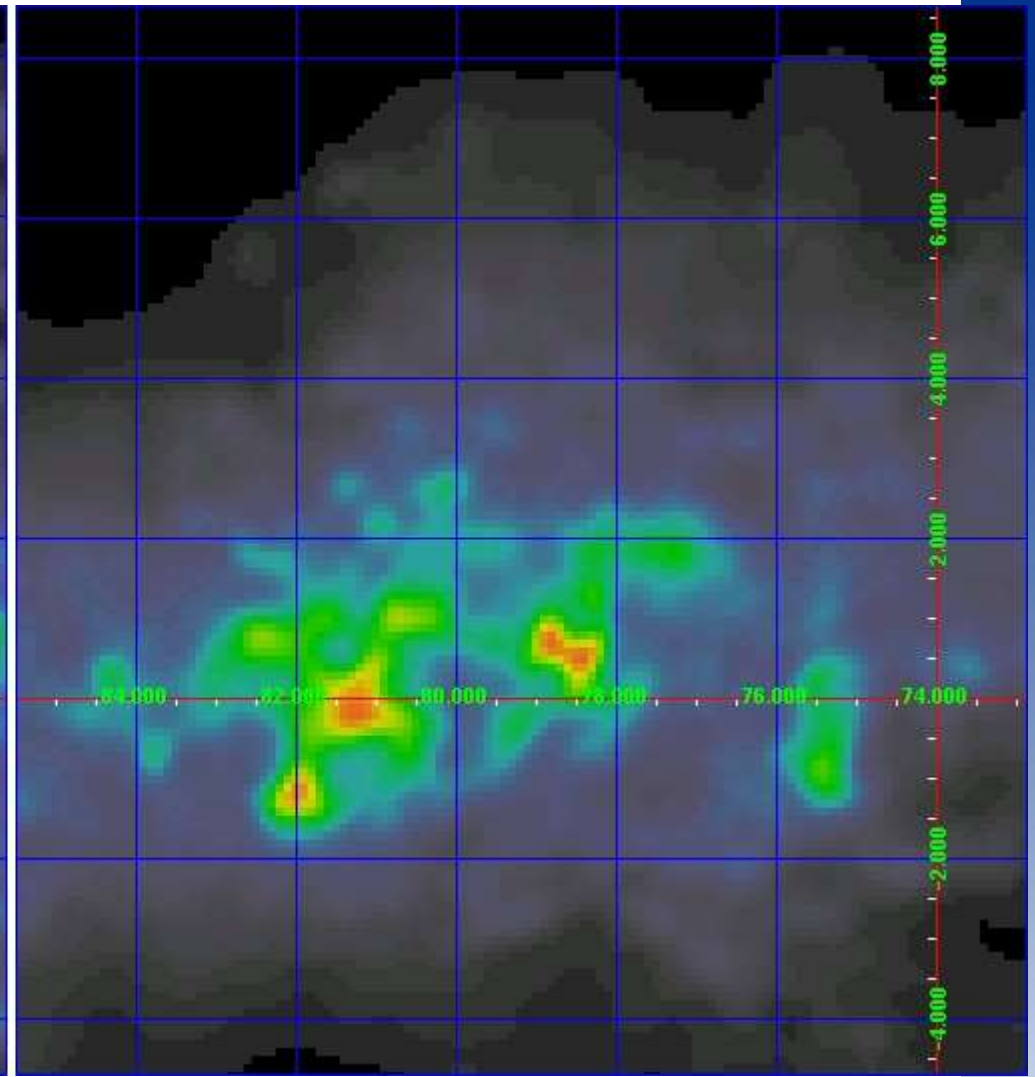
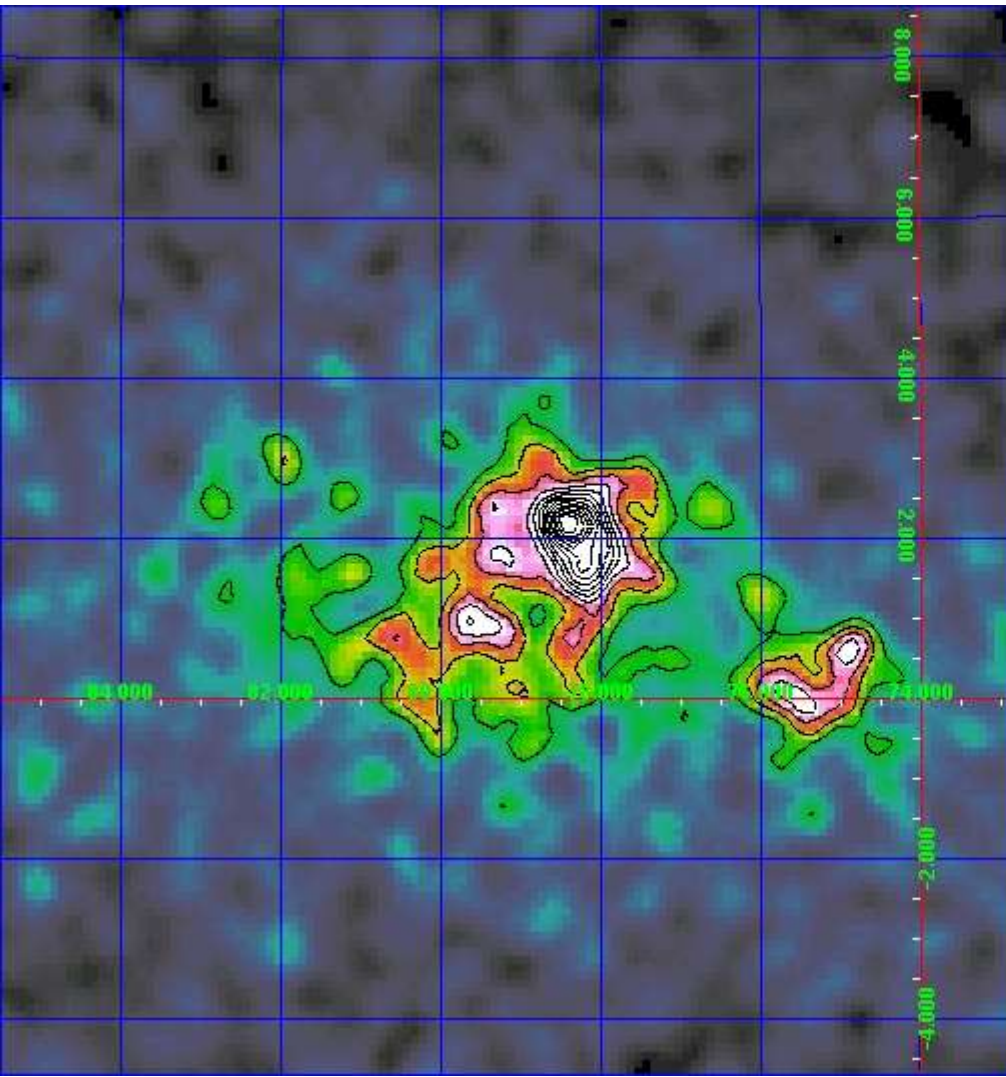
Cygnus Region

2007 - 2008



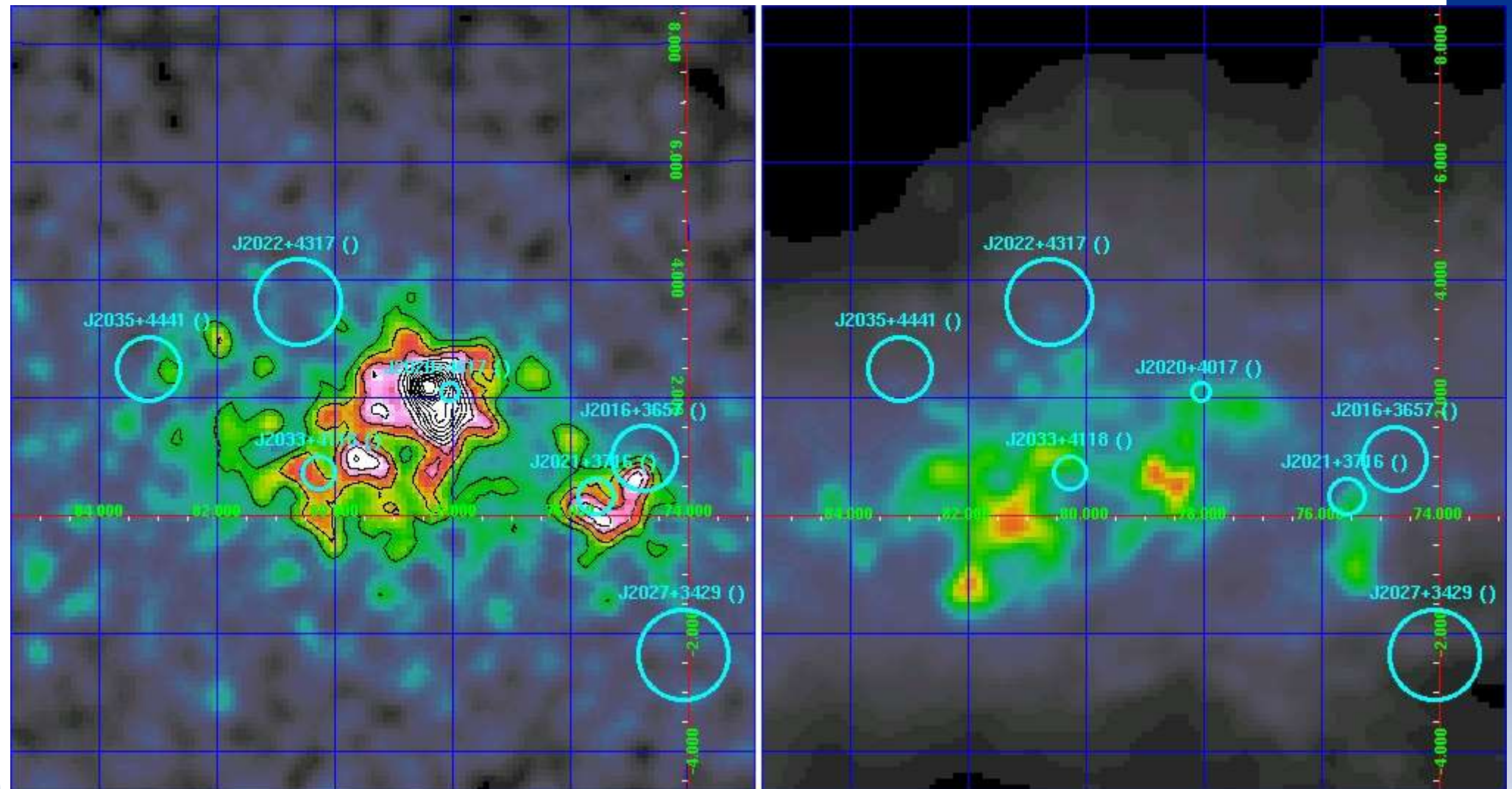
Cygnus Region

2007 - 2008



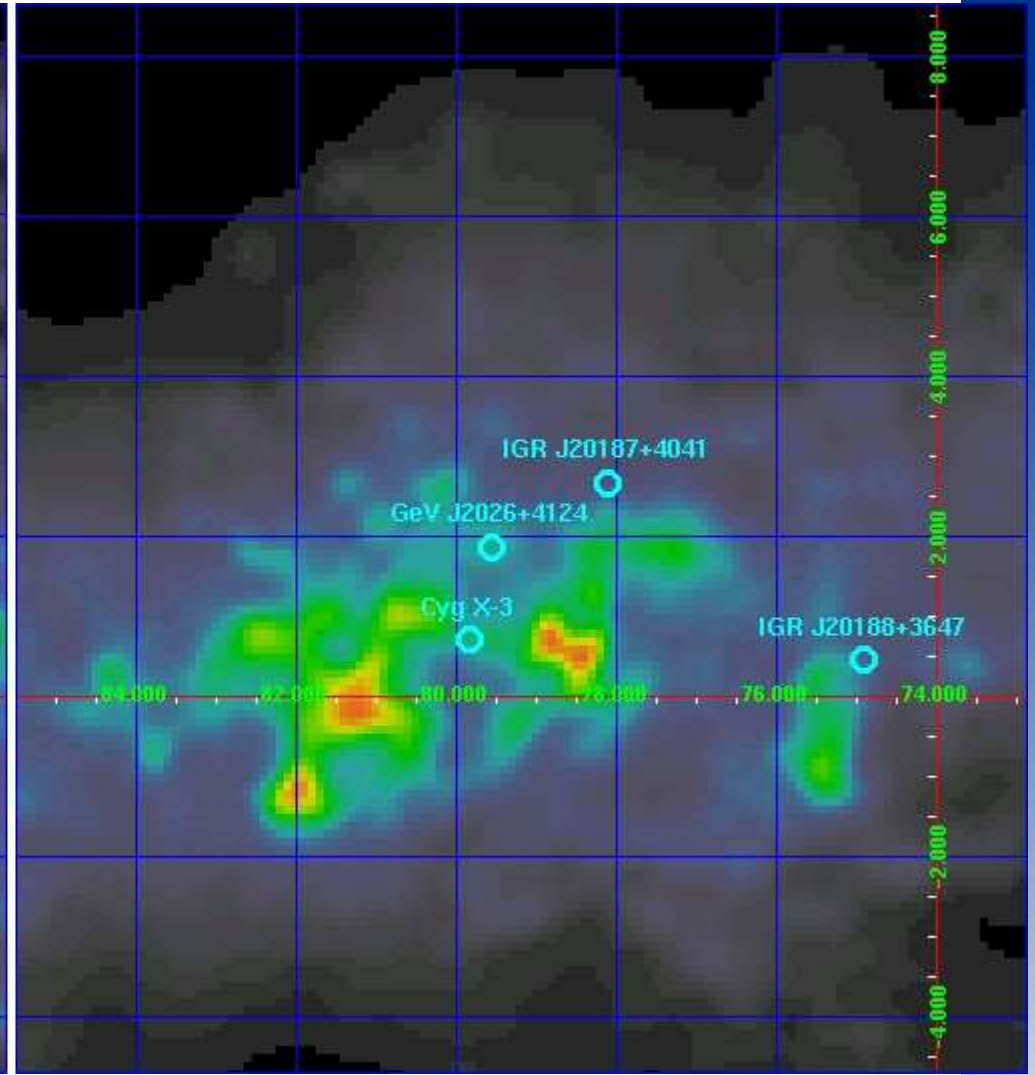
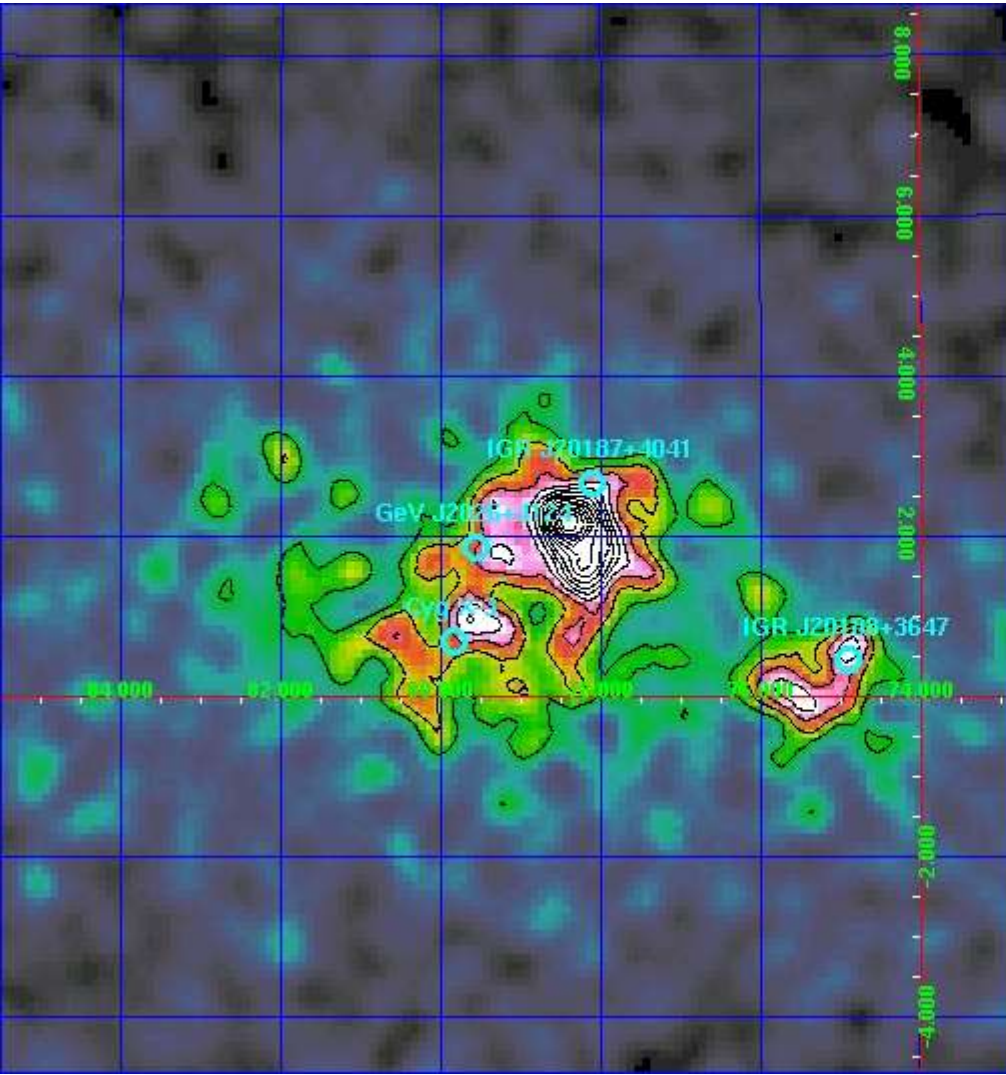
Cygnus Region

2007 - 2008



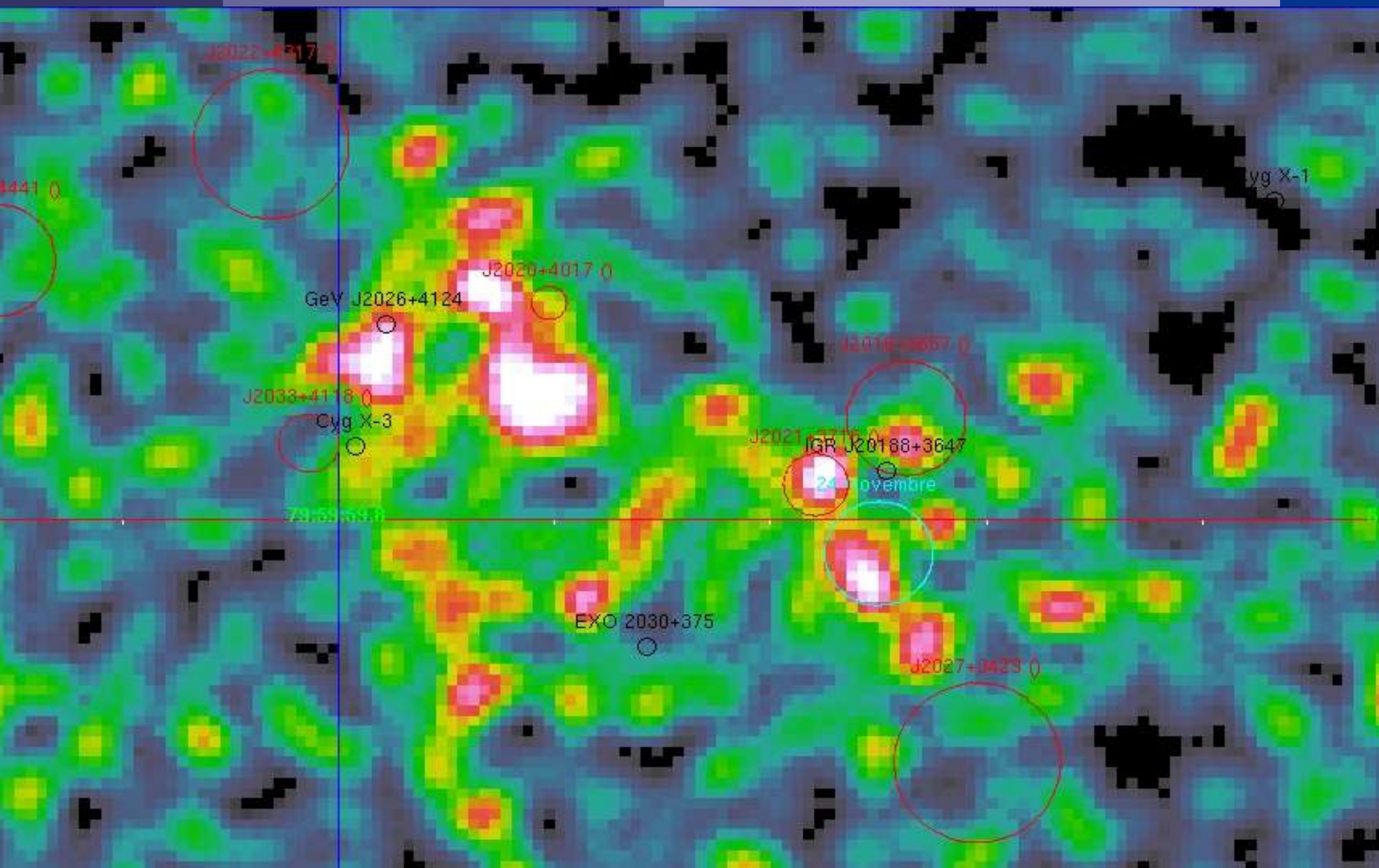
Cygnus Region

2007 - 2008



Cygnus Region

Nov 18-28, 2007



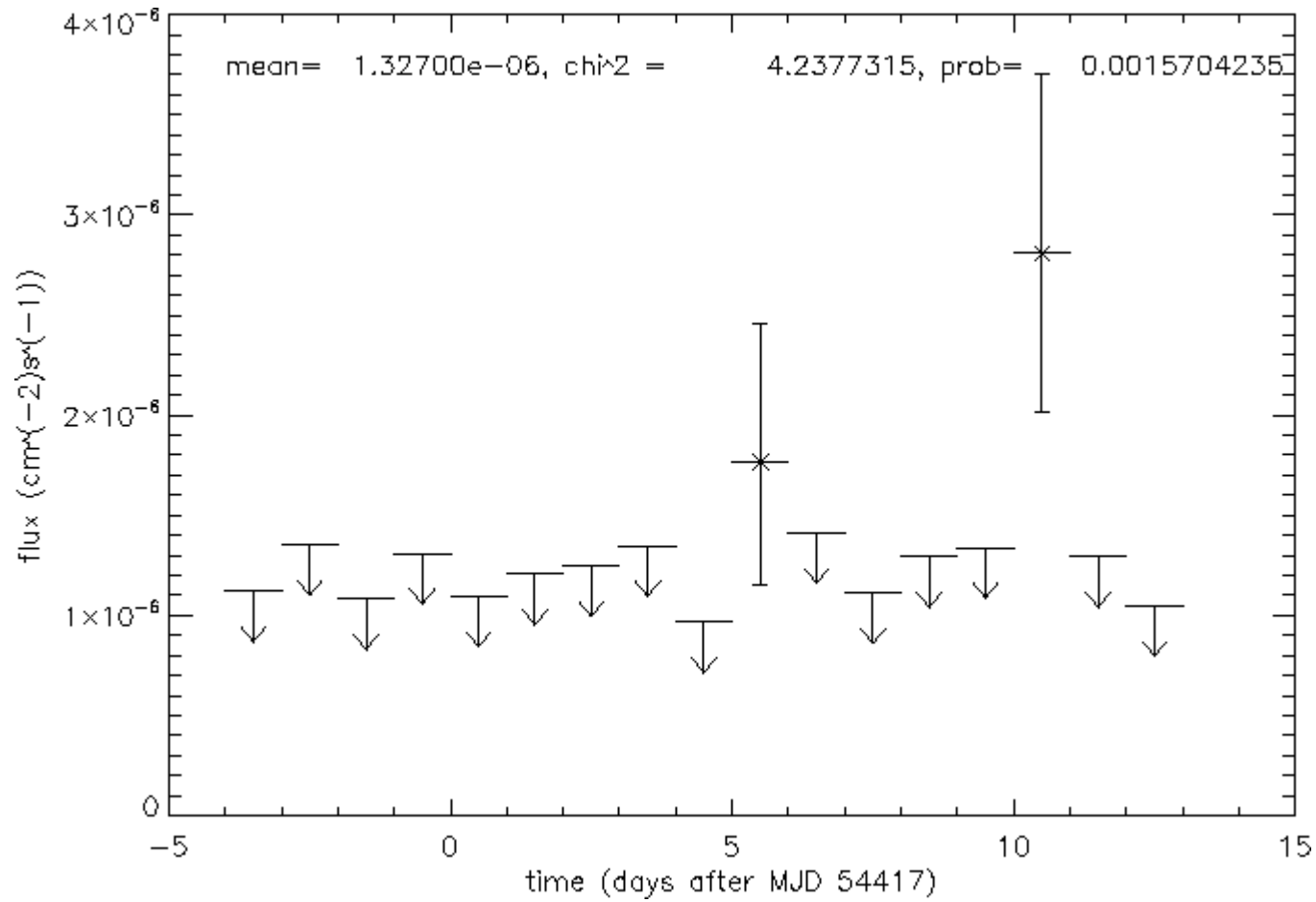
AGLJ2022+3622

- ATEL #1308 Chen et al.
 - AGILE gamma-ray detection of a strongly variable source in the Cygnus region
- Observed November 9-25, 2007
- 1-day flare on November 23-24, 2007
- Significance and flux
 - $(2.6 \pm 1.0) \times 10^{-6} \text{ cm}^{-2} \text{ s}^{-1}$ at 3.8σ
- Position $(l,b)=(75.0,-0.4)^\circ$, error $\sim 1^\circ$

AGLJ2022+3622 -- Possible Source Counterparts

- 3EG J2021+3716 = GeV J2020+3658
 - (Roberts et al. 2002)
 - Pulsar Wind Nebula PSR J2021.1+3651
 - No day-scale variability expected
- 3EG J2016+3657 = B2013+370 (G74.87+1.22)
 - (Halpern et al. 2001)
 - Blazar outside error box
- MGRO J2019+37
 - MILAGRO TeV source
 - extended and diffuse
- IGR J20188+3647 (Sguera et al. 2006)
- Other

AGLJ2022+3622 -- Light Curve

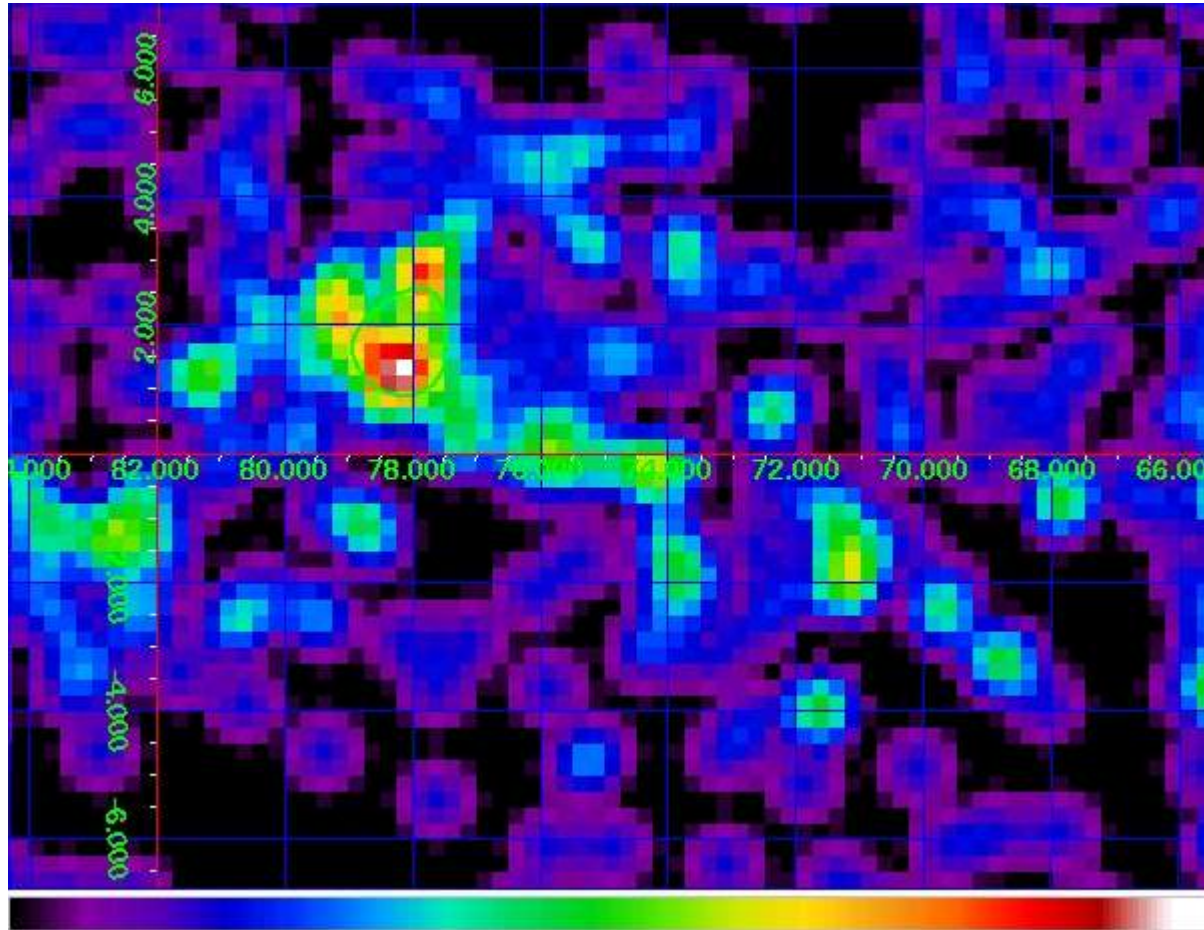


AGLJ2020+4019

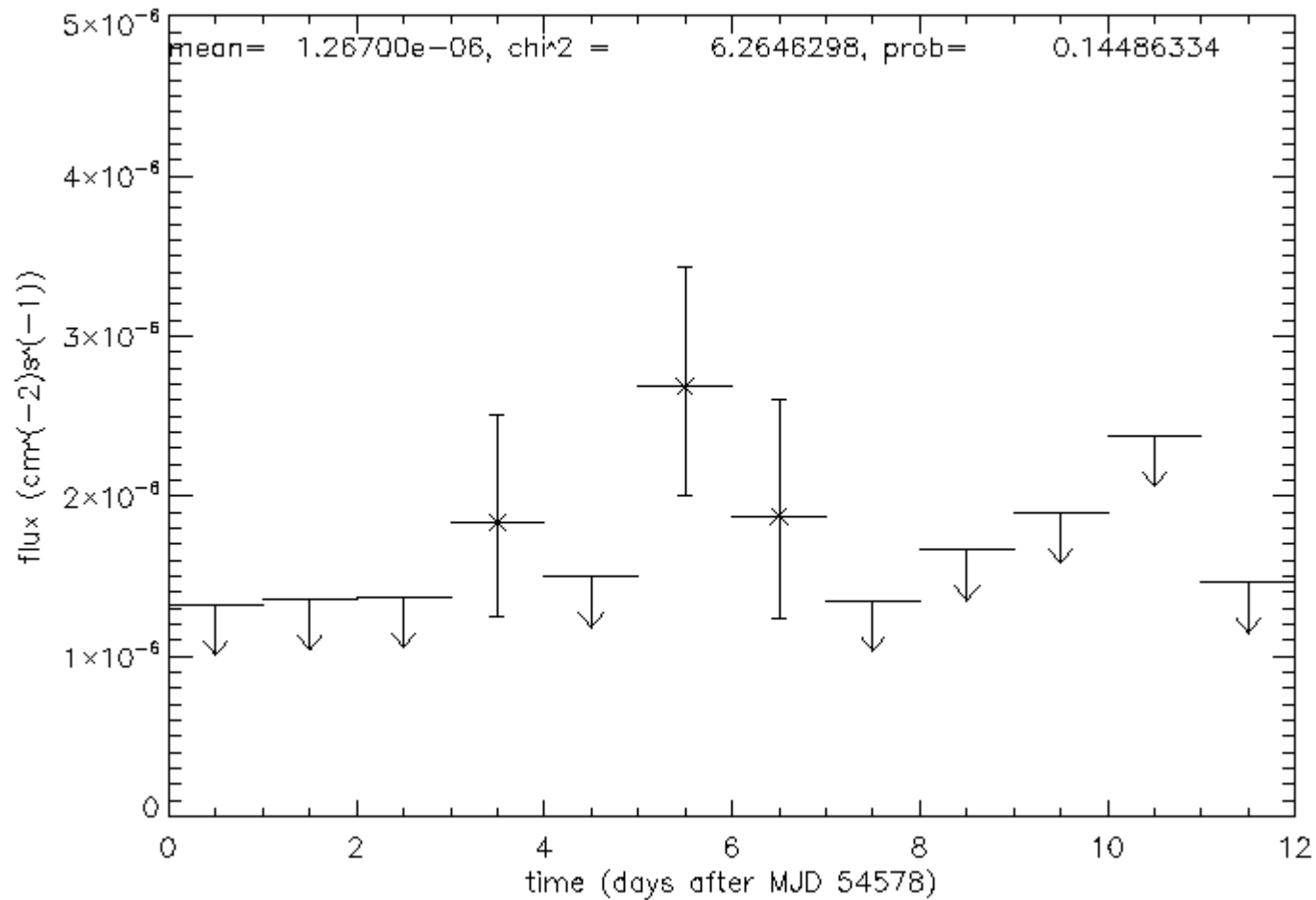
- Cygnus Region
- Persistent Emission
 - $(1.27 \pm 0.08) \times 10^{-6} \text{ cm}^{-2} \text{ s}^{-1}$ at 19σ
 - Position: $(l,b) = (78.31, 2.05)^\circ$, error $\sim 0.25^\circ$
- 1-day flare on April 27-28, 2008
 - $(2.9 \pm 0.8) \times 10^{-6} \text{ cm}^{-2} \text{ s}^{-1}$ at 3.7σ
 - Position: $(l,b) = (78.1, 2.0)^\circ$, error $\sim 0.8^\circ$
- 3EGJ2020+4017
- 2MASX J20183871+4041003 = IGR J20187+4041
 - Swift/XRT ToO shows that source is variable

	26/03/06	29/04/08	28/05/08	29/05/08
Counts/s	0.021+/-0.003	0.025+/-0.004	0.040+/-0.003	0.029+/-0.003
Flux		2.3e-12	4.4e-12	3.3e-12

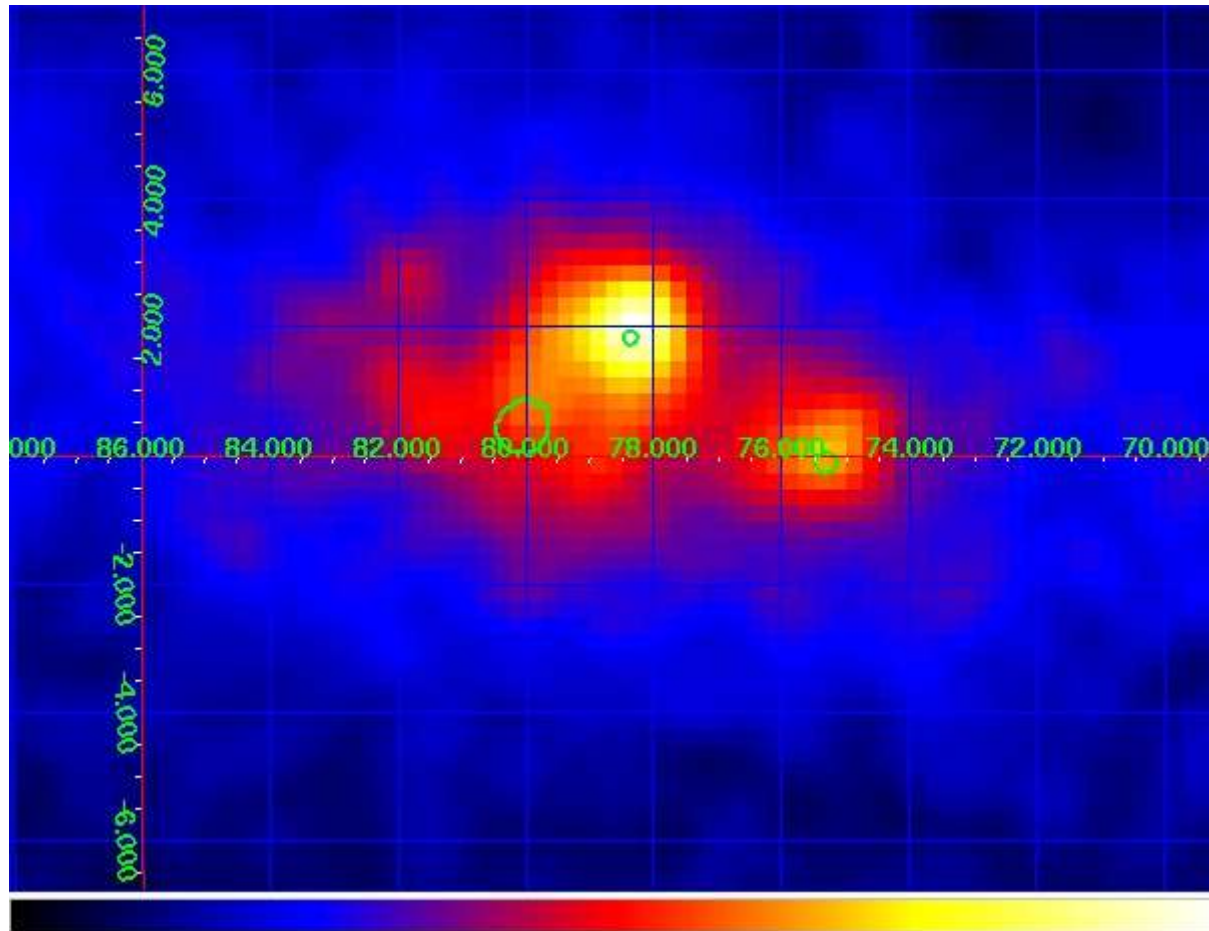
AGLJ2020+4019 -- April 27-28, 2008 Counts Map



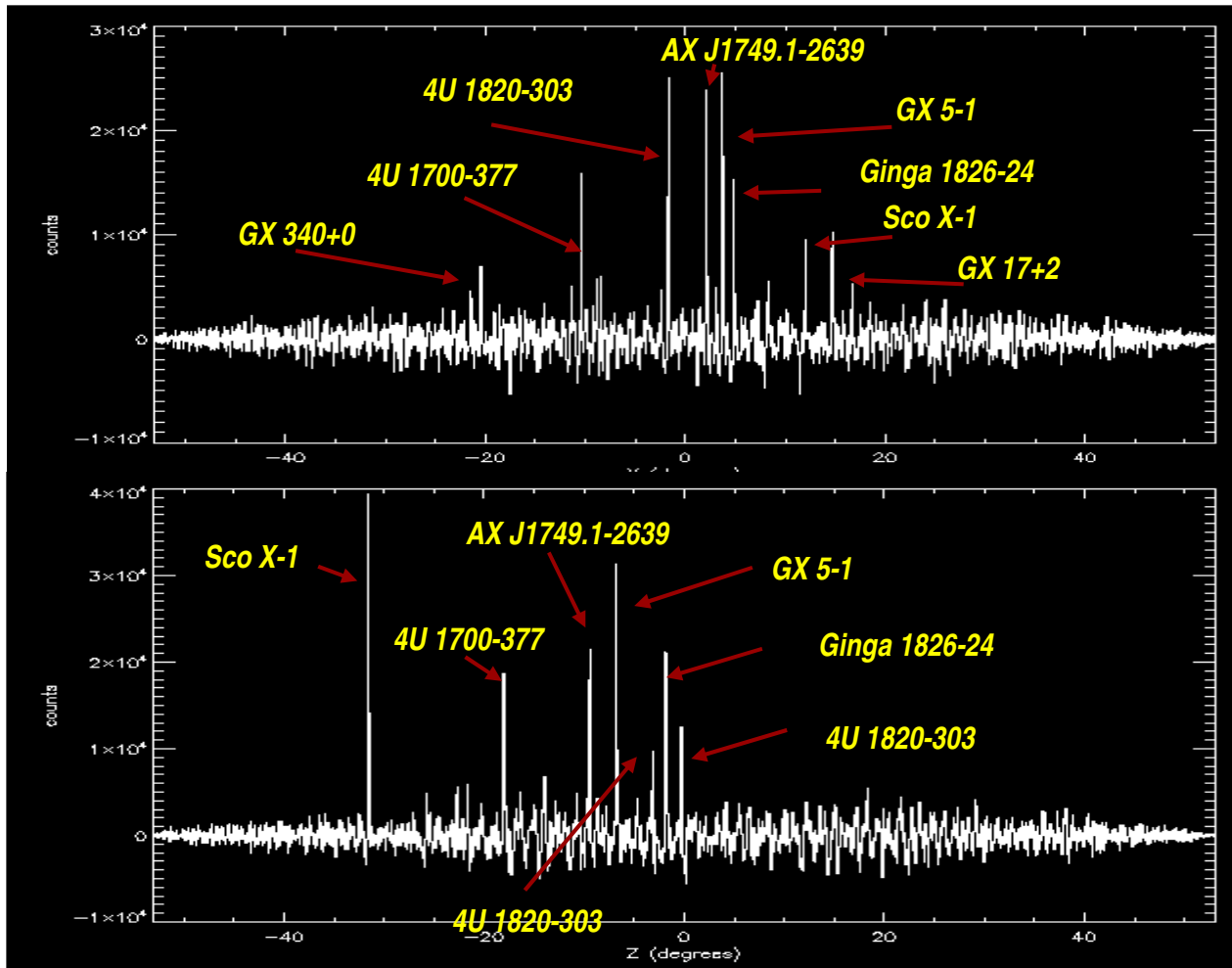
AGLJ2020+4019 -- April 27-28, 2008 Light Curve



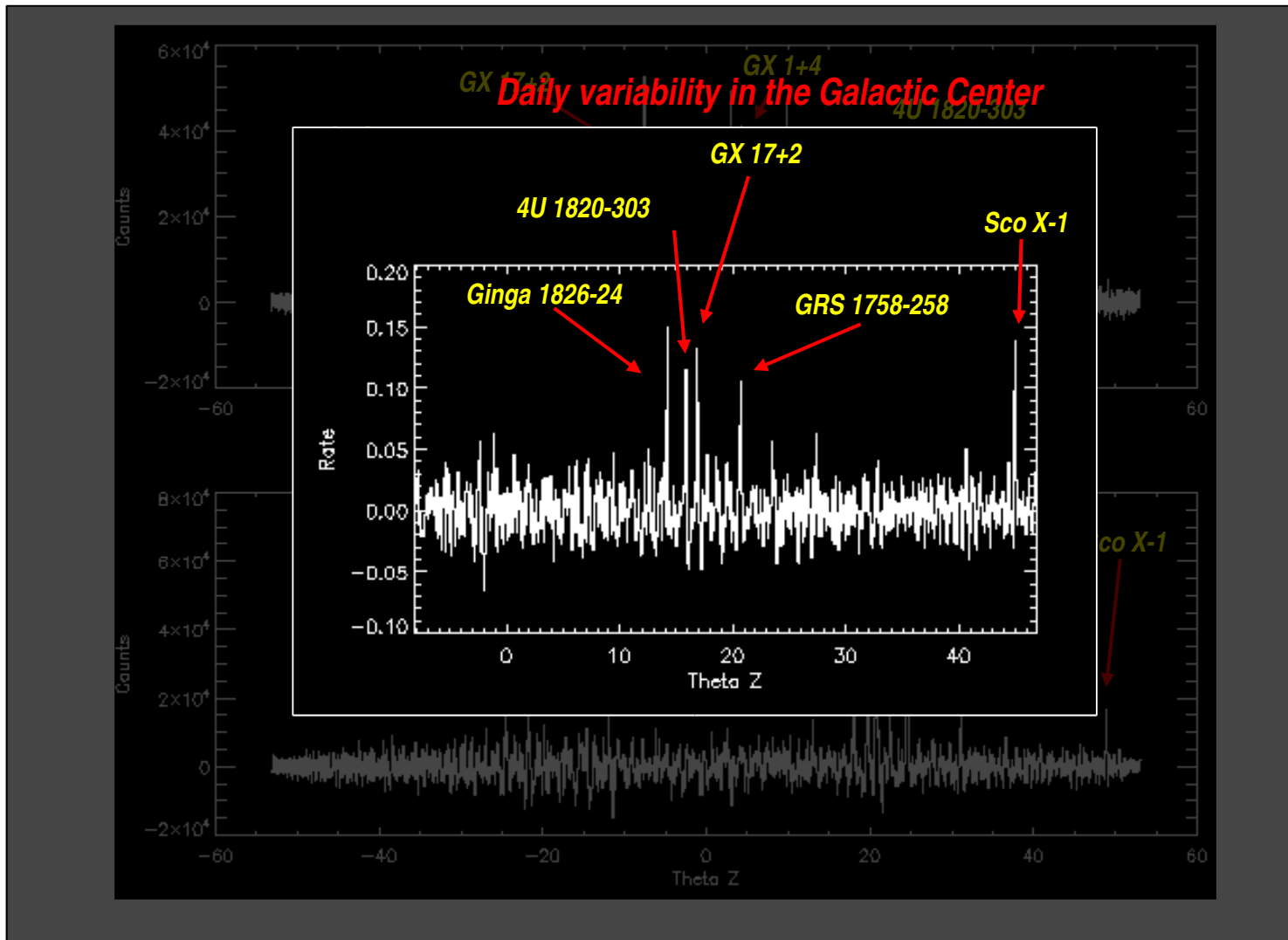
Cygnus region



Galactic Center as seen by SuperAGILE - I



Galactic Center as seen by SuperAGILE - II

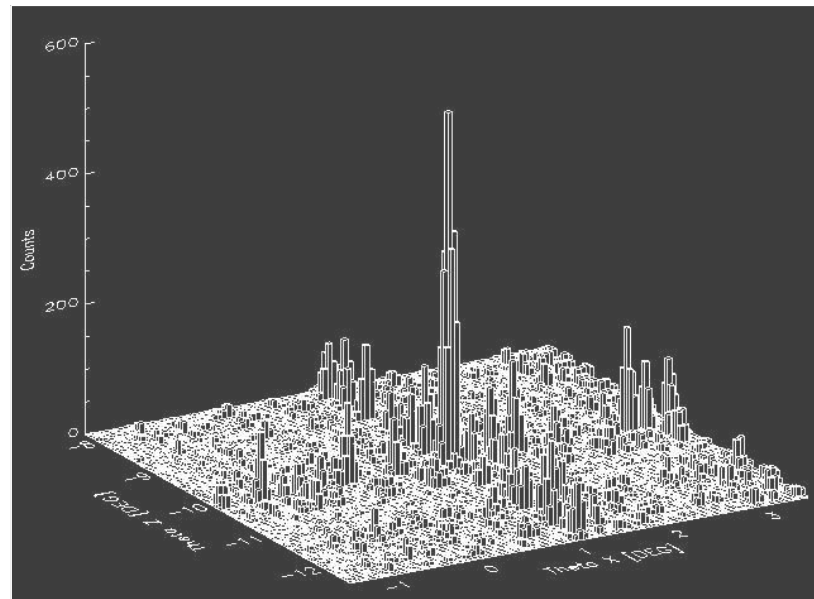
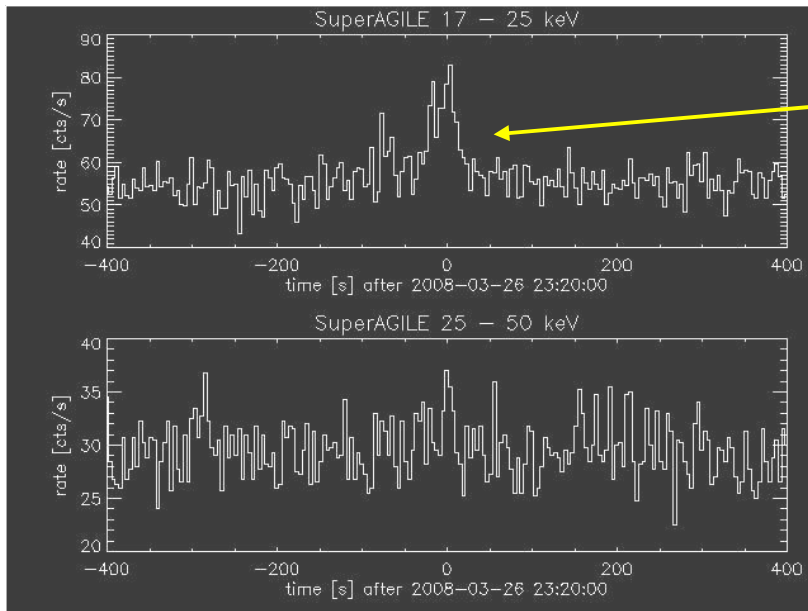


IGR J17473-2721/XTE J1747-274

GR J17473-2721/XTE J1747-274 is an **X-ray Burster** !

ATel #1445 (Del Monte et al.) – 27 Mar 2008

**SuperAGILE detection of the first known
type-I X-ray burst**

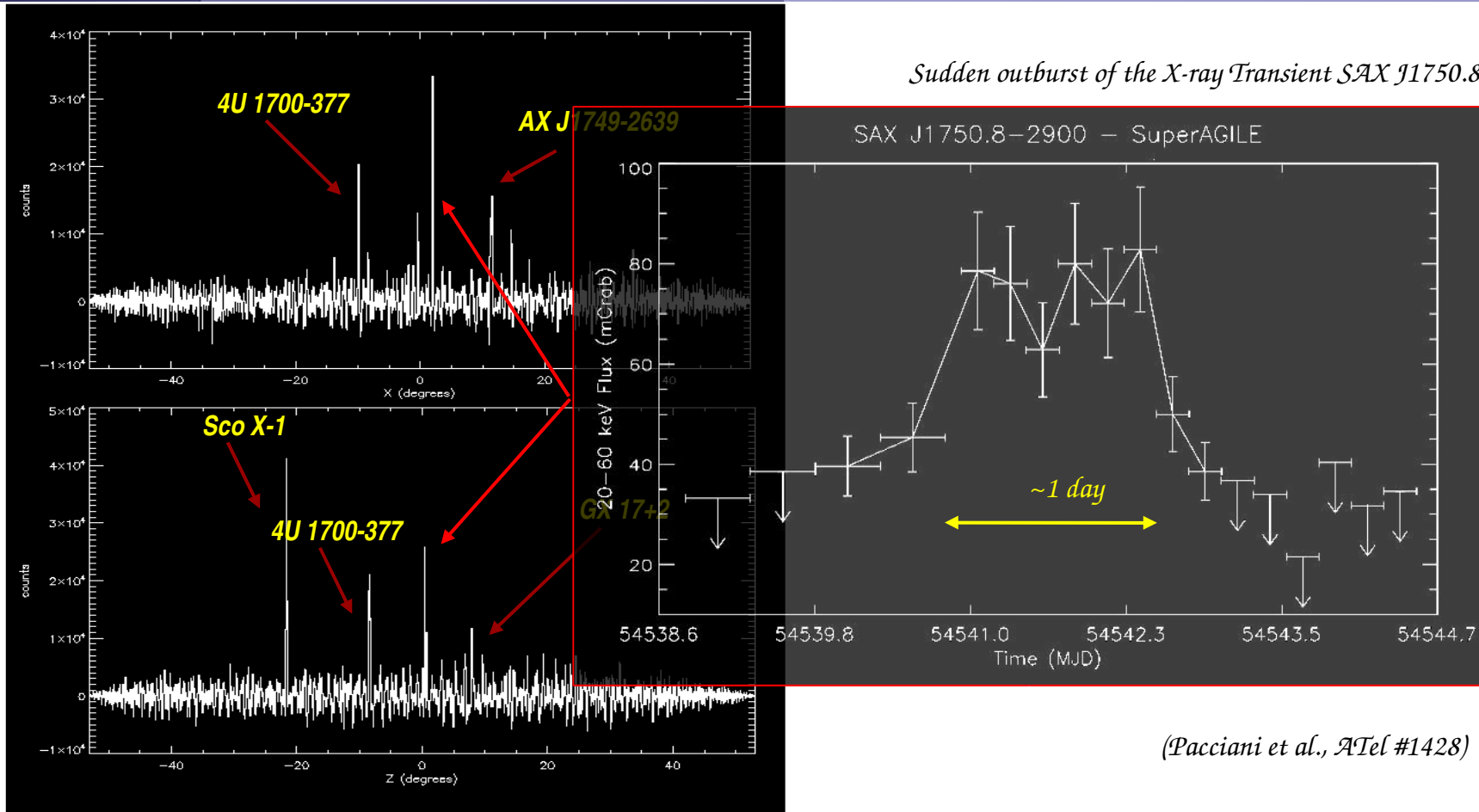


Confirmed by later observations

(ATels# : 1459, 1460, 1461, 1468)

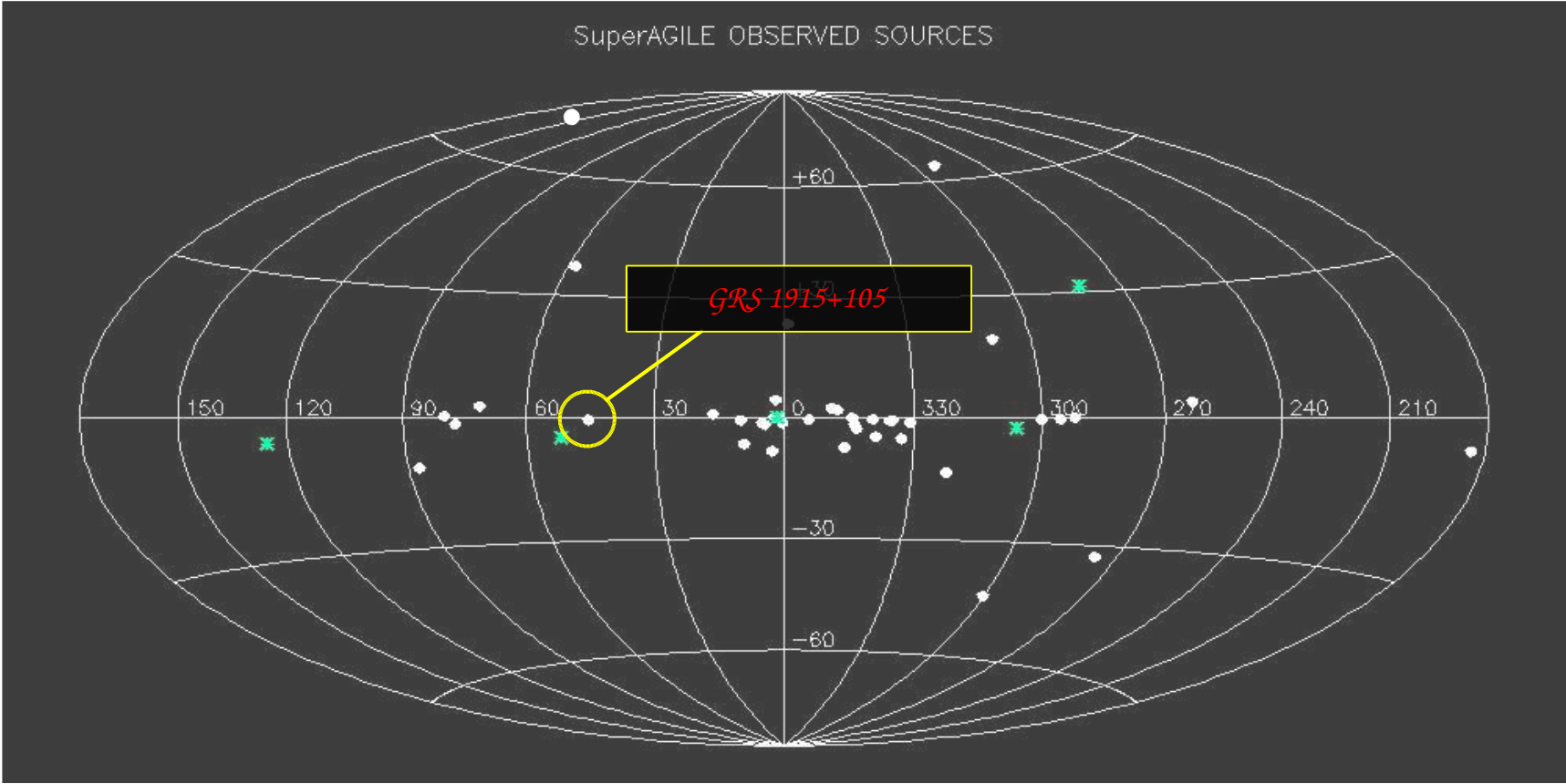
SAX J1750.8-2900

Sudden outburst of the X-ray Transient SAX J1750.8-2900

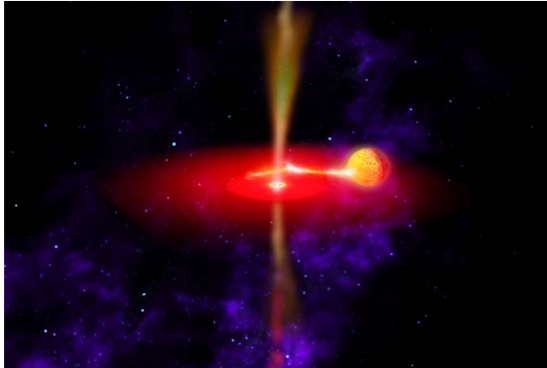


(Pacciani et al., ATel #1428)

GRS 1915+105



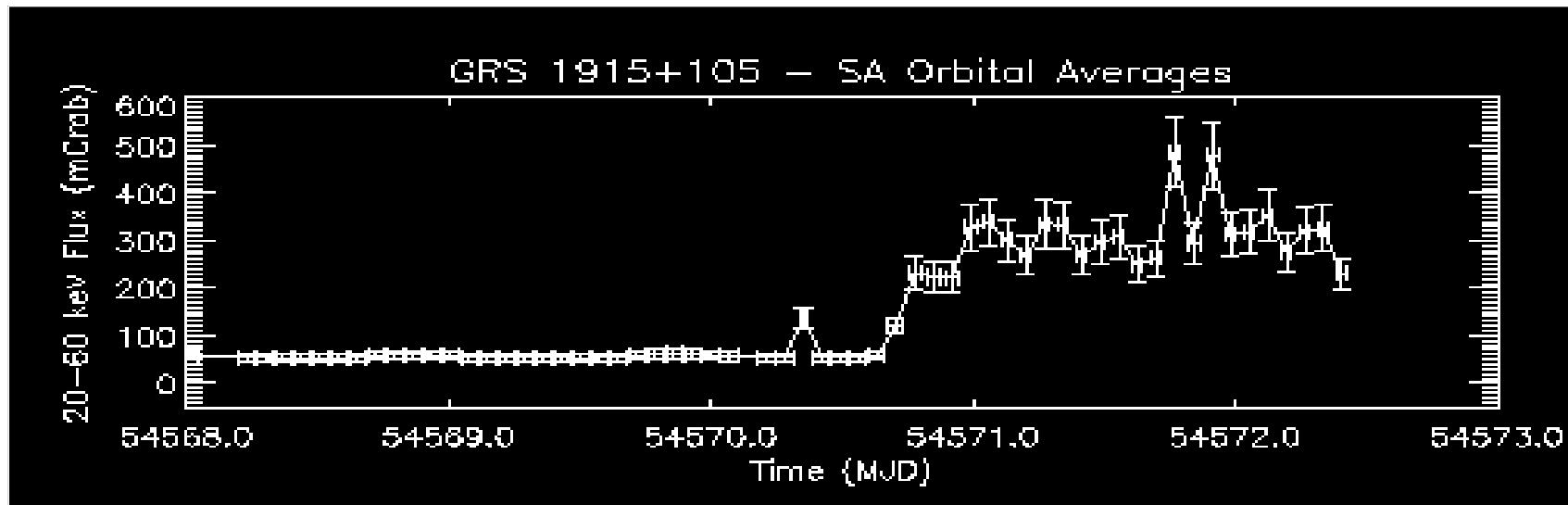
GRS 1915+105



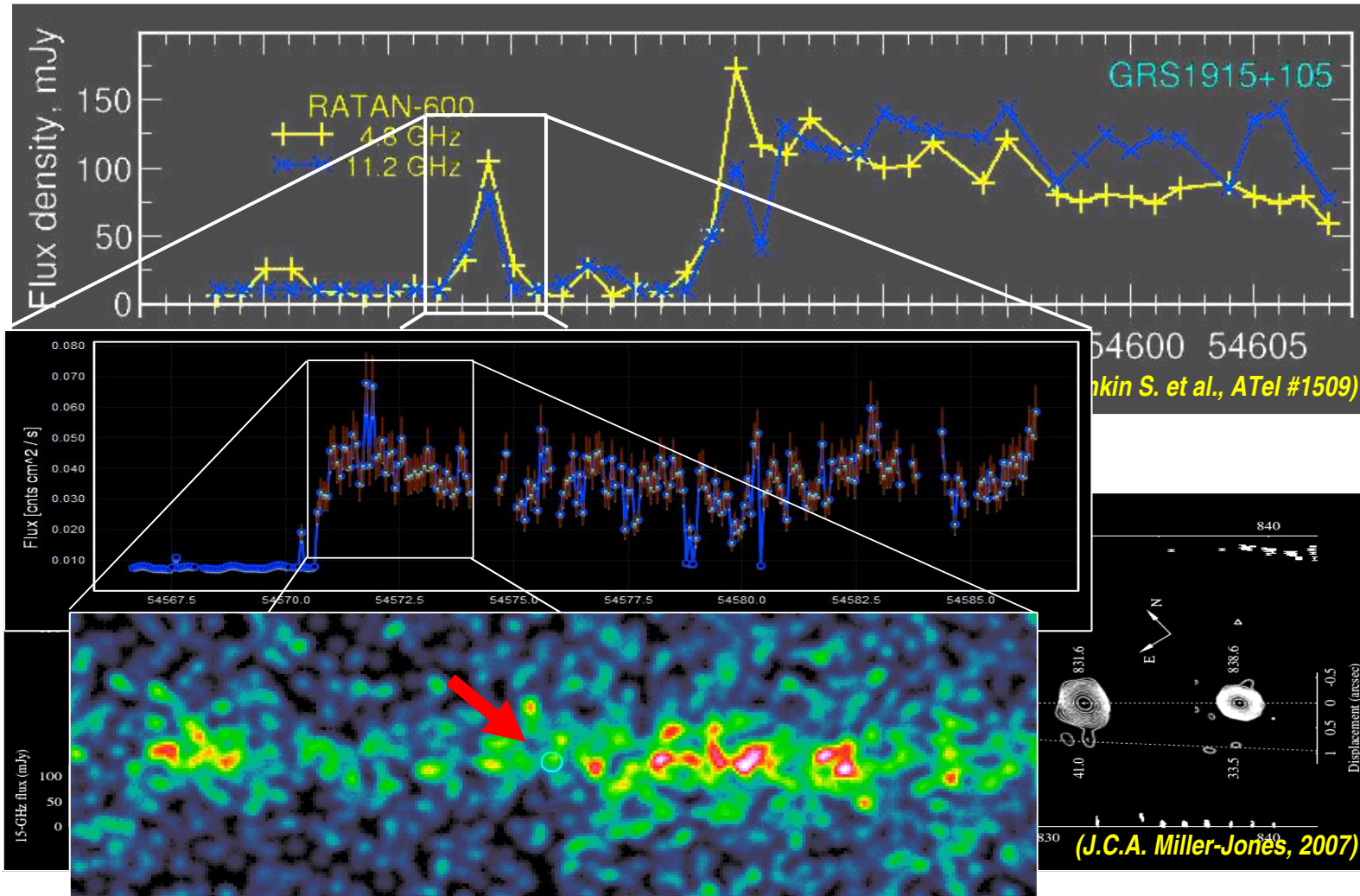
15 April 2008

Recent reactivation of the microquasar

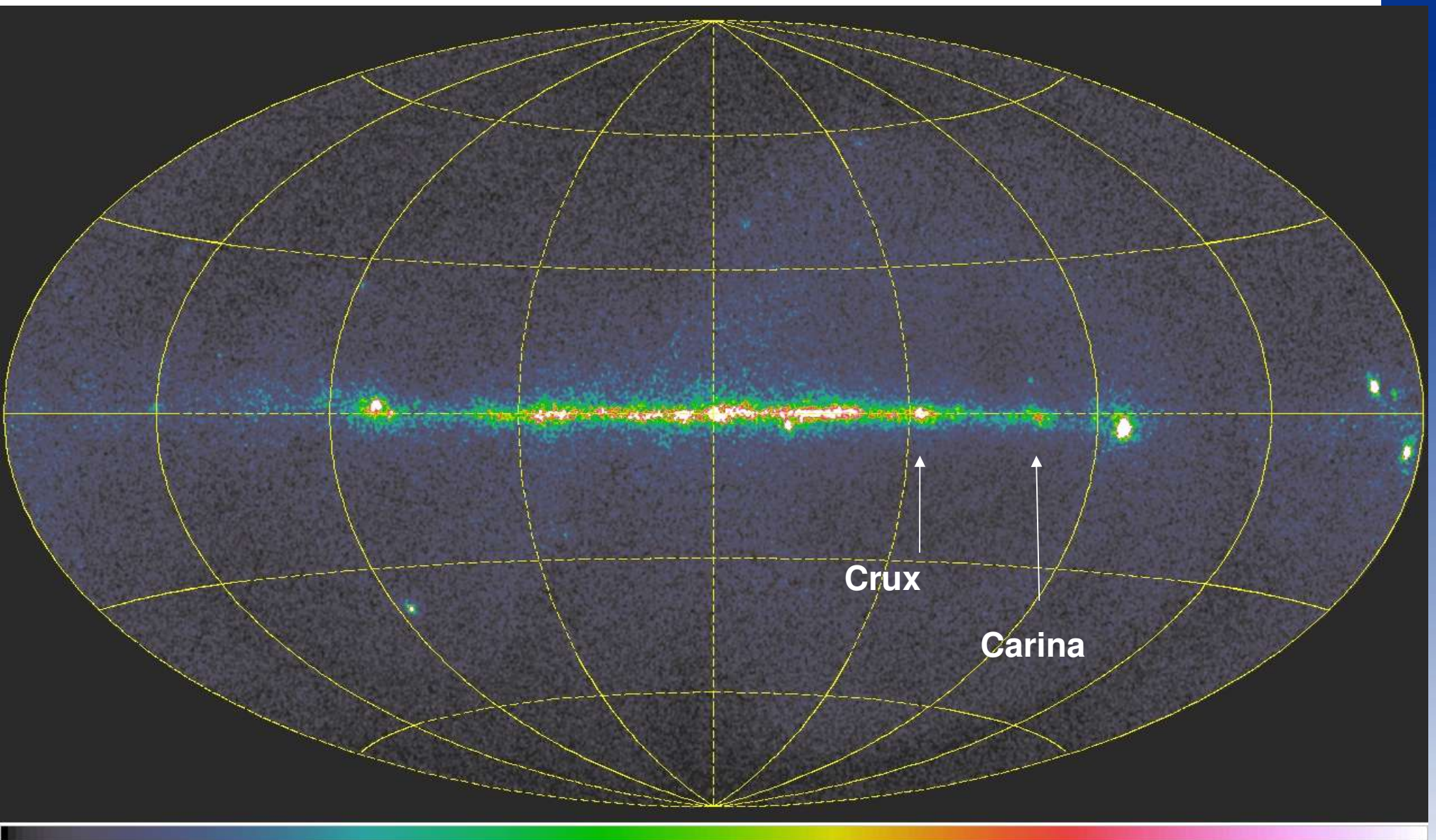
GRS 1915+105



GRS 1915+105

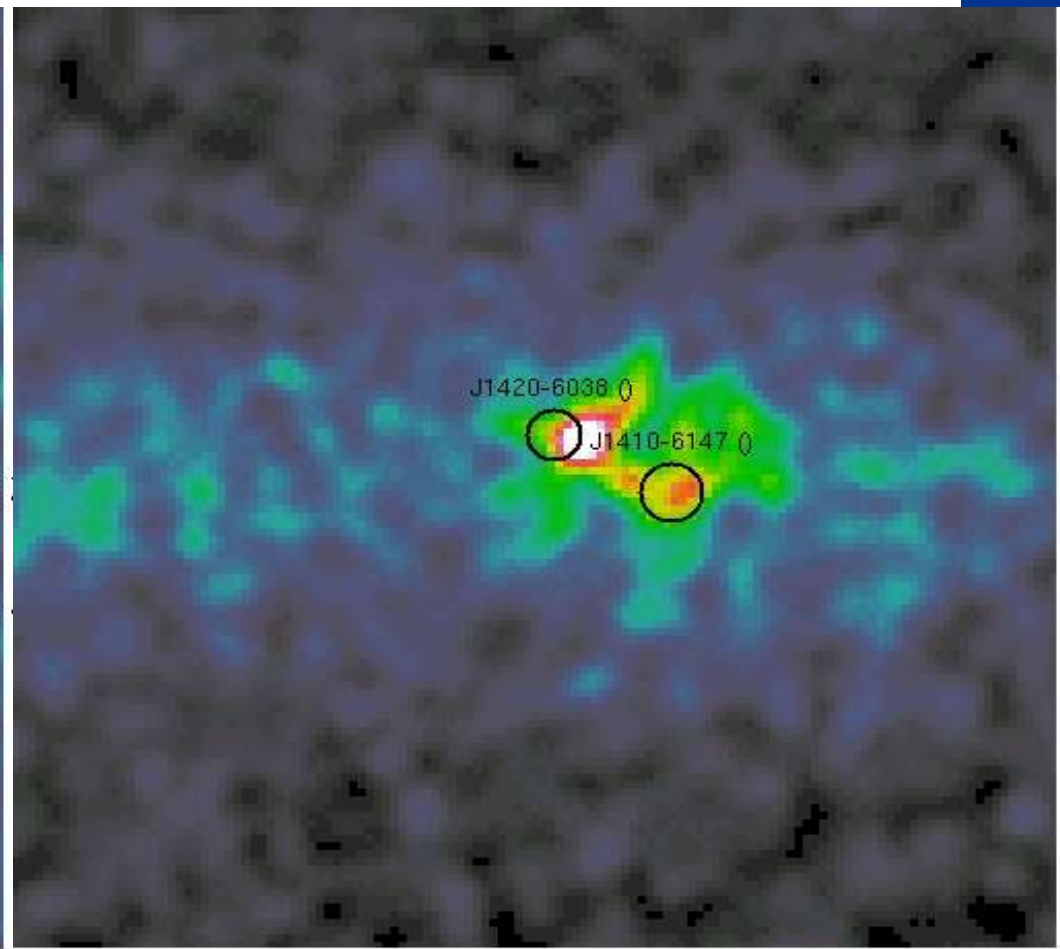
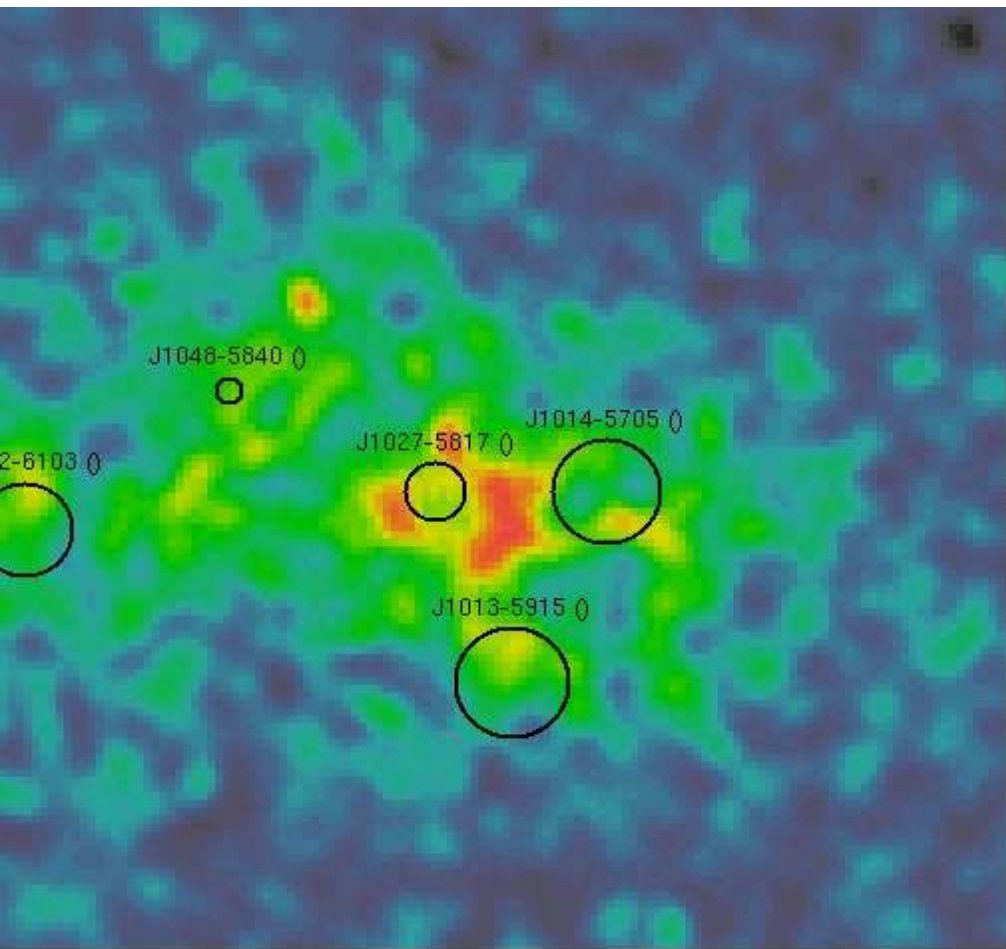


Crux & Carina



Carina Arm

Crux Arm



0.0002

0.0004

0.0006

0.0008

0

0.0005

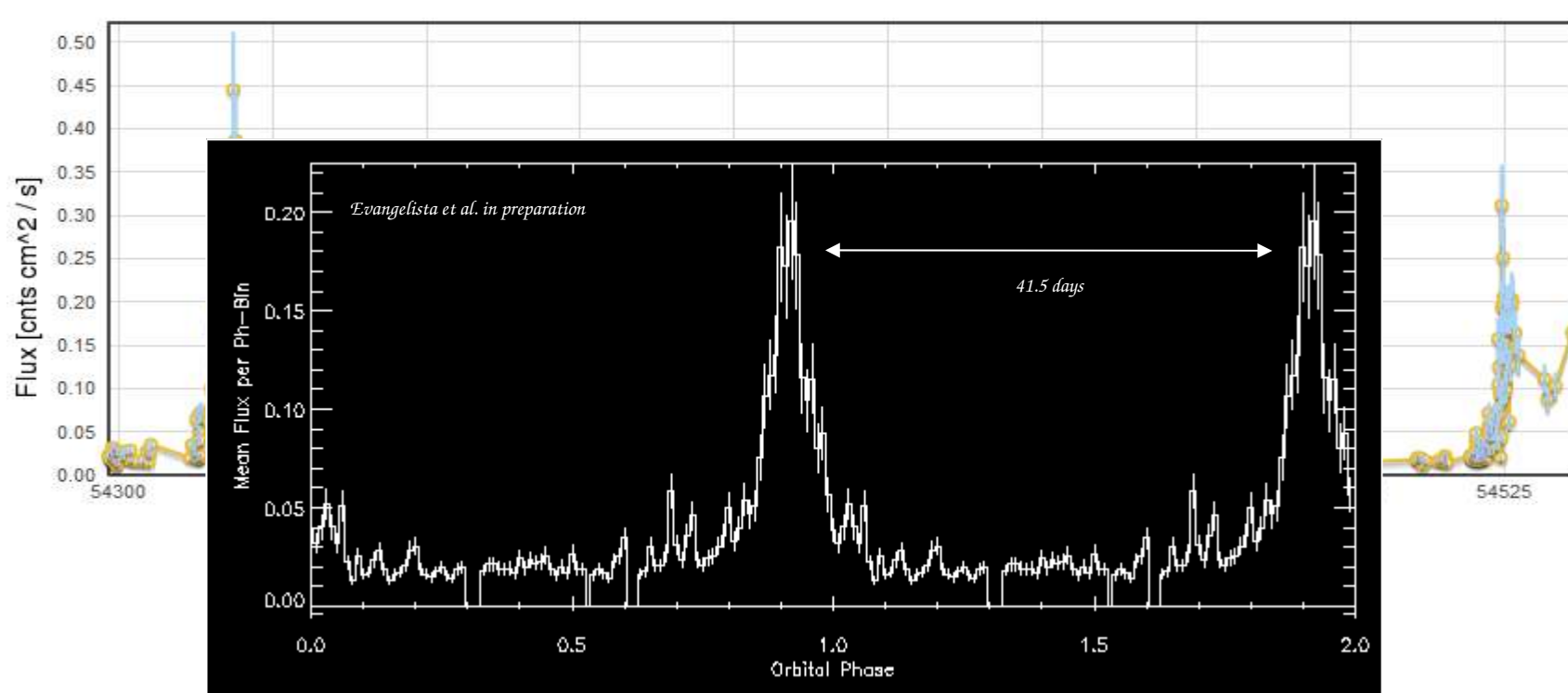
0.001

0.0015

GX 301-2

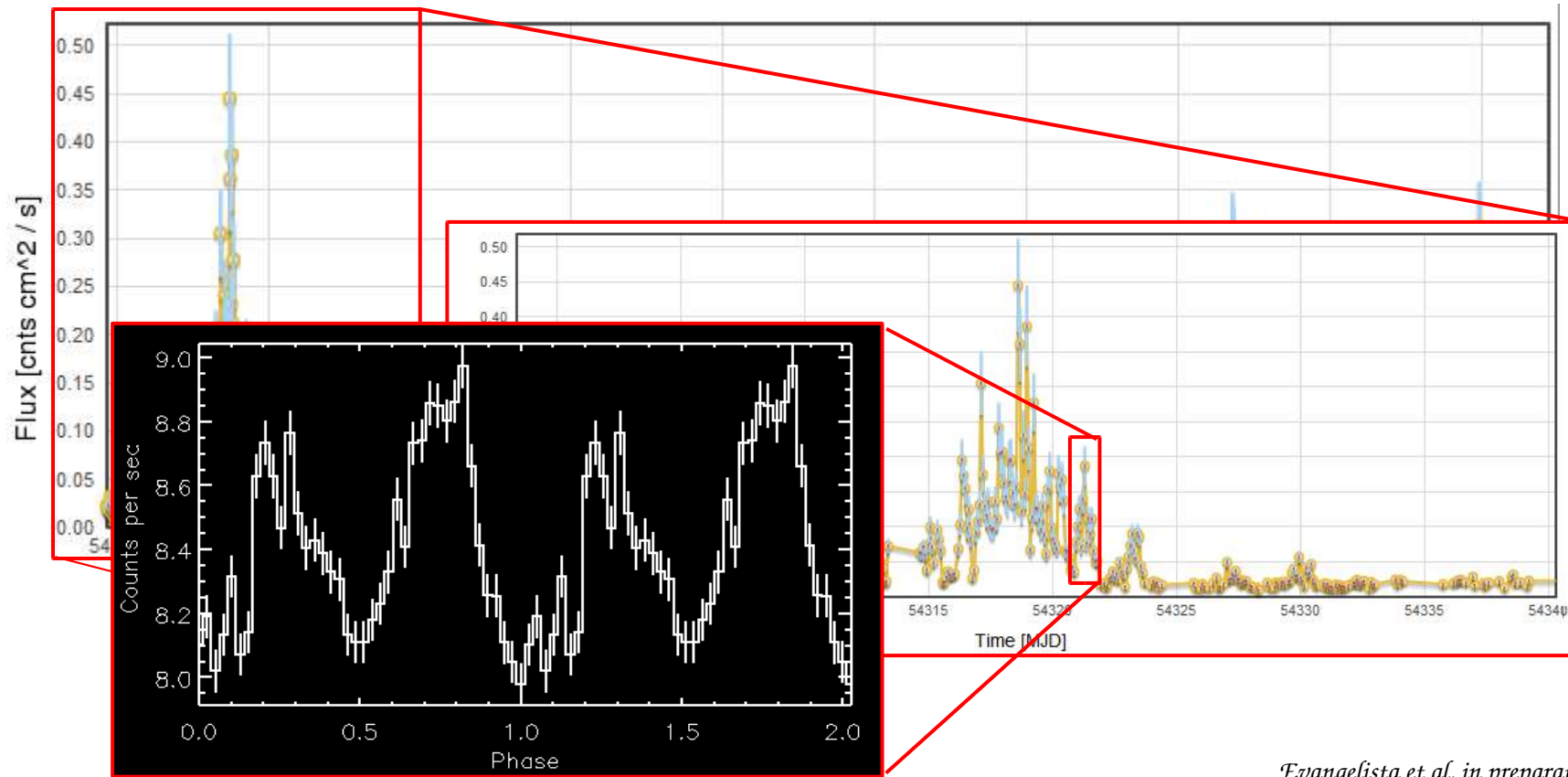
41.5 d orbital period

The regular flares 1-2 days before periastron...



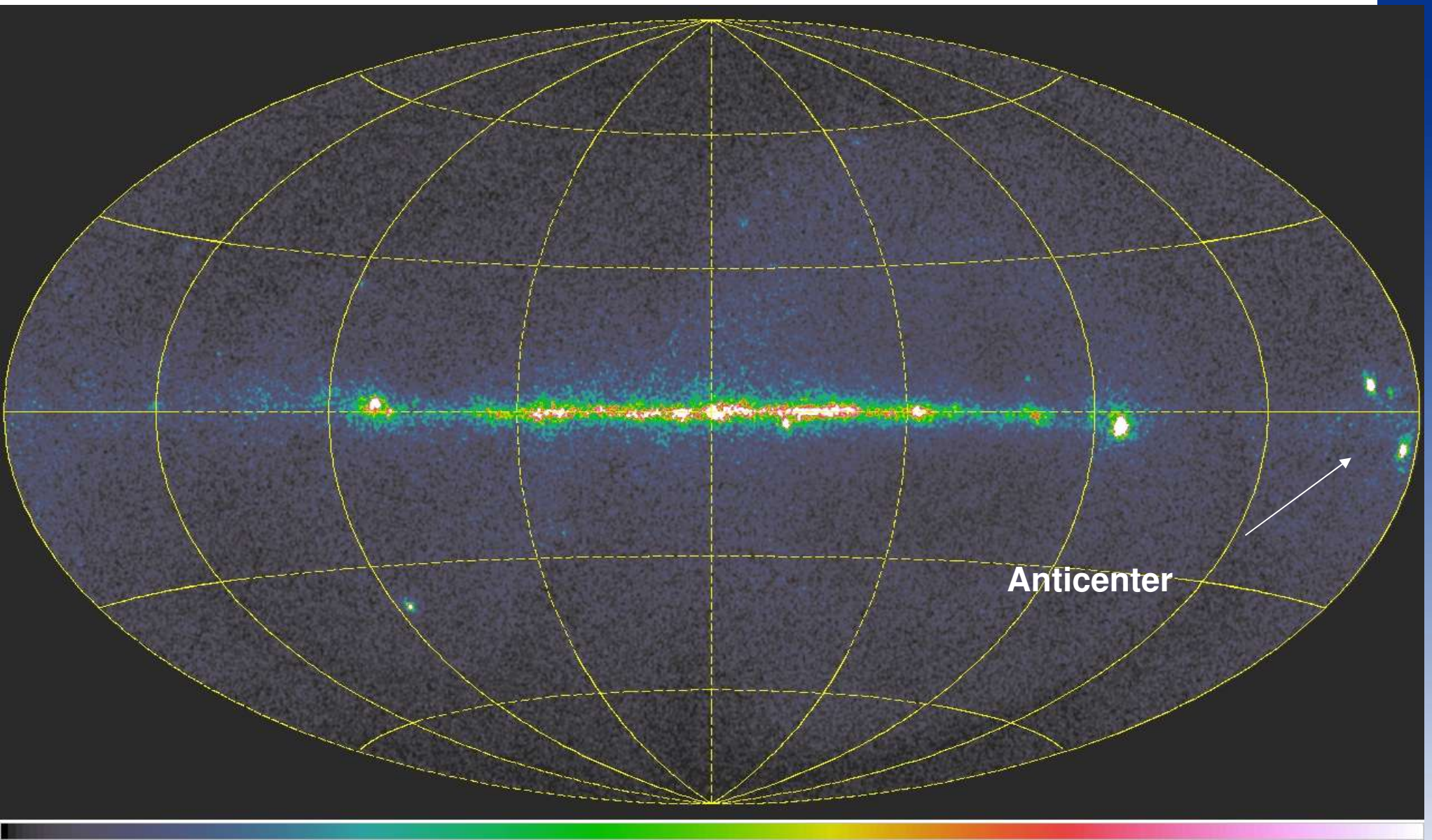
GX 301-2

And the 680s X-ray Pulsar

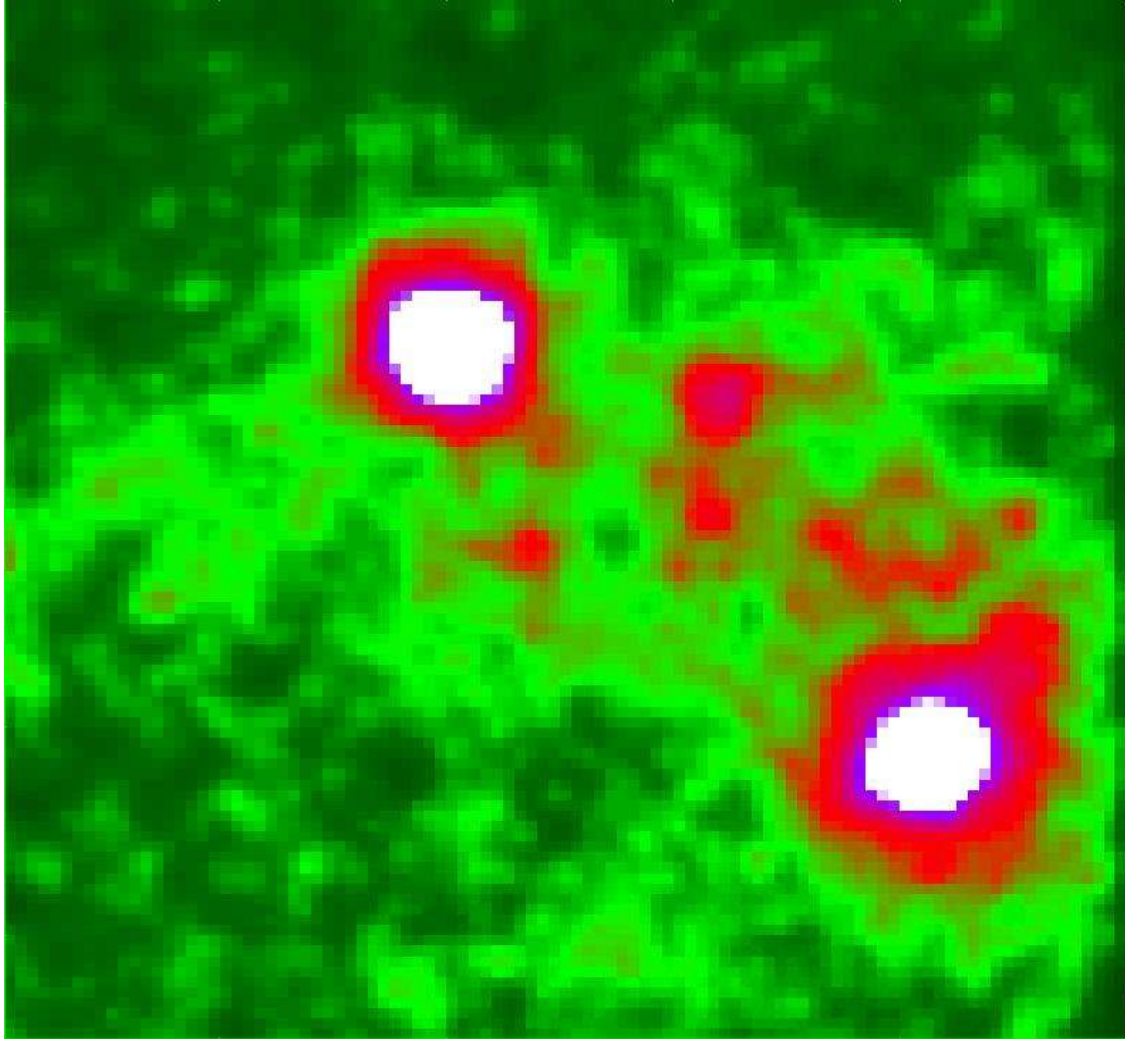


Evangelista et al. in preparation

Anticenter region



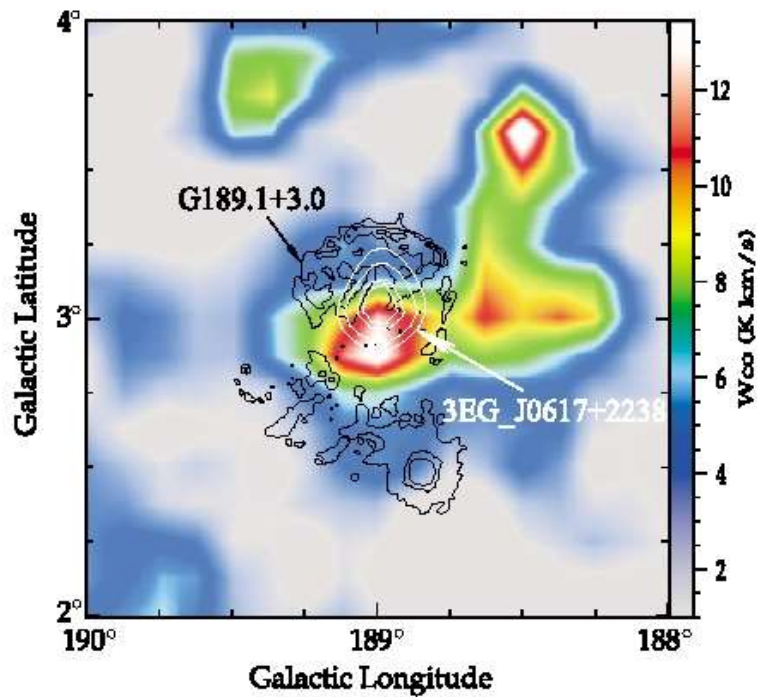
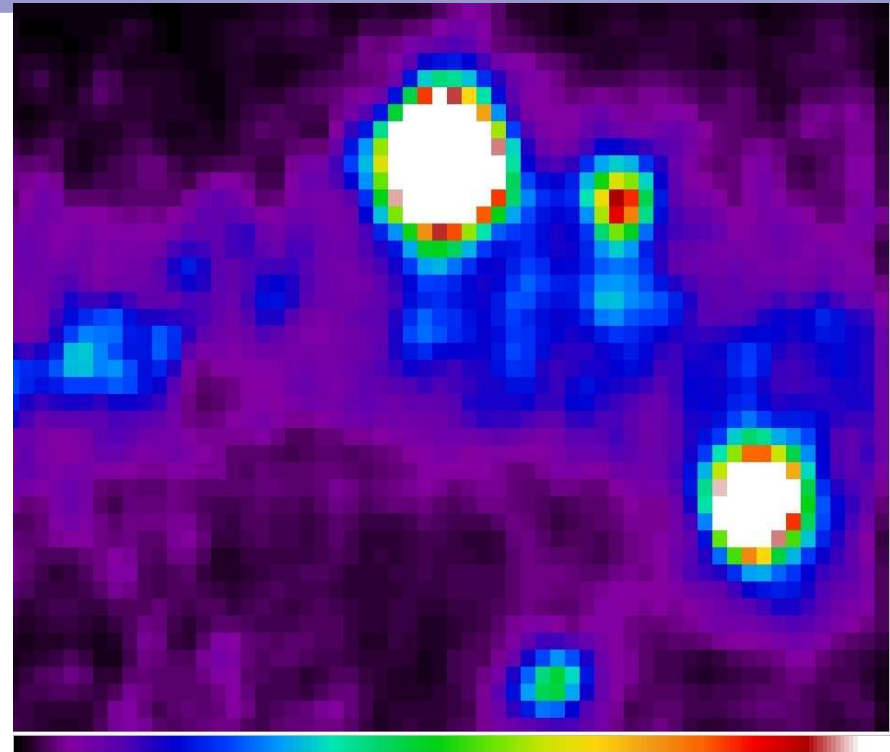
Anticenter – 3EG J0617+2238



AGILE Obs. August –October 2007 March 2008

Anticenter – 3EG J0617+2238

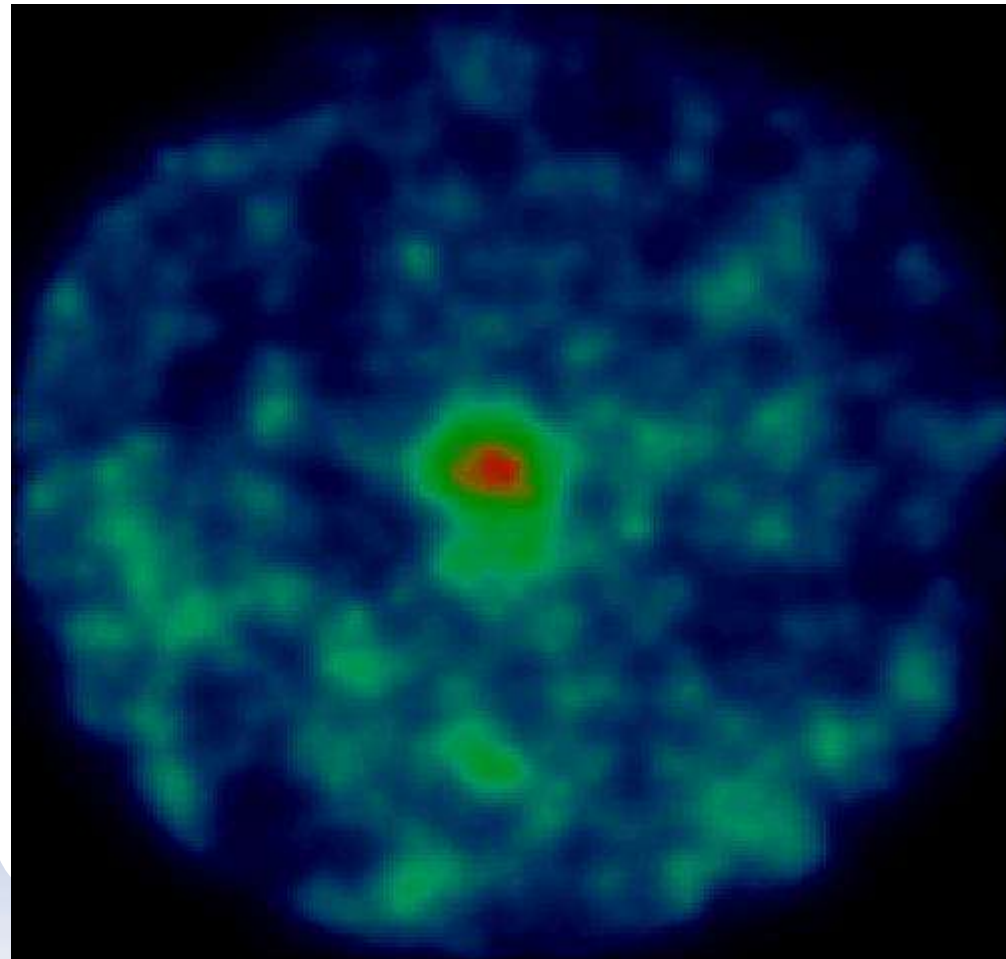
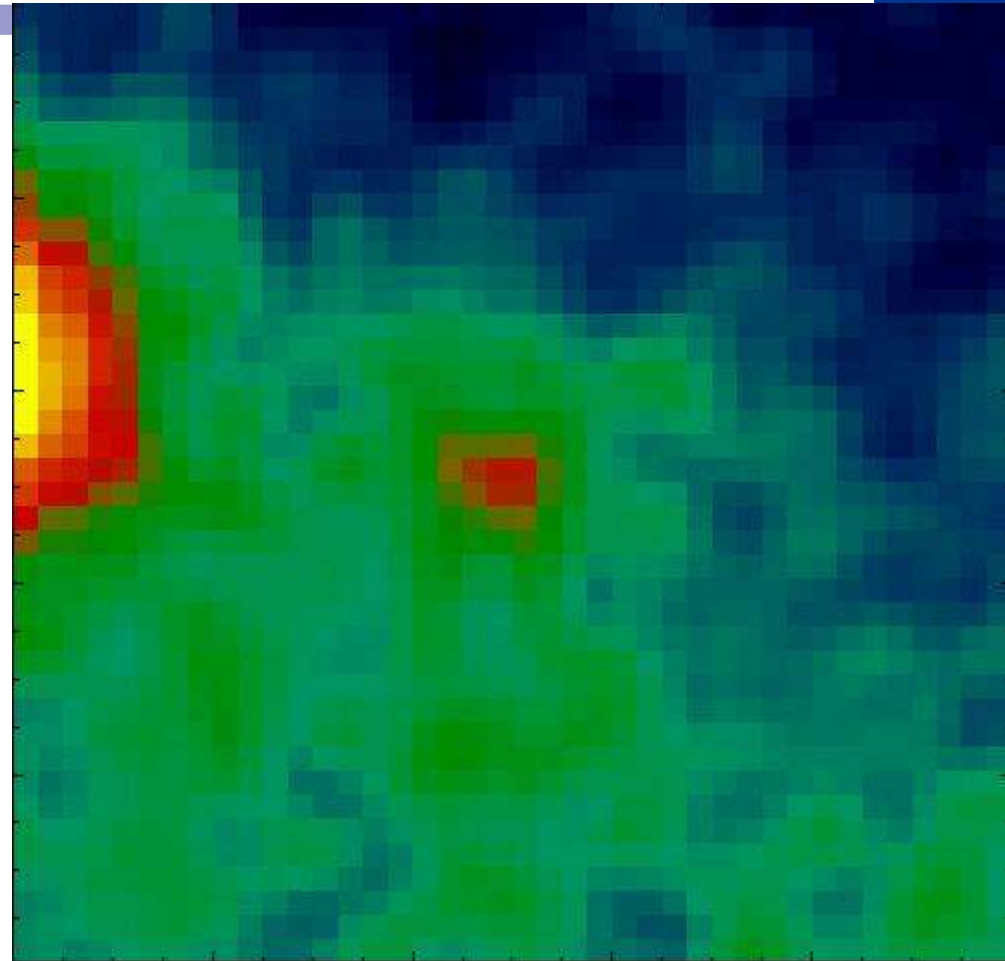
EGRET Obs.



IC 443

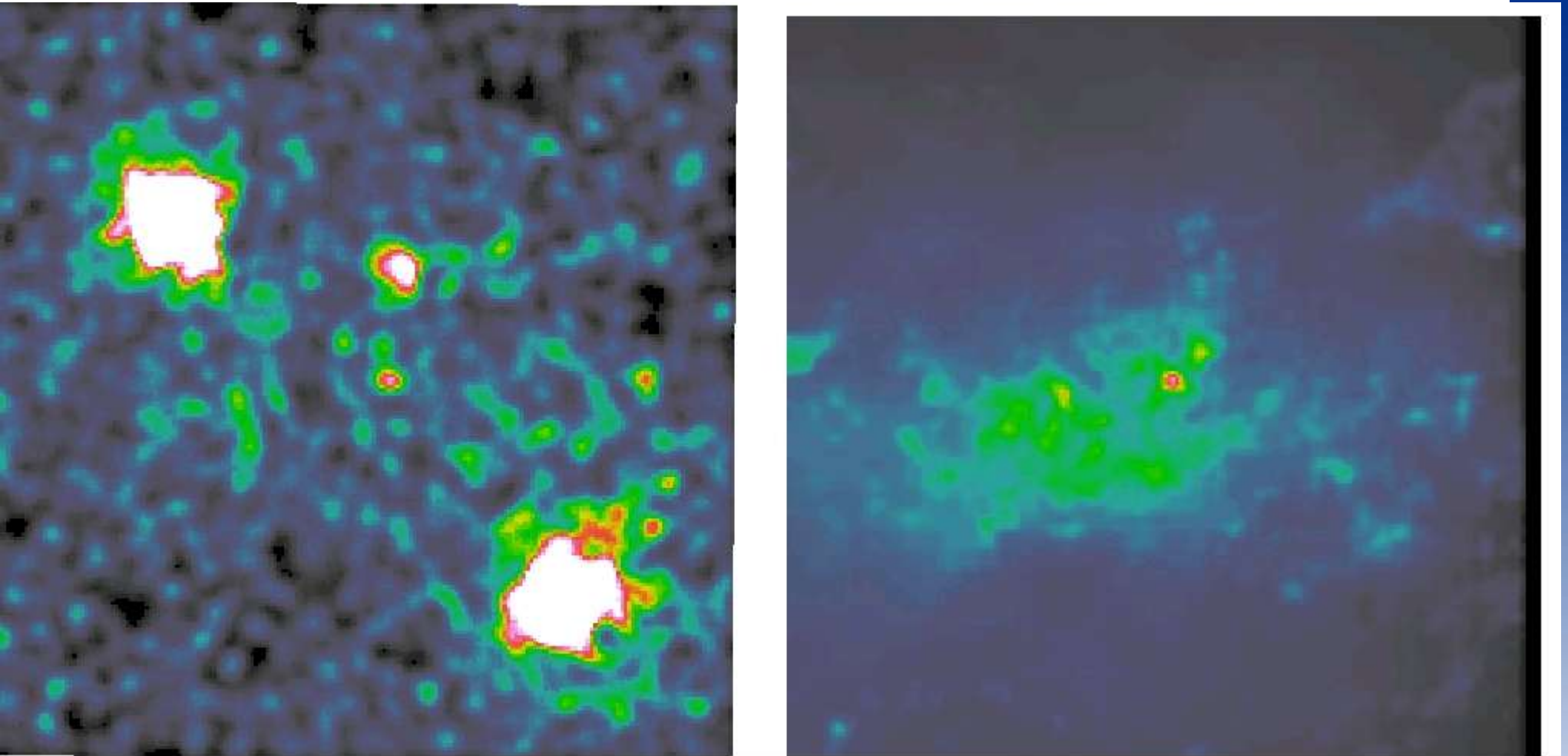
Anticenter – 3EG J0617+2238

EGRET Obs.



IC 443

Anticenter – Molecular Clouds Complex



0.0001

0.0002

0.0003

0.0004

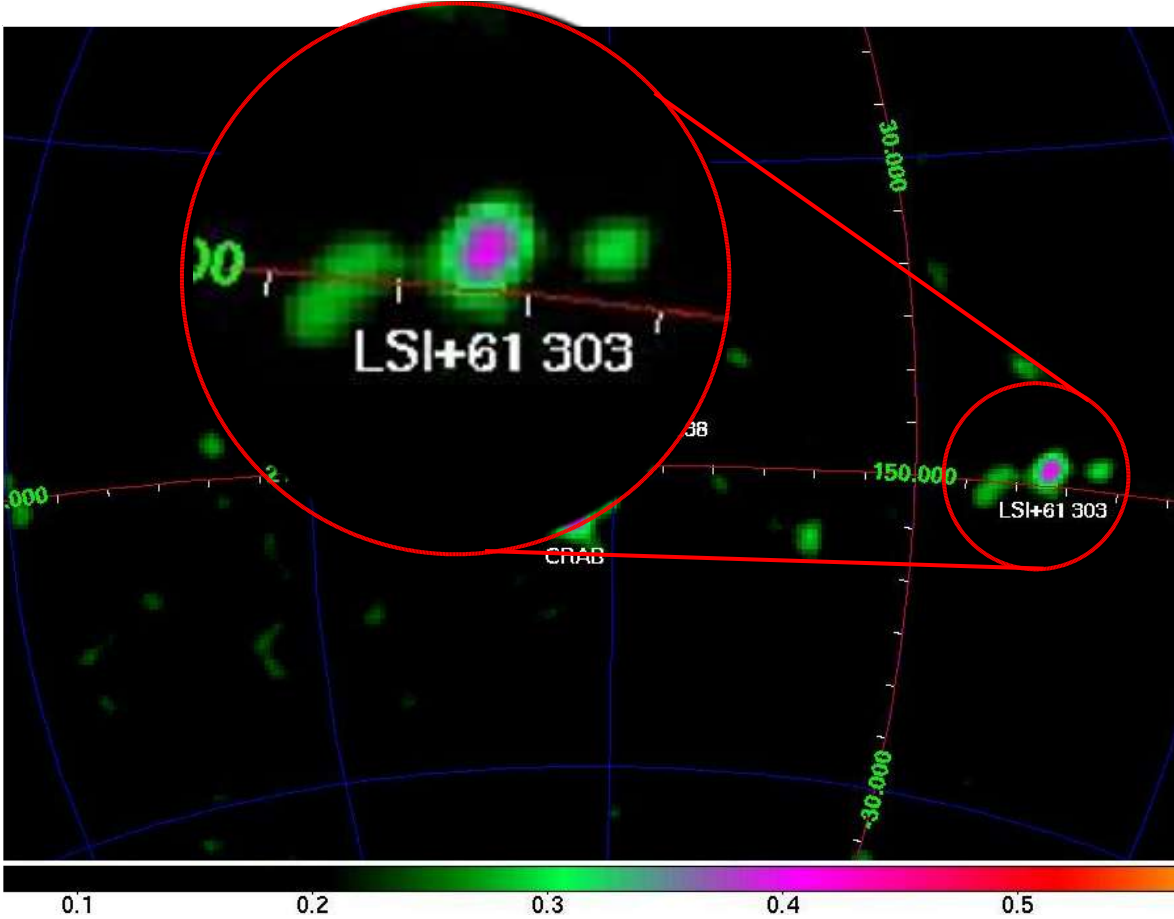
0.0005

0.0006

Intensity map – $\text{ph/cm}^2 \text{ sec sr}$

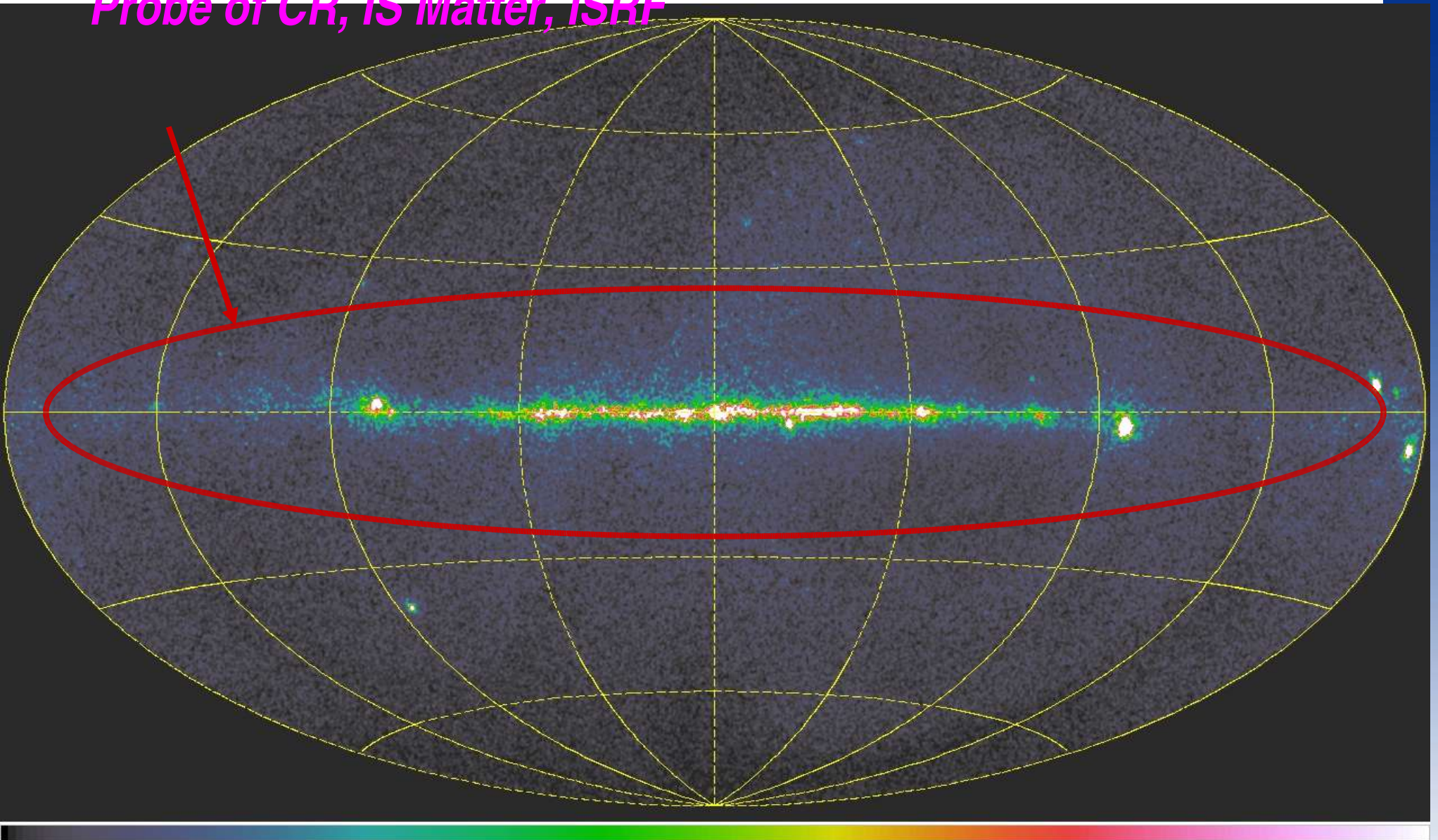
LSI +61°303

GRID Galactic anticenter observation



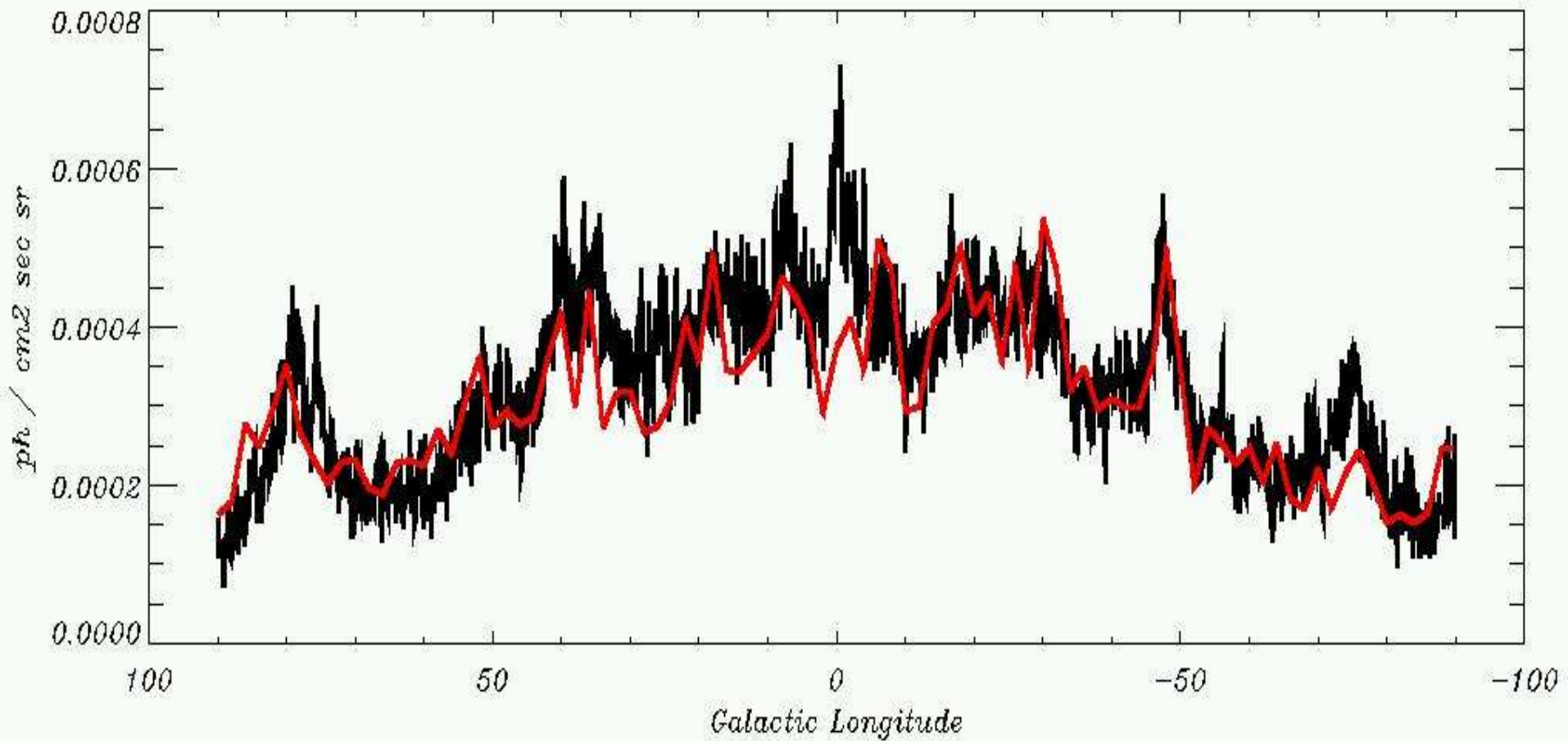
The γ -ray interstellar emission

Probe of CR, IS Matter, ISRF



AGILE Observations vs Model

($-90 < l < 90$)



Conclusion

- AGILE has observed sources in both X- and gamma-rays in all regions of the Galactic plane
- AGILE observes variability and detects new transients on time scales of 1 day in both X- and gamma-rays, even in crowded, high diffuse emission Galactic plane regions
- Field of view and long exposure allow characterization of variability of individual sources