Calibration of the Chandra PSF: Off-Axis PSF

CXO Calibration Review
30 October 2001
(Revised 10 December 2001)

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Measurements of Chandra's off-axis PSF are ongoing. We present here a qualitative comparison of observation and simulations using two different mirror models, SAOsac and MARX.

Choosing sources to measure the observed off-axis PSF is a little more difficult than one might imagine.

ACIS is the preferred detector:

- spectral sensitivity
- larger pixel size not an issue for off-axis images

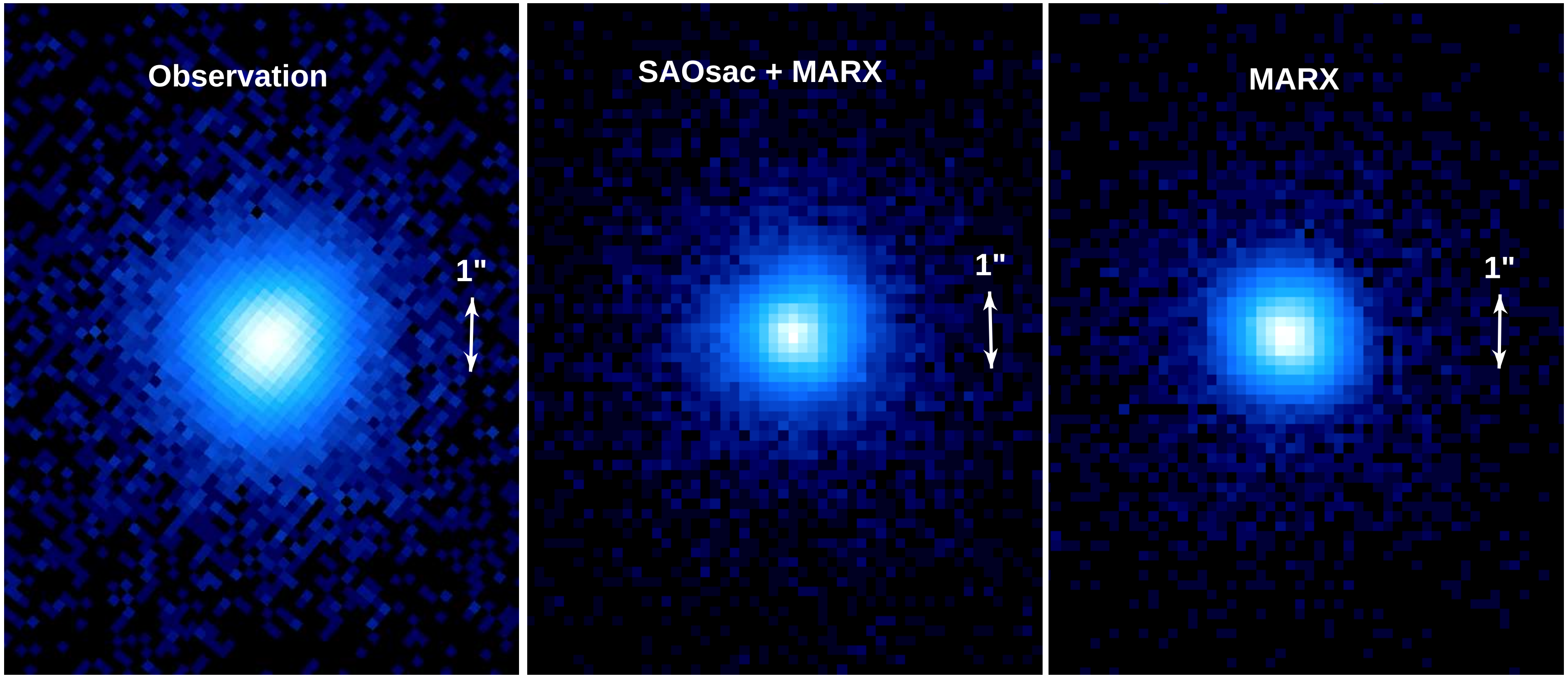
However, the brightest off-axis ACIS obsevations still show pileup! For this study we use HRC-I images. Unfortunately the HRC has no spectral sensitivity.

Selected Off-axis Point sources

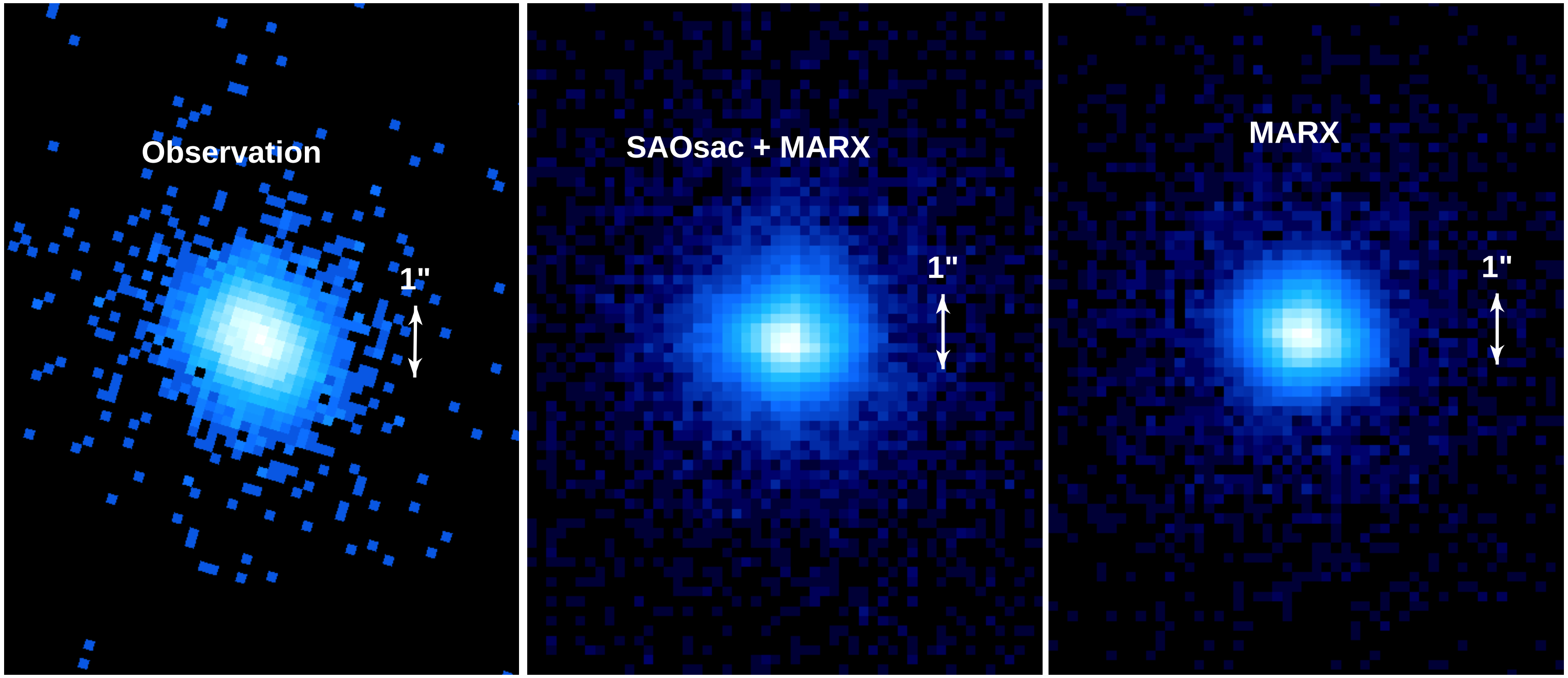
OBSID	Object	$\theta[']$	$\phi[^\circ]$	Net Counts
1385	AR Lac	0.29	23.68	51909.1
1476	2REJ1032+532	0.75	103.15	5650.57
1472	HR1099	2.016	276.76	17779.8
1469	HR1099	5.247	359.84	16177.2
1468	HR1099	10.250	359.89	14398.6
1118	LMC X1	15.972	177.43	23258

The sources were modeled as mono-chromatic point sources with an energy of 1.5keV. Two mirror models were used, SAOsac and MARX. The detector, HRC-S, was simulated with MARX.

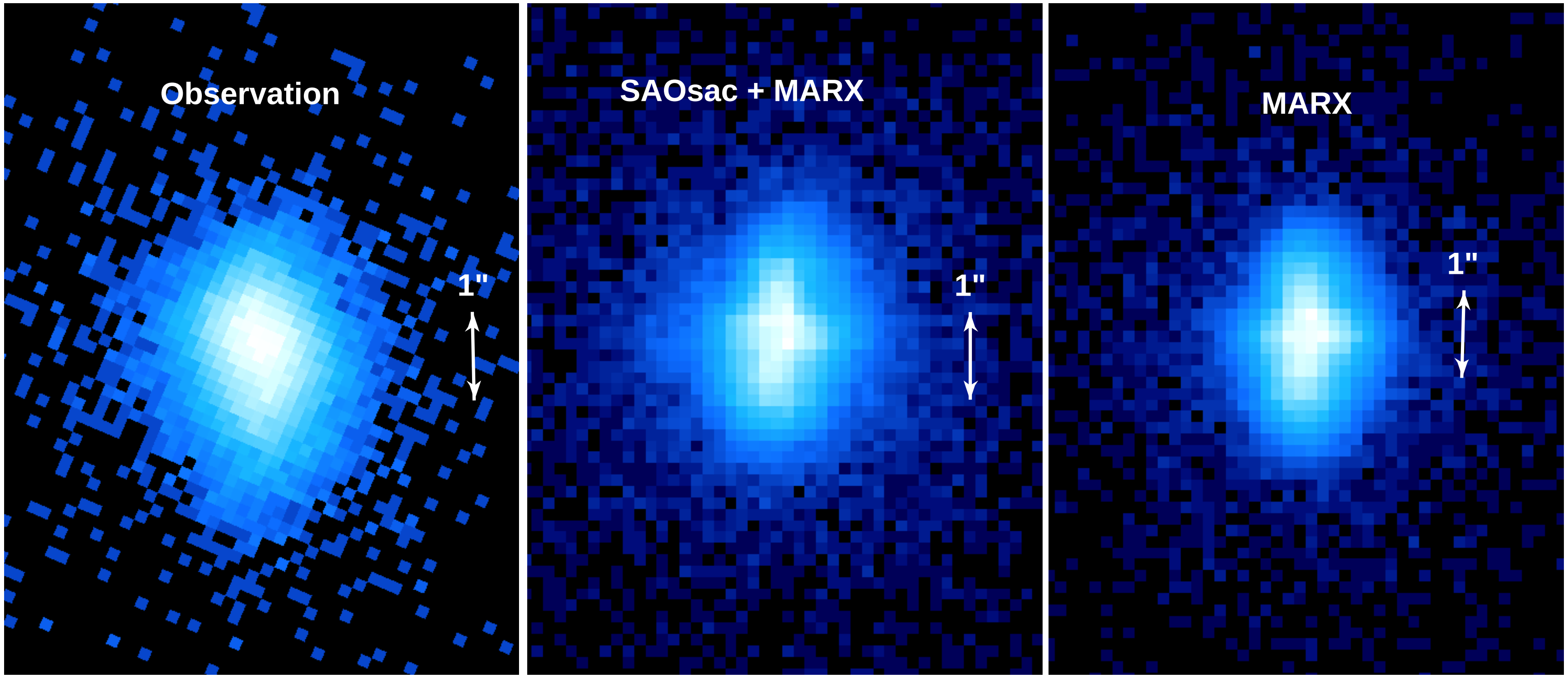
AR Lac [OBSID 1385] $\theta = 0.29'$, $\phi = 23.68^{\circ}$



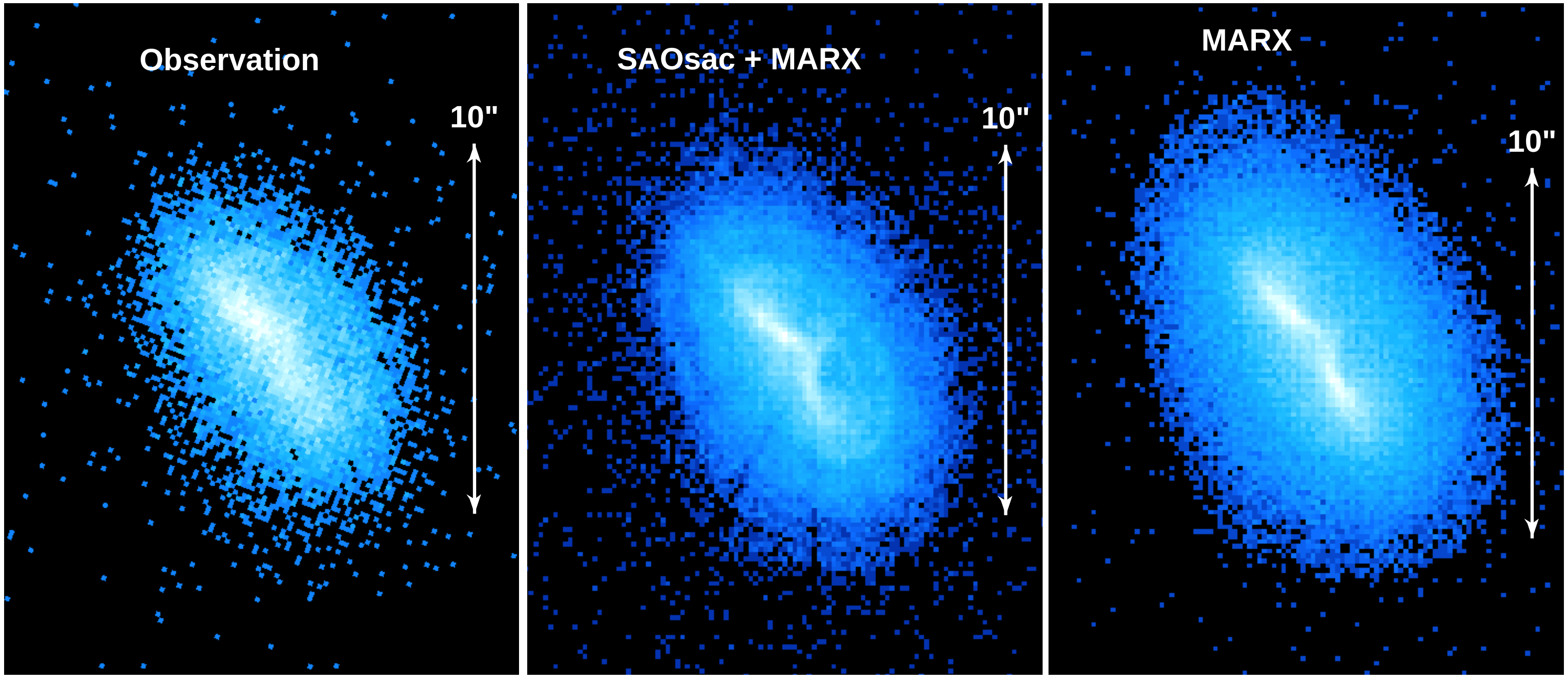
REJ1032+532 [OBSID 1476] $\theta = 0.75', \phi = 103.15^\circ$



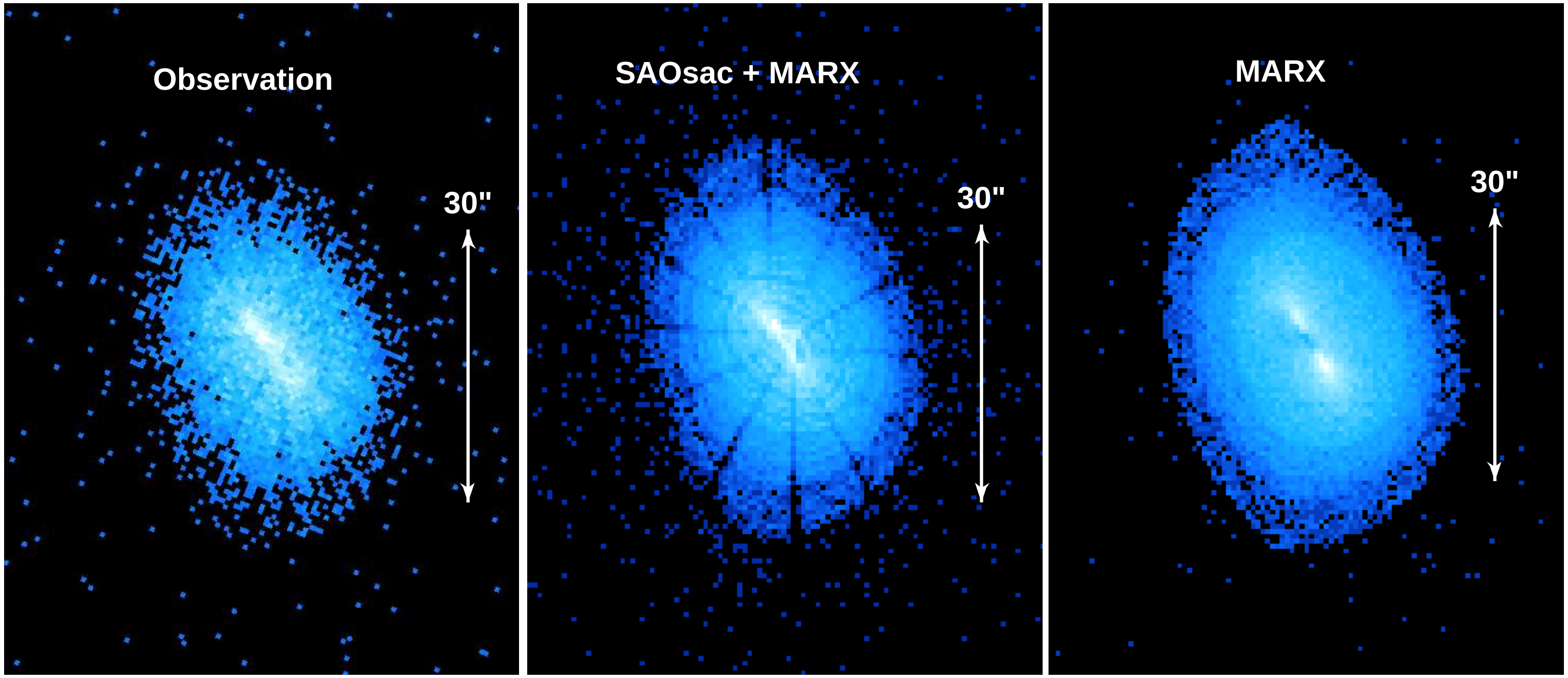
HR1099 [OBSID 1472] $\theta = 2.016', \phi = 276.76^\circ$



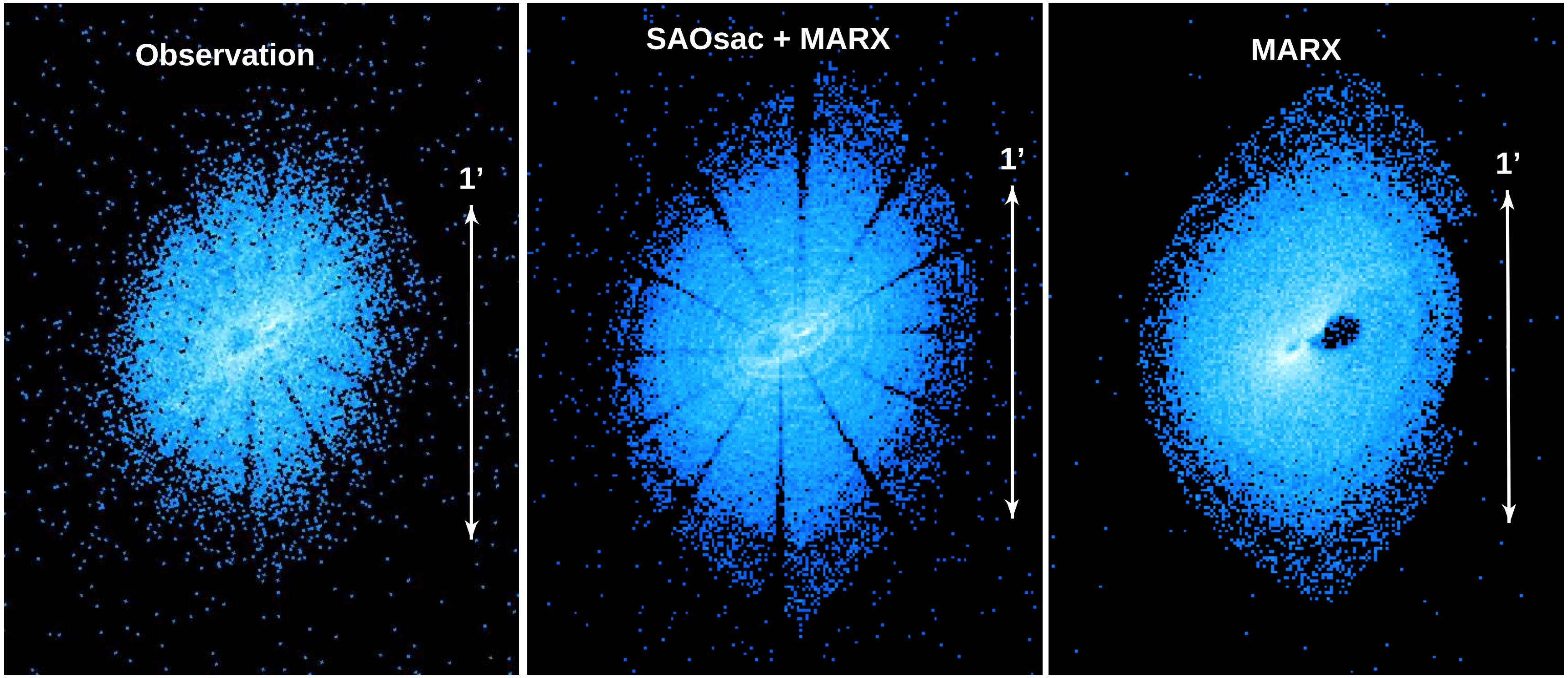
HR1099 [OBSID 1469] $\theta = 5.248', \phi = 359.84^{\circ}$



HR1099 [OBSID 1468] $\theta = 10.254' \phi = 359.89^\circ$



LMC X1 [OBSID 1118] $\theta = 15.972', \phi = 177.43^\circ$



Conclusions

- The simulations of the sources closer to the optical axis show more pronounced sub-arcsecond structure than do the observations. We have not simulated the residual systematics in the HRC event position reconstruction. This may resolve this issue.
- The AR Lac observation seems more extended than the simulations. We have not applied the same corrections to it as were done in the analysis of it presented the On-axis PSF presentation, so this is expected.
- The SAOsac mirror model appears to more faithfully reproduce the observed PSF at larger off-axis angles.