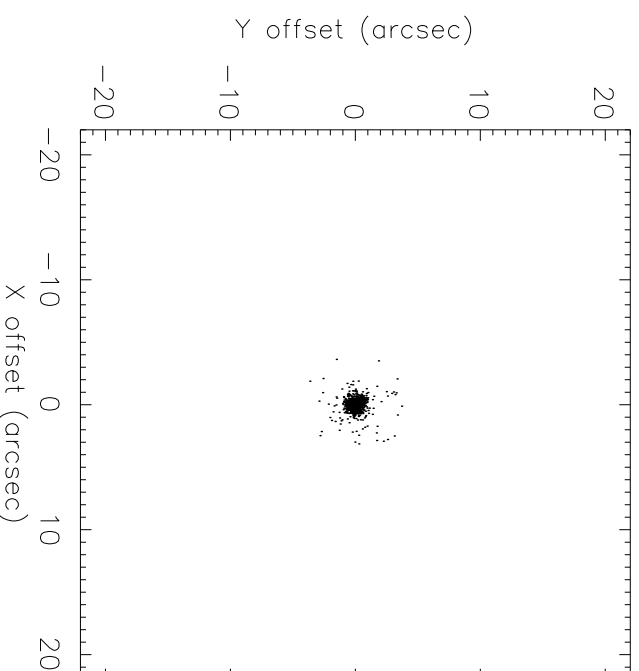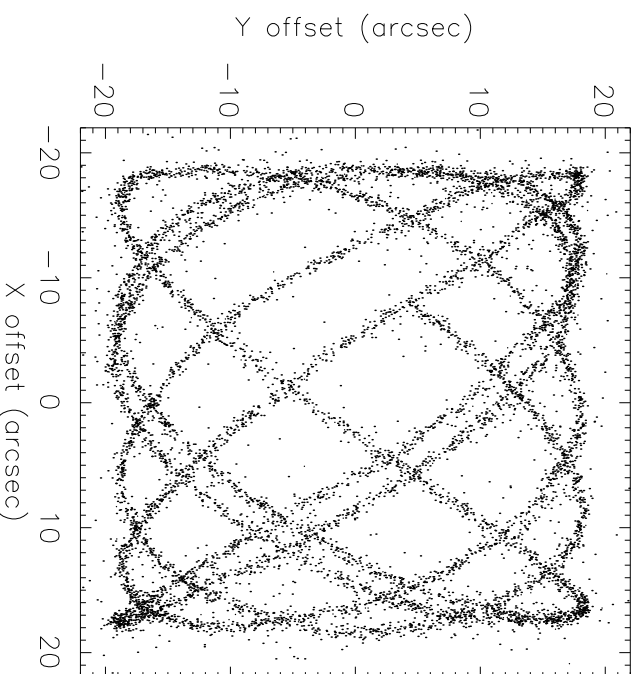# Chandra Aspect

- Aspect solution is a time history of the exact pointing attitude and spacecraft alignment

- Allows conversion from detector pixel coordinate to sky position (RA,Dec), as well as contruction of exposure maps

Resources

Aspect chapter of Proposers Observatory Guide – Description of hardware, aspect processing and products, and operations

Aspect Information page – `http://cxc.harvard.edu/cal/ASPECT/` Contains latest information on caveats, calibration, and aspect performance.

Caveats – `http://cxc.harvard.edu/cal/ASPECT/aspect_caveats.html`

Help desk

Chandra Science

About Chandra | Archive | Proposer | Instruments & Calibration
Data Analysis | Newsletters | Calibration Database | NASA Archives and Centers

CXC Search

Chandra Aspect

Absolute astrometry

Current absolute astrometric accuracy

Thread to detect and fix aspect offsets

High-precision astrometry and image reconstruction with Chandra

Plate scale and relative chip (plate) positions

General aspect help / information

Align event files

ACIS pile-up mimicking bad aspect

Image reconstruction performance

CXC aspect processing caveats

Chandra absolute pointing accuracy

Papers

15-Nov-00	Kalman filtering in Chandra Aspect Determination (ADASS Poster)	Postscript PDF Poster
27-Mar-00	Initial performance of the aspect system on the Chandra Observatory: Post-facto aspect reconstruction	Postscript PDF
27-Mar-00	Initial performance of the attitude control and aspect determination sub-systems on the Chandra Observatory	Postscript PDF

Technical notes and Talks

CIAO workshop aspect viewgraphs

Chandra Calibration Review: Aspect

CXC internal aspect page
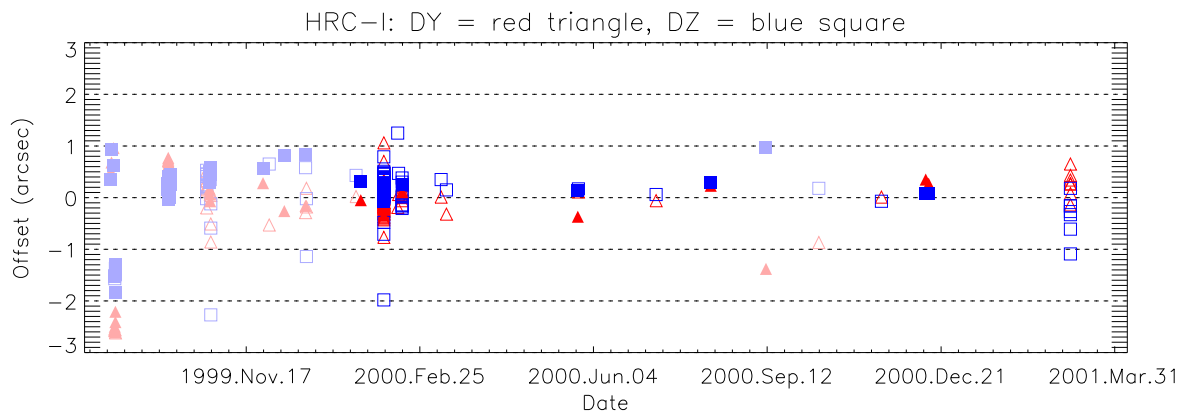
Calibration and Performance
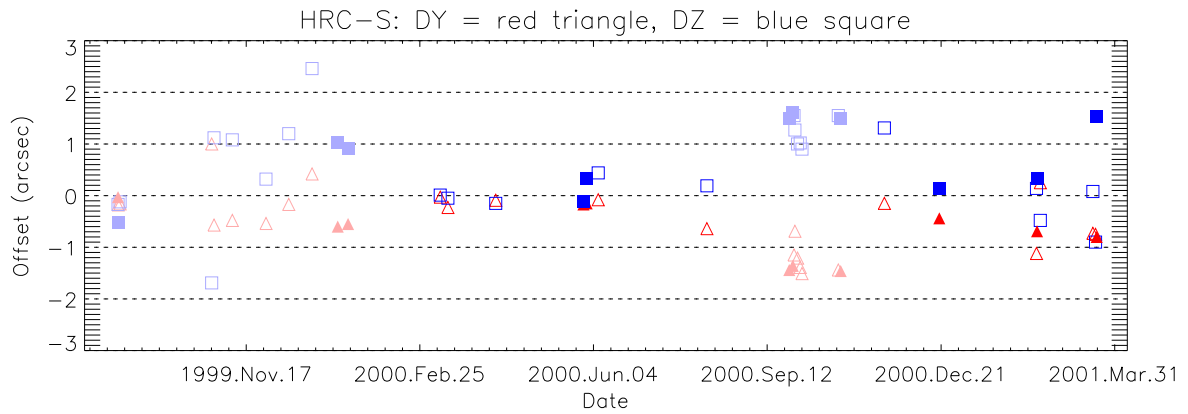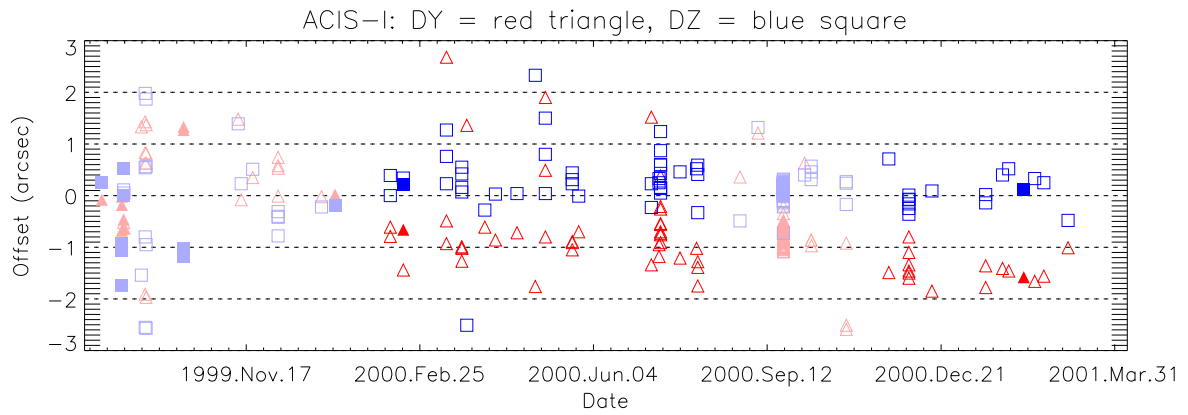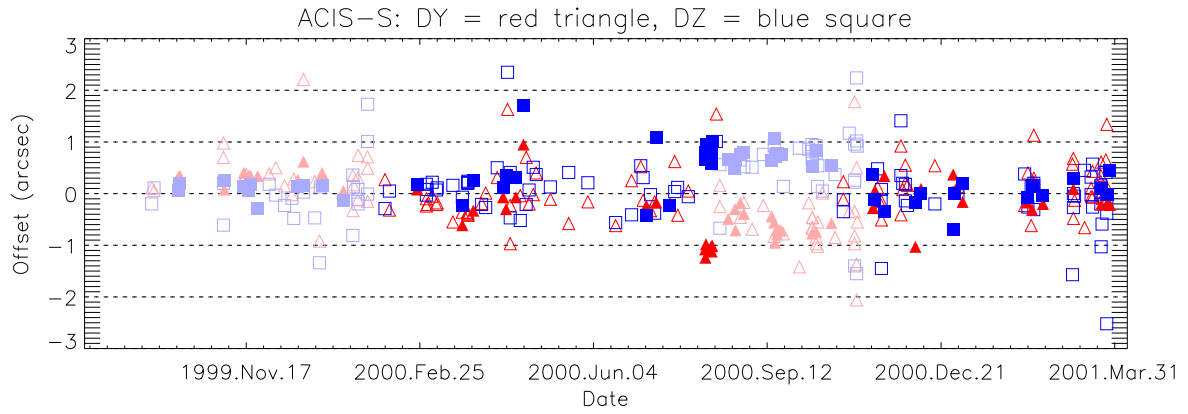
- Celestial location

  Measures absolute accuracy of Chandra X-ray source locations. Based on observations of point sources with accurately known coordinates, the source location error circle (1-σ) has a radius of 0.6 arcsec.

  CAVEAT: Offsets exist in some observations A tool has been developed to easily correct these offsets. See Aspect Caveats.

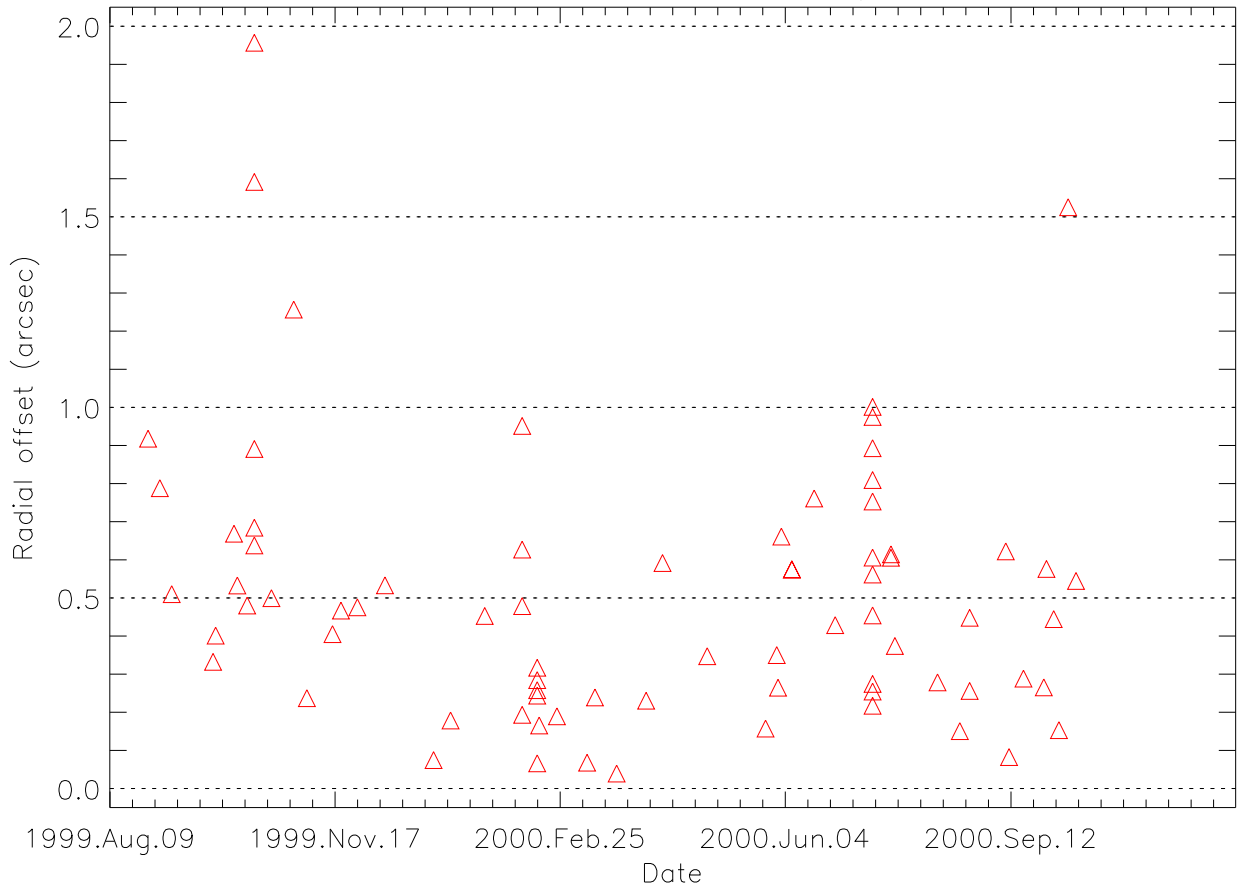- Image reconstruction

  Measures the effective blurring of the X-ray PSF due to aspect reconstruction. Latest analysis shows aspect reconstruction introduces an almost negligible blurring, equivalent to a gaussian sigma of less than 0.07 arcsec.

ACIS−S: DY = red triangle, DZ = blue square

ACIS−I: DY = red triangle, DZ = blue square

HRC−S: DY = red triangle, DZ = blue square

HRC−I: DY = red triangle, DZ = blue square

Radial offsets for all data points

Radial offsets for ICRS or Hipparcos data points
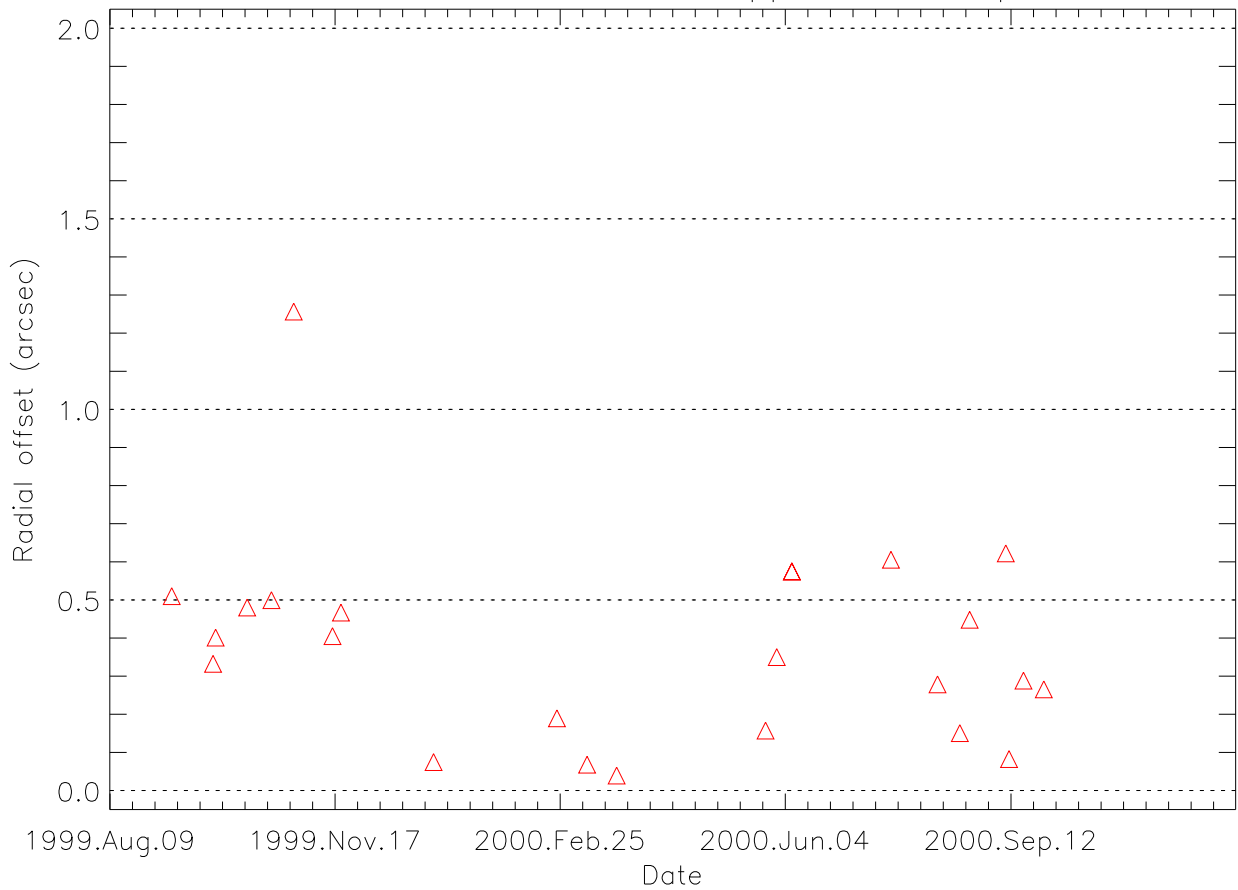
Fix aspect offset

1. Copy your event file (*evt_file*) to what will be the new aspect-corrected version
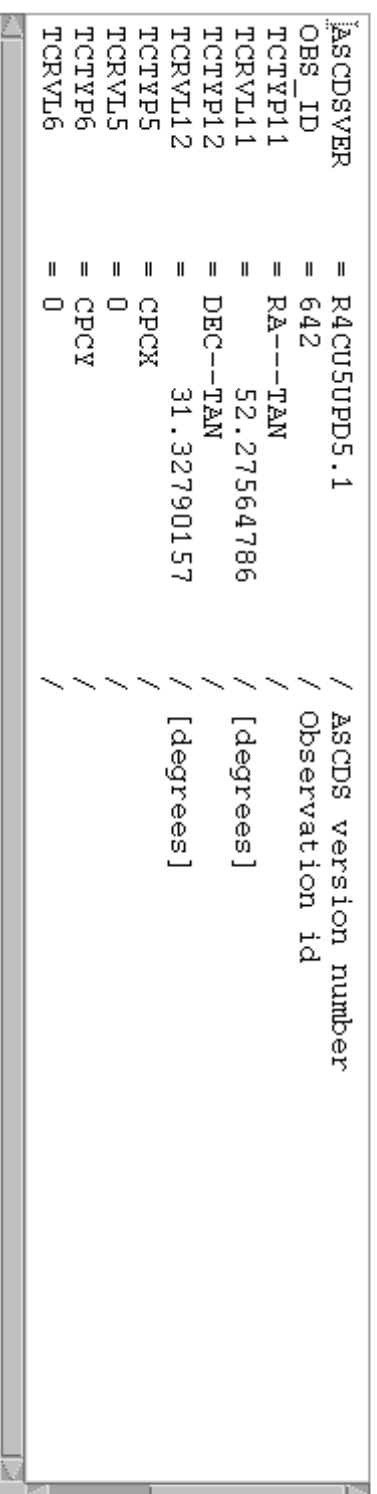   - If the file is unzipped already

     `cp evt_file aspcorr_evt2.fits`
   - If the file is zipped

     `gunzip --stdout evt_file > aspcorr_evt2.fits`
   - If you only want the central 1.0 arcminute

     `dmcopy "evt_file[events][sky=circle(4096,4096,1.0')]" aspcorr_evt2.fits`
2. In the text box below, cut and paste below the results of doing:

`dmlist aspcorr_evt2.fits header,raw,clean | egrep '(TCTYP|TCRVL|ASCDSVER|OBS_ID)'`

```
ASCDSVER    = R4CU5UPD5.1      / ASCDS version number
OBS_ID      = 642              / Observation id
TCTYP11     = RA---TAN         /
TCRVL11     = 52.27564786      / [degrees]
TCTYP12     = DEC--TAN         /
TCRVL12     = 31.32790157      / [degrees]
TCTYP5      = CPCX             / [degrees]
TCRVL5      = 0                /
TCTYP6      = CPCY             /
TCRVL6      = 0                /
```

Submit Query

100%

Fix aspect offset

Cut and paste the following commands to fix the event file aspcorr_evt2.fits

```
punlearn  dmhedit
dmhedit  infile=aspcorr_evt2.fits  filelist=none  operation=add  \
         unit=degrees  key=TCRVL11  value=189.2111015047604
dmhedit  infile=aspcorr_evt2.fits  filelist=none  operation=add  \
         unit=degrees  key=TCRVL12  value=62.22975563905
dmhedit  infile=aspcorr_evt2.fits  filelist=none  operation=add  \
         unit=degrees  key=RA_NOM  value=189.2111015047604
dmhedit  infile=aspcorr_evt2.fits  filelist=none  operation=add  \
         unit=degrees  key=DEC_NOM  value=62.22975563905
```

Improving absolute astrometry

- Improved celestial location precision is possible for some observations by cross-correlating detected X-ray sources with high-precision optical, IR, or radio catalogs.

- This technique has been used to achieve absolute astrometry accurate to $+/-0.3$ arcsec (90% confidence, Sgr A* field), $+/-0.15$ arcsec (Hubble Deep Field), and $+/-0.1$ arcsec (Orion Nebula cluster).

- Details available:

  http://cxc.harvard.edu/ciao/threads/arcsec_correction.thread.html
  http://cxc.harvard.edu/cal/ASPECT/improve_astrometry.html