



## Where is the source? Continuing efforts to improve astrometric accuracy

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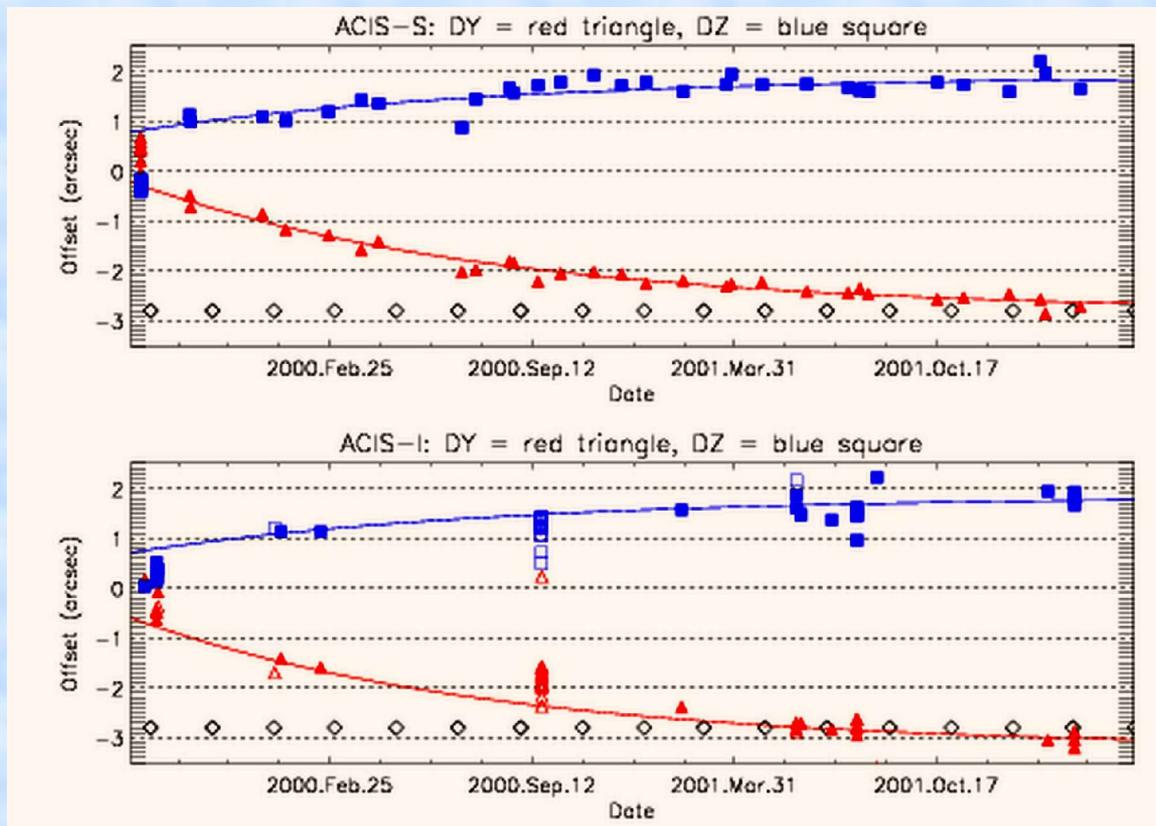
## Monitoring and Calibrating the *Chandra* boresight

- Absolute astrometric accuracy of Chandra data is monitored by means of a Perl script which automatically does the following:
  - Retrieve OBSCAT information about all observations in the specified time interval
  - Exclude ObsIDs from observations categories which typically have extended structure (e.g. SNR)
  - Retrieve event data and relevant aspect data
  - Run celldetect to determine X-ray source positions
  - Retrieve optical/radio source positions from ICRF, Tycho, USNO A-2, 2MASS, and SIMBAD (for target name)
  - Cross-correlate and report all matches within 3''



## May-2002 Boresight Calibration

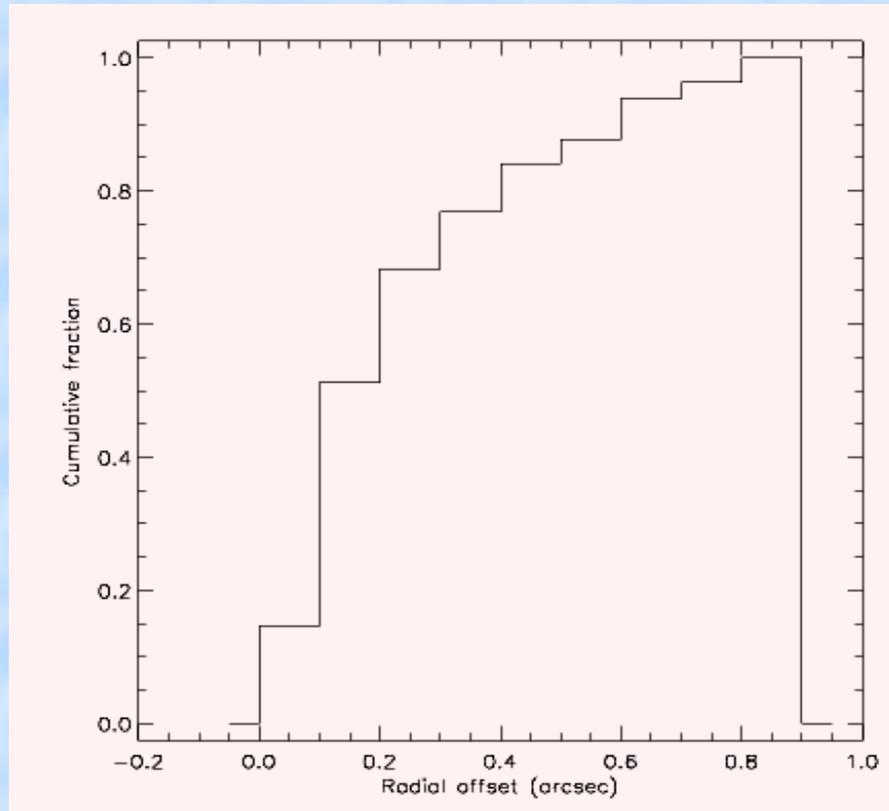
- Last change in CALDB boresight coefficients was May-2002
  - Based a subset of on-axis sources with excellent ground astrometry





### May-2002 Boresight Calibration

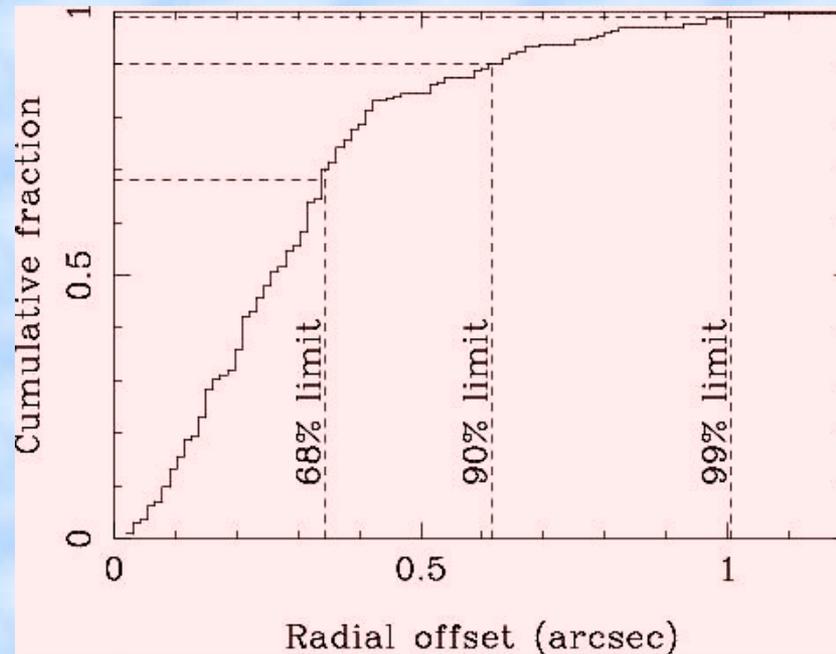
- After applying calibration, 90% of calibration X-ray sources within 0.6" of optical/radio position *[as seen in the 2002 Cal workshop]*





## Checking the calibration in Sep-2003

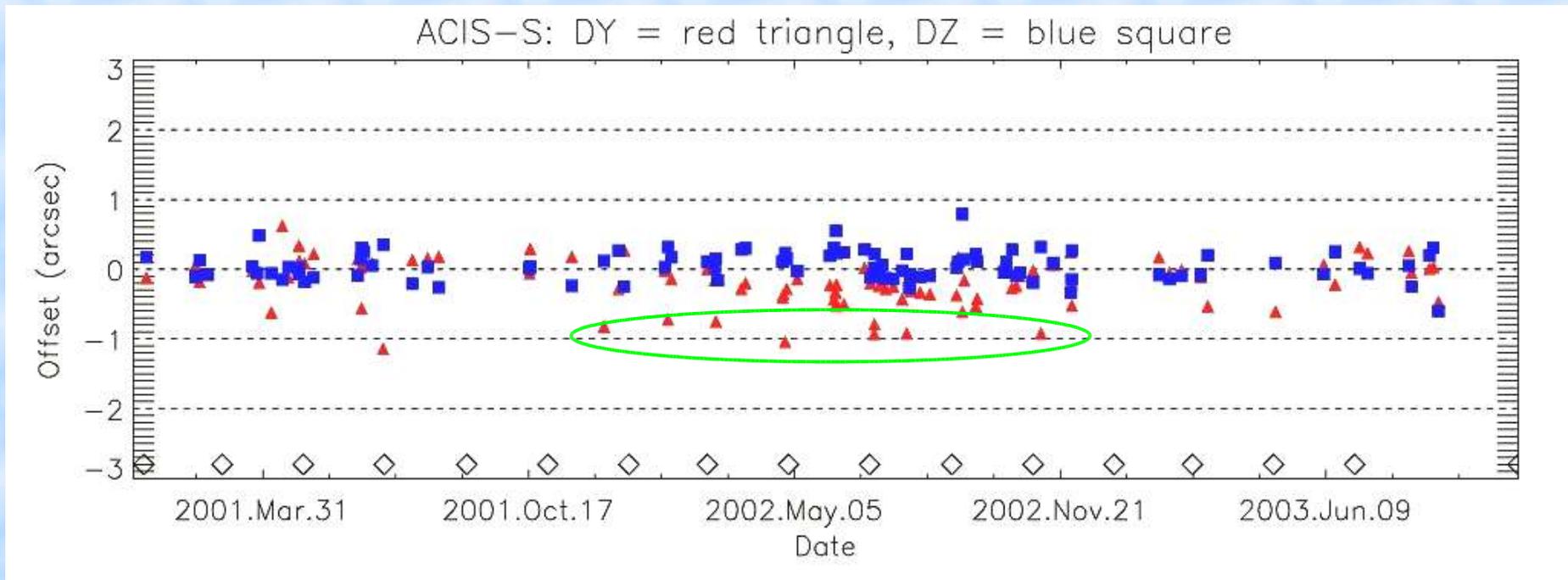
- In Sep-2003 a much larger sample of 225 sources was analyzed
  - Includes sources at off-nominal SIM-Z and off-axis angle up to 2'
  - Includes sources not used in May-2002 calibration





### Outliers in distribution

- Absolute astrometry from previous histogram good, but there seem to be systematic outliers in the ACIS-S data

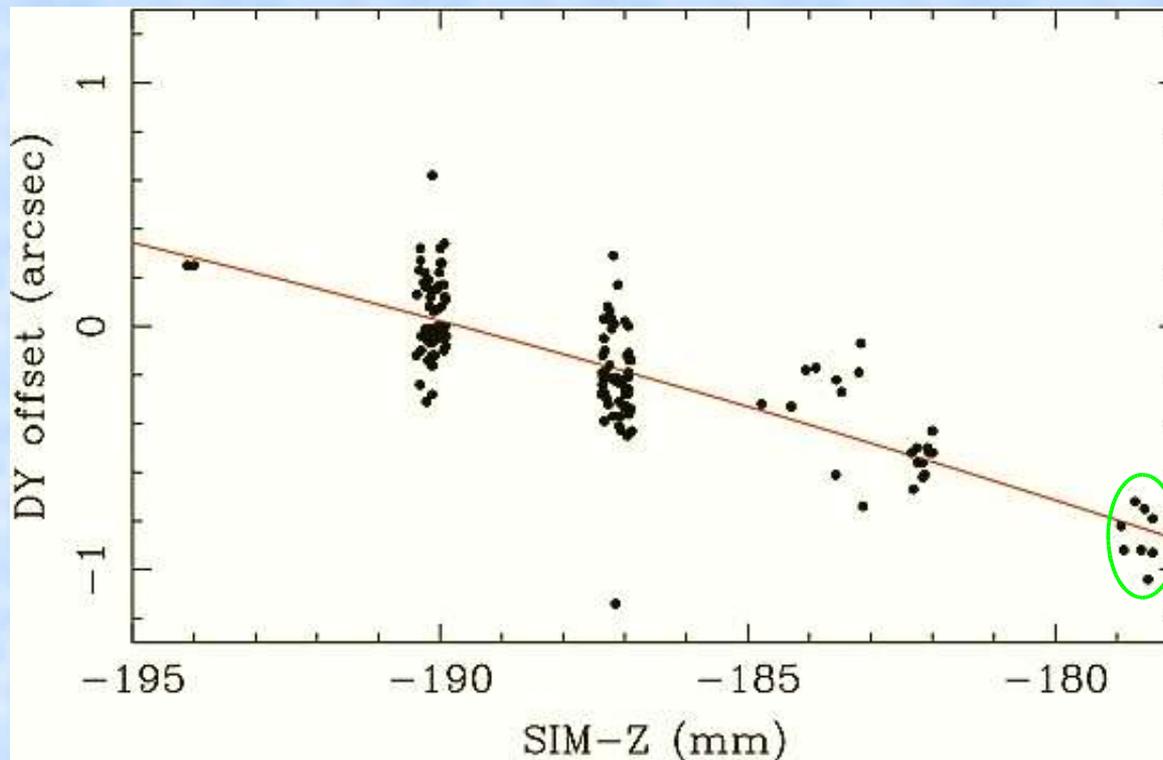


- ALL of the circled outliers from one program using SIM-Z = -11 mm



### SIM-Z dependence of aspect offset

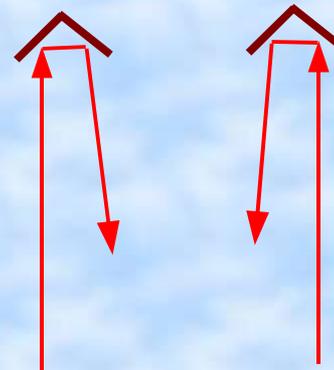
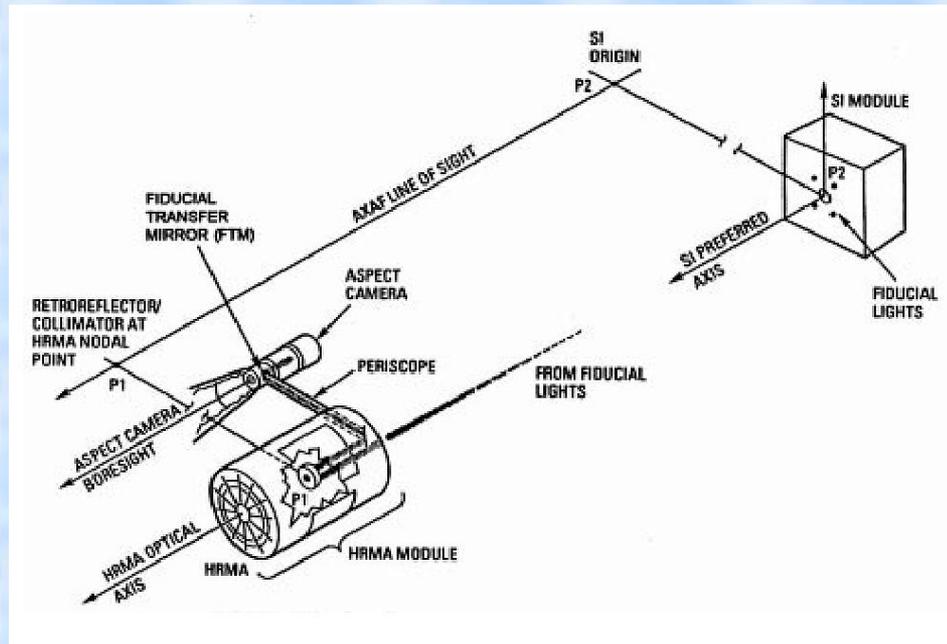
- Plot of aspect offset for ACIS-S observations versus SIM-Z shows an obvious and significant trend





## SIM-Z dependence of fid light positions

- Corner cube which images fid lights into ACA is not precisely square

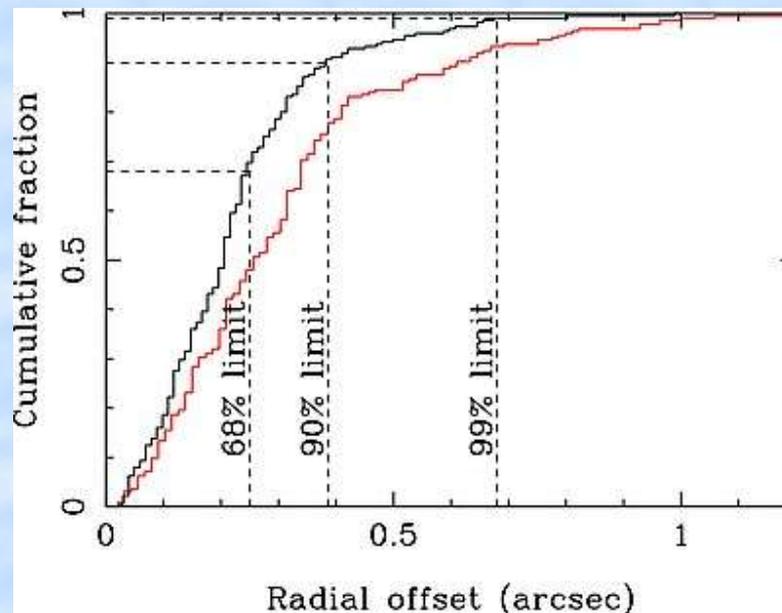


- As SIM translates from -10mm to +20mm, apparent angular distance between fids can vary by up to 4 arcsec (worst in ACIS-I)
- ACIS-I was corrected in 2002, but not ACIS-S



## Distribution of offsets with updated calibration

- Using updated CALDB coefficients with fid SIM-Z position dependence improves results noticeably



- Formal testing of the new CALDB values is in progress
- 90% source location error circle expected to be below 0.4''



## FINAL NOTE

- To achieve this level of accuracy, you must always apply the “Fix Aspect Offsets” tool, described in the thread at

[http://asc.harvard.edu/ciao/threads/arcsec\\_correction/](http://asc.harvard.edu/ciao/threads/arcsec_correction/)

- There is also a way to do this in batch mode

[http://asc.harvard.edu/cal/ASPECT/fix\\_offset/fix\\_batch](http://asc.harvard.edu/cal/ASPECT/fix_offset/fix_batch)