Chandra PSF
&
High-Angular Resolution Imaging

(a user's view)

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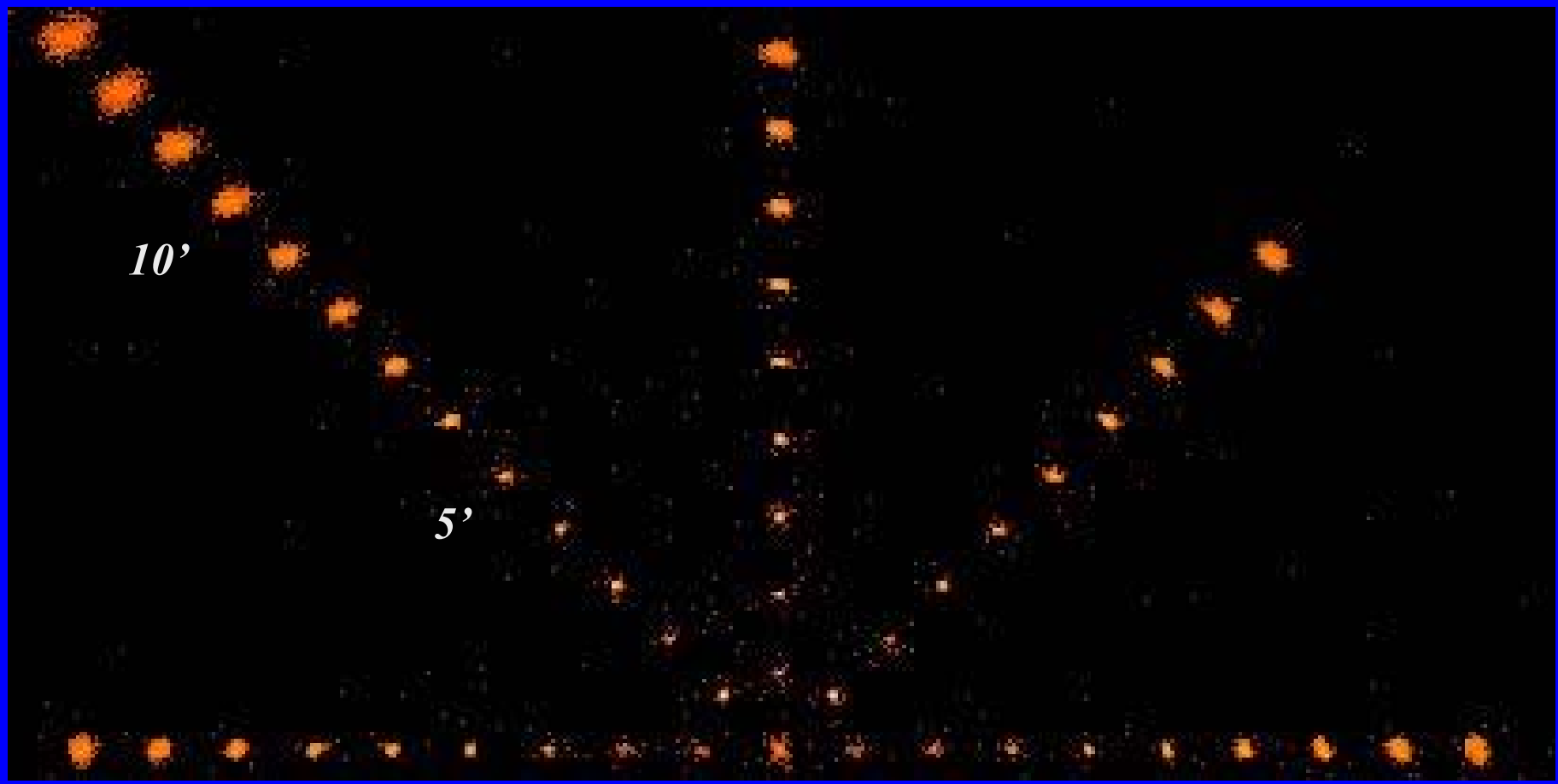
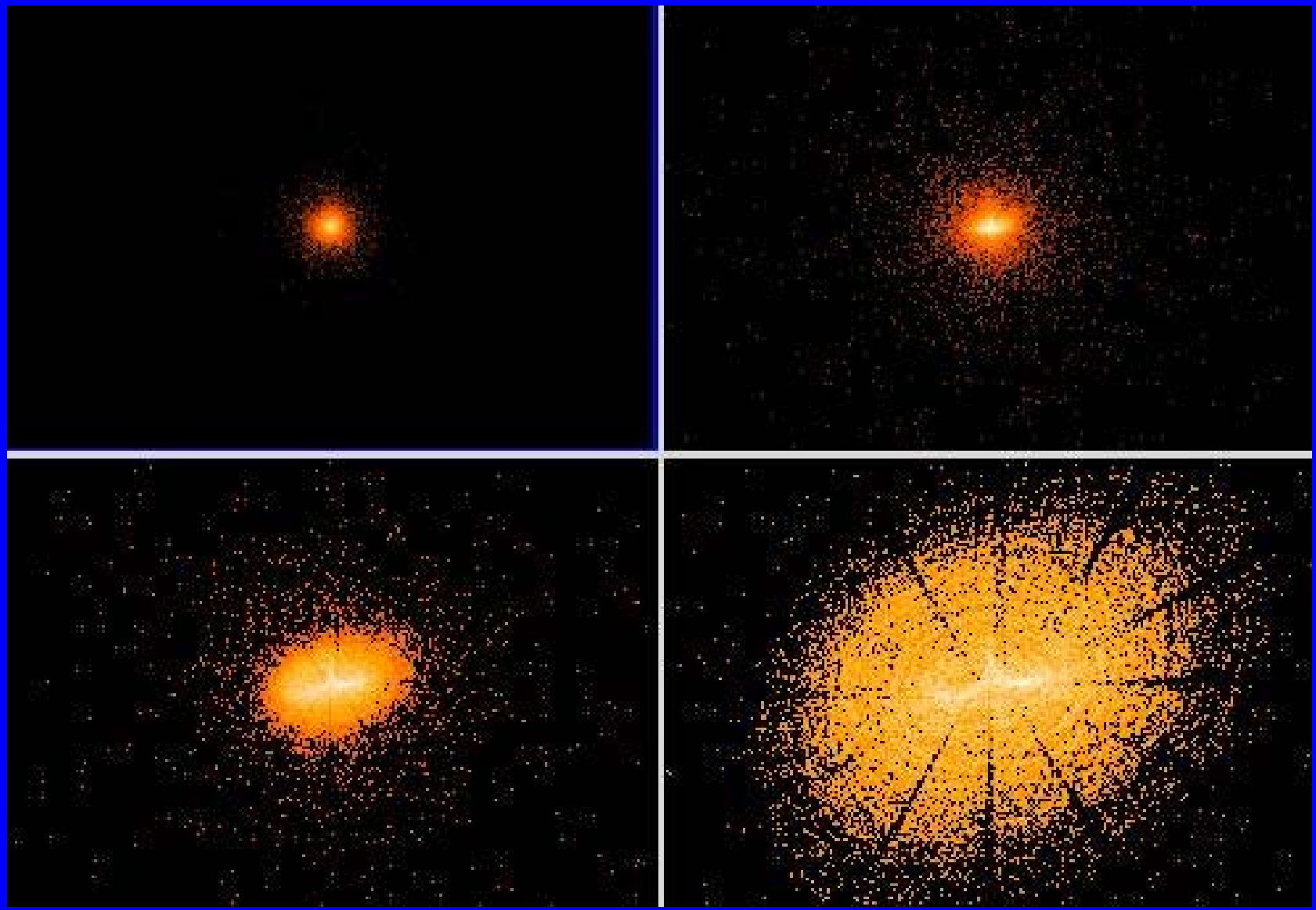
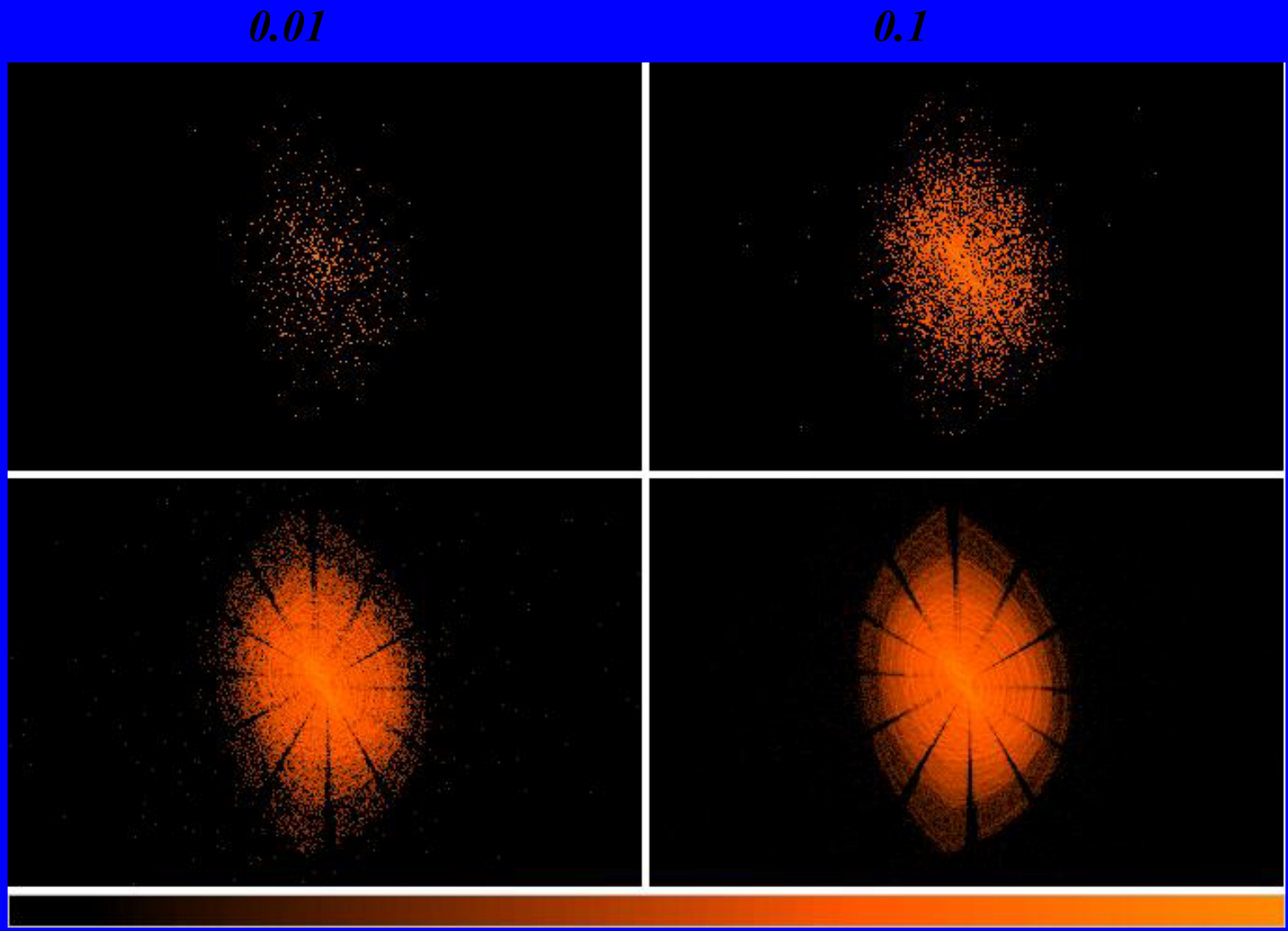
Chandra/HRMA PSFs 0-13’ off-axis



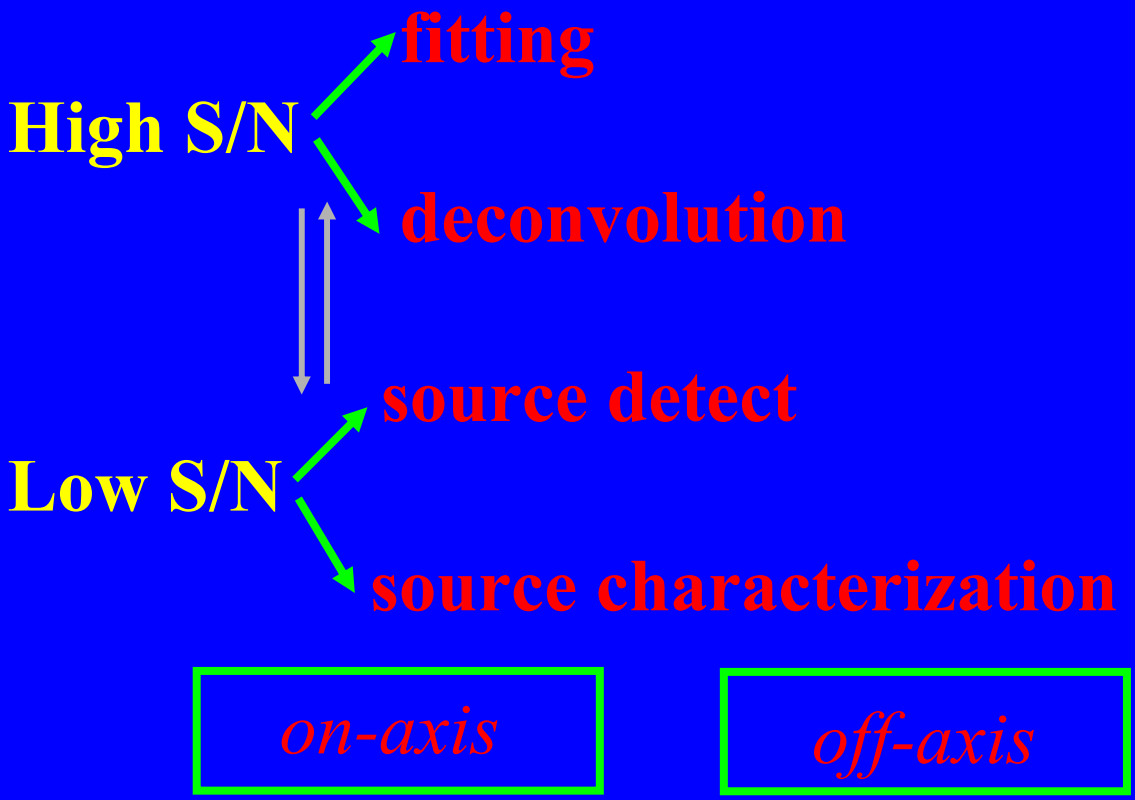
PSF varies as a function of off-axis angle and wavelength/spectrum

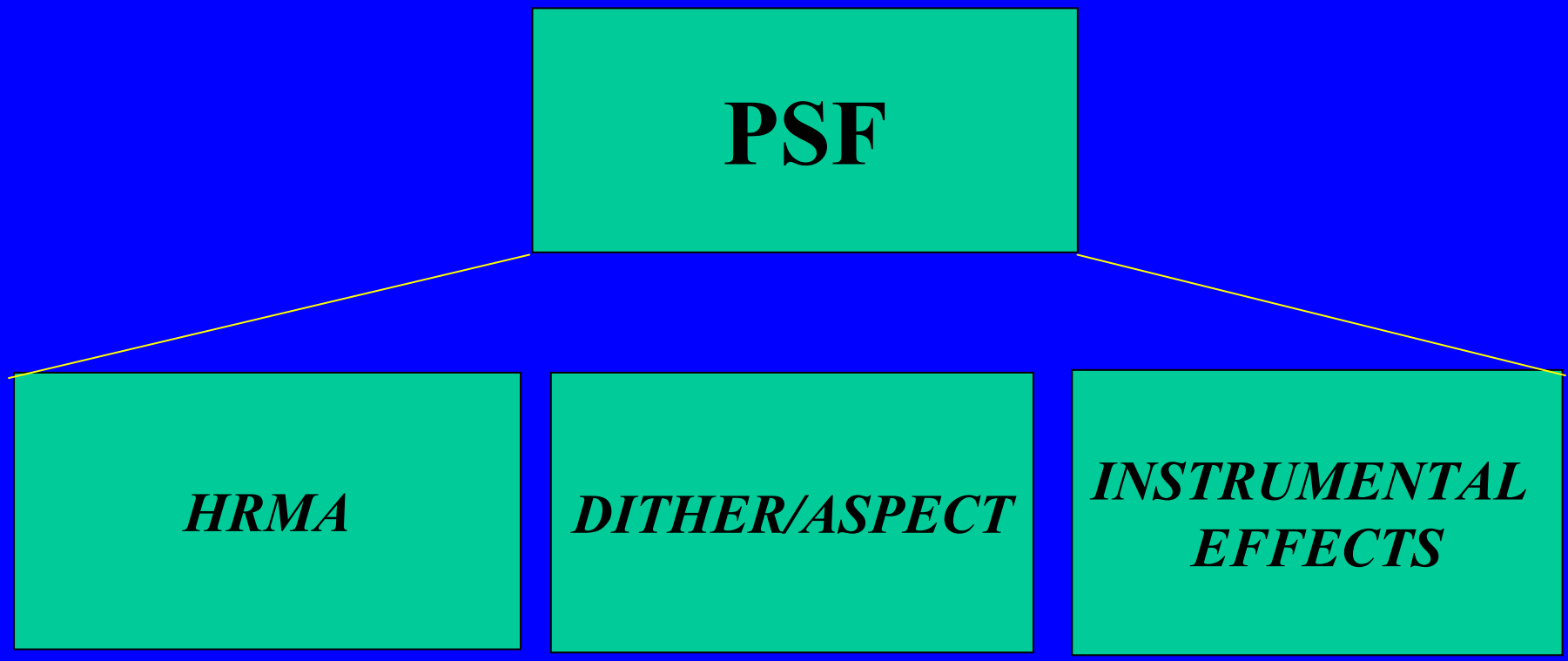
Chandra/HRC PSFs for 1.5 keV




0.01
0.1
2
10

2-D PSF characterization is a key *to* multi-scale analysis applications



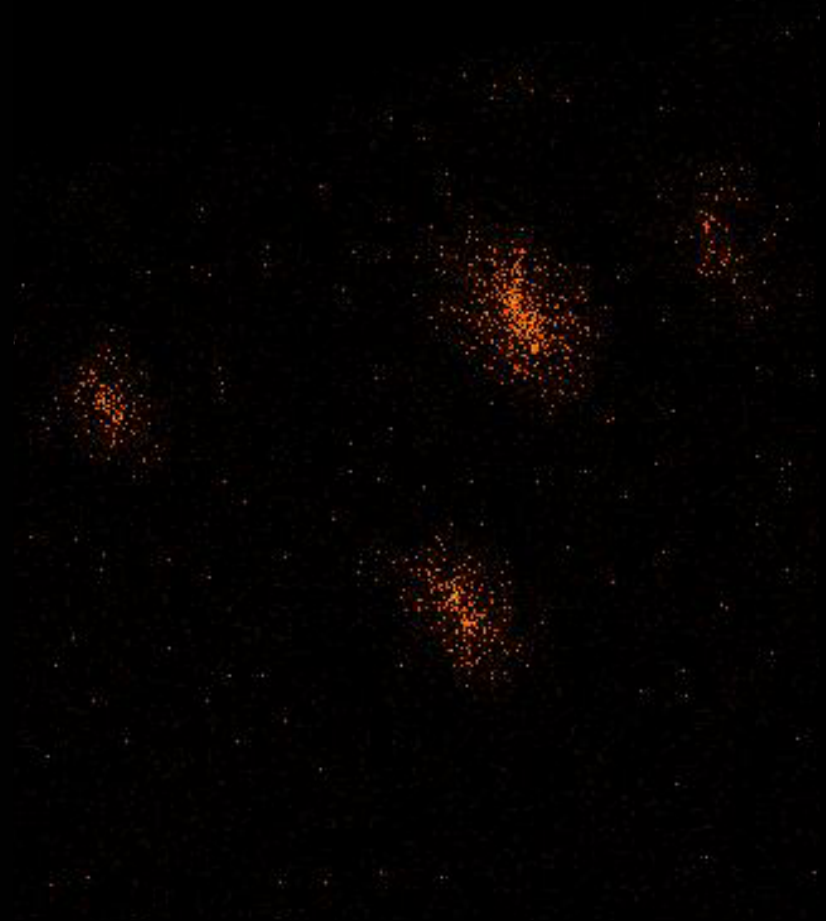

PSF
HRMA
DITHER/ASPECT
INSTRUMENTAL EFFECTS

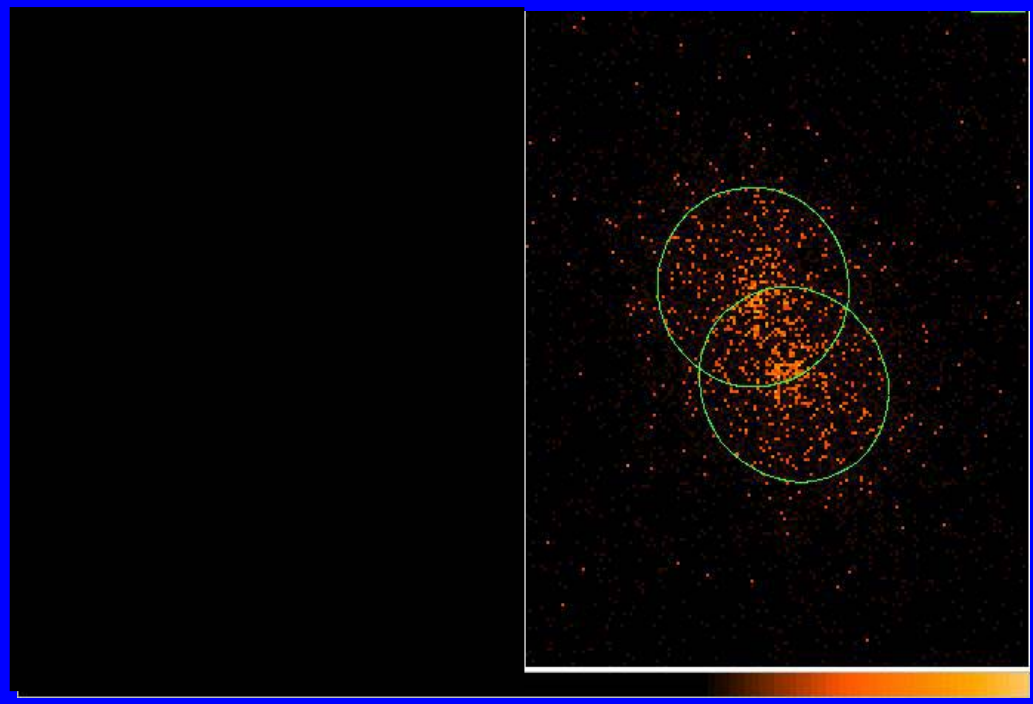
Current PSF modeling:

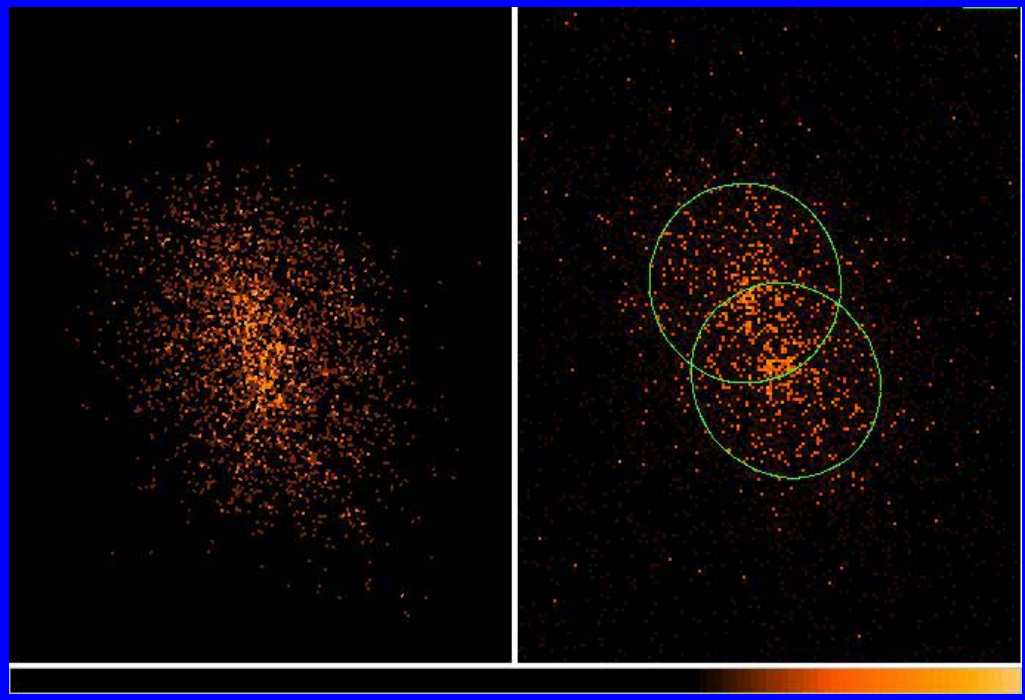
- HRMA PSF model from simulation: ChaRT/SAOsac
- Detector:

  psf_project_ray, MARX
- Aspect (e.g.conv. 0.06”)

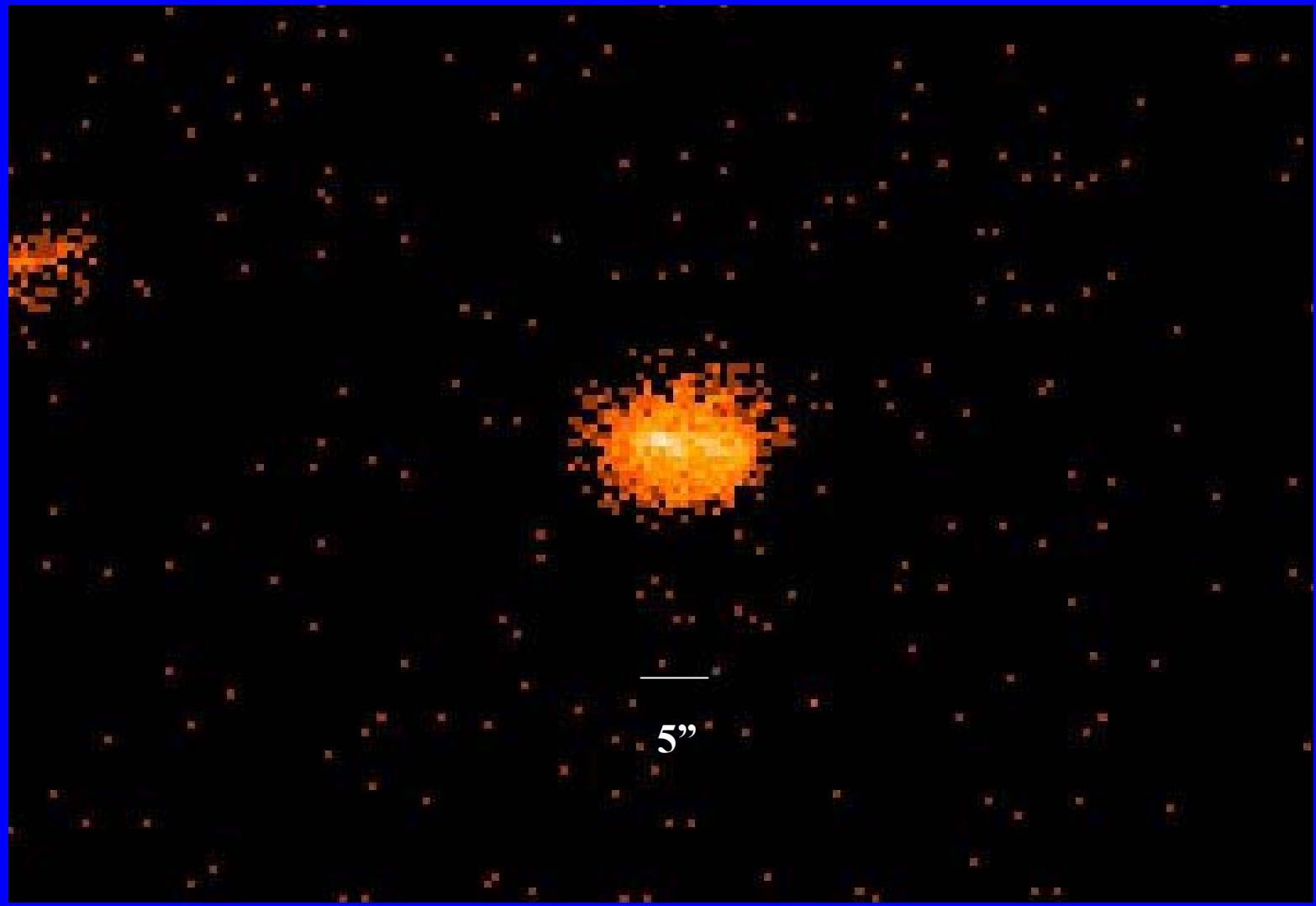
ACIS-S (ACIS-I aim point) 15’ off-axis source





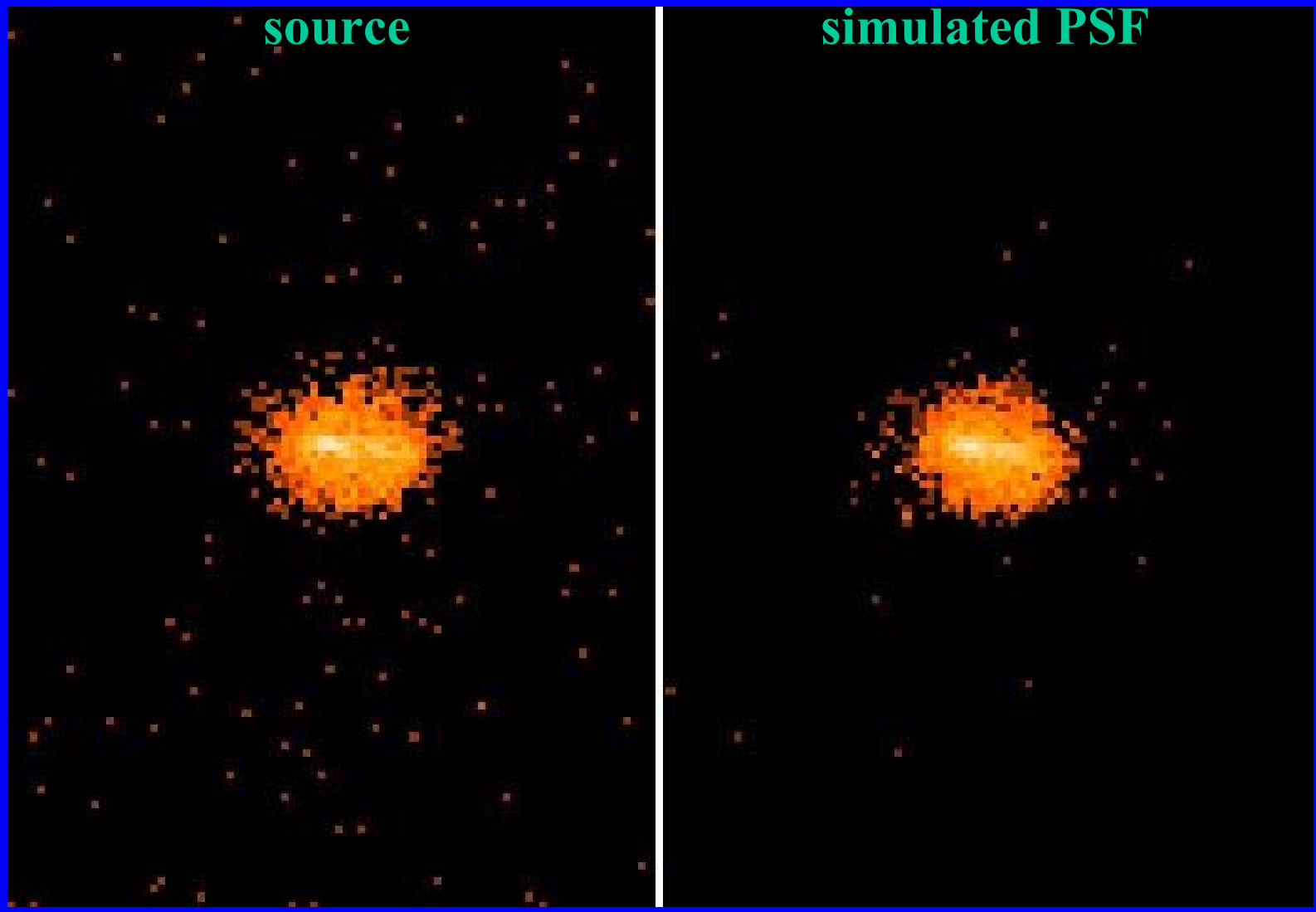


Chandra/ACIS obs. of a 2000 cnts source at 6’ off-axis

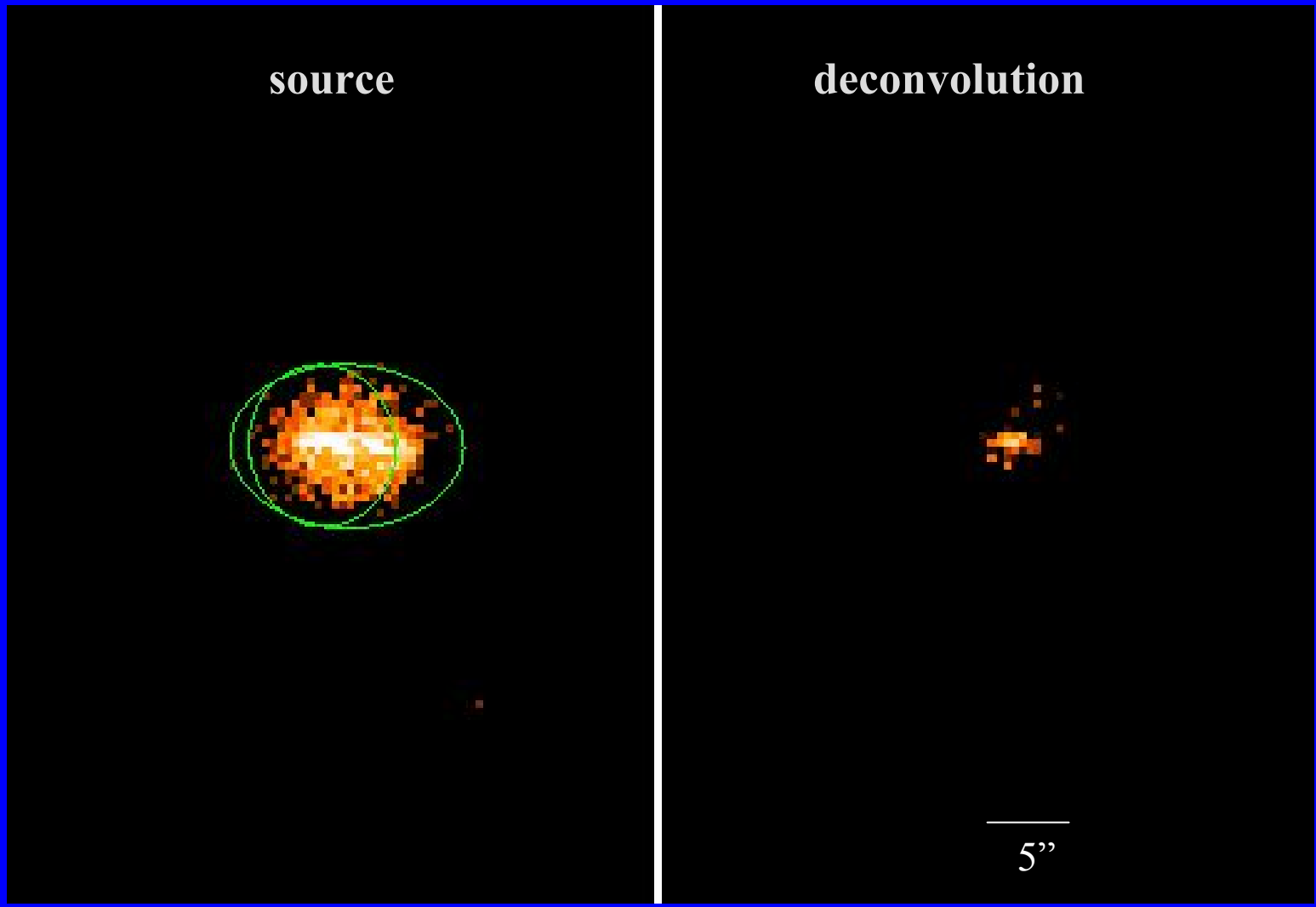


Wavedetect result

3” binary?

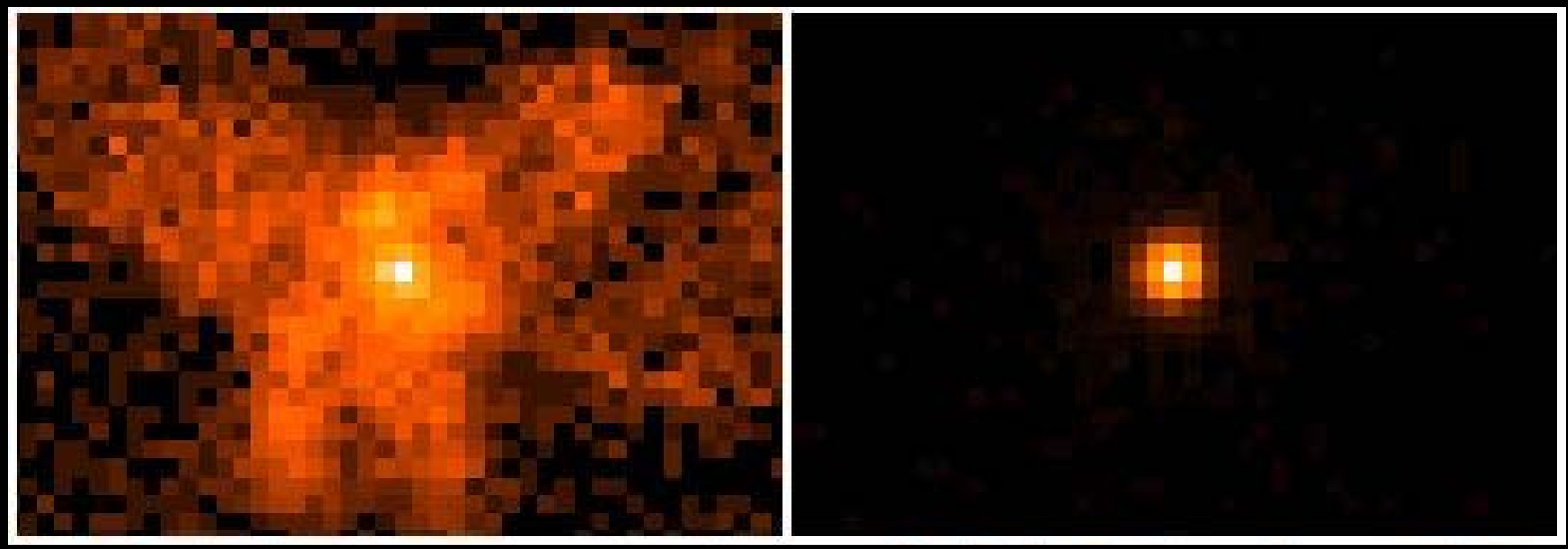


ChaRT/MARX


source
deconvolution
5”

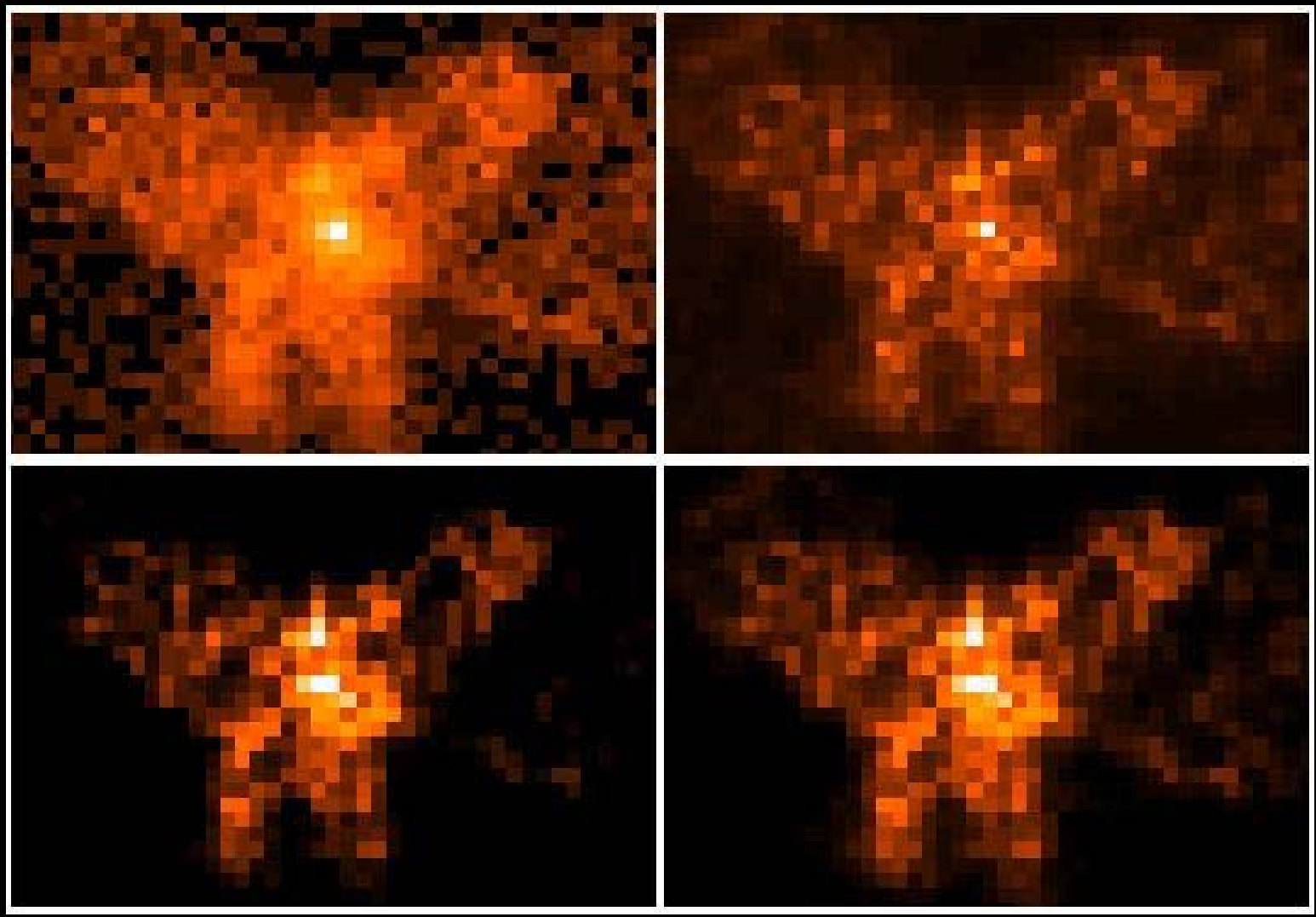
NGC6240

sim PSF



2”

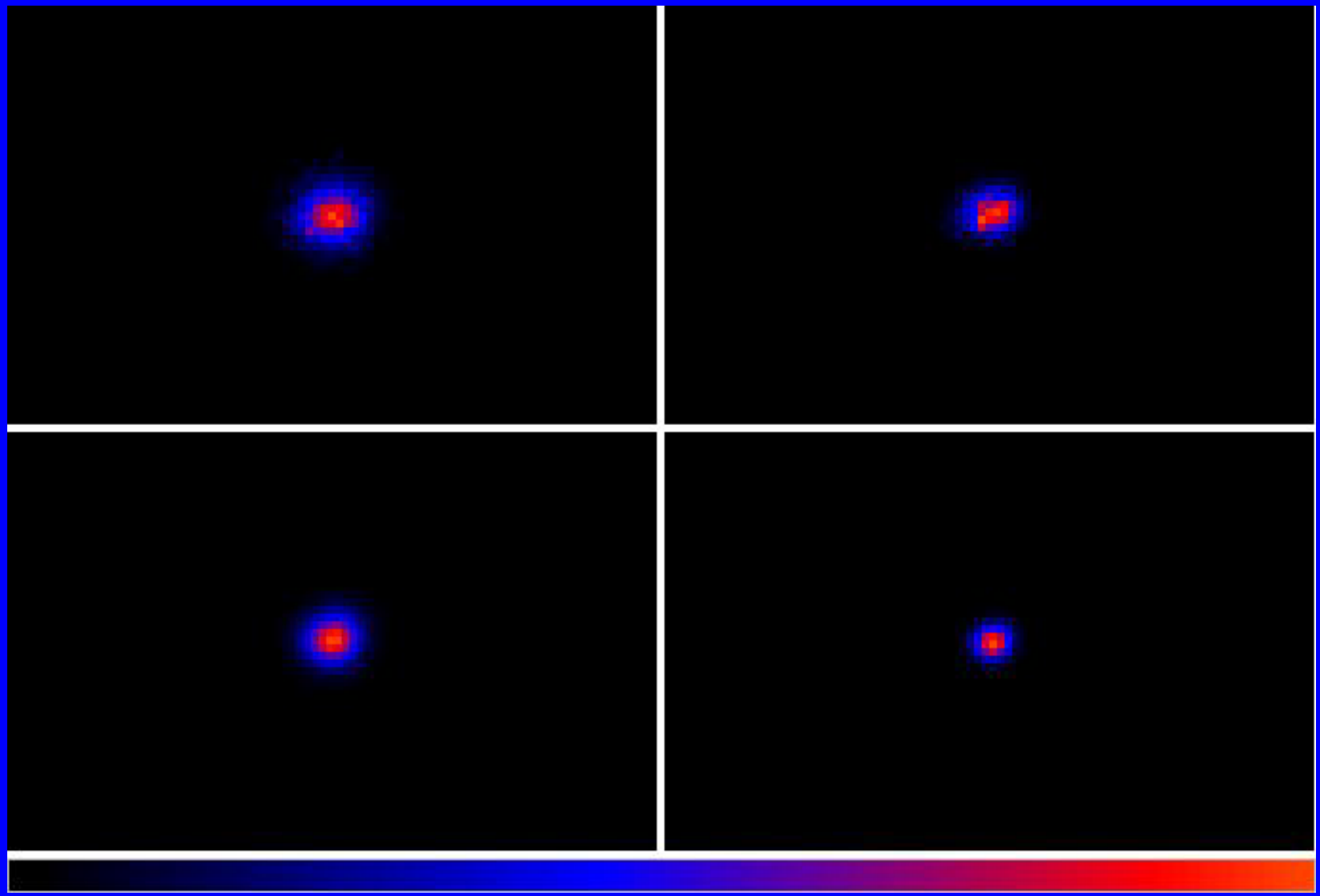
original **deconvolved image**



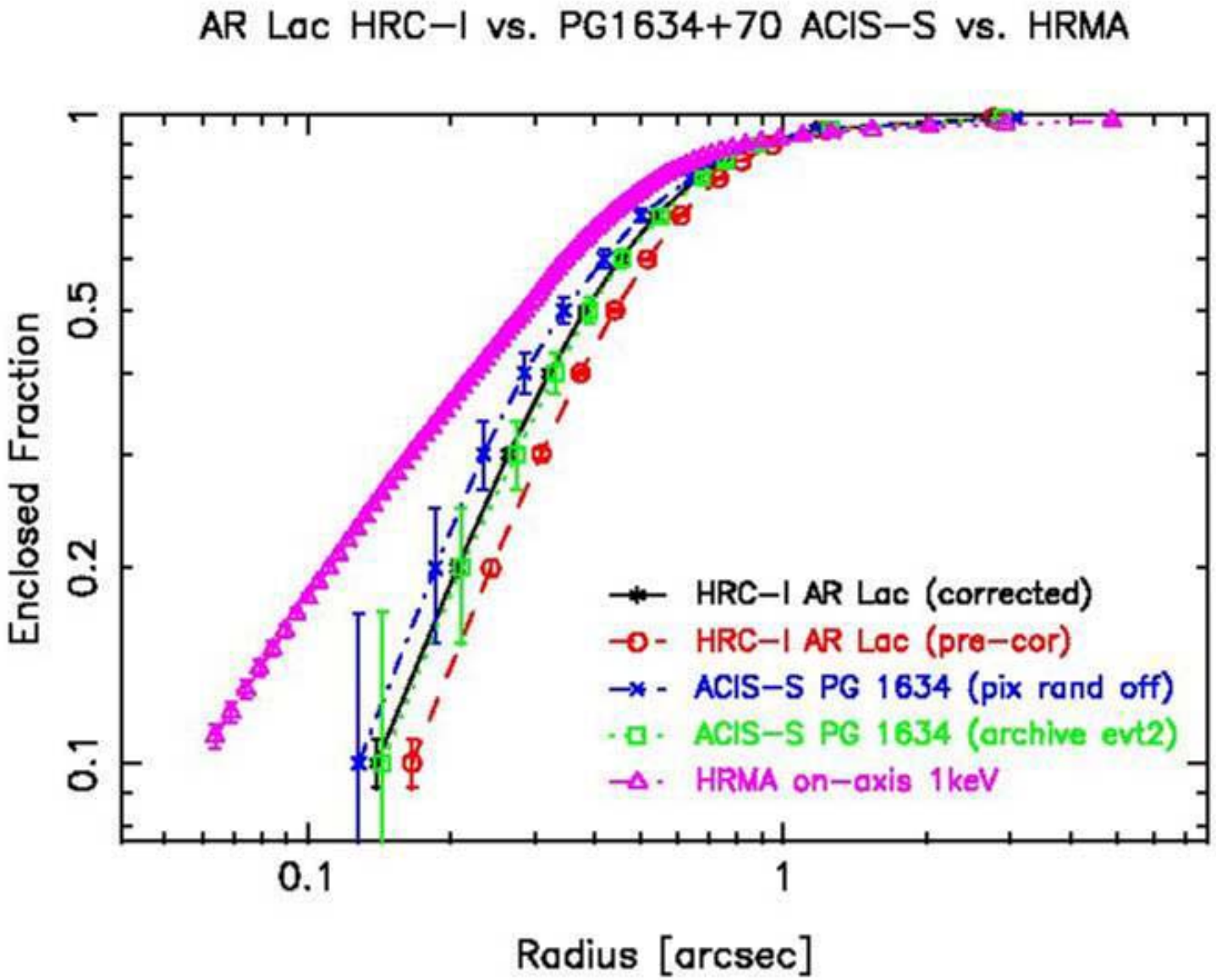
significance map: *3 sigma* significance map: *1 sigma*

HRC-I Resolved source?

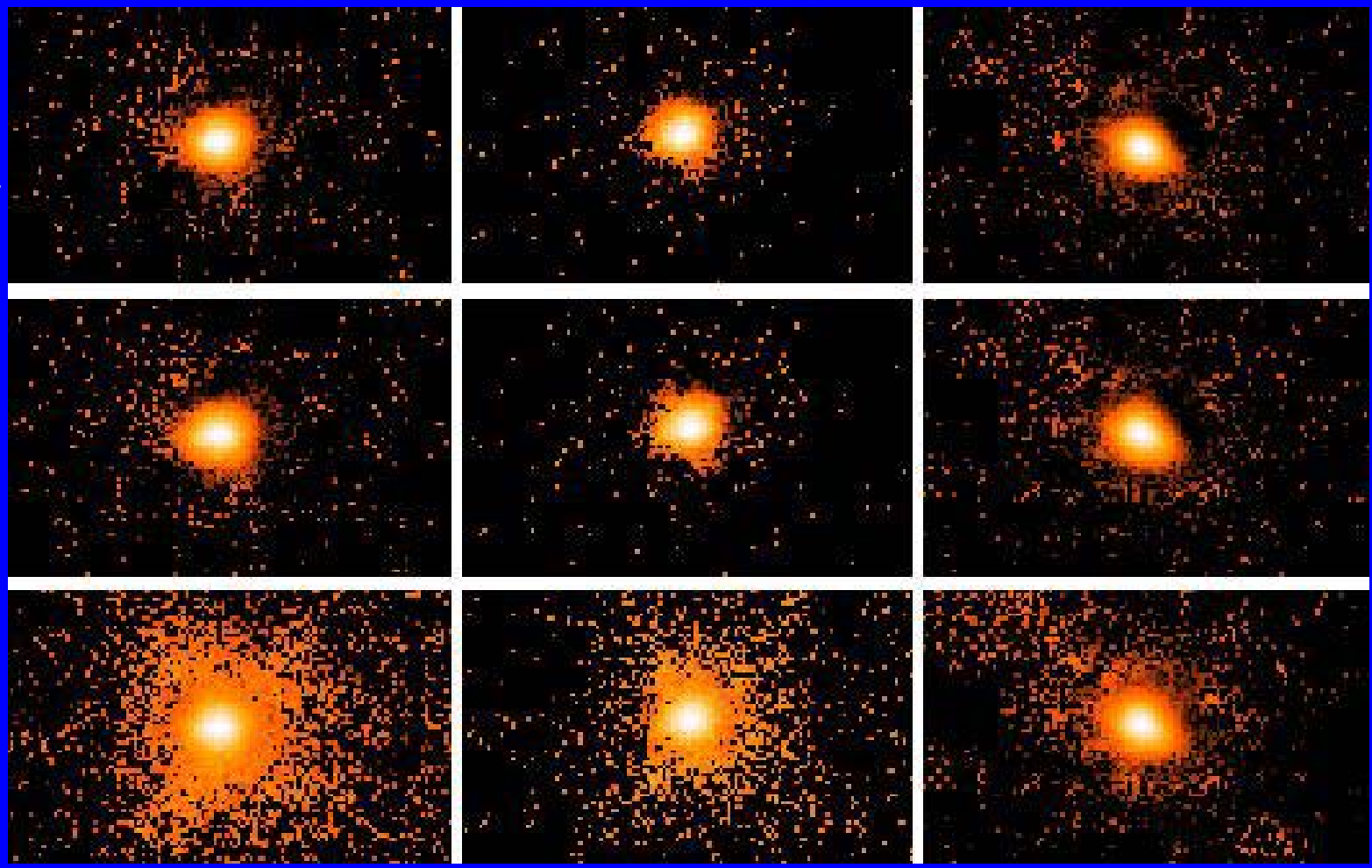
Deconvolution with PSF



HRC-I unresolved source?


AR Lac HRC−I vs. PG1634+70 ACIS−S vs. HRMA
Enclosed Fraction
0.1
0.2
0.5
1
0.1
1
Radius [arcsec]
HRC−I AR Lac (corrected)
HRC−I AR Lac (pre−cor)
ACIS−S PG 1634 (pix rand off)
ACIS−S PG 1634 (archive evt2)
HRMA on−axis 1keV

HRC-I obs ervations: 3 OBSIDs – same source



evt2 MJ-deg

evt2 arch

evt1

Obsid 1

Obsid 1

Obsid 1

PSF issues

How do I know how accurate is the PSF model?

SAOsac rays:

- **on axis PSF:**
  e.g. accuracy- core, wings (<2keV and >2kev);
- **off-axis PSF:**
  e.g. inner structure

Systematic errors? Statistical errors? Monte-Carlo errors?

Aspect:

dither modeling and aspect blur

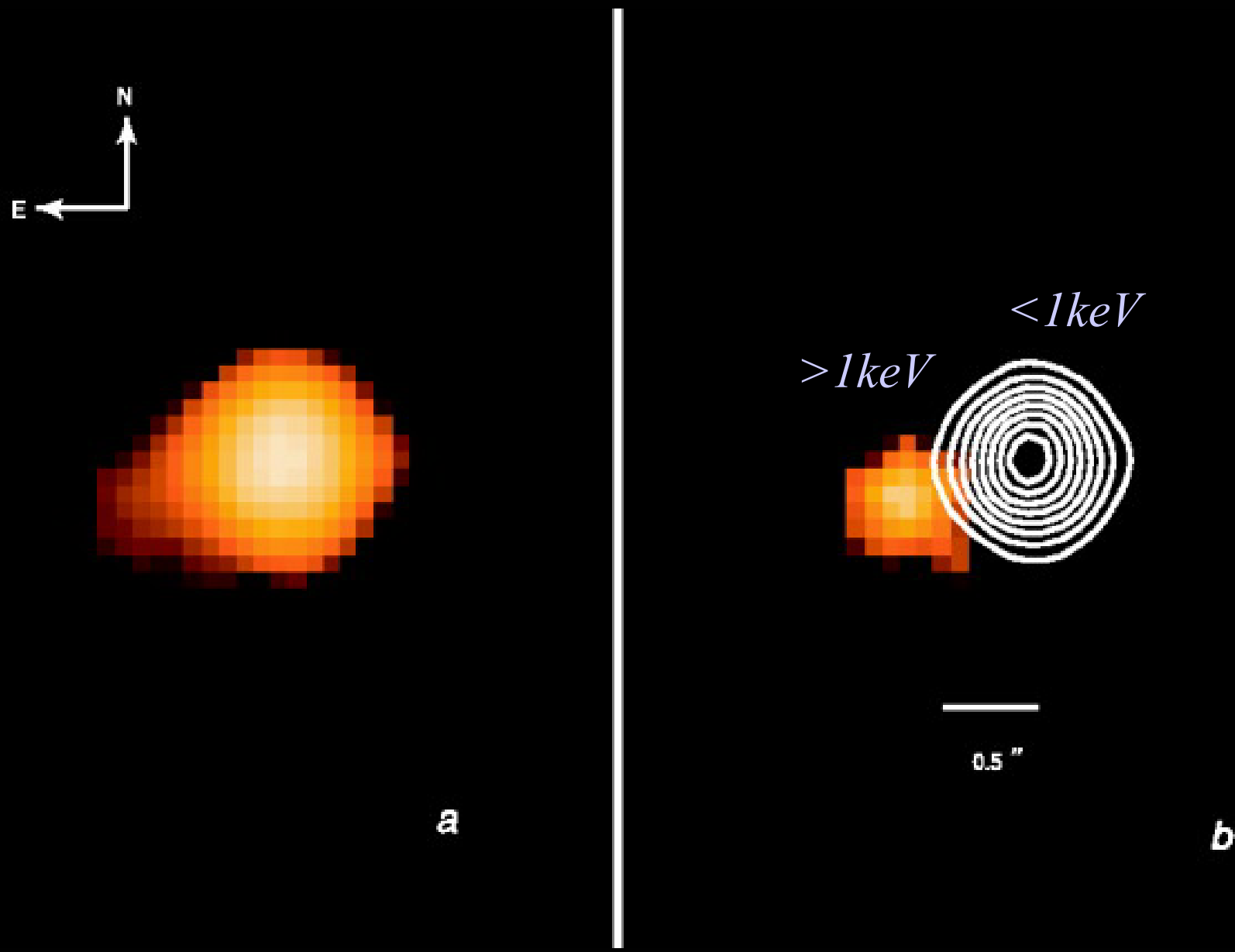
Can we model dither in SAOsac? Aspect "estimator" tool?

Detectors:

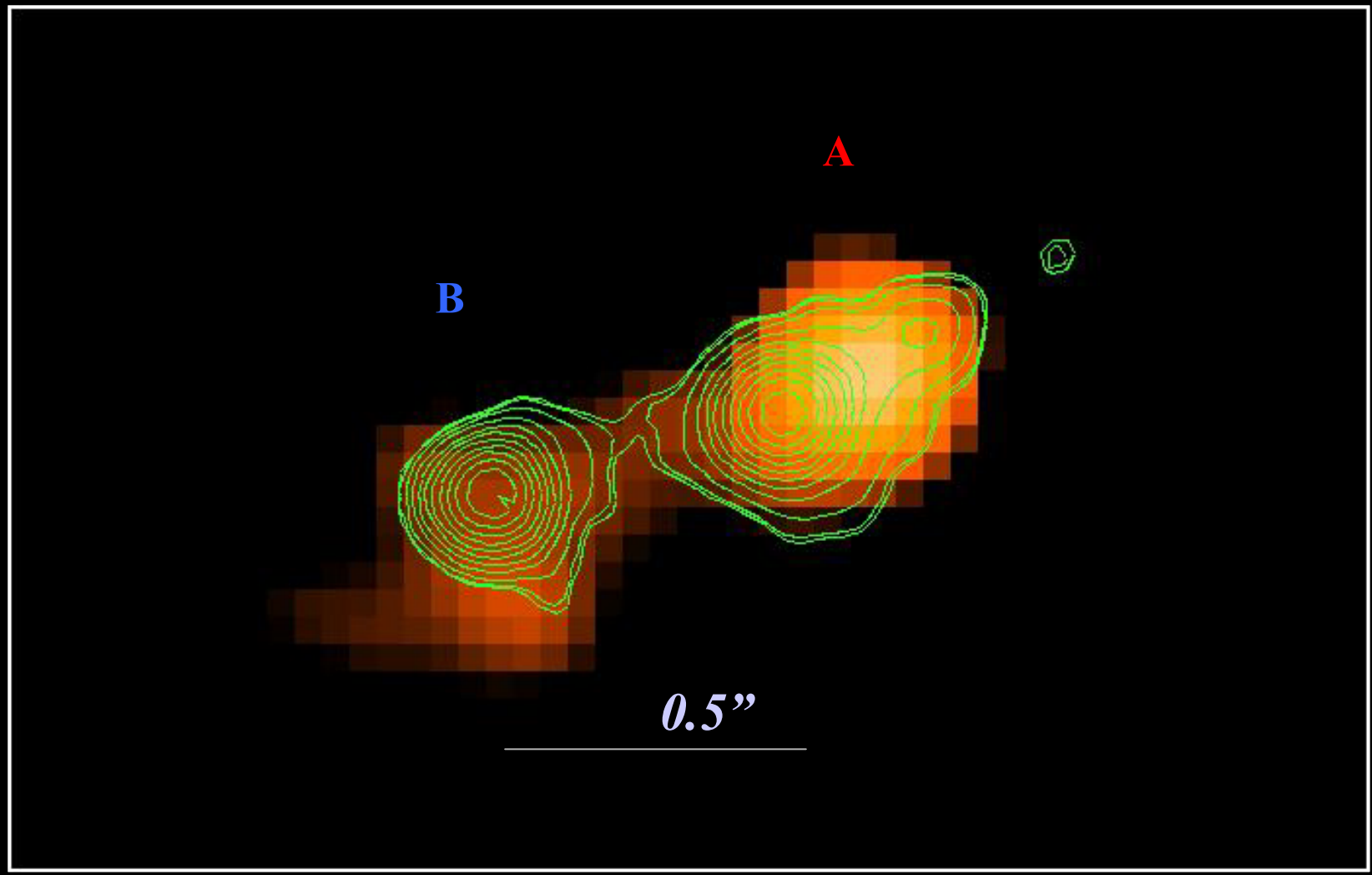
- ***ACIS:***
  e.g. pixelization, pixel randomization, 2-D pileup effects, grades, CTI, other detector effects?

- ***HRC:***
  e.g. additional blur caused by dithering - residual errors in the position errors in evt reconstruction 3-4 pixels

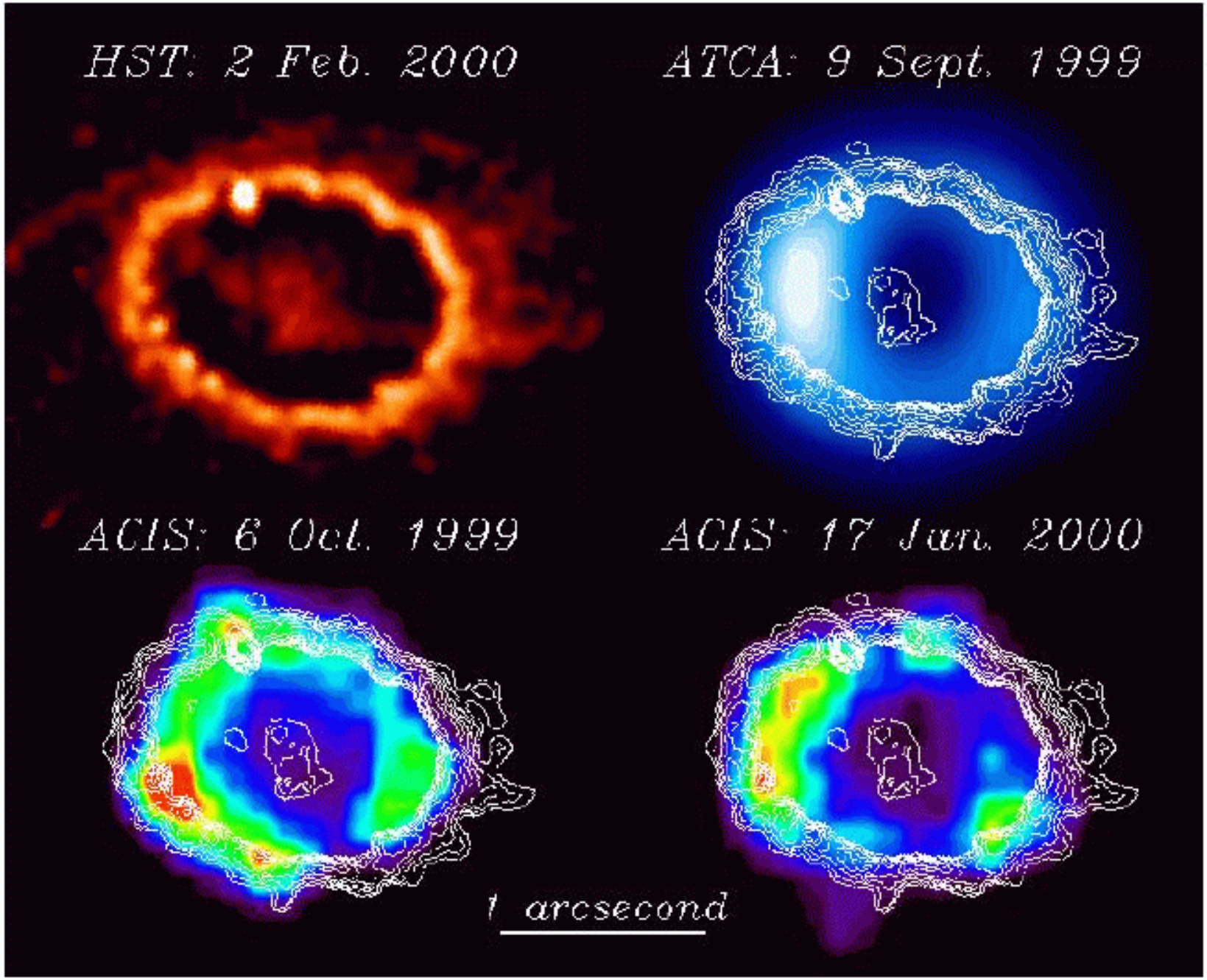
Mira AB Chandra/ACIS-S



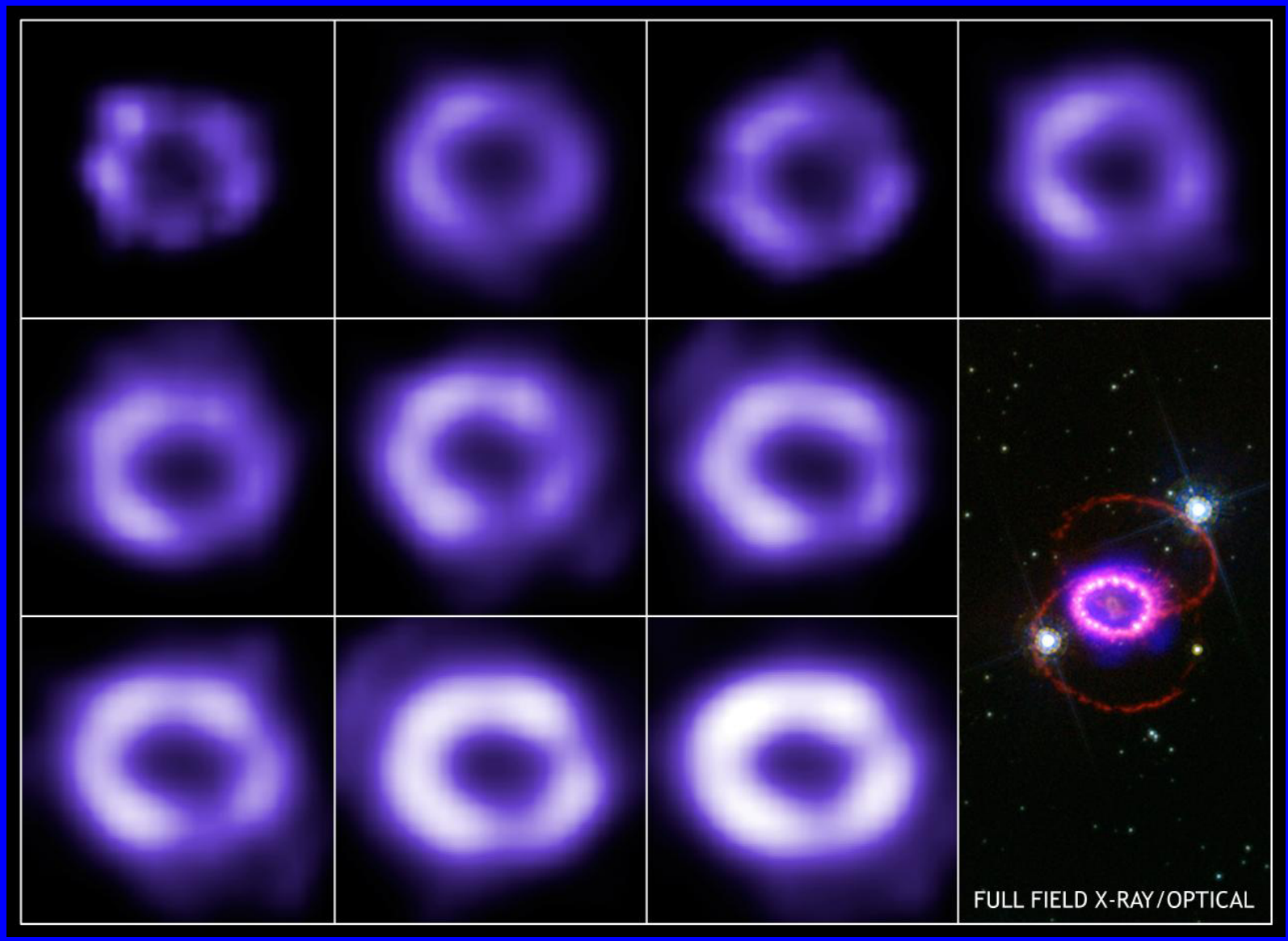
Mira AB **Chandra ACIS-S (12/03)+ HST (2/04)**



SN1987 A



Burrows et al. 2001


FULL FIELD X-RAY/OPTICAL

- How good is current calibration of the PSF?
- Estimates of uncertainties
- More realistic detector & aspect (dither) simulators