
Cleaning
ISGRI
PICSIT
JEM-X ?
Mosaic images

How to get rid of image systematics ?

The standard isgri imaging software does an good job however systematics exceed statistics in deep images:

- Accurate detector background maps are difficult to derive (time variability, energy dependence, lack of flat fields).

  → Use dithering to build background images, remove sources, apply the proper weighting in background substraction

- Instrument model defficiencies leads to imperfect ghost cleaning

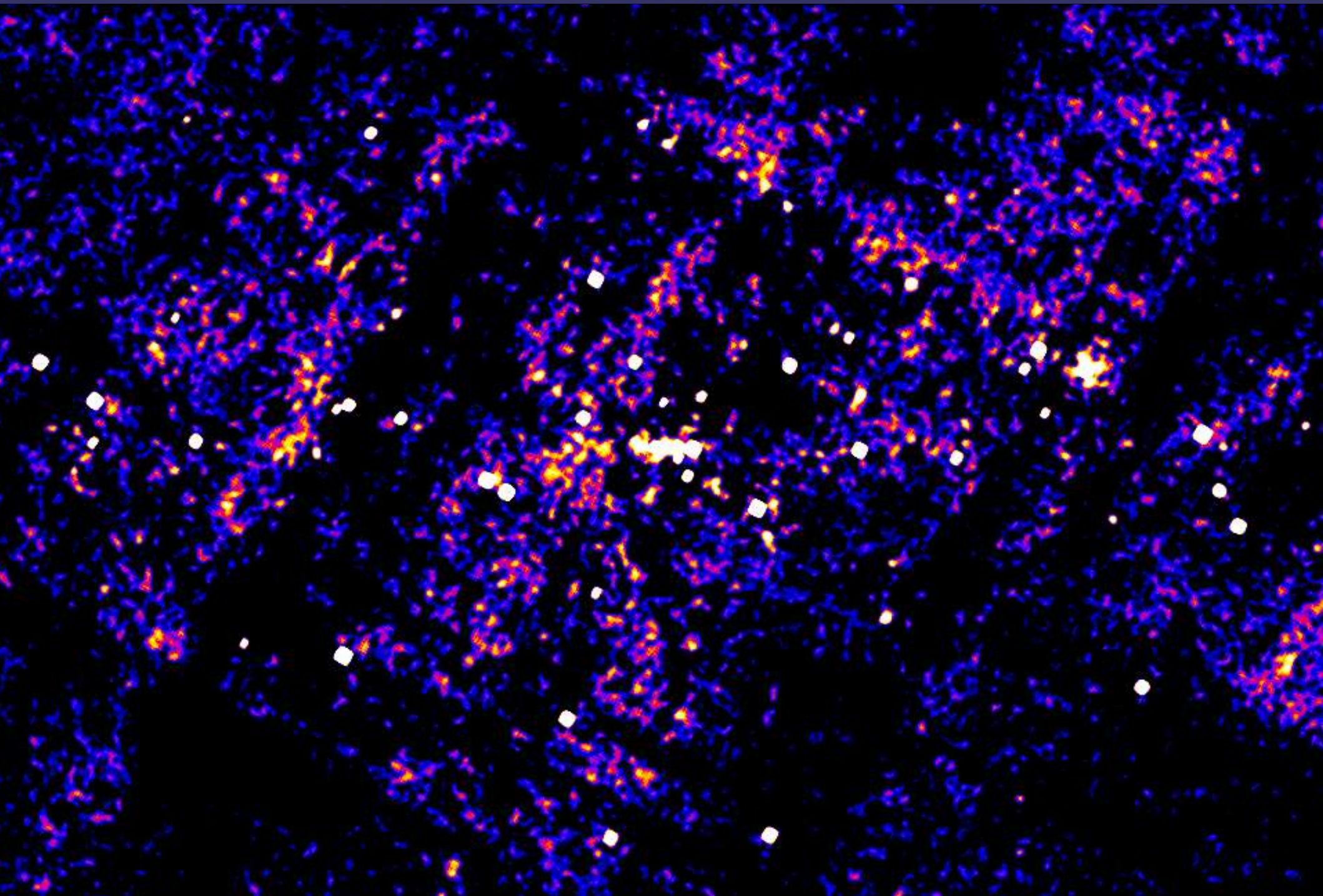
  → Disregard (by weighting) sky areas affected by ghosts of bright sources in each individual image before generating the mosaic (field rotation helps)

Software

- skybackground: creation of background images
- image_mosaic: mosaic images incl. background scaling and substraction, filtering, ghost weighting, accurate pixel geometry and redistribution
- mosaic_spec: fitting psf, flux and spectral extraction from images

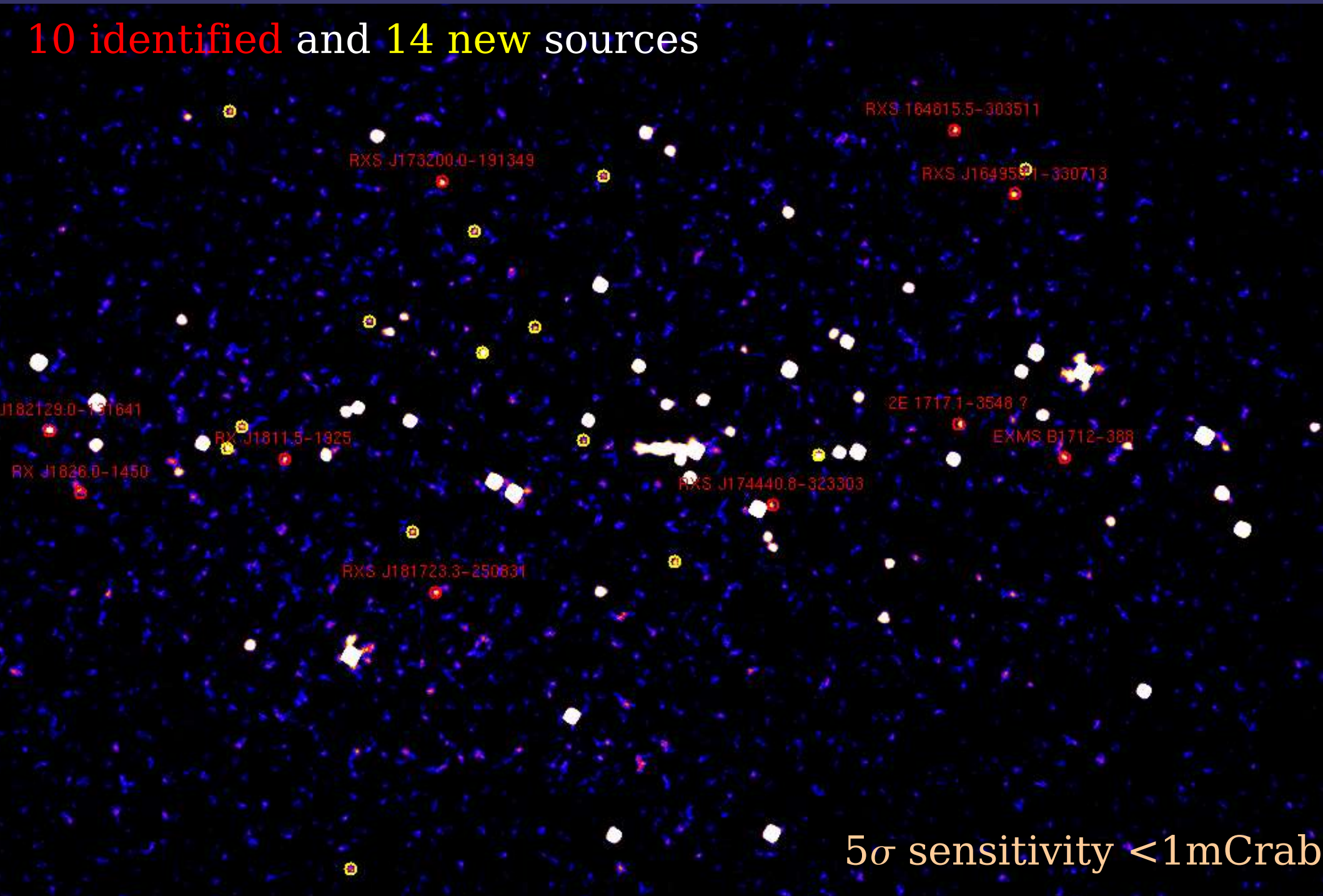
This software implements corrections that are independent of the standard software. Improvement of the standard software will automatically be taken into acount.

The IBIS survey mosaic (2003 data; 20-60 keV; 2-7σ)



Cleaned: (2003 data; 23-63 keV) eff. exp. (0.5-1.5) 10^6 sec

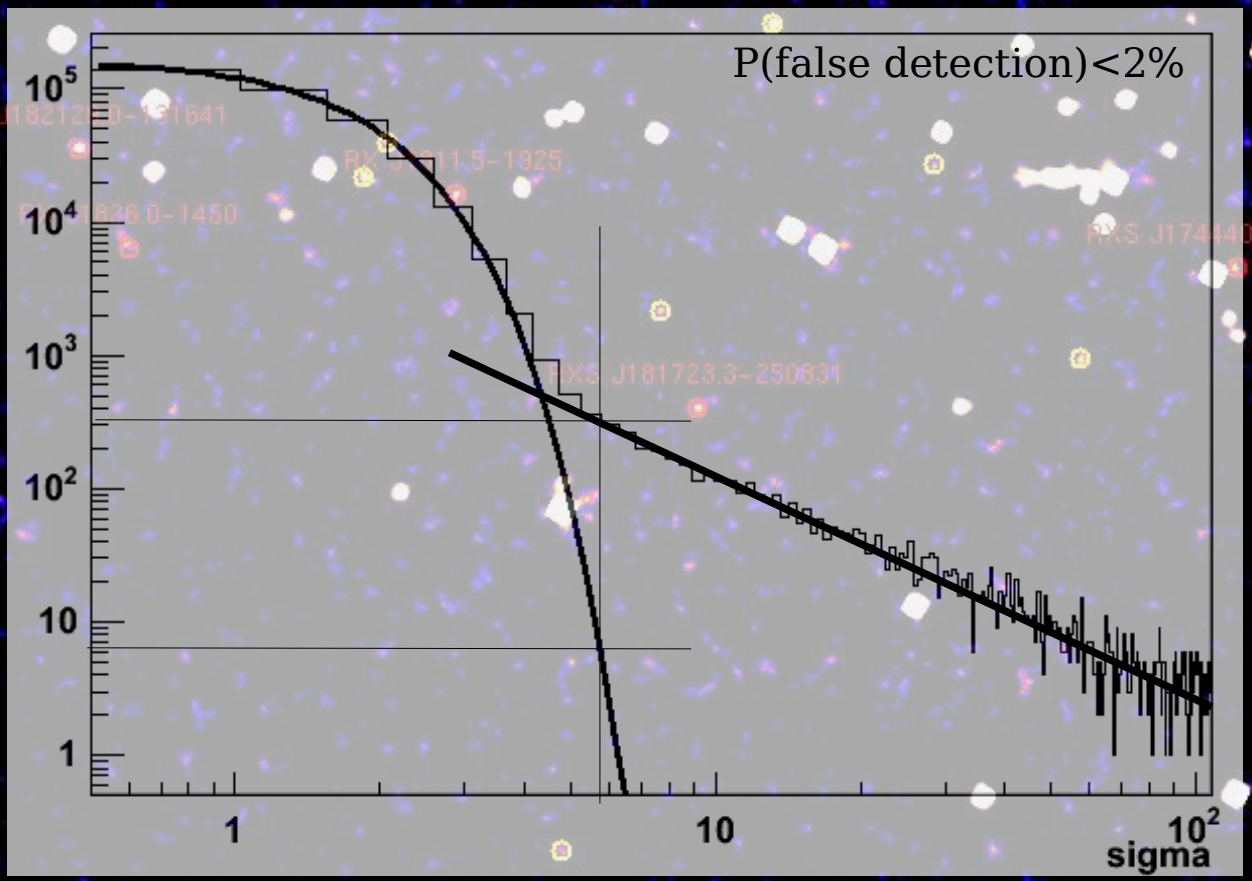
10 identified and 14 new sources



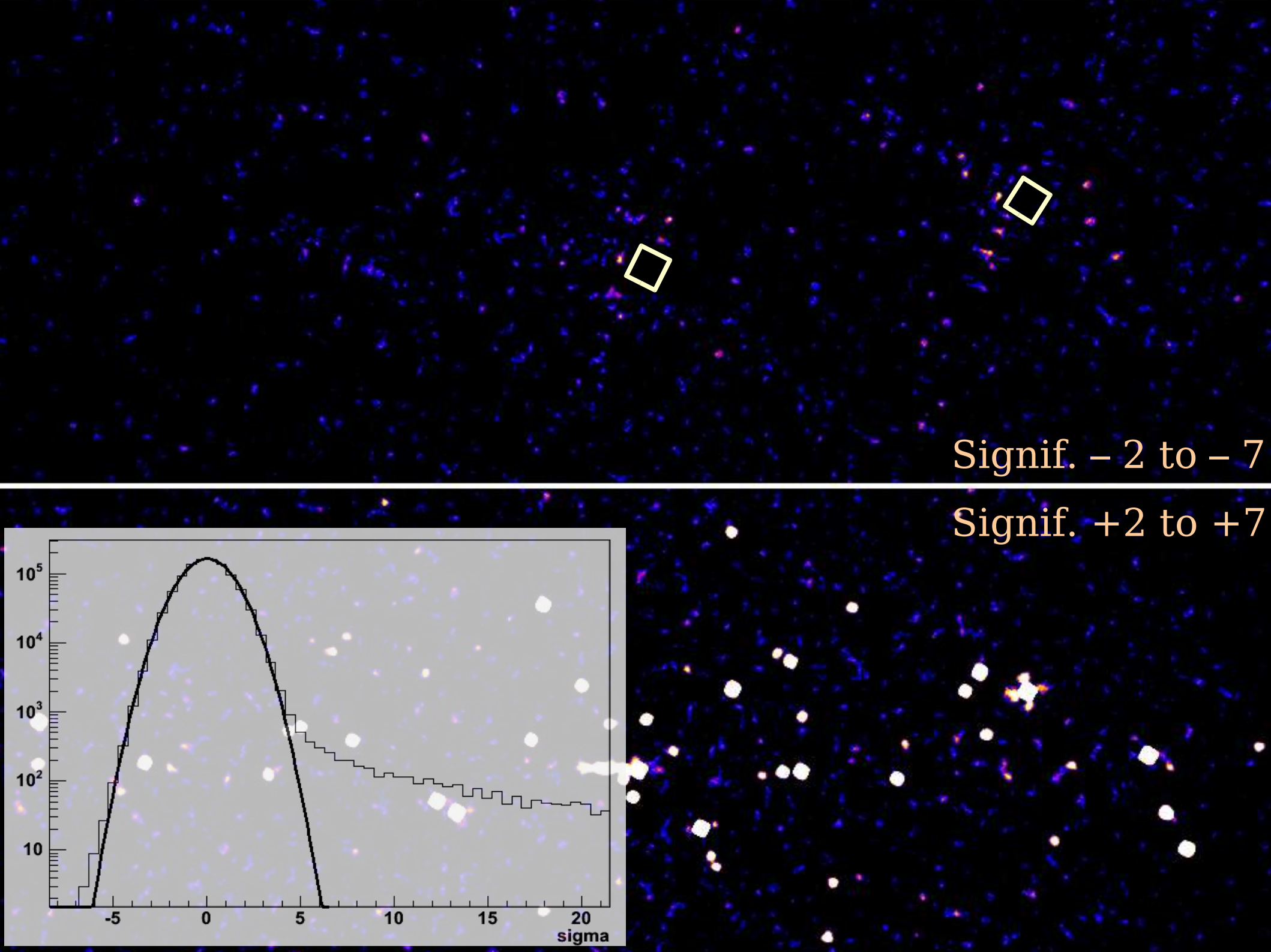
5σ sensitivity <1mCrab

Cleaned: (2003 data; 23-63 keV) eff. exp. (0.5-1.5) 10^6 sec

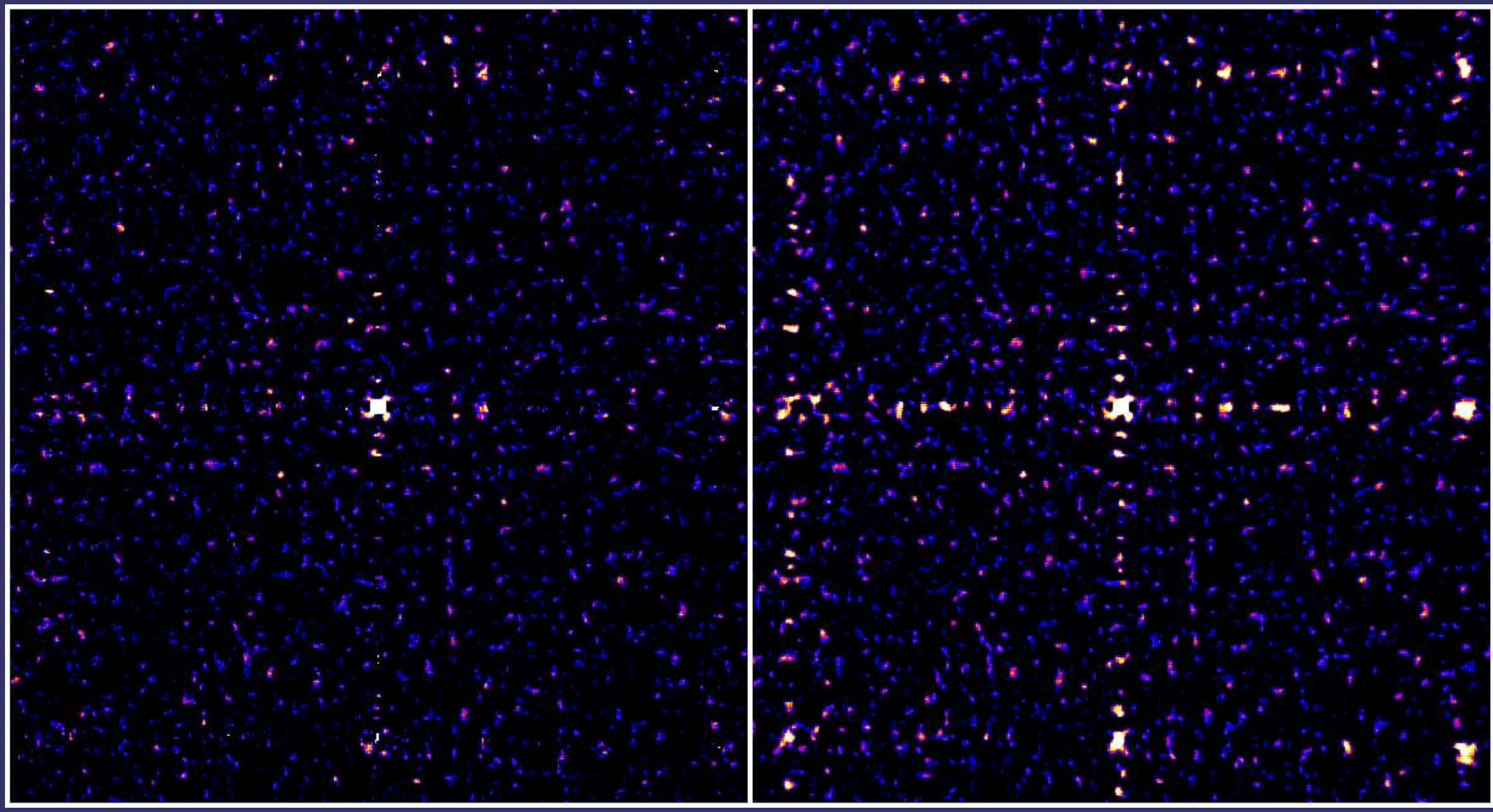
10 identified (3? by chance) and 14 new sources



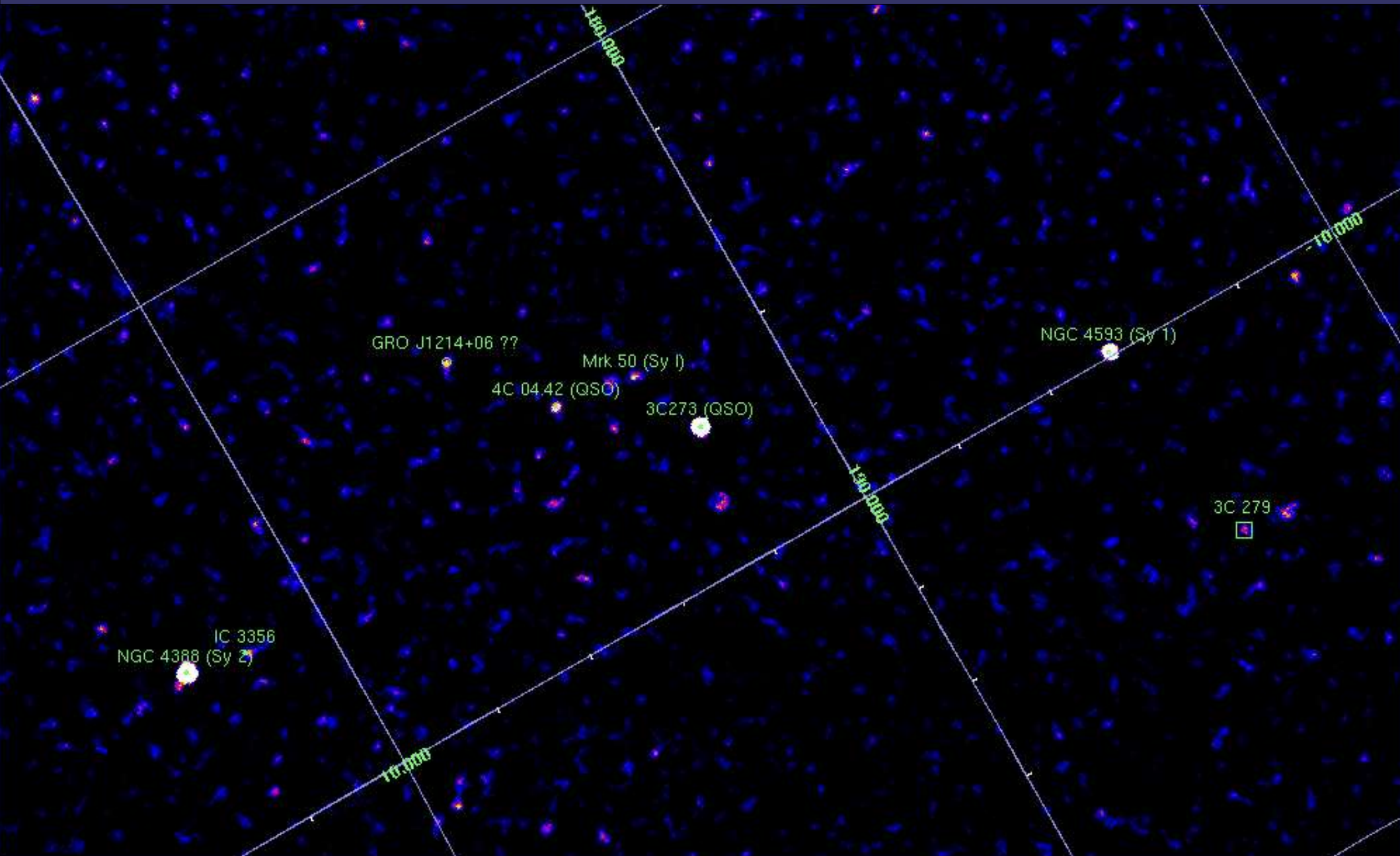
5σ sensitivity <1mCrab


Signif. – 2 to – 7
Signif. +2 to +7
10^5
10^4
10^3
10^2
10
-5
0
5
10
15
20
sigma

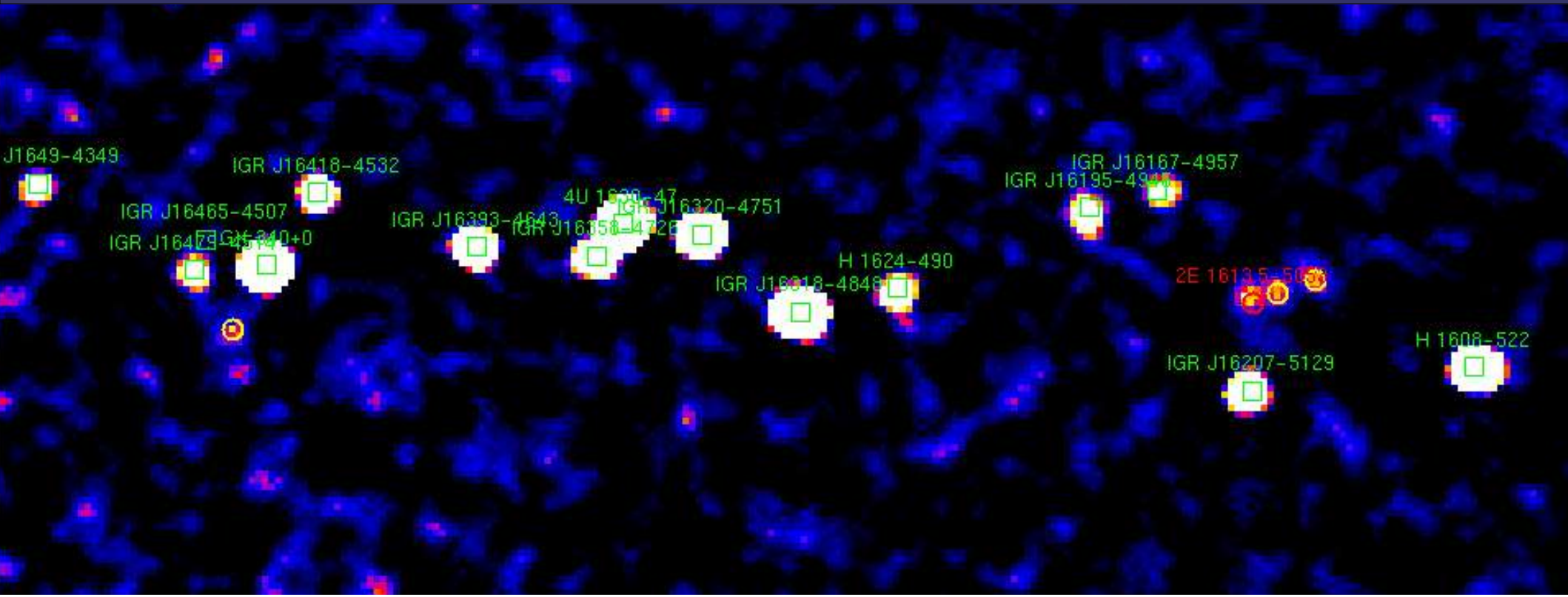
Crab (rev 170) (significance 2 to 7)

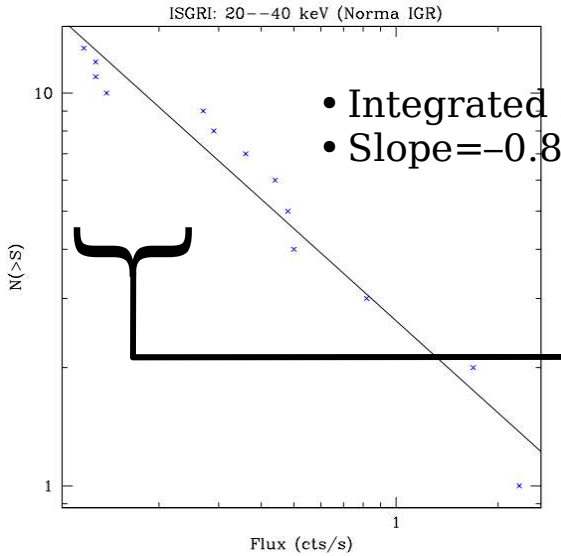


3C 273 field eff. exp. 350 ksec
5σ sensitivity ~2mCrab At least 8 sources are detected
(30 AGNs in deep extragalactic survey ?)



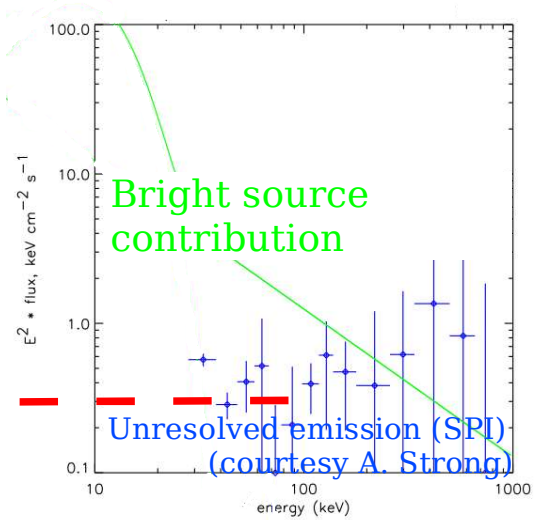
Norma arm tangent region (25-80keV) eff. exp. 500 ksec



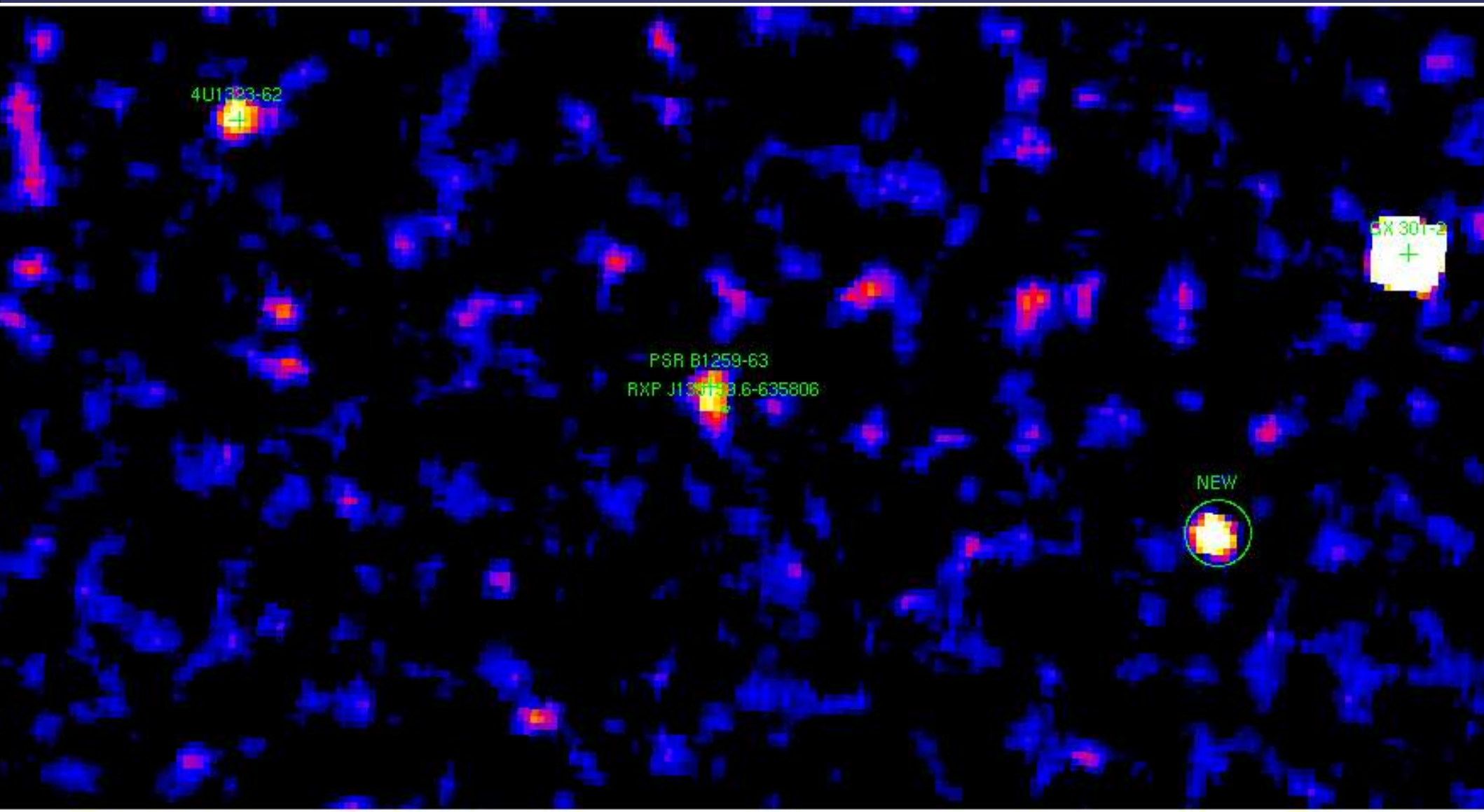


- Integrated flux: 100mCrab
- Slope=–0.8 down to 1mCrab

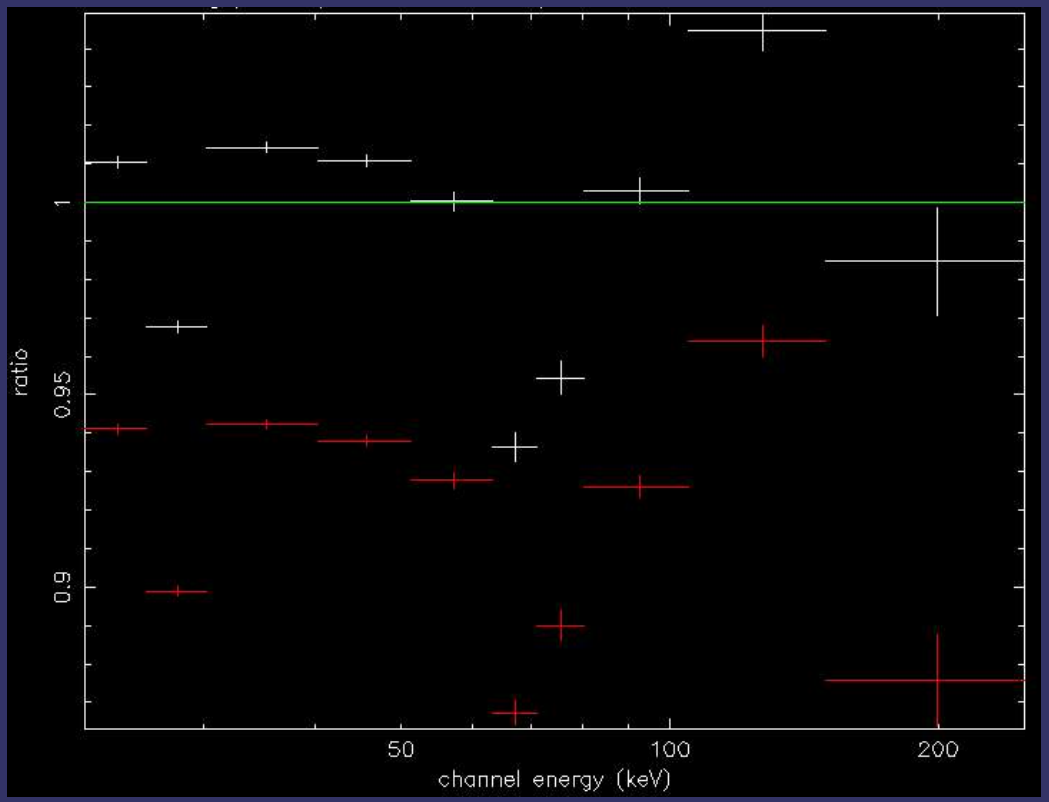
Faint (<3mCrab) sources contribution compatible with level of unresolved emission



PSRB 1259-63 eff. exp. 190 ksec
3 mCrab source detected at 7σ



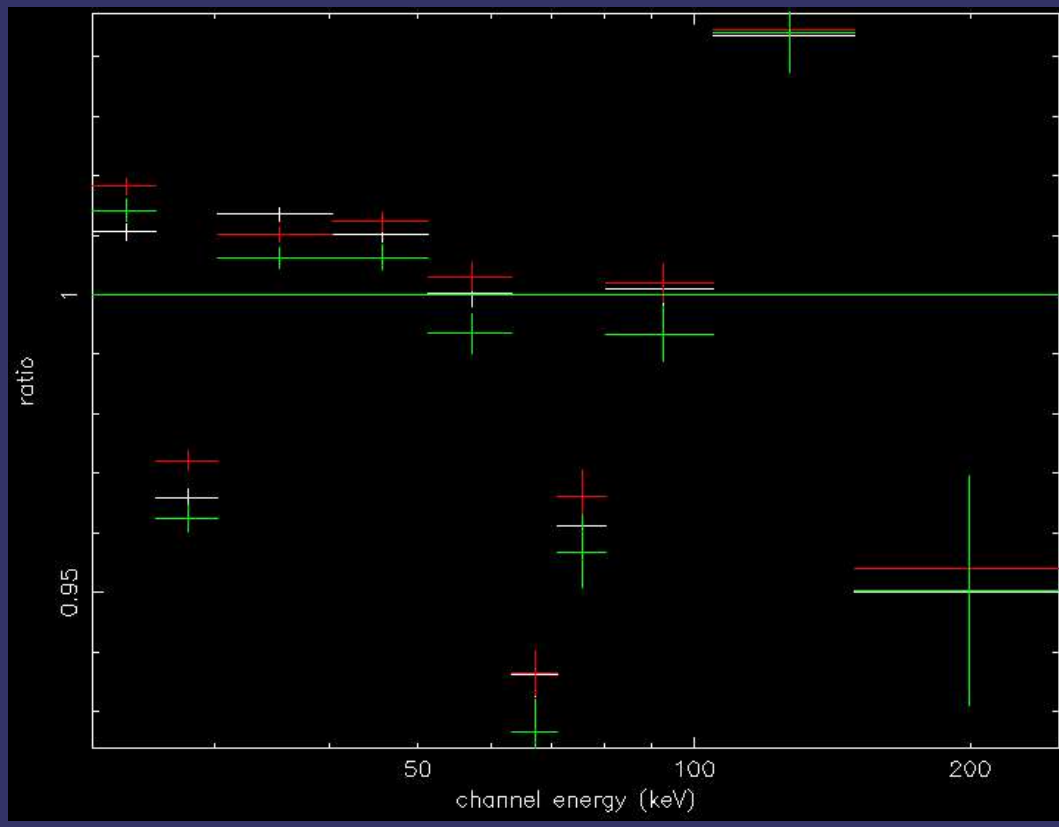
Crab spectra (rev 170)



Residuals of the Crab spectrum derived from mosaic image (red) and standard spectral extraction (white) compared to powerlaw fit.

Residuals from imaging and standard spectral extraction methods are identical however the normalization is 6% lower.

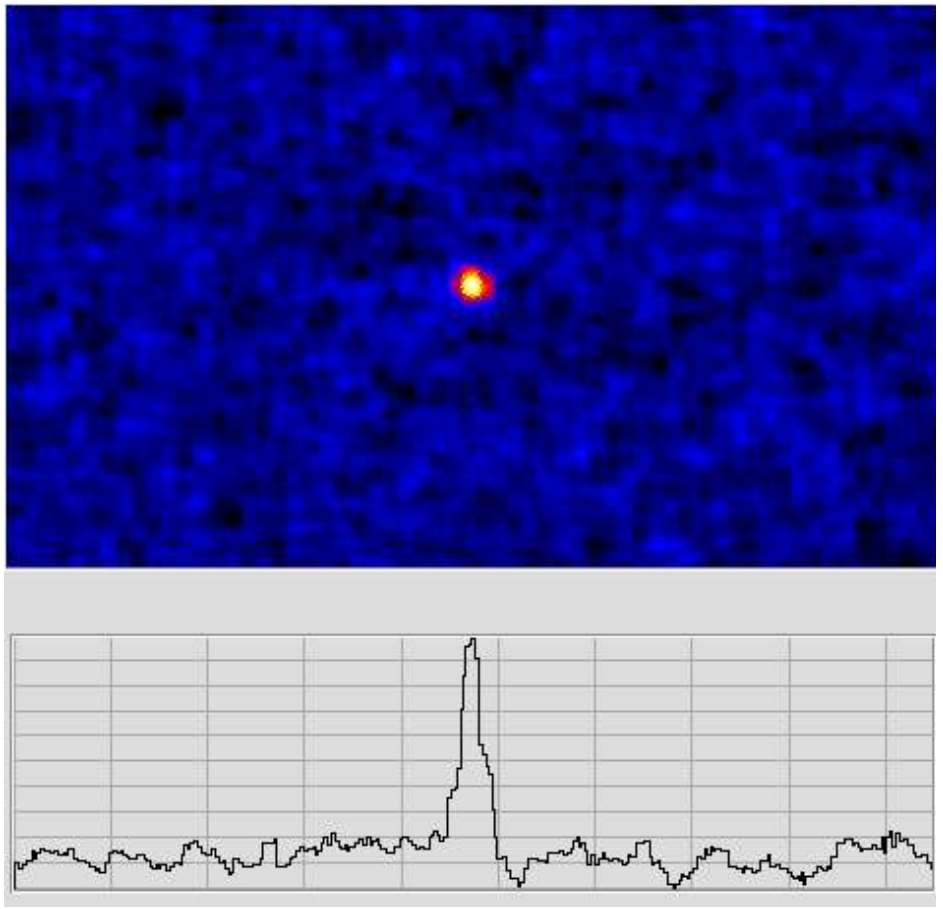
For low s/n sources imaging is more reliable and allows to correct for the background features.



Crab spectrum derived from mosaic for off-axis angles of 10 (red), 6 (green) and 3 (white) degrees.

Is it good for other instruments ?

- PICSIT: Much flatter images are obtained. The significance of Crab is doubled (when compared to OSA, incl. bkg map).



Crab rev 39, PICSIT single events
250-340 keV: 23σ detection in 60 ksec exp.

- JEM-X: Input images need first to be improved (geometry & photometry).