

JEM-X: Thermal alignment effects

CBJ, SB, NJW, NL
DNSC

JEM-X Cross-Correlation

Skyim = Detim*Mask

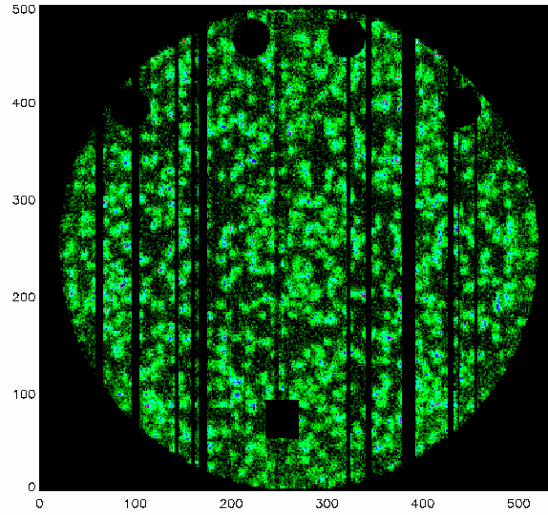
Skyim(u,v) = $\sum_i \text{Detim}(x_i, y_i)$, where Mask_{u,v}(i) open.

JEM-X: Analog Imaging. Energy dependent position resolutions.

Pixel Size ? < mask hole, in most cases 1.5 mm.

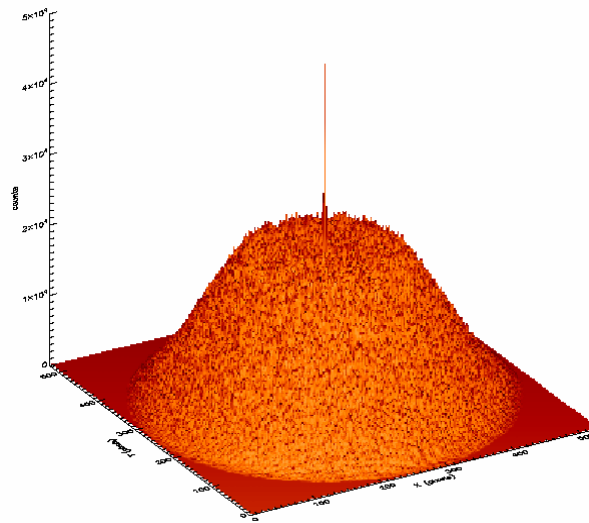
Skyim: 525x525 pixels (13x13 deg) of 1.5'x1.5'.

Detim: Crab on-axis



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Skyim: Crab on-axis

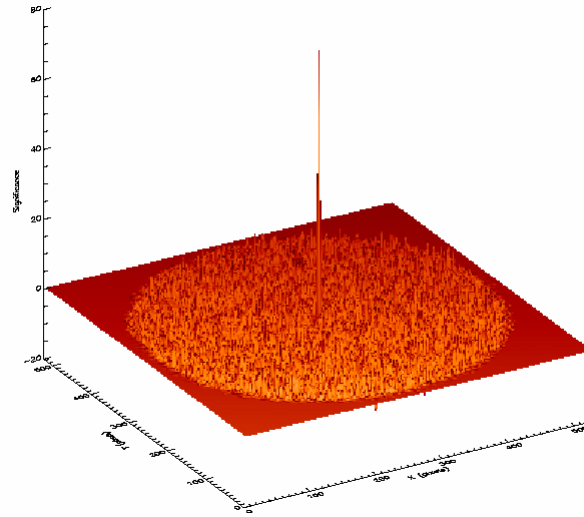


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Skyim/Bckim/RMSim

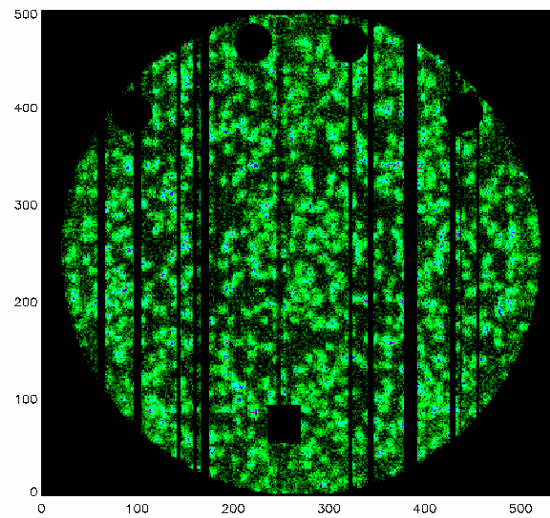


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Detim: Crab on-axis

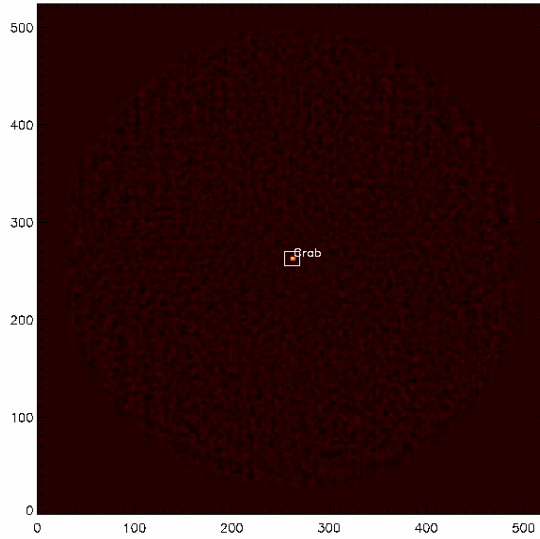


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Source Finding

Orbit = 483 PID= 43

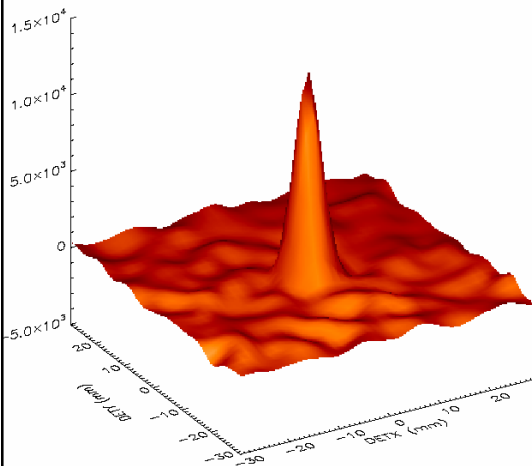
1 pixel: 1.5'x1.5'



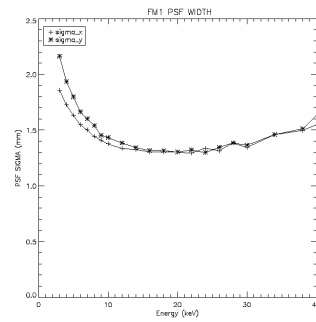
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JEM-X PSF

Crab



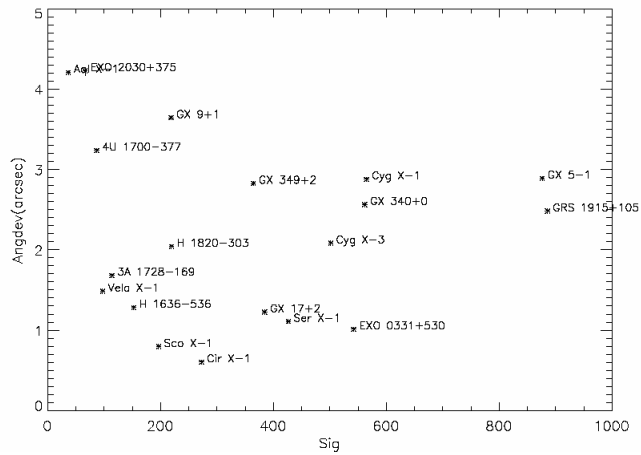
$$N = N_{\text{peak}} * f_{\text{dead}} * f_{\text{coll}} * 4/3$$



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Source Localization

JEM-X1 Misalignment:
4000 detections of strong sources in Orbit 270 to 320.

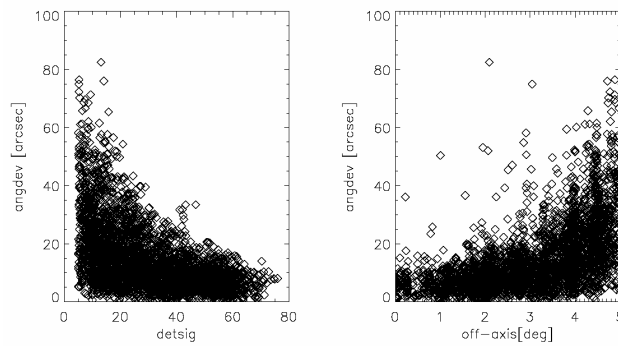


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Source Localization

The JEM-X alignment was determined from 4000 detections (> 1 year) of well known sources: *Cyg X-1, Cyg X-3, GRS 1915, Ser X-1, Sco X-1, GX 17+2, GX 9+1, GX 5-1, etc*

Detection Significance and Off-axis Angle

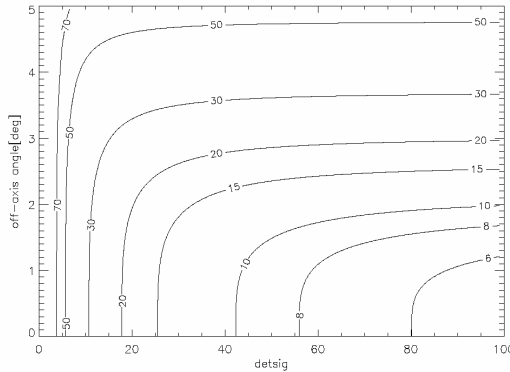


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Source Localization

Contour lines of 95% confidence radii (arcseconds)

$$\begin{aligned} \text{dev}_s &= 200 \times \text{detsig}^{-0.8} \\ \text{dev}_o &= 2.2 \times \text{offaxis}^2 \\ \text{dev}^* &= \sqrt{\text{dev}_s^2 + \text{dev}_o^2} \end{aligned}$$



1 Crab source, 1000 sec, on-axis: $r_{95\%} = 7''$

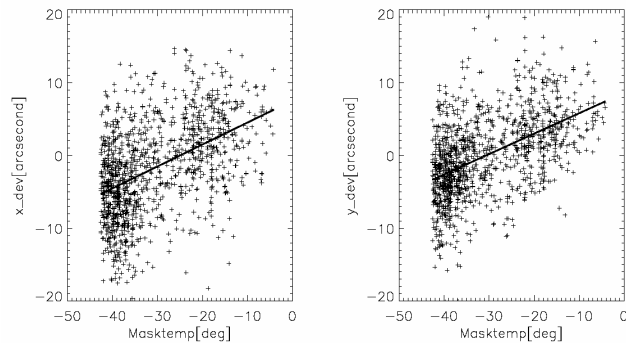
1 Crab source, 1000 sec, 3 deg : $r_{95\%} = 22''$

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Source Localization

The JEM-X alignment was determined from 4000 detections (> 1 year) of well known sources: *Cyg X-1, Cyg X-3, GRS 1915, Ser X-1, Sco X-1, GX 17+2, GX 9+1, GX 5-1, etc*

Mask Temperature



Slope = 0.42 arcsecond/deg C

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Source Localization

Spacecraft & Instruments Coordinate Systems

