

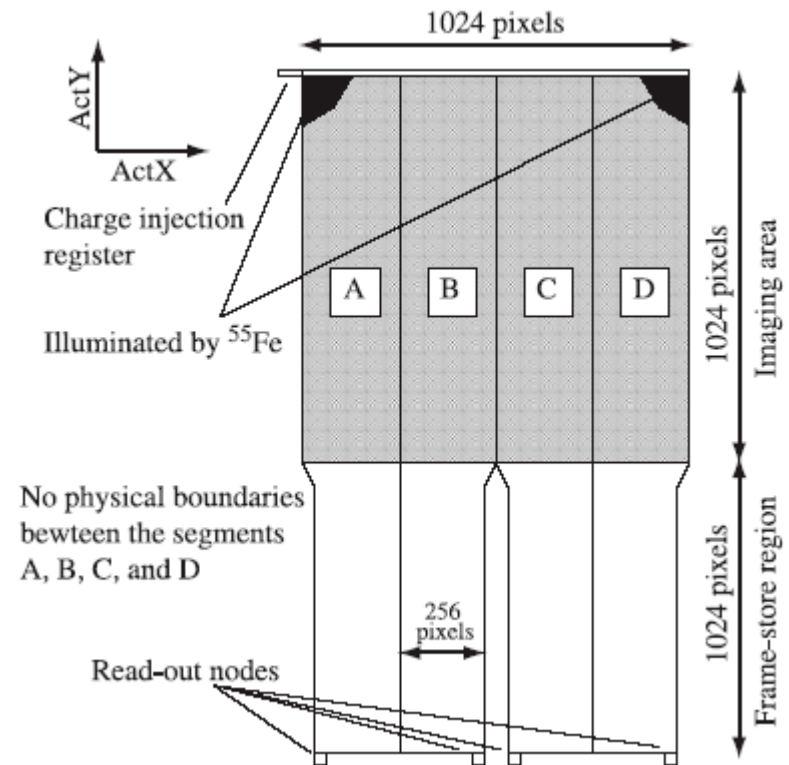
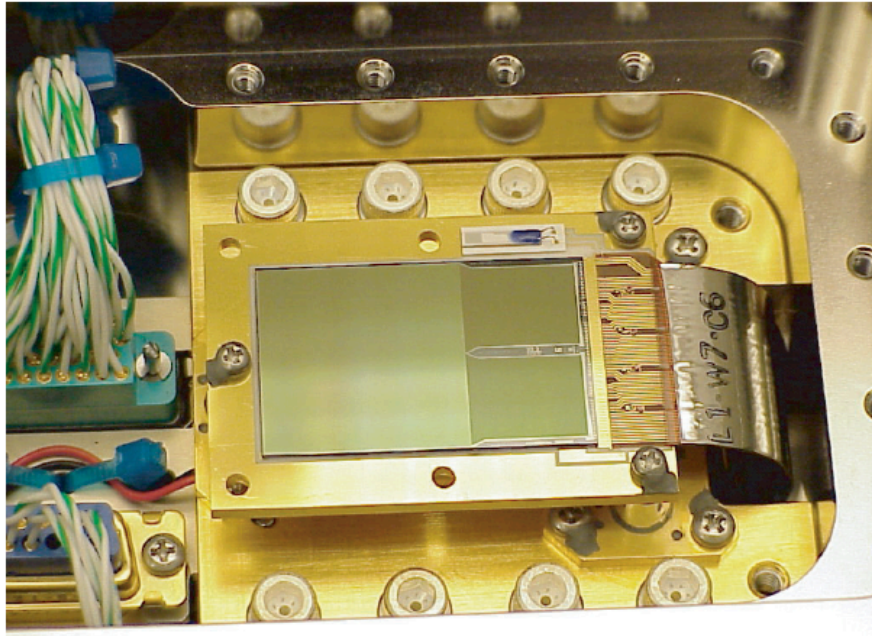
Suzaku XIS cal status

Hironori Matsumoto (Kyoto Univ.)
Eric Miller (MIT)

- XIS system
- Spaced-row Charge Injection (SCI)
- Contamination

XIS system=X-ray CCD

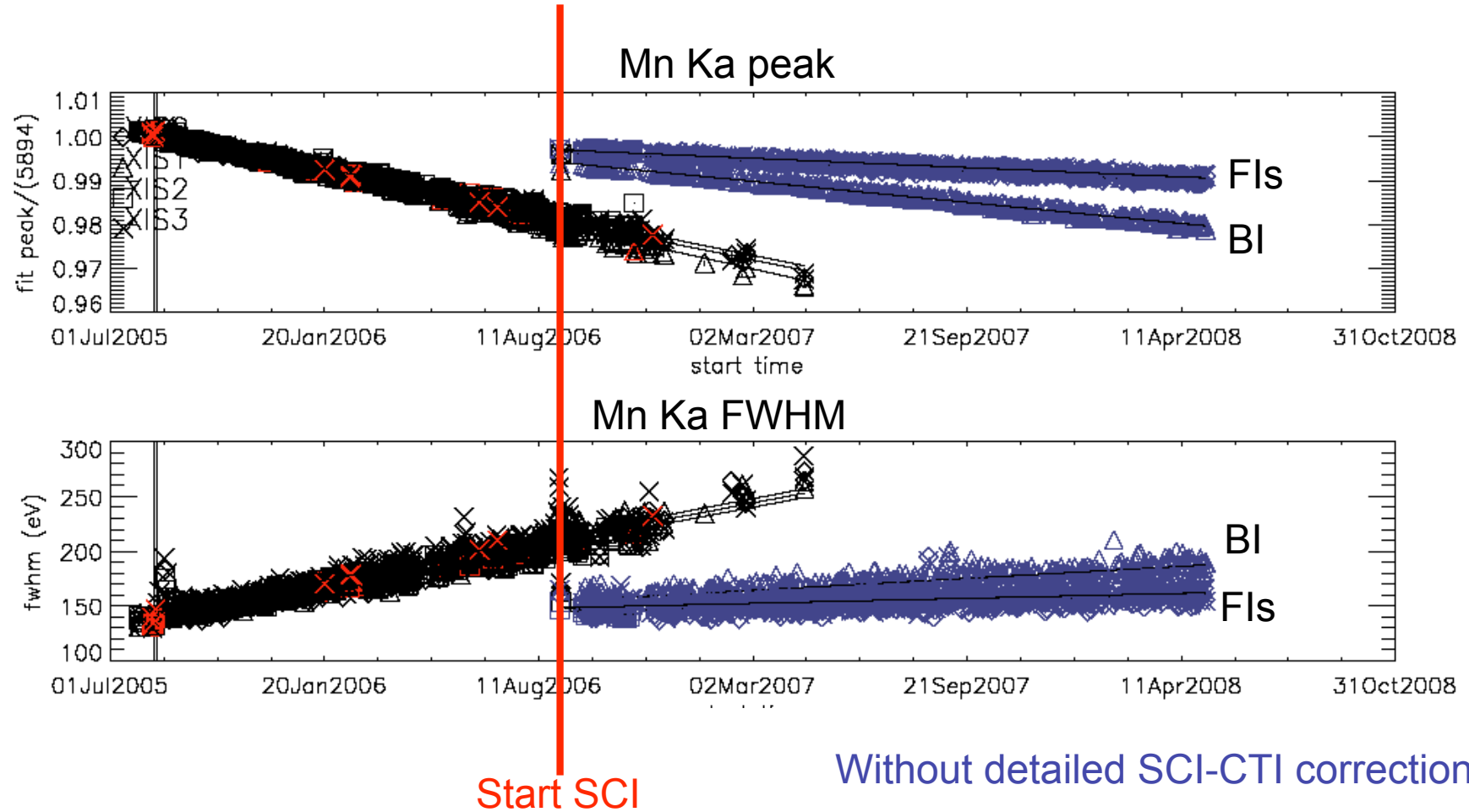
Picture of one CCD camera



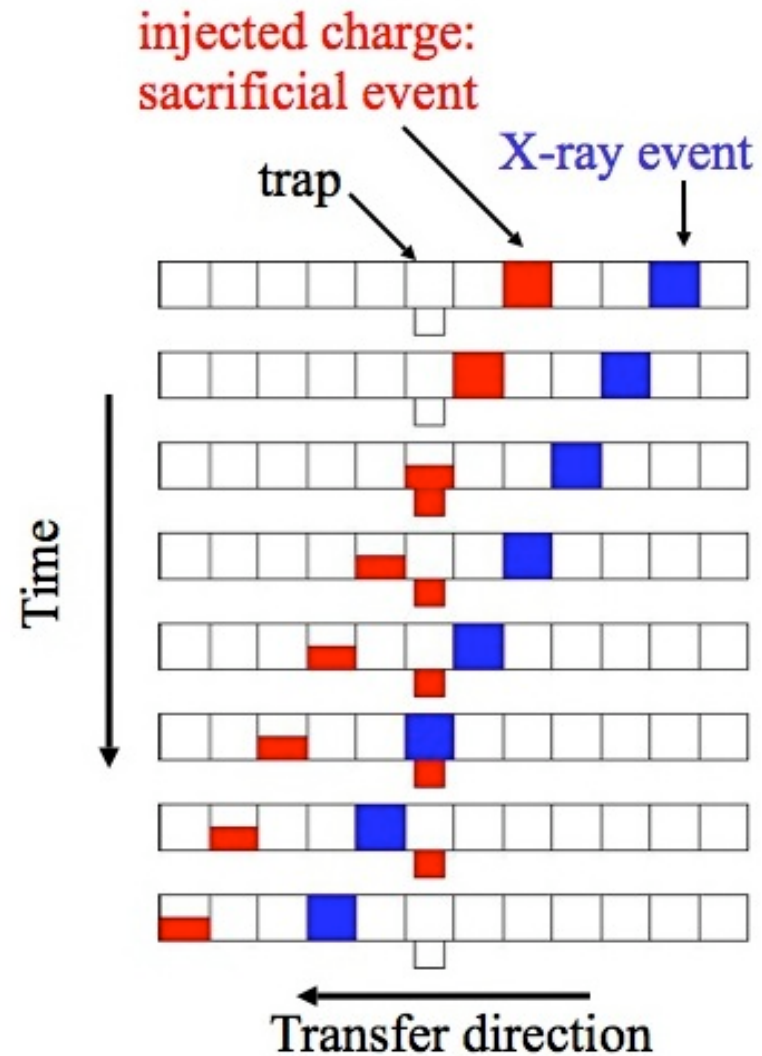
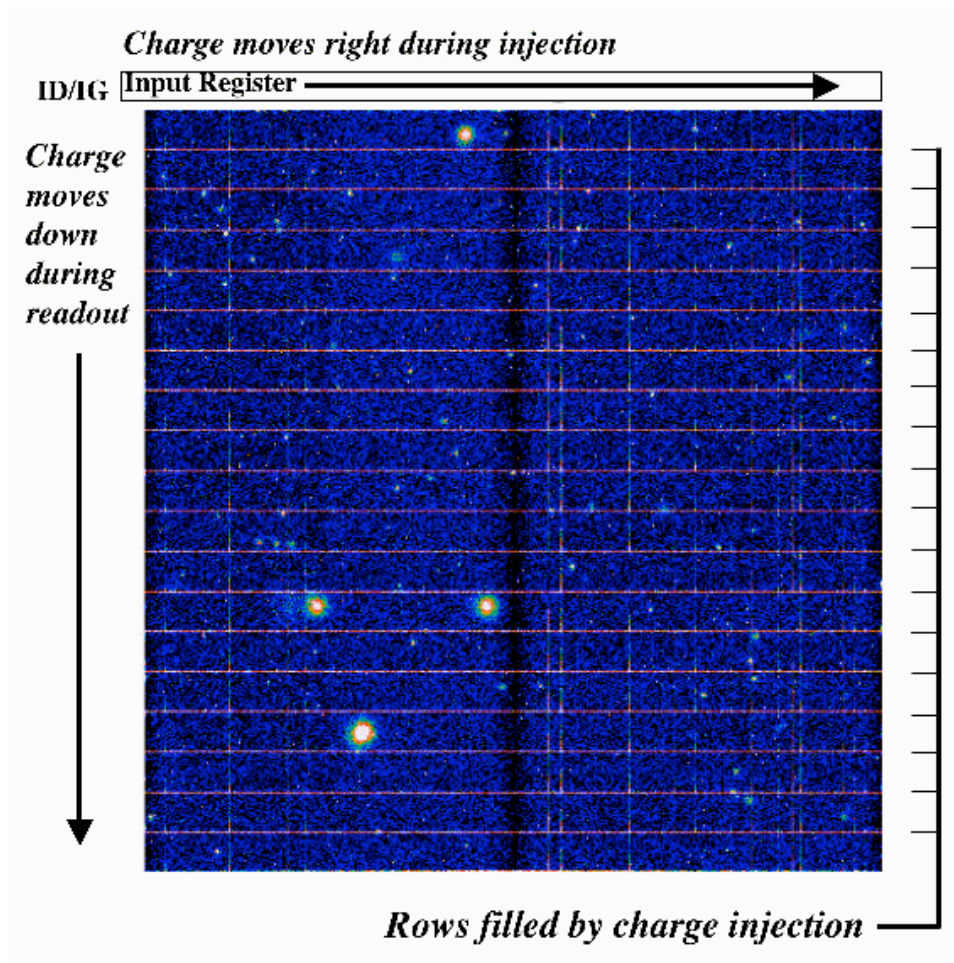
- 4CCD cameras (XIS0, 1, 2, 3)
 - XIS0 & XIS3 ... Front-Illuminated CCD (FI)
 - XIS1 ... Back-illuminated CCD (BI)
 - XIS2 ... No operation (malfunction on Nov. 9, 2006)

CTI is increasing

Measured with the calibration sources (^{55}Fe)

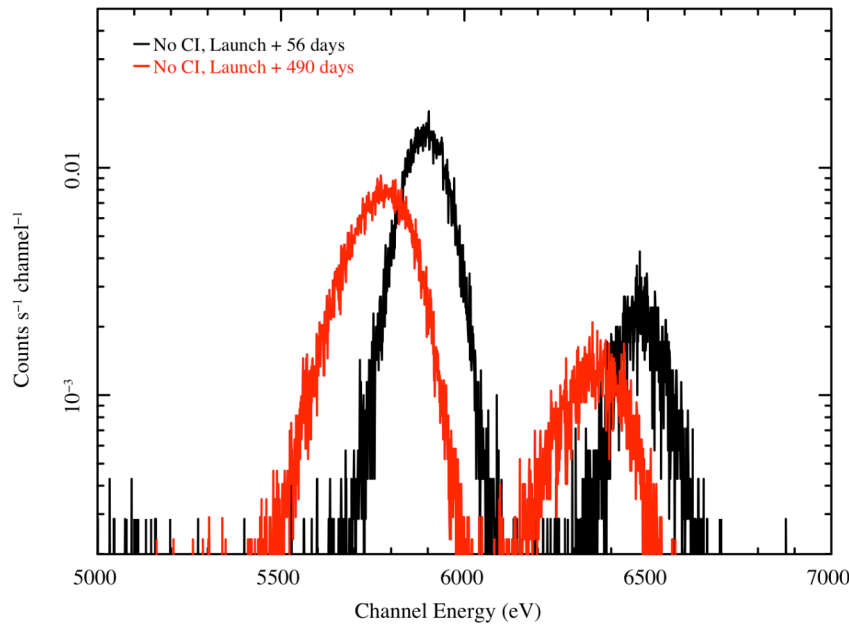


Spaced-row Charge Injection (SCI)

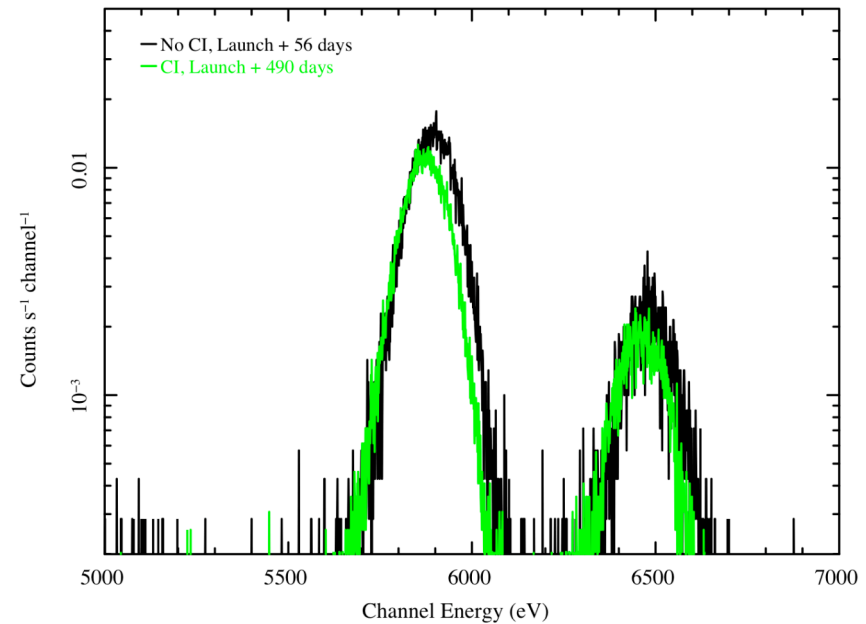


with/without SCI (55Fe)

Black: No SCI (Launch+56days) → Red: No SCI (Launch+490days) → Green: SCI (Launch+490days)

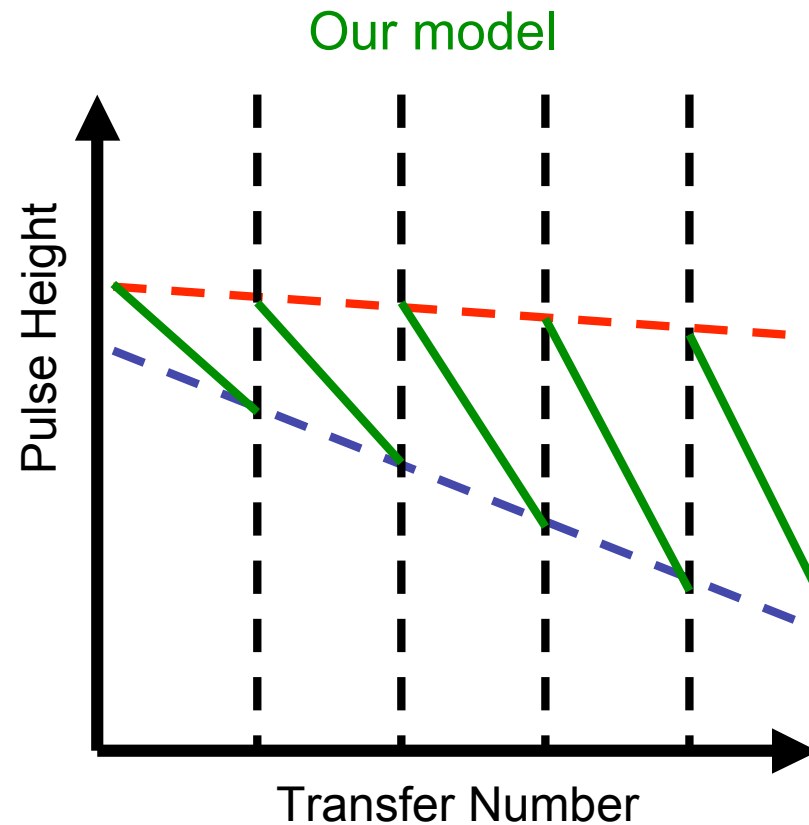
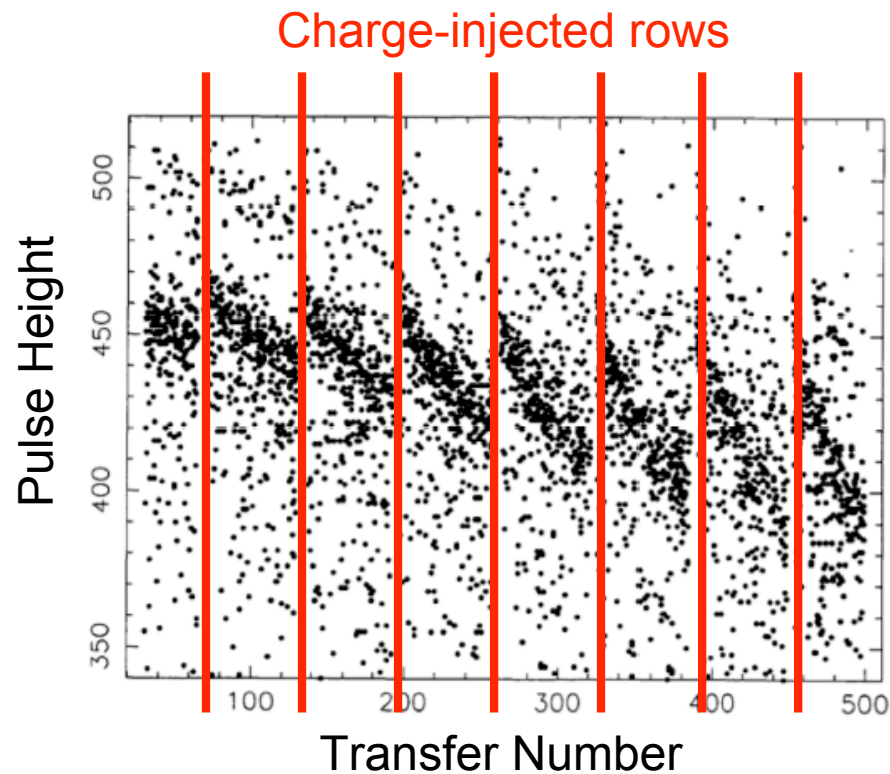


- Black
 - No SCI
 - Launch+56days
 - FWHM=144eV
- Red
 - No SCI
 - Launch+490days
 - FWHM=206eV



- Black
 - No SCI
 - Launch+56days
 - FWHM=144eV
- Green
 - with SCI
 - Launch+490days
 - FWHM=140eV

CTI with SCI: Saw-tooth structure

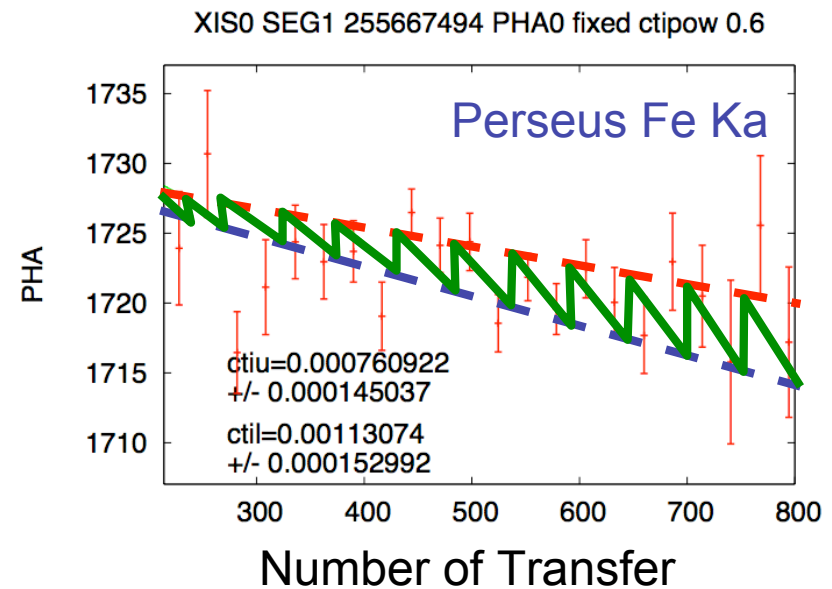
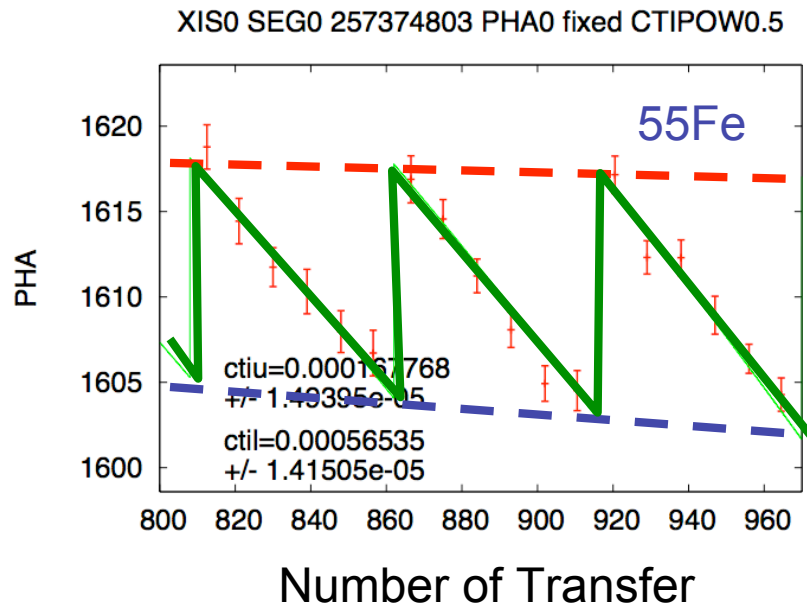


Ground experiment with a proton-damaged CCD (Tomida et al. 1997, PASJ)

- Measure the “envelope” lines (red and blue lines) with data
- Connect the lines to determine the CTI (green line)

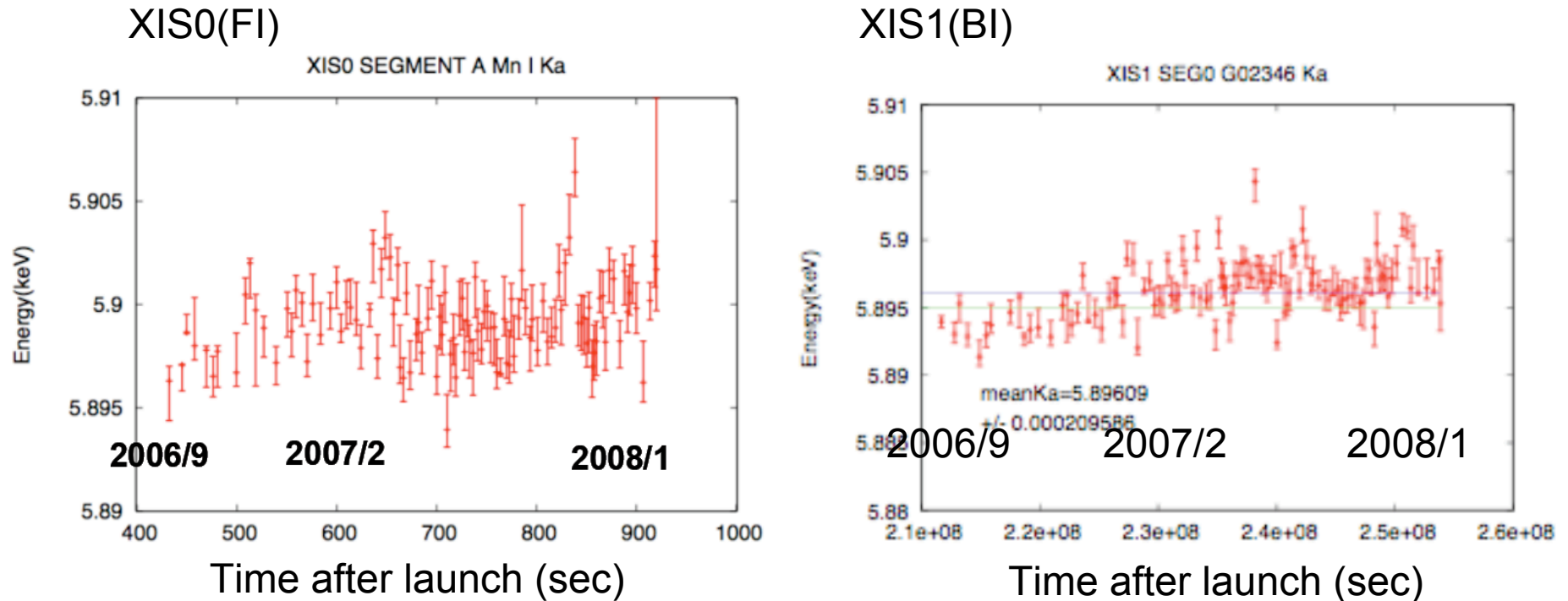
Measure the saw-tooth structure

- Obtained the envelope lines (red and blue) by the calibration sources and the Fe Ka line from the Perseus cluster.
- Then we obtained the saw-tooth structure (green line) by connecting the lines.



After the saw-tooth CTI correction (1)

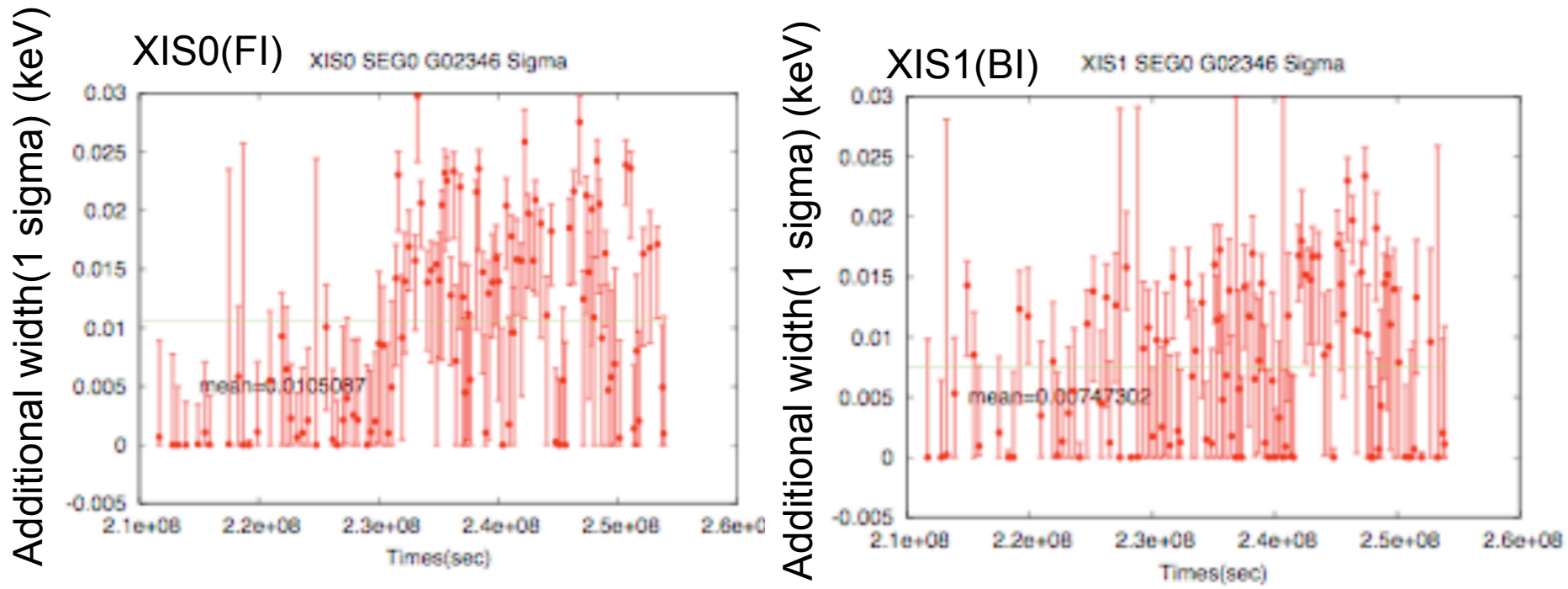
Center energy of the Mn Ka line



- Systematic error of the gain is less than ~ 15 eV at 5.9 keV.
- In the low energy band, the error is less than ~ 10 eV confirmed with the E0102 and Cygnus Loop observations.

After the saw-tooth CTI correction (2)

Deviation of the Mn Ka line width (1sigma) from values predicted by response files.

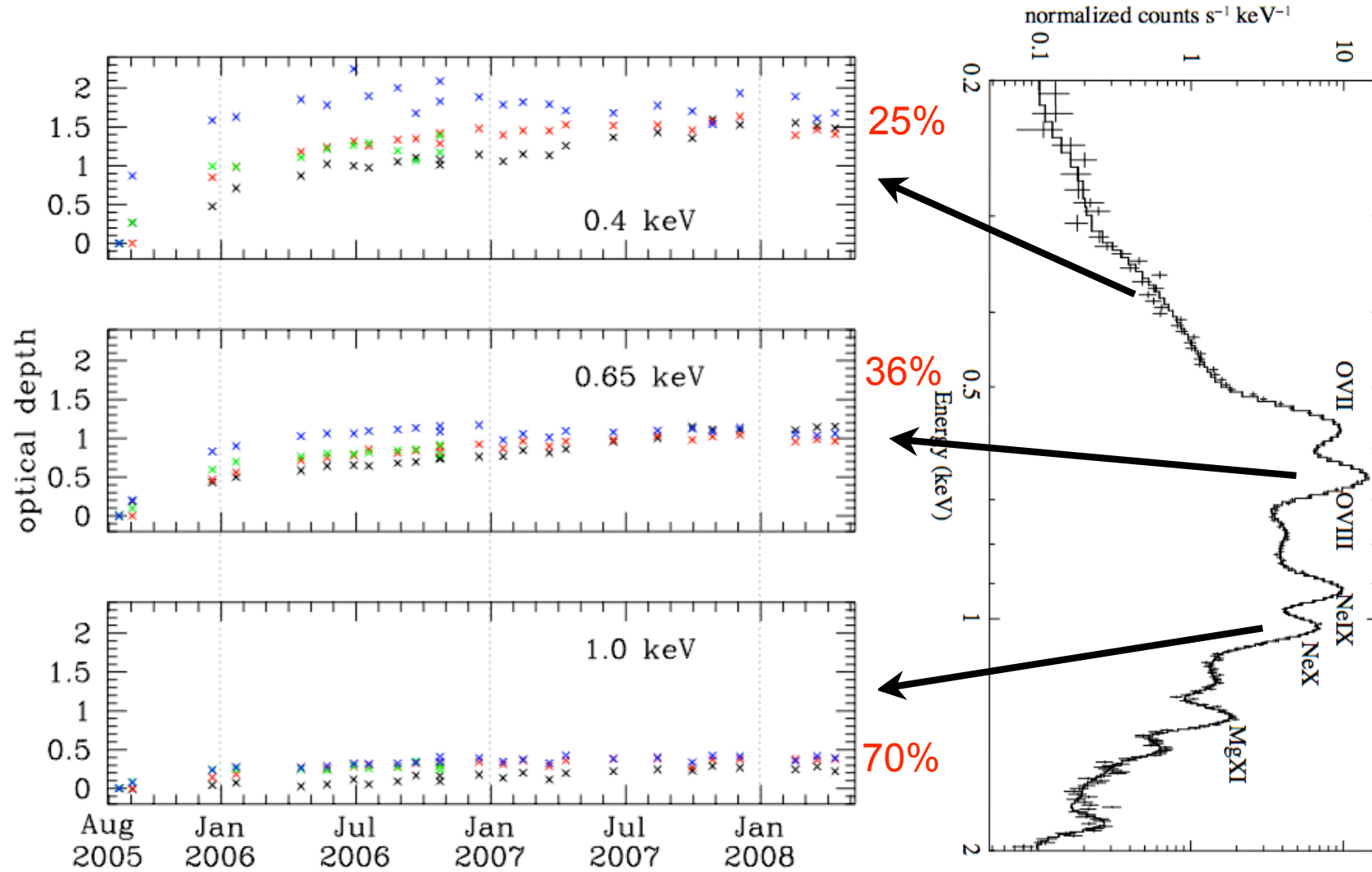


Systematic error on the line width is less than 20 eV at 5.9 keV.

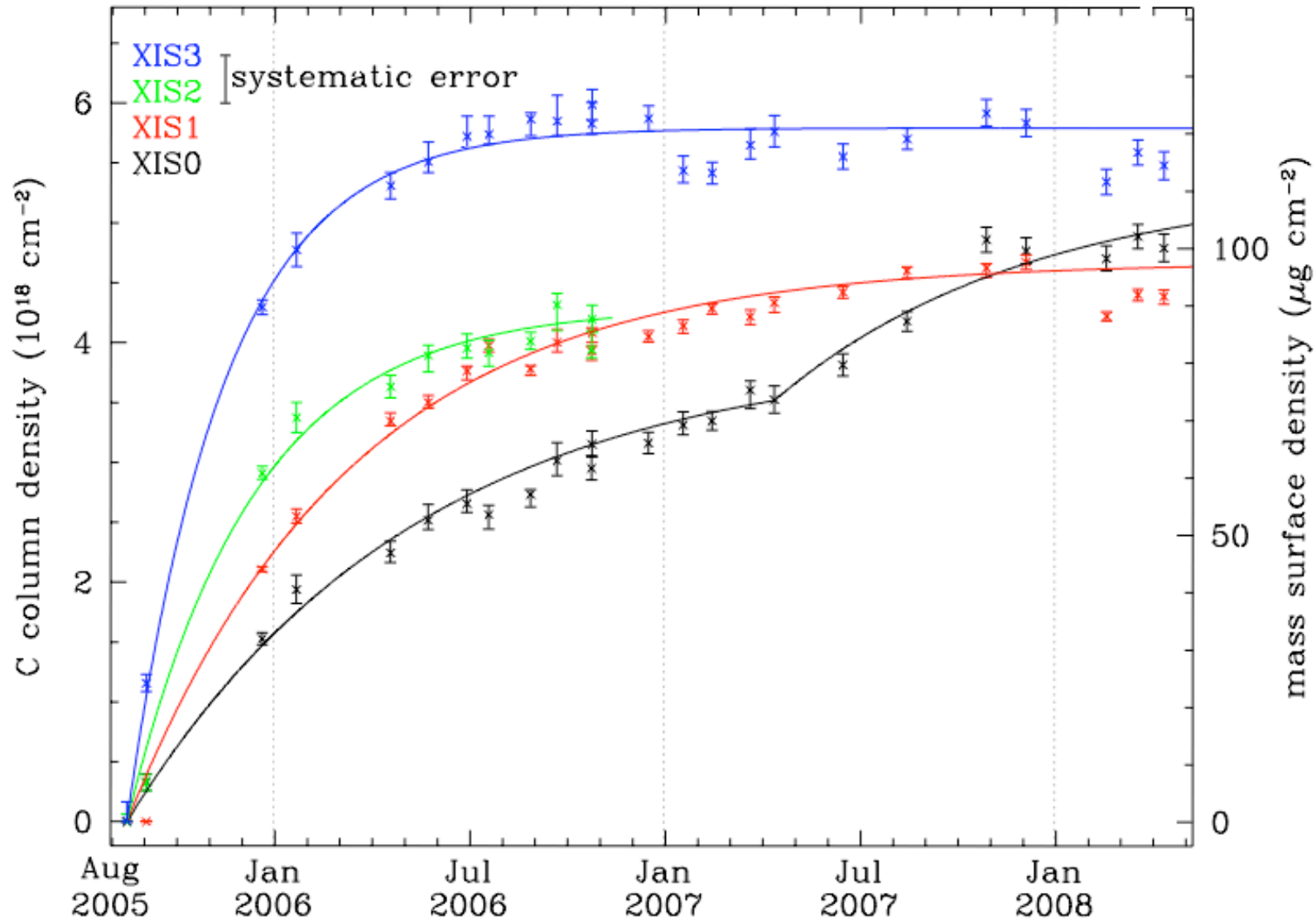
Contamination on the *Suzaku*/XIS

- soft response (< 1 keV) degraded after launch
- molecular contaminant on OBFs
- varies with time, position on detector, **detector**
- composition uncertain
 - assume DEHP (plasticizer) from IRU; $C_{24}H_{38}O_4$
 - *BUT* C/O > 6 appears likely; also C-band degradation
- appears to have ~ stabilized
- monitoring
 - on-axis: **E0102** (monthly), RXJ1856 (2x/yr), PKS2155
 - full-field: **bright Earth** (monthly), Cygnus Loop, clusters

Contamination: On-Axis

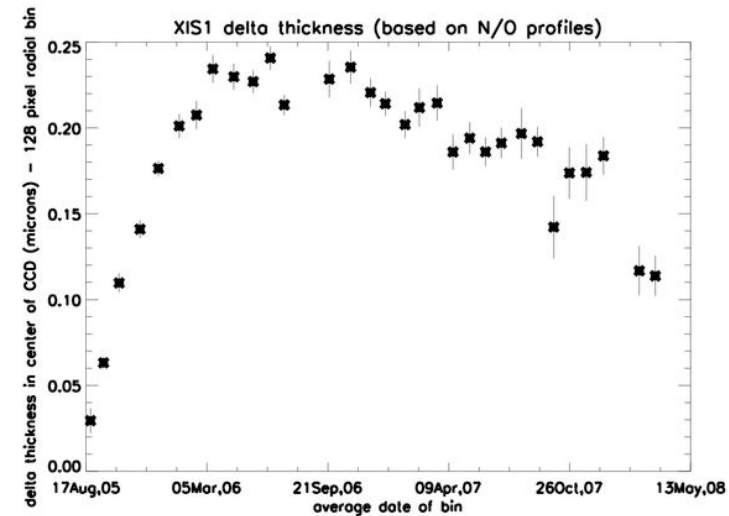
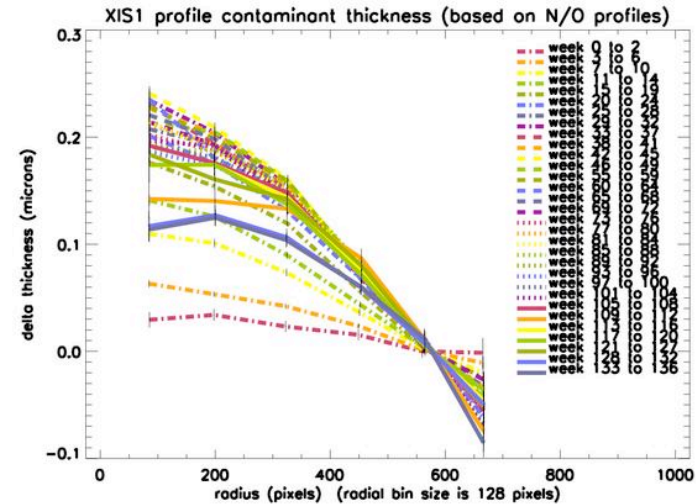


Contamination: On-Axis



Contamination: Spatial Non-Uniformity

- measured by line ratio of OK (525 eV) and NK (392 eV) in bright Earth data
- radial gradient
 - more contaminant in center
 - OBF temperature gradient
 - decreasing with time; building up in outer parts?
- A_{Ω} (full-field) not as degraded as A_{eff} (on-axis)
 - 50% vs. 36% @ 0.65 keV



XIS Contamination: Summary

- on-axis appears to have ~ stabilized
- off-axis contamination lower, may be catching up
- monitoring continues
- open questions
 - composition: C/O > 6? something else?
 - A_{eff} at energies < 0.3 keV ? decrease unexplained by current contamination model
 - why detector-detector differences?
 - temporal variation (“wiggles”); thermal? background?