Chandra Calibration Status
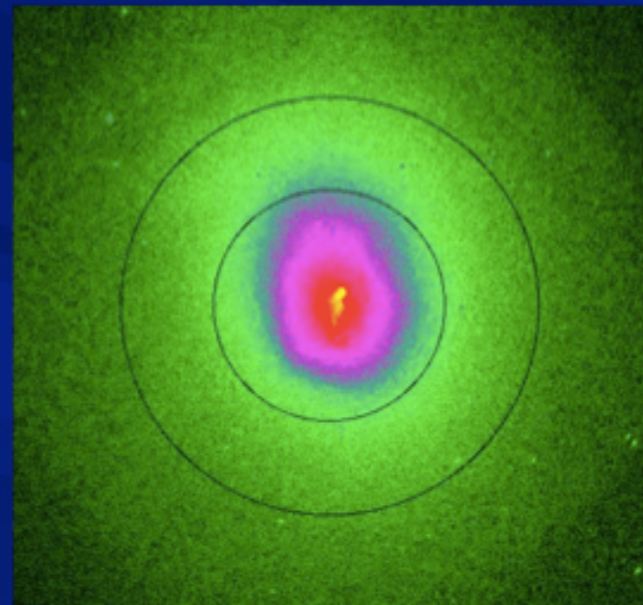
/21

Contamination Build-Up on the ACIS Filters
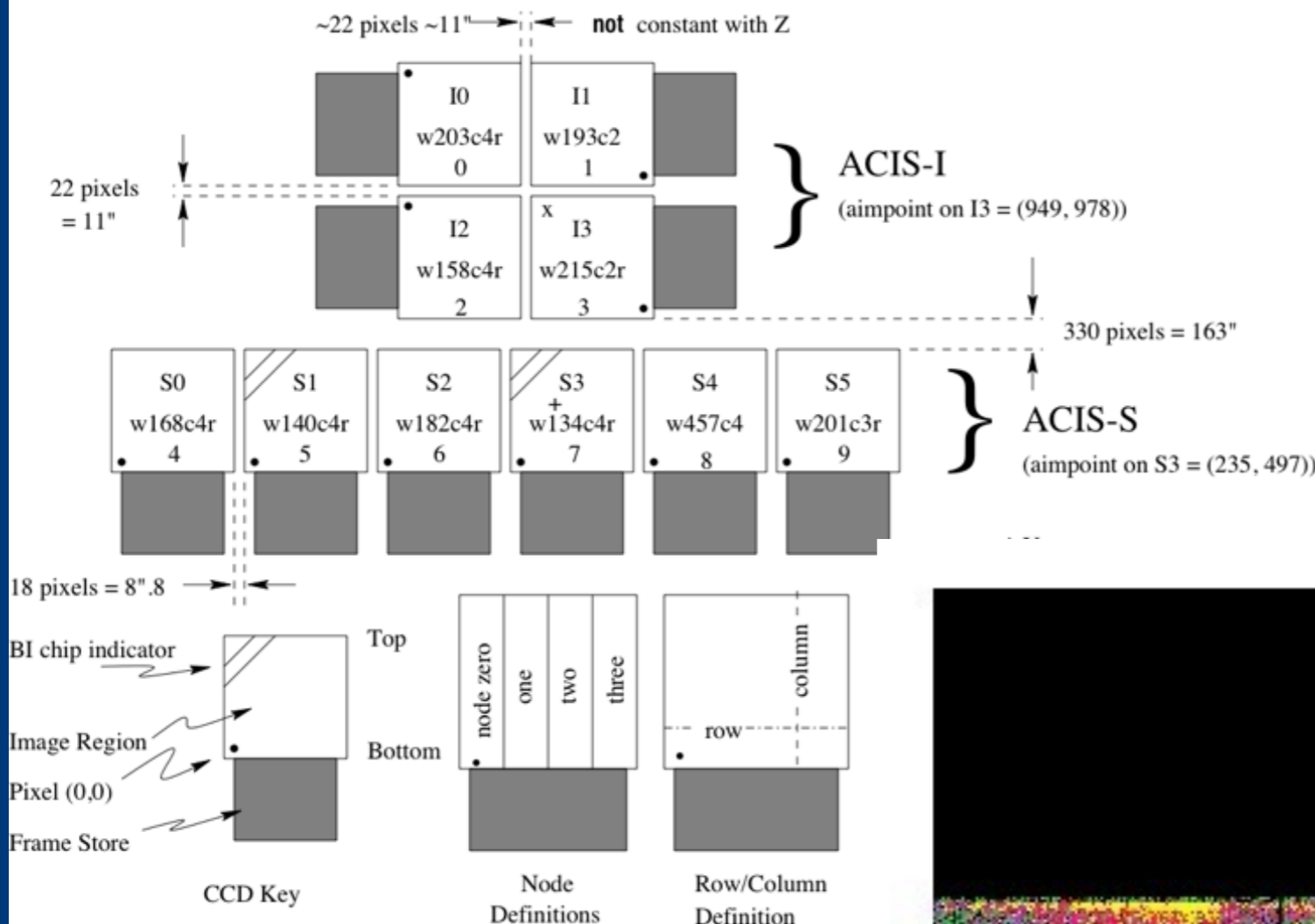
Abell 1795

Blazars

Mkn 421
PKS 2111-304

E0102-72
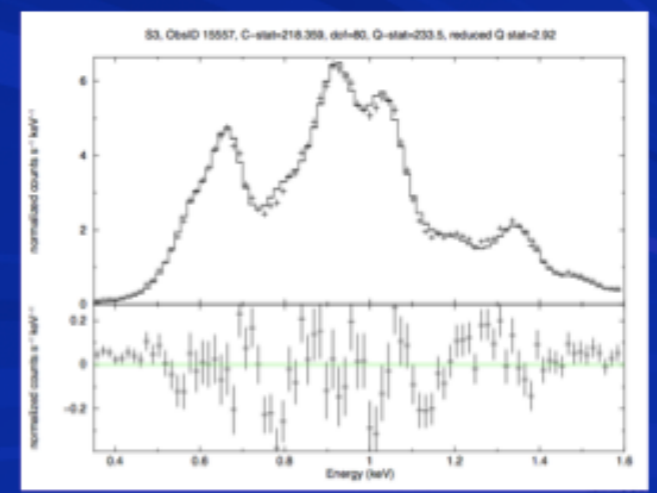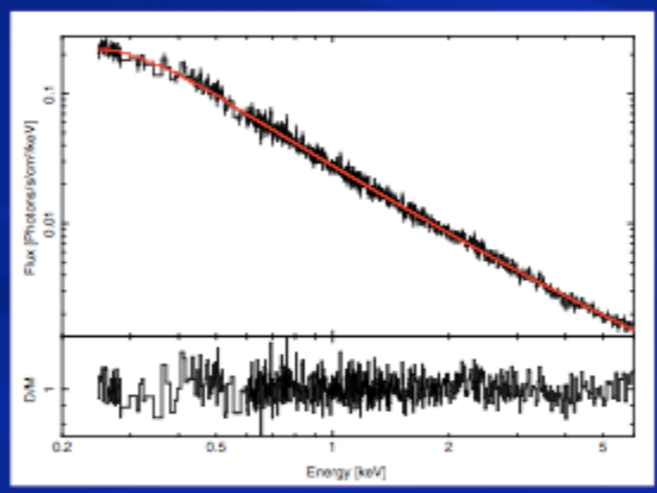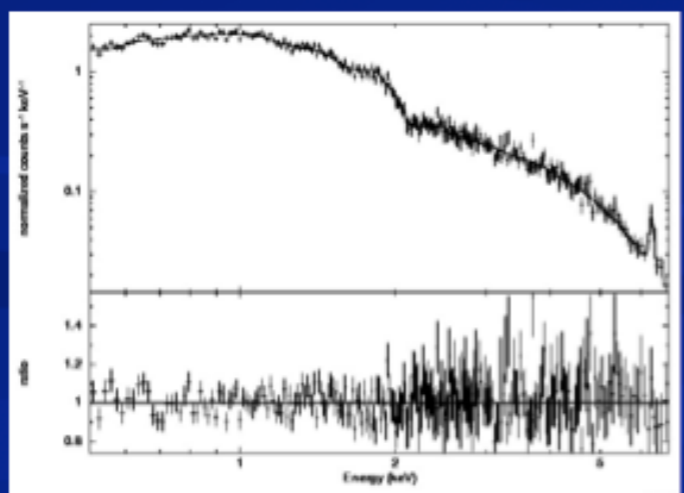
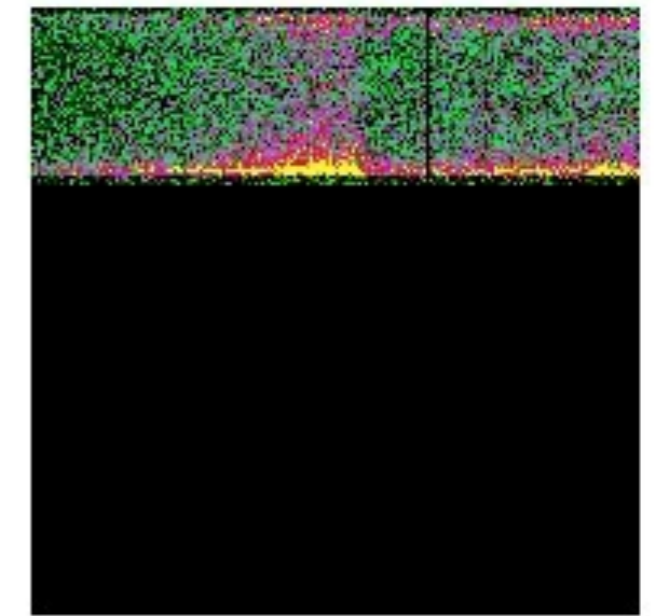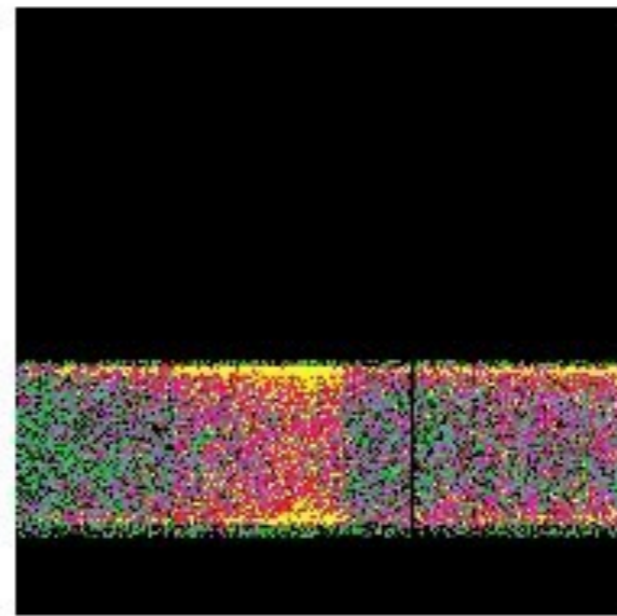# Contamination Build-Up on theACIS Filters

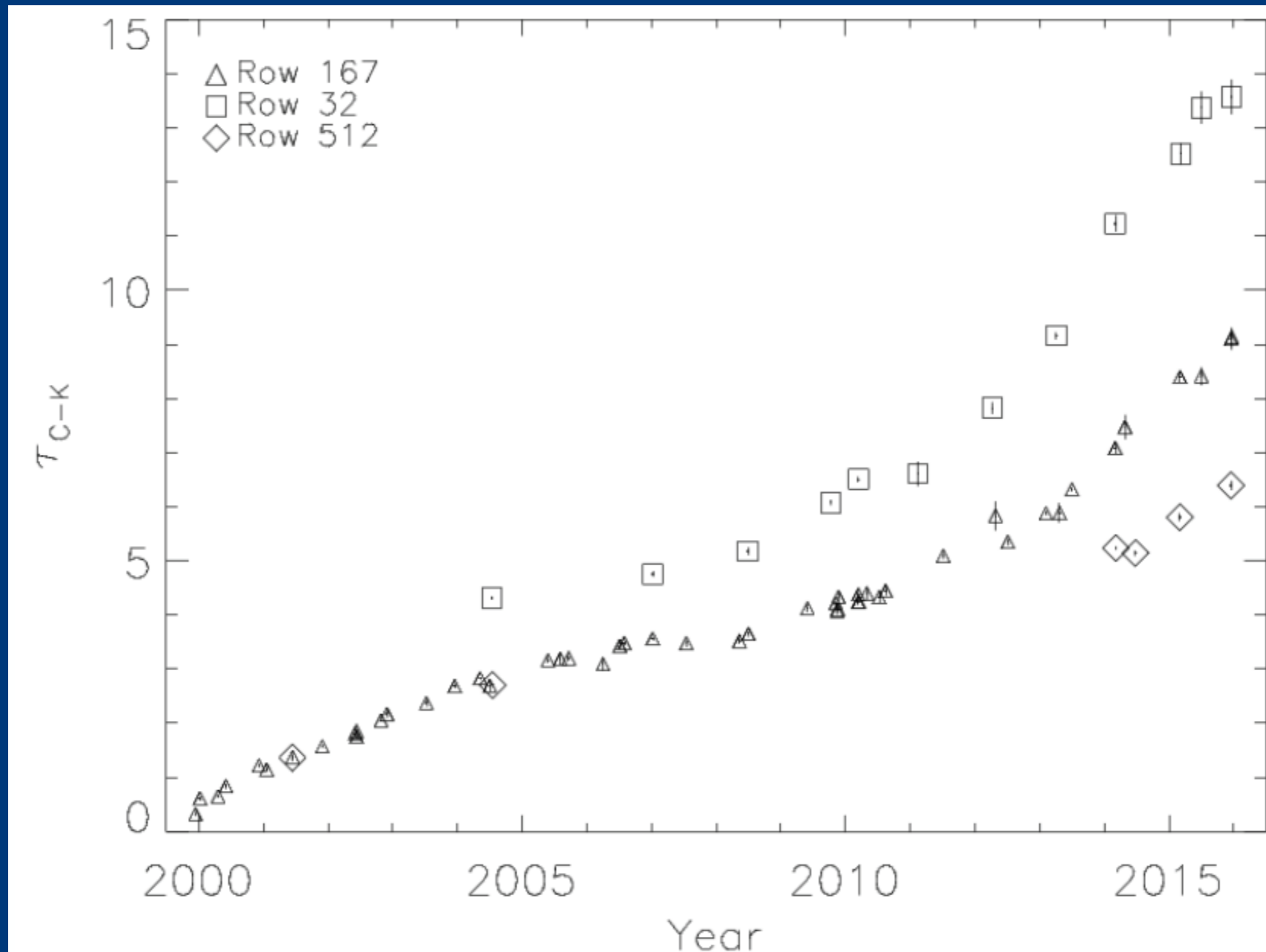## Dec. 2015 HETG/ACIS-S Big DIther observations of Mkn 421
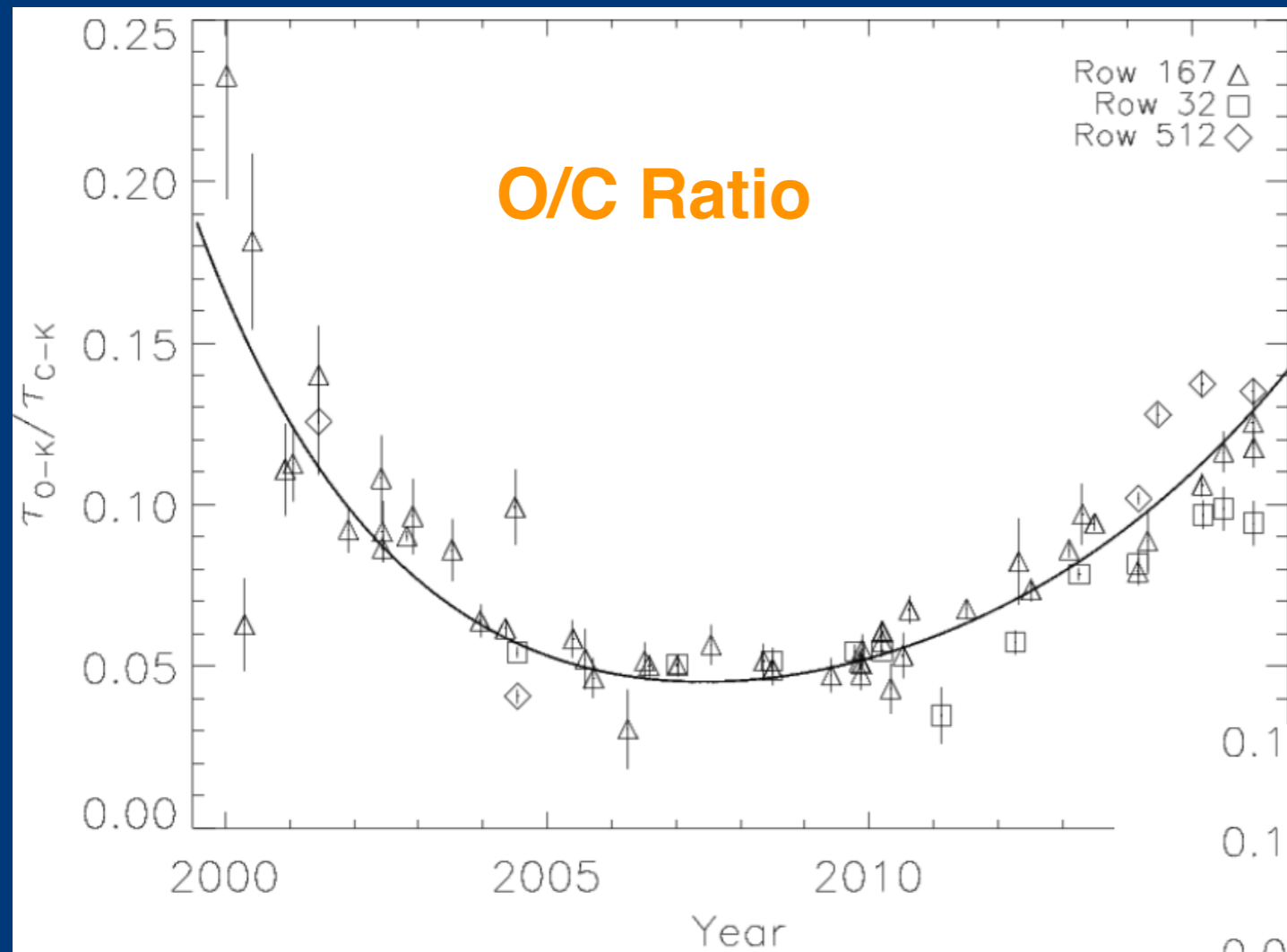
Contamination Build-Up on the ACIS filters

Components of the ACIS contamination model
- **Time-dependence**
- **Spatial variations**
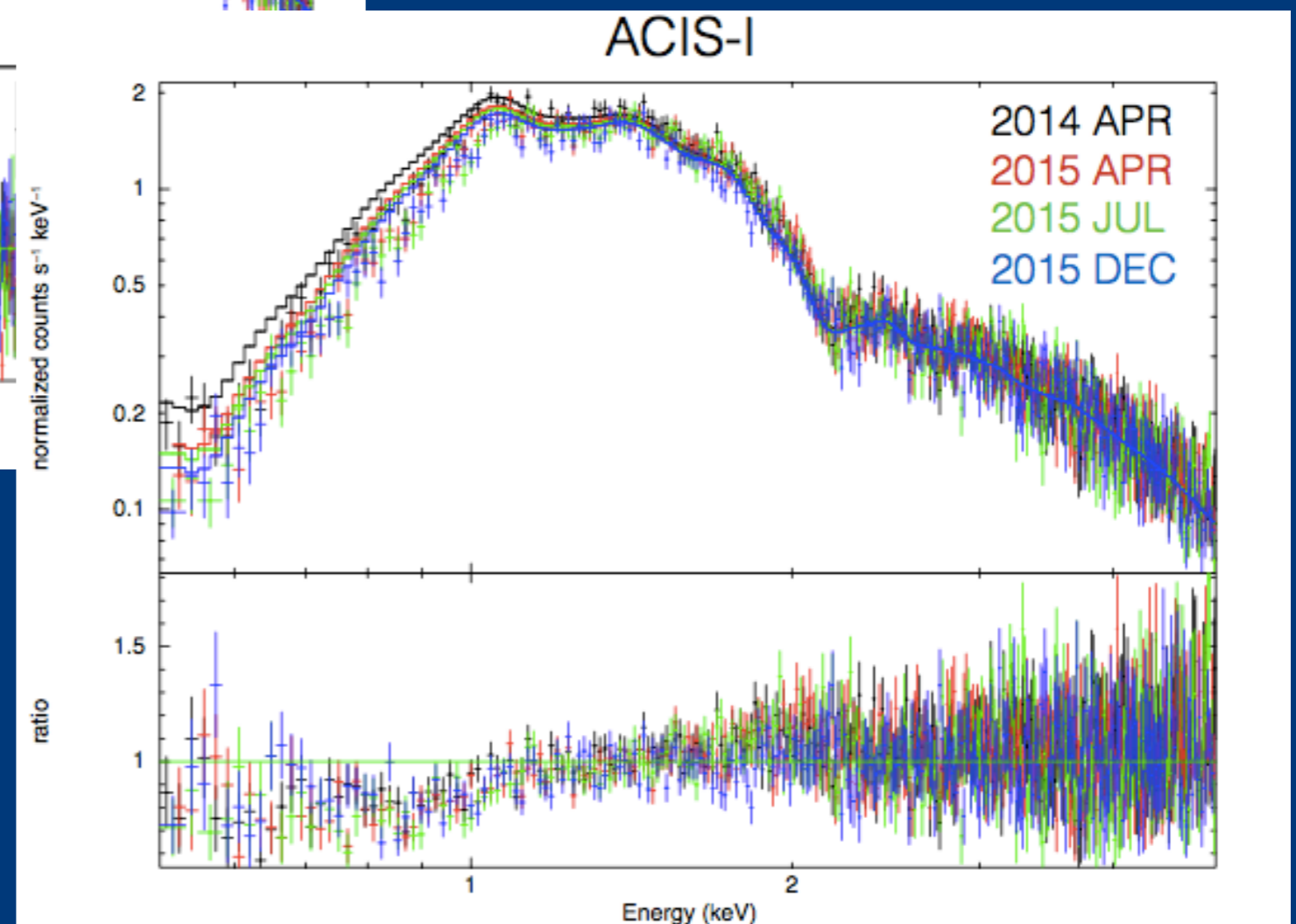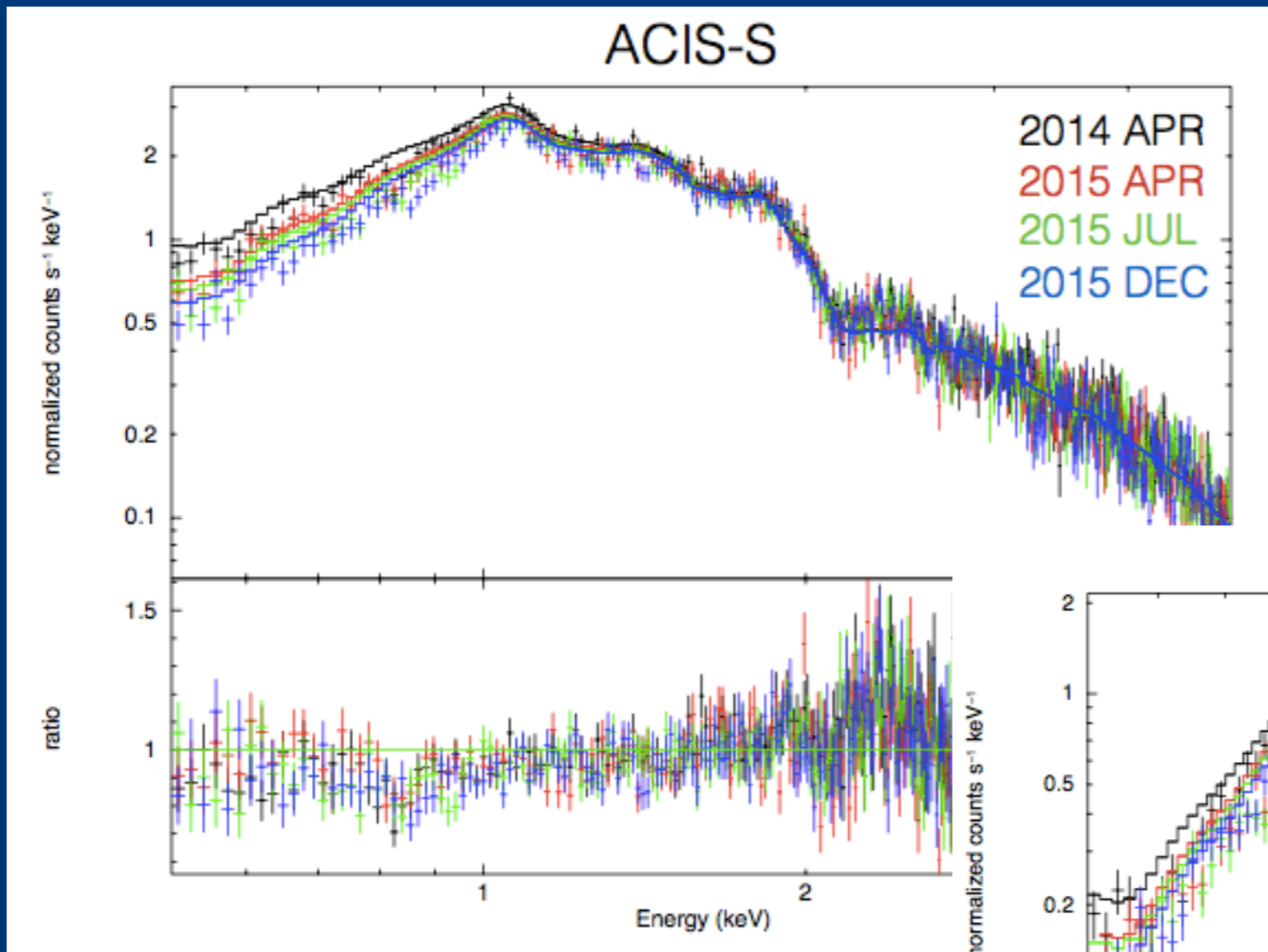- **Chemical composition C, O and F**

Contamination Build-Up on the ACIS filters

O/C Ratio

F/C Ratio

Evidence for multiple sources of contamination
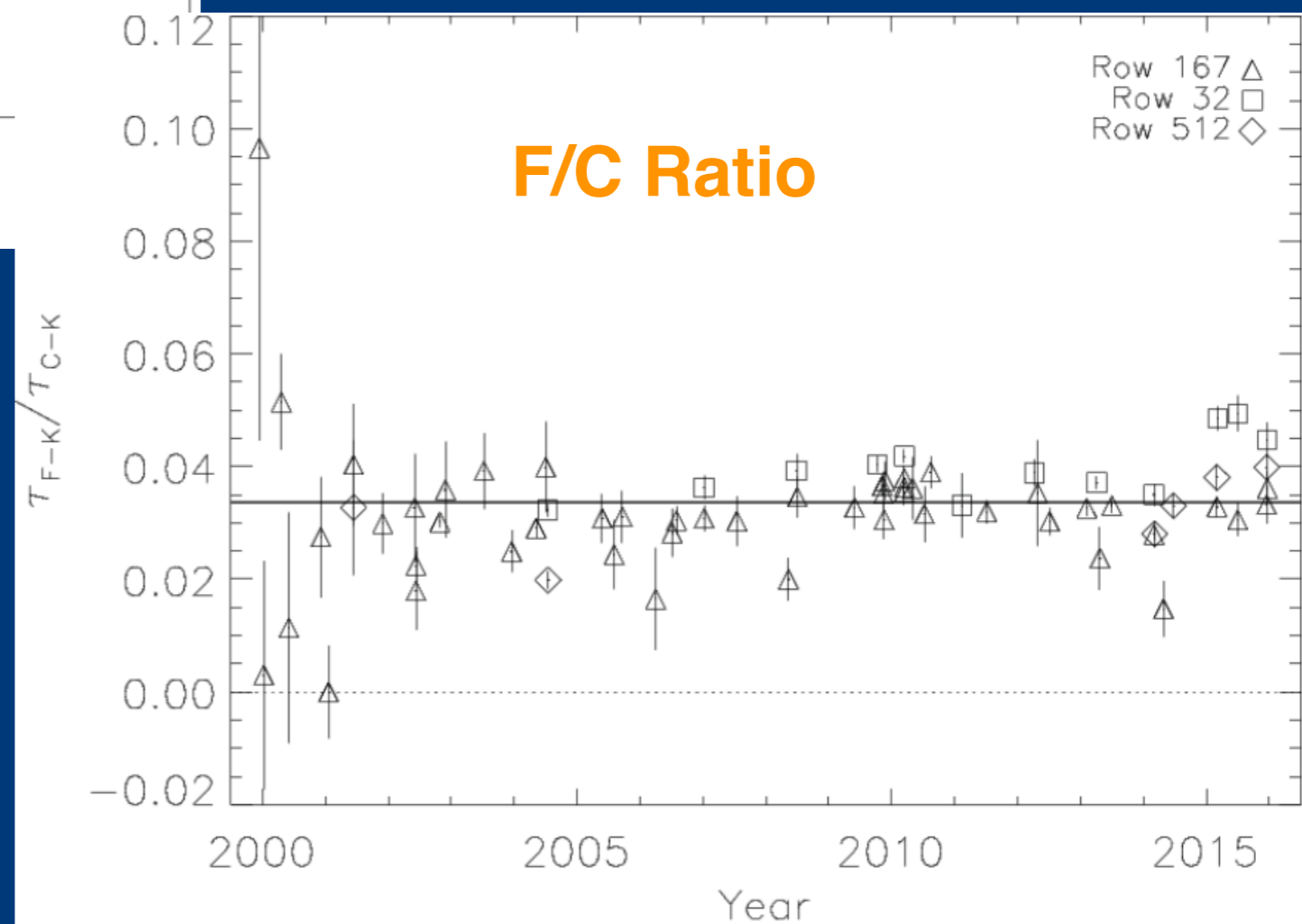
Contamination Build-Up on the ACIS filters

Contamination Build-Up on the ACIS filters

ACIS-S Observations of E0102-72
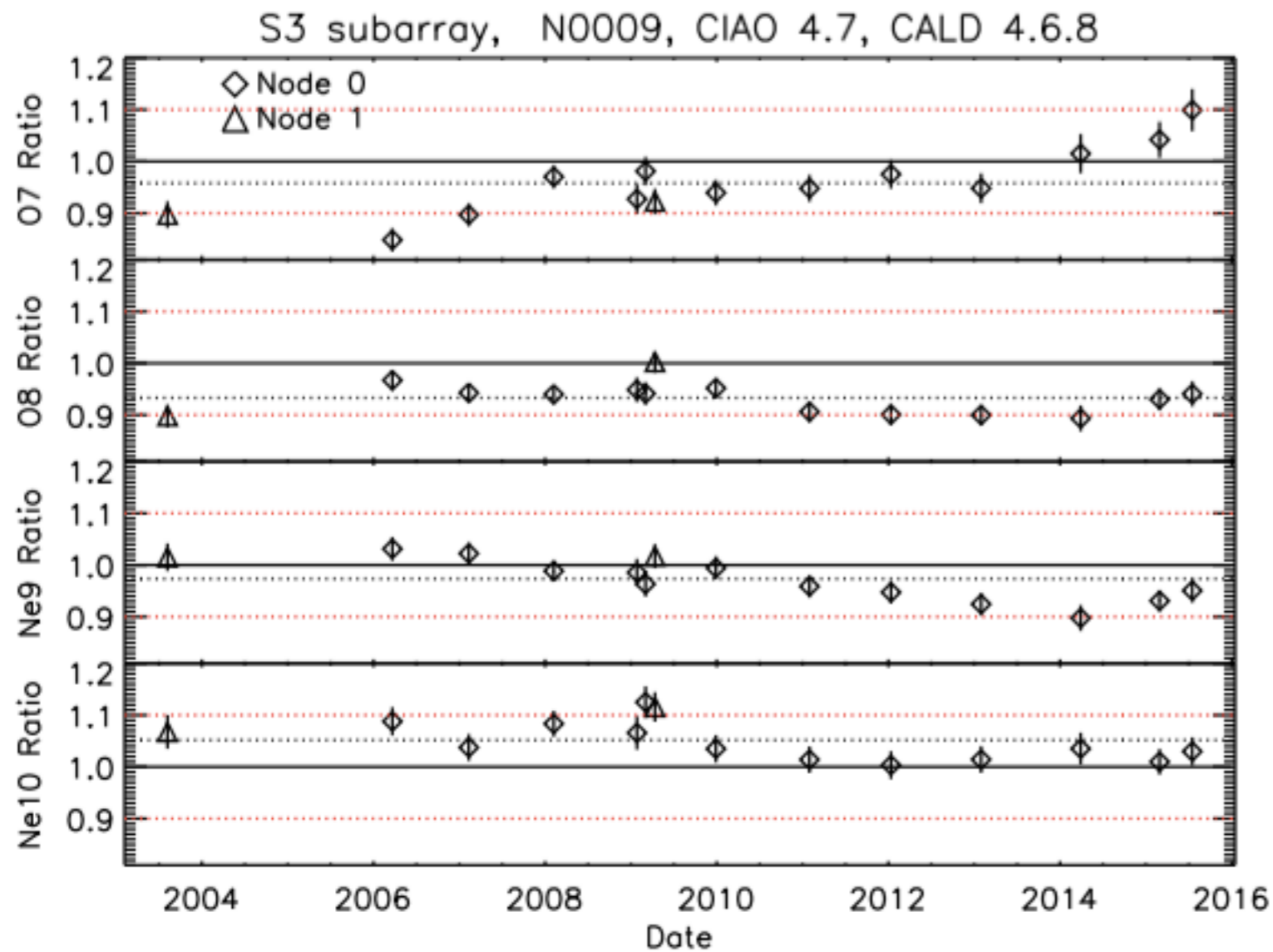
IACHEC Model - black solid line

ACIS Average - black dashed line

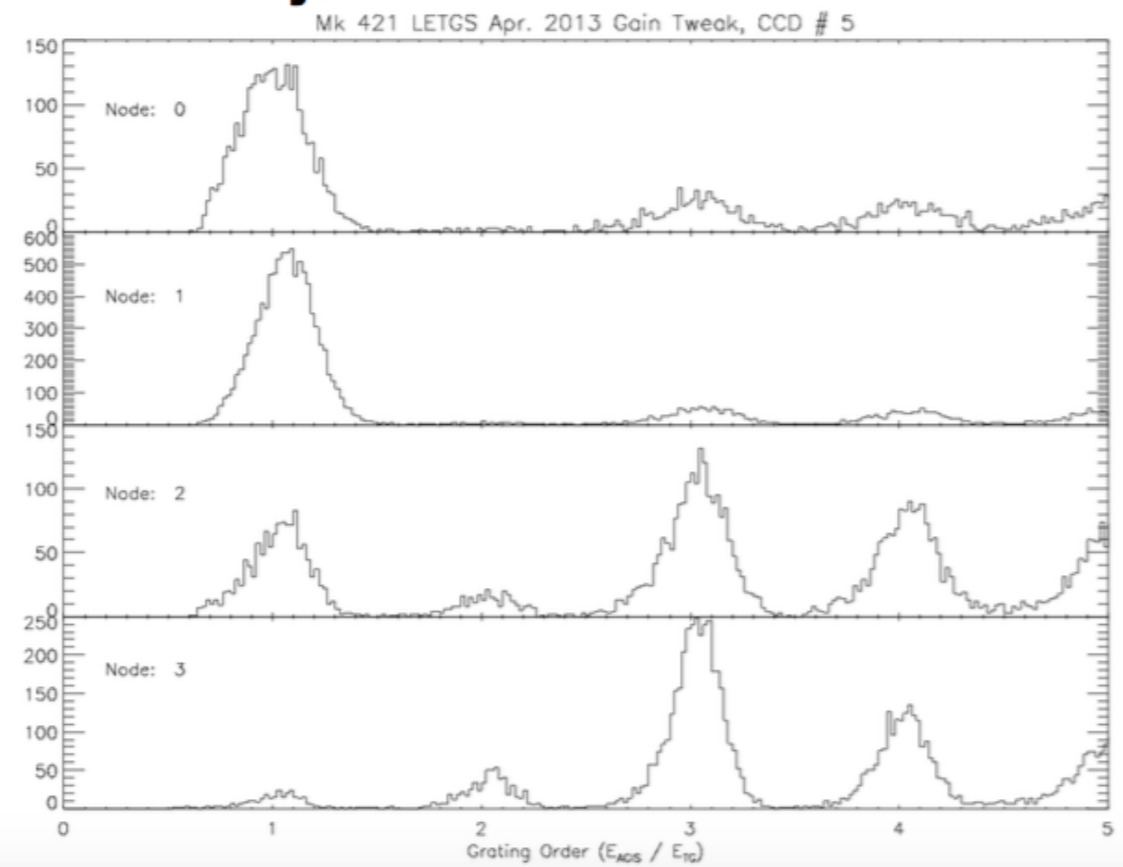# Adjustments to ACIS-S1 Low Energy Gain

Old

New
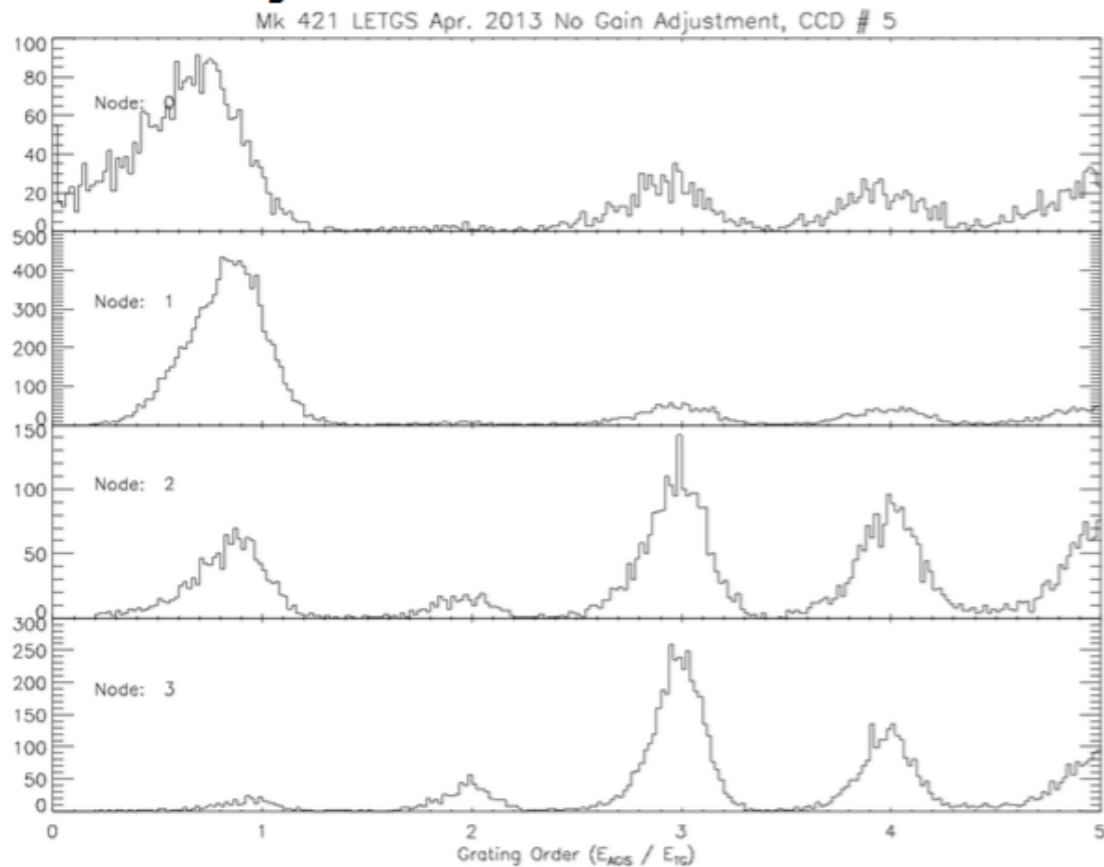
Comparison of photon energies computed from the detector gain and LETG dispersion relation. The old ACIS-S1 gain tables led to the exclusion of low energy events with the default OSIPs.

ACIS Spectral Resolution

ACIS spectral resolution has degraded with time due to increasing CTI and to a lesser extent higher operating temperatures.
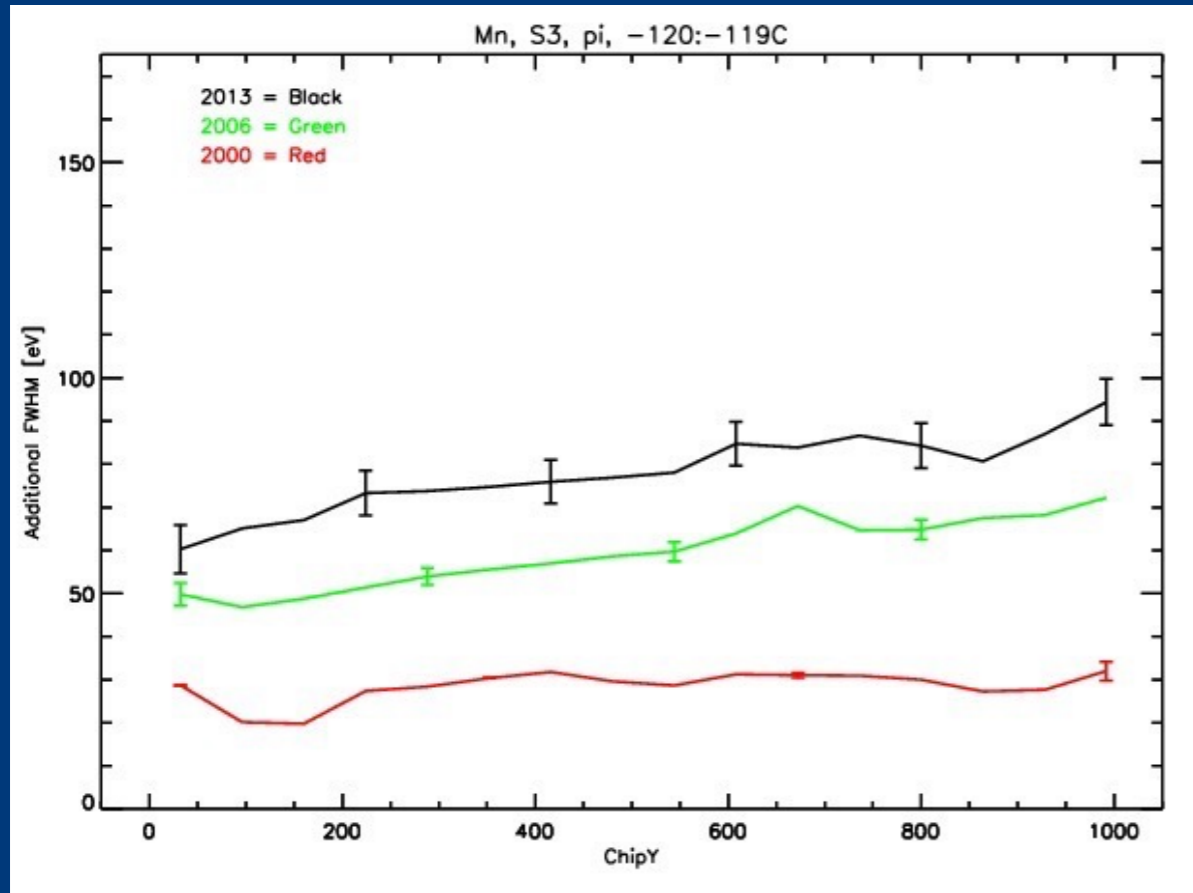
**Work has commenced on developing
a set of time-dependent
scatter matrices**
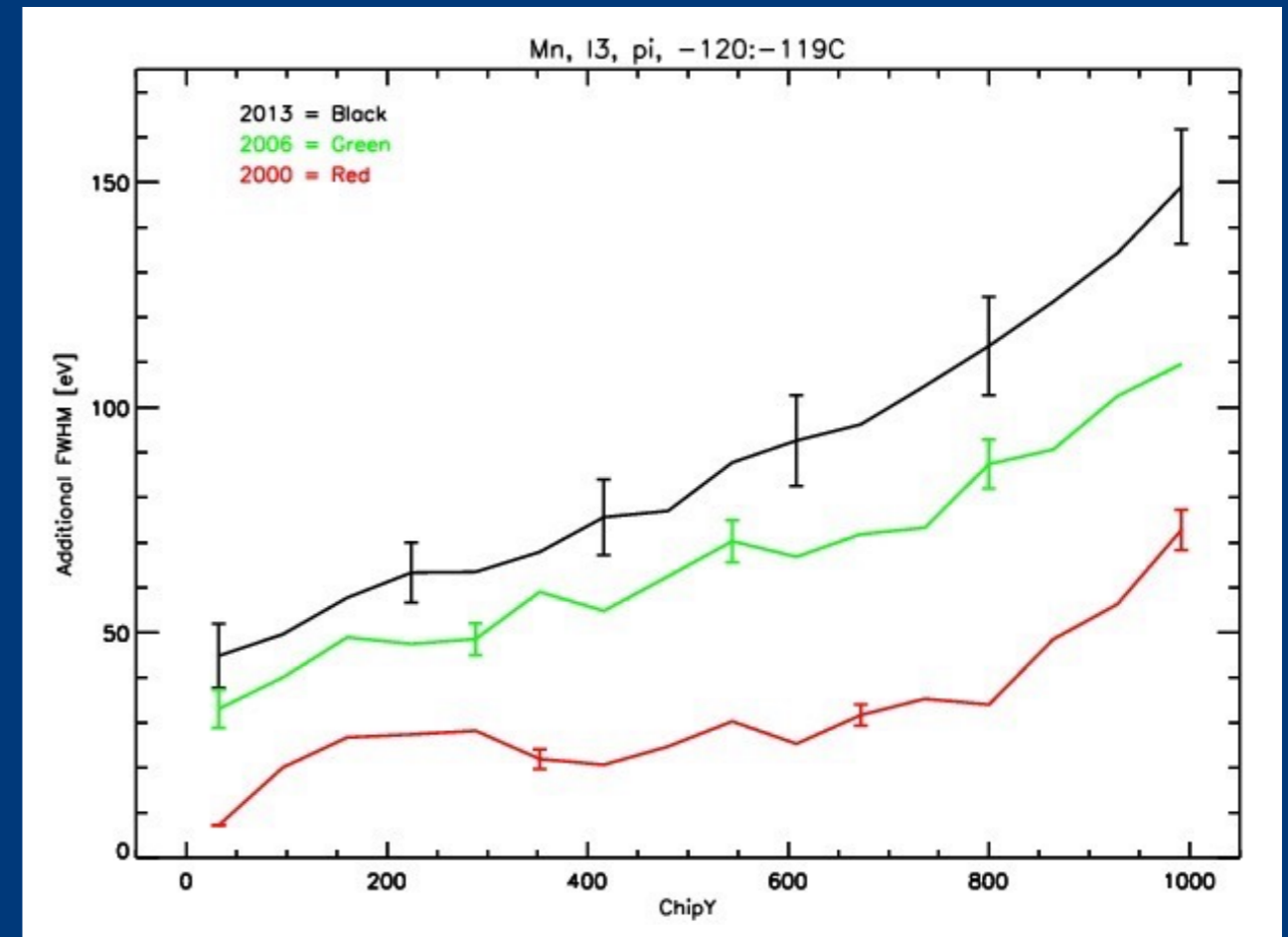
LETG/HRC-S vs LETG/ACIS-S Cross-Calibration

Mkn 421 Observation

Old S1 detector gains

New S1 detector gains

HRC-S Calibration Status
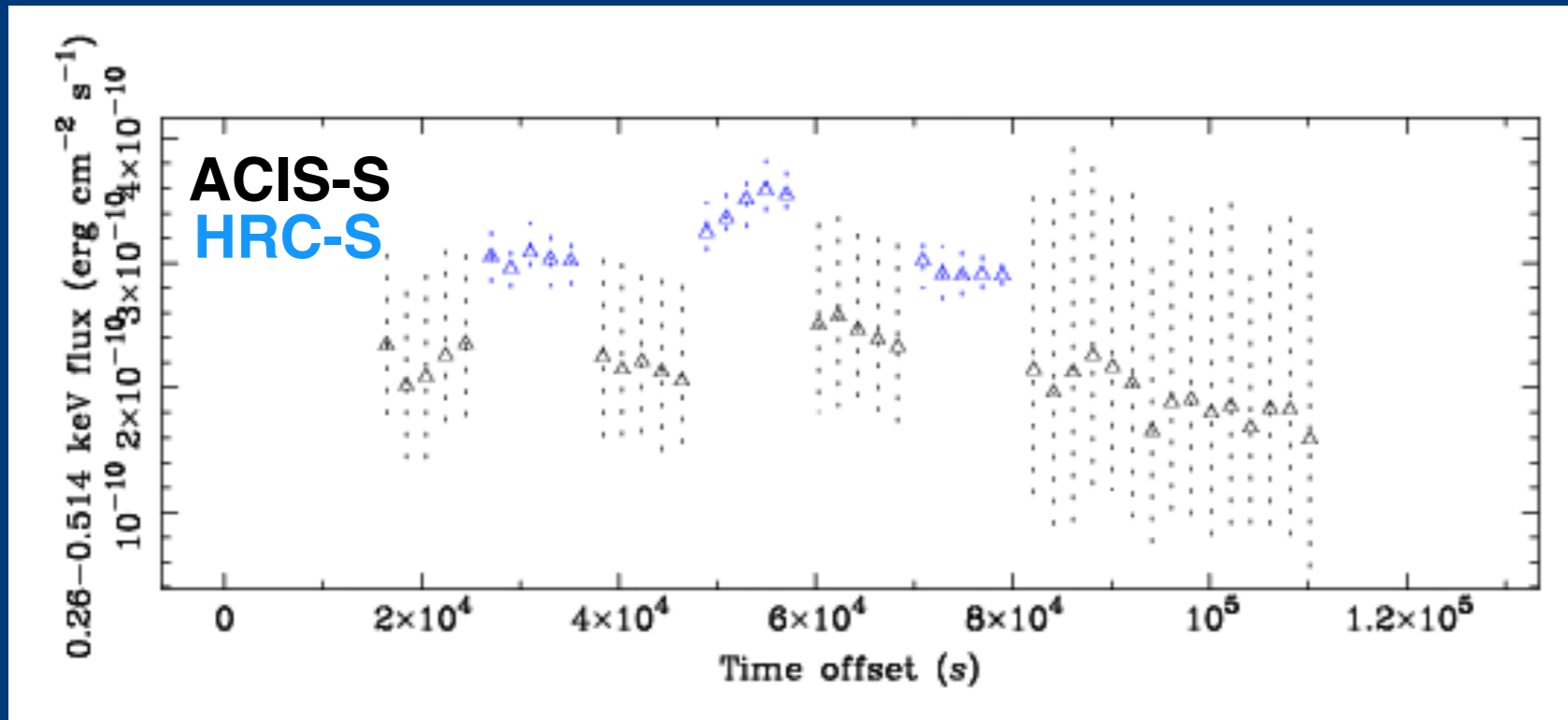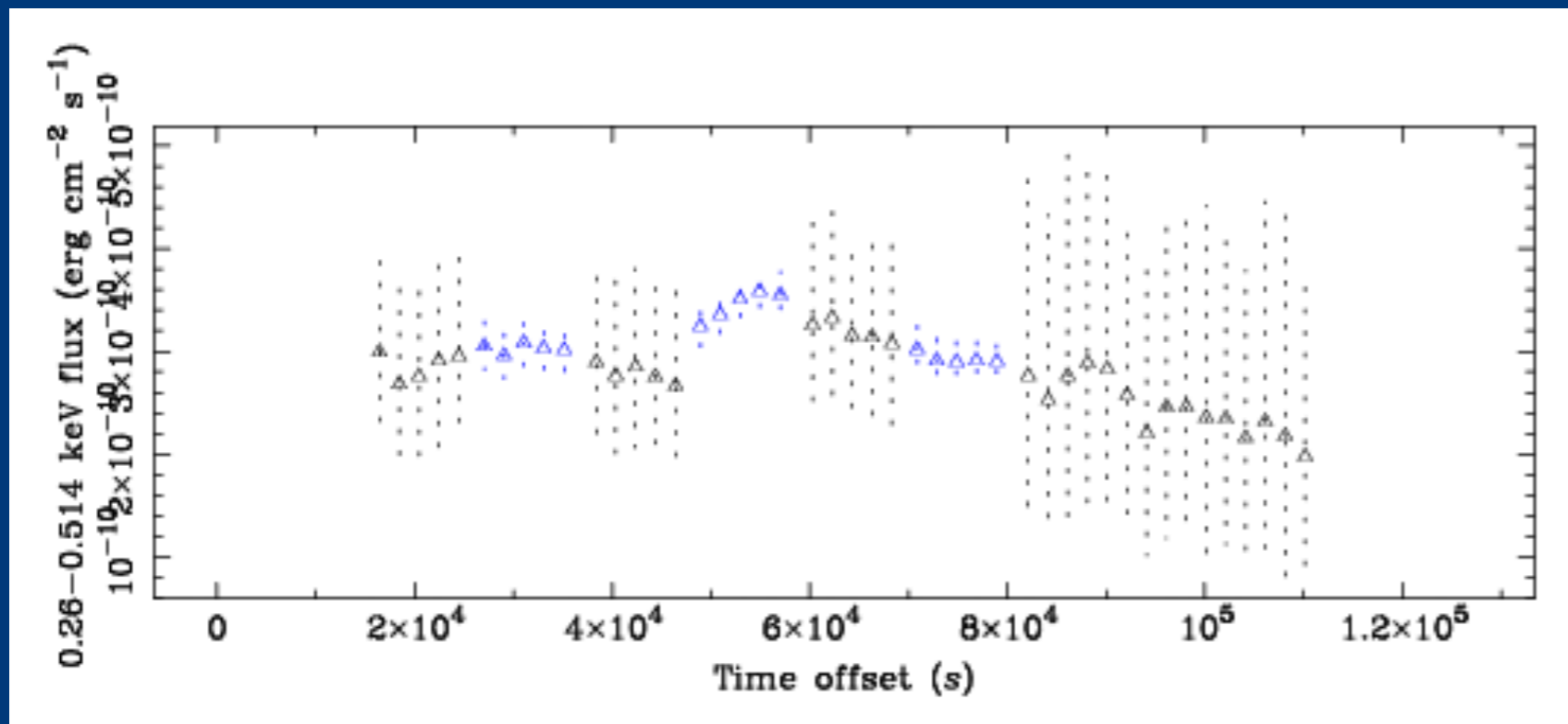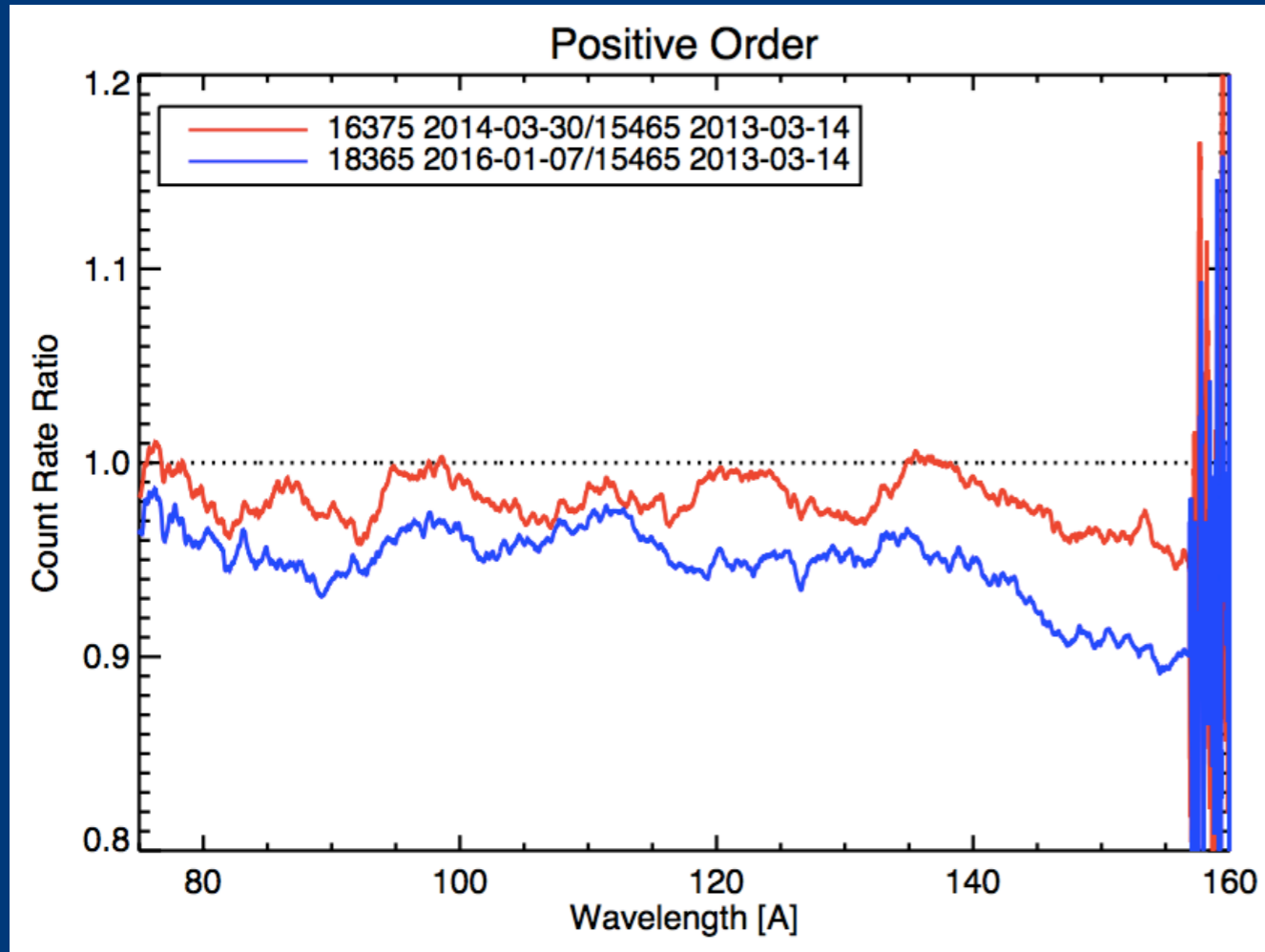

Positive Order

16375 2014-03-30/15465 2013-03-14
18365 2016-01-07/15465 2013-03-14

LETG/HRC-S Observations of HZ43

- **25% loss in gain over past two years.**

- **5% loss in QE over past two years.**

- **Requires updates to CALDB files.**

- **No plans for increasing the HRC-S HV.**

HRC-S Calibration Status

Positive Order

Legend:
- 16375 2014-03-30/15465 2013-03-14 (red)
- 18365 2016-01-07/15465 2013-03-14 (blue)

of HZ43

- 25% los
- 5% loss
- Require
- No plar

HRC-S Calibration Status

HRC-S Calibration Status
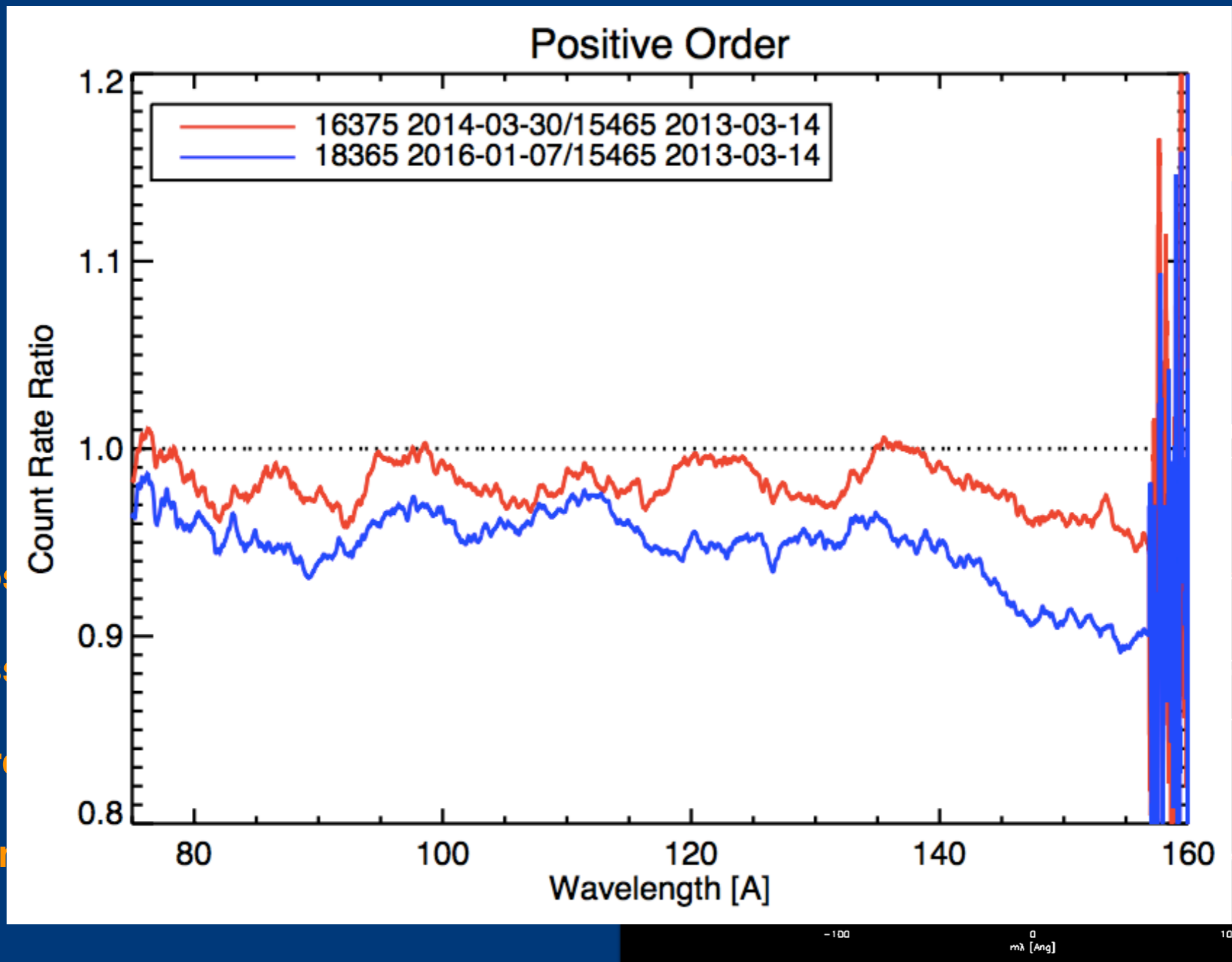
HRC-S Calibration Status

Positive Order
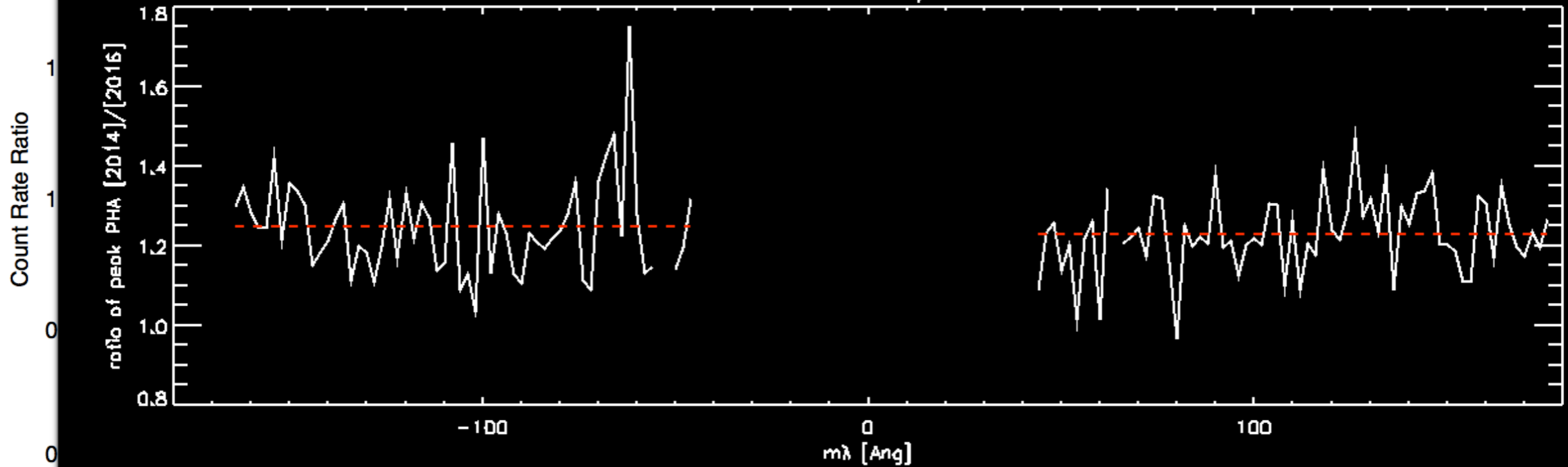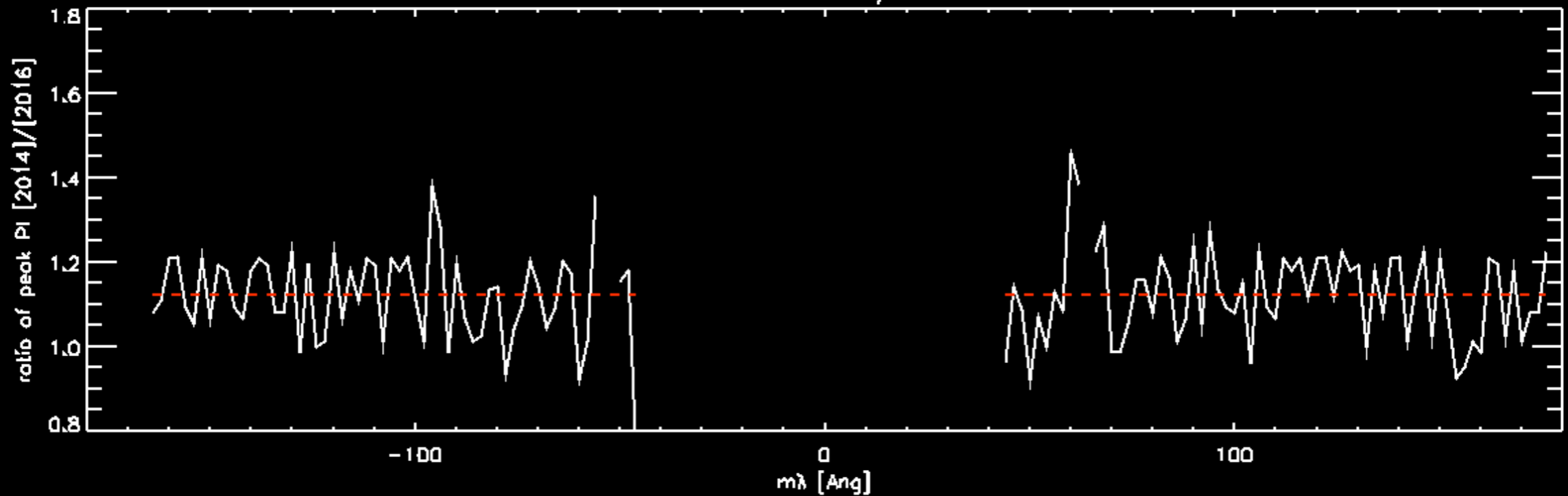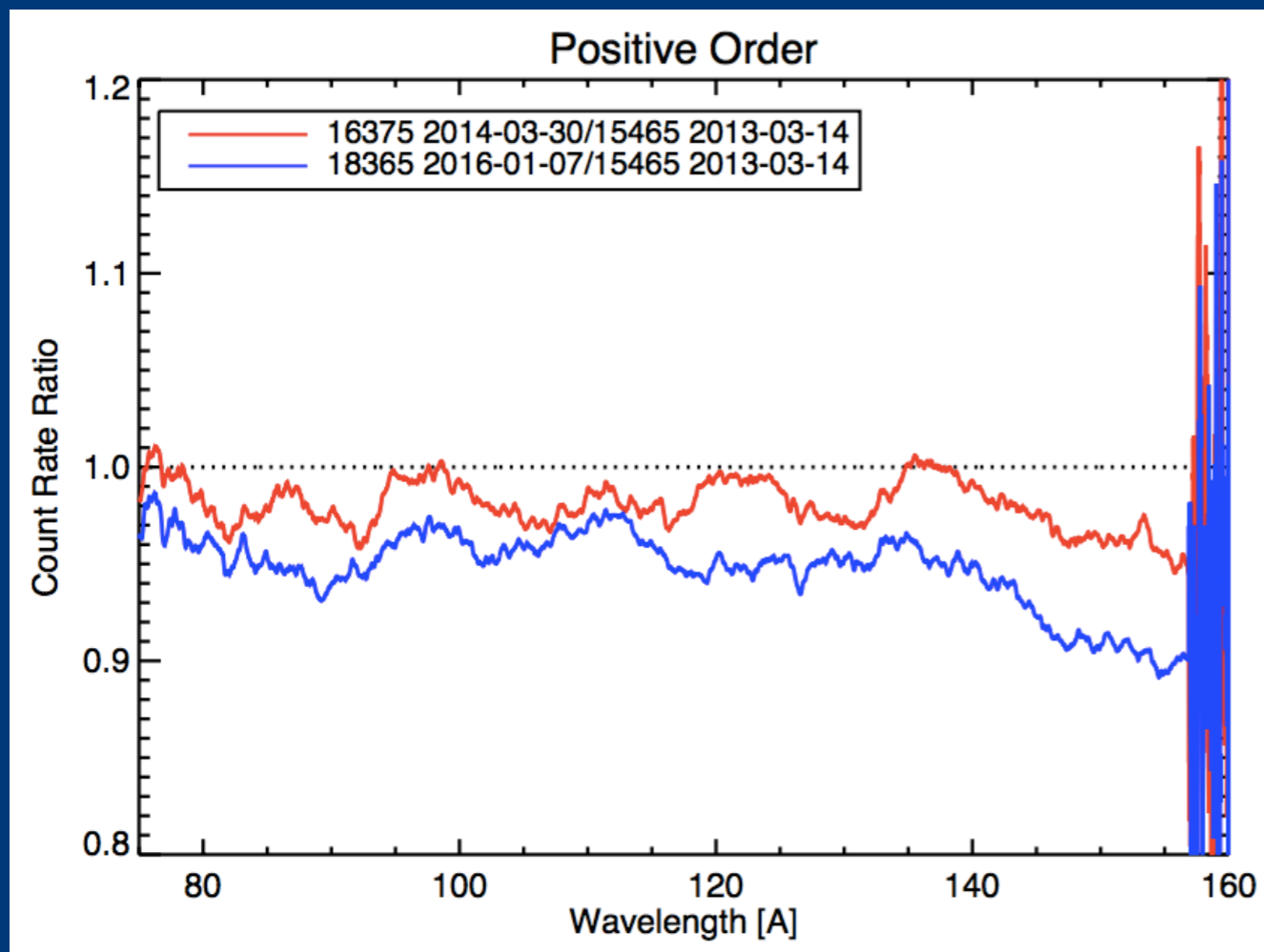
LETG/HRC-S Observations of HZ43

- **25% loss in gain over past two years.**

- **5% loss in QE over past two years.**

- **Requires updates to CALDB files.**
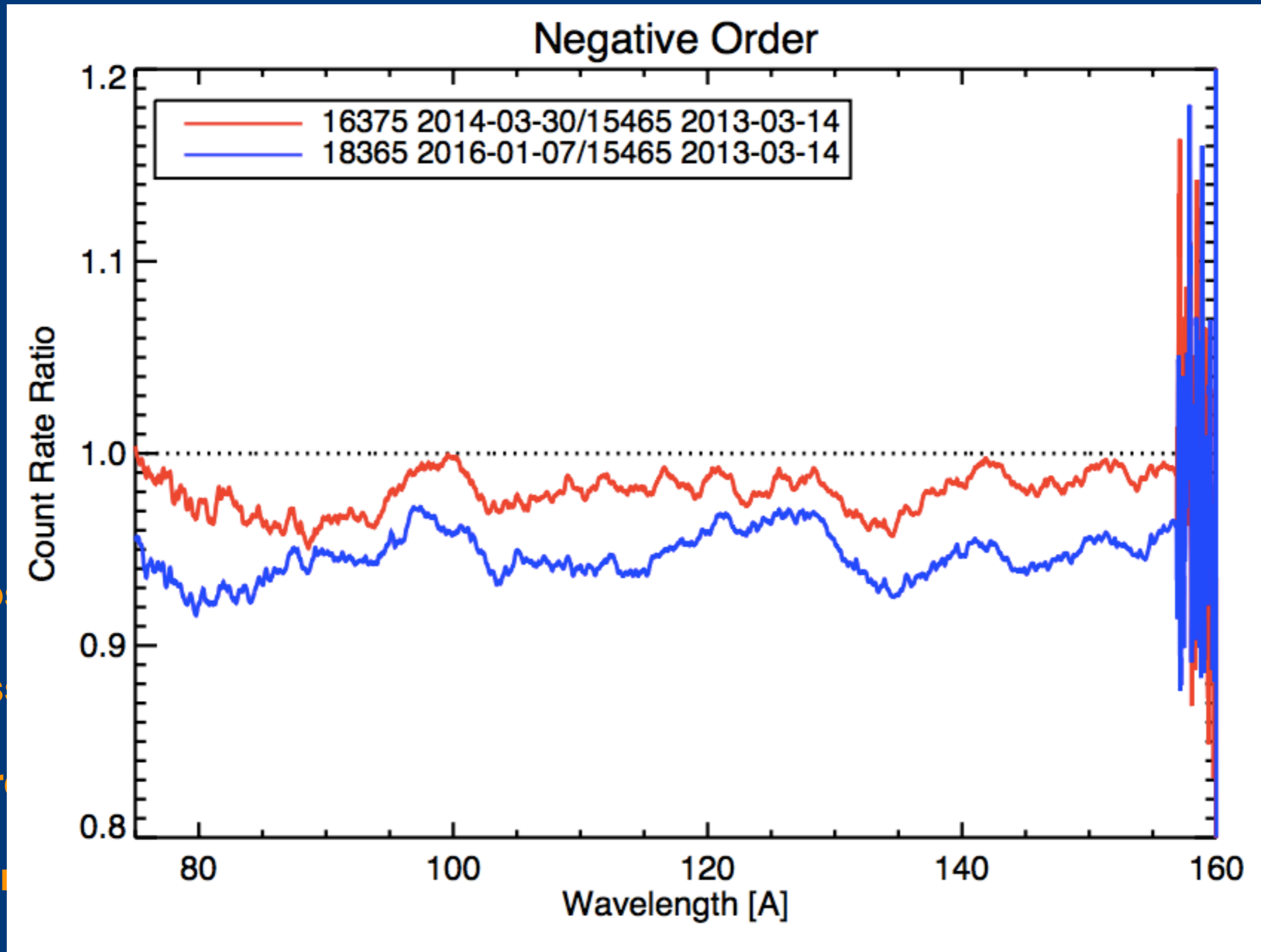
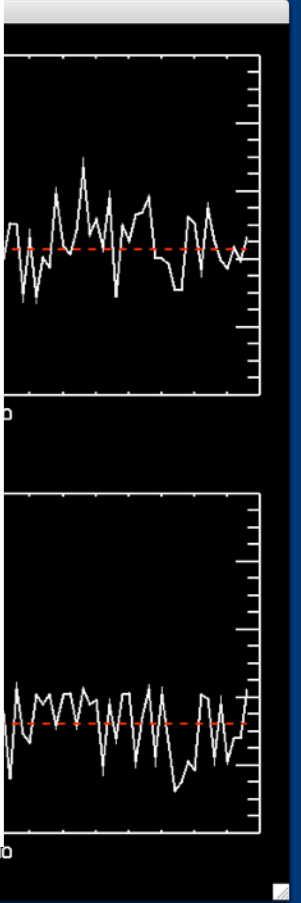- **No plans for increasing the HRC-S HV.**

LETG/HRC-S Calibration Status
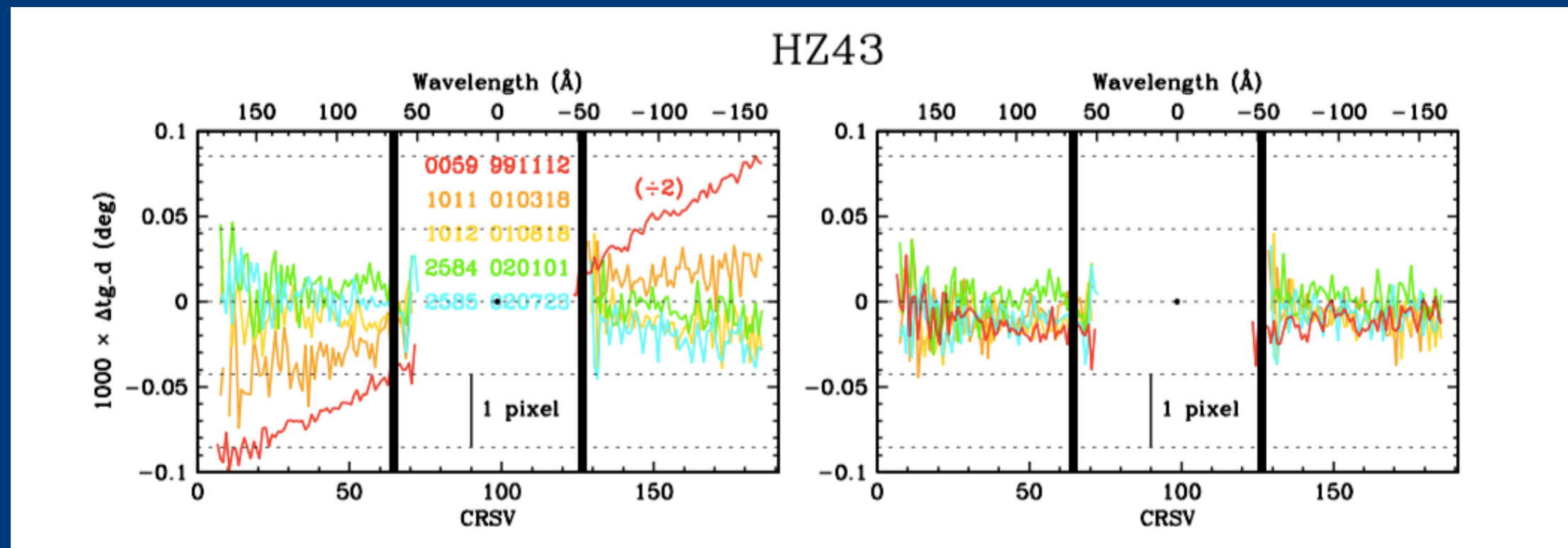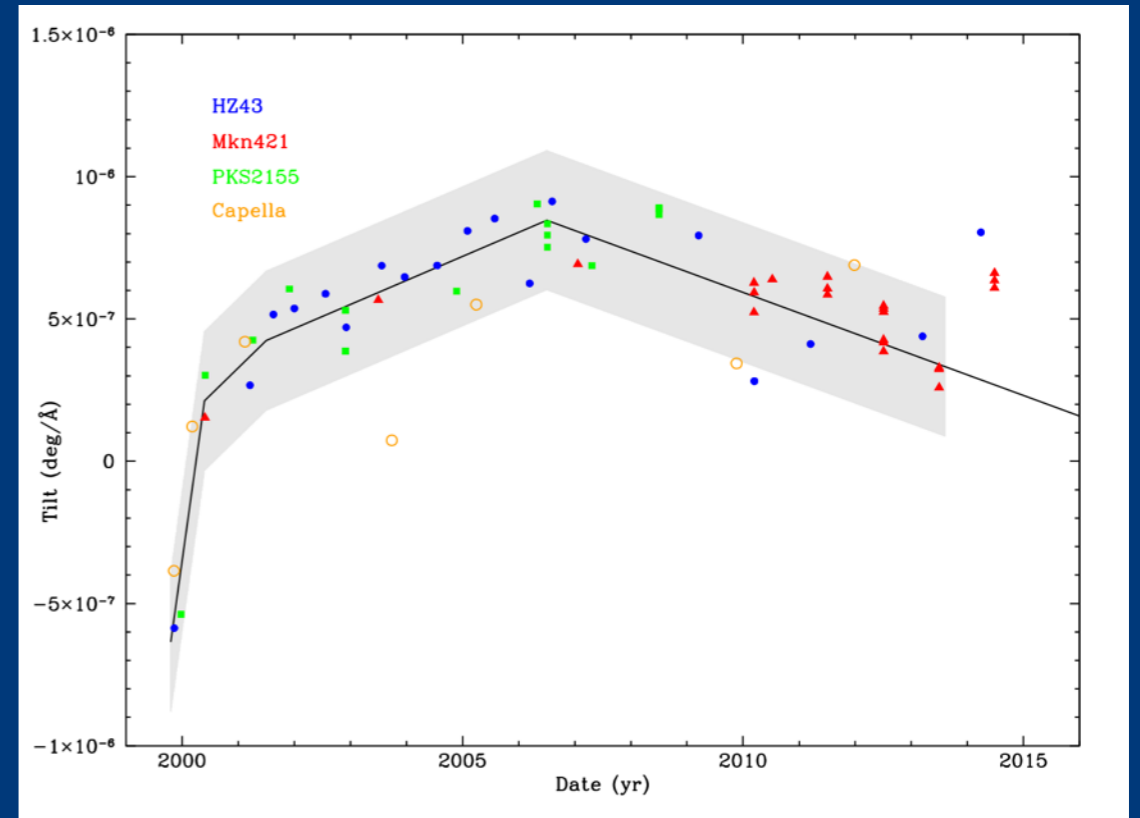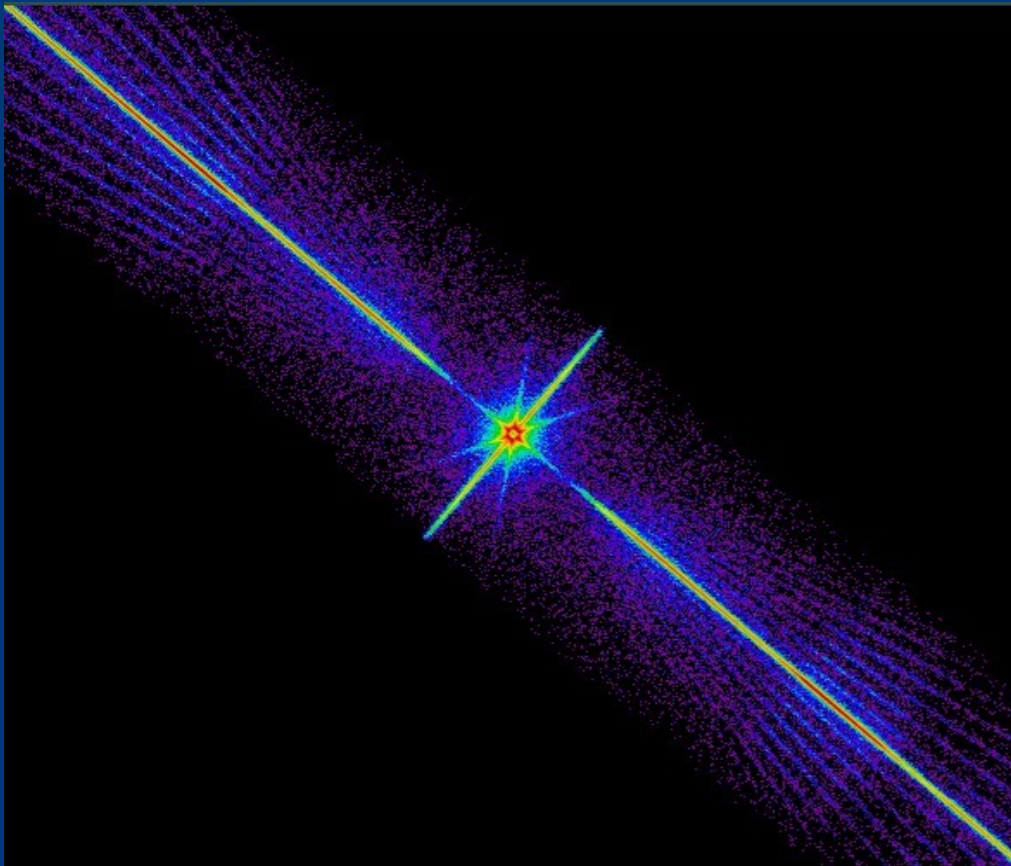
Time-dependent tilt correction

LETG/HRC-S Calibration Status

Time-dependent tilt correction

Time-dependent tilt correction

LETG/HRC-S Calibration Status

Time-dependent tilt correction
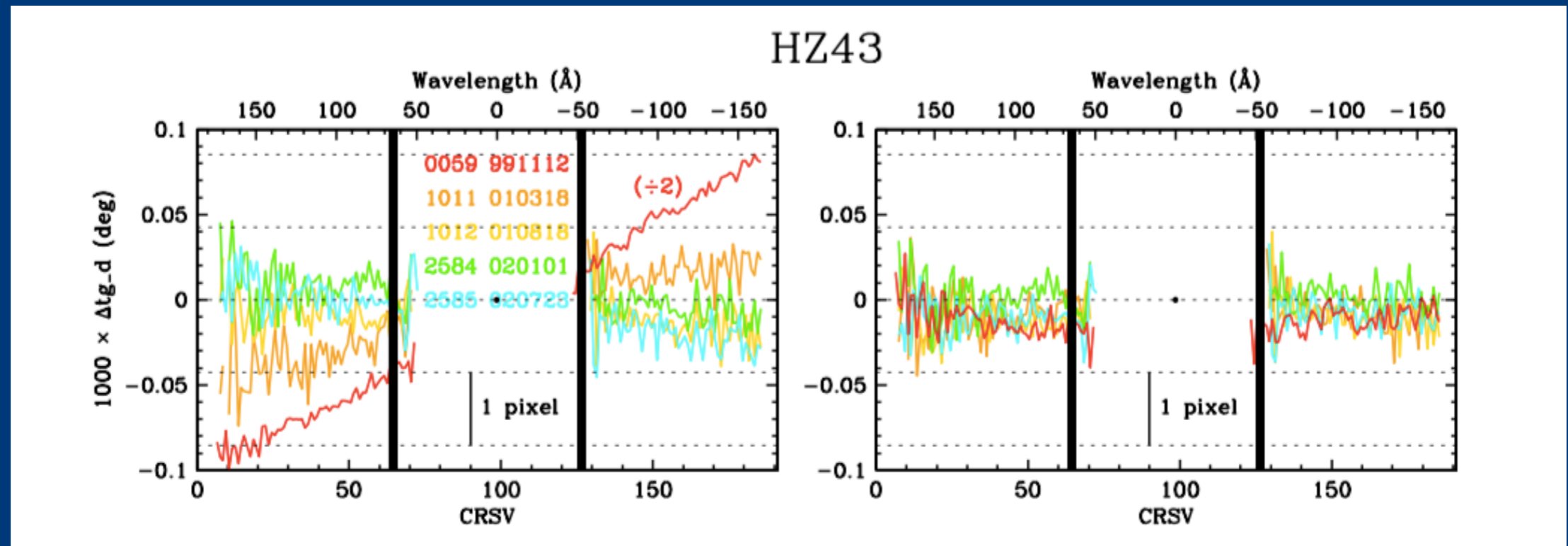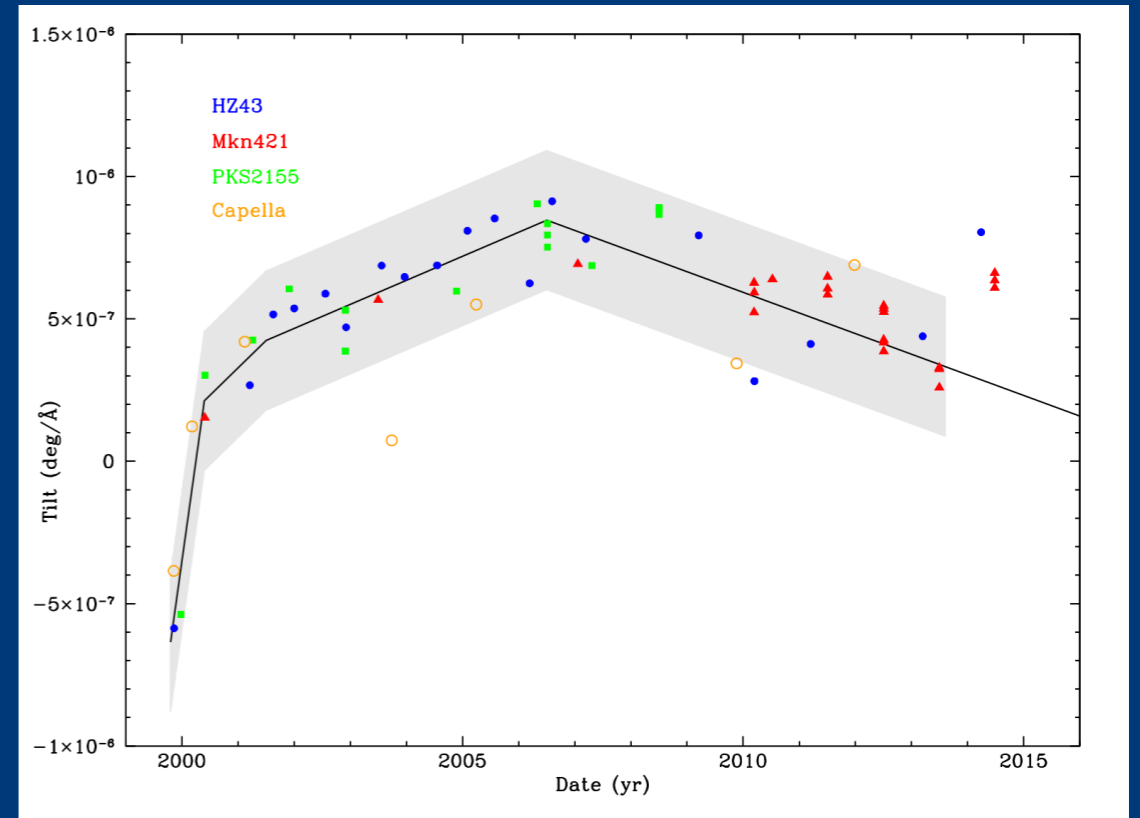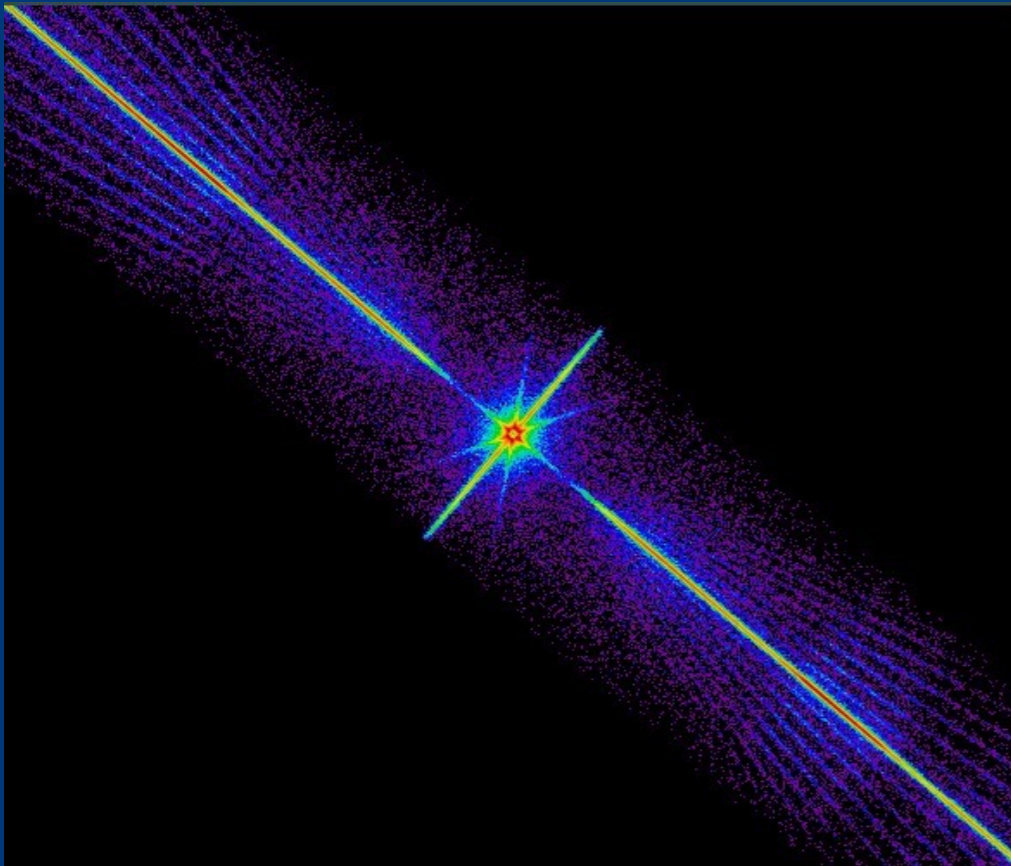
LETG/HRC-S and LETG/ACIS-S Cross-Calibration

MKN421 15xxx Series Flux Lightcurves, 0.8−5.0keV

ACIS−S/HEG: Blue
ACIS−S/MEG: Red
ACIS−S/LEG: Green
HRC−S/LETG: Cyan
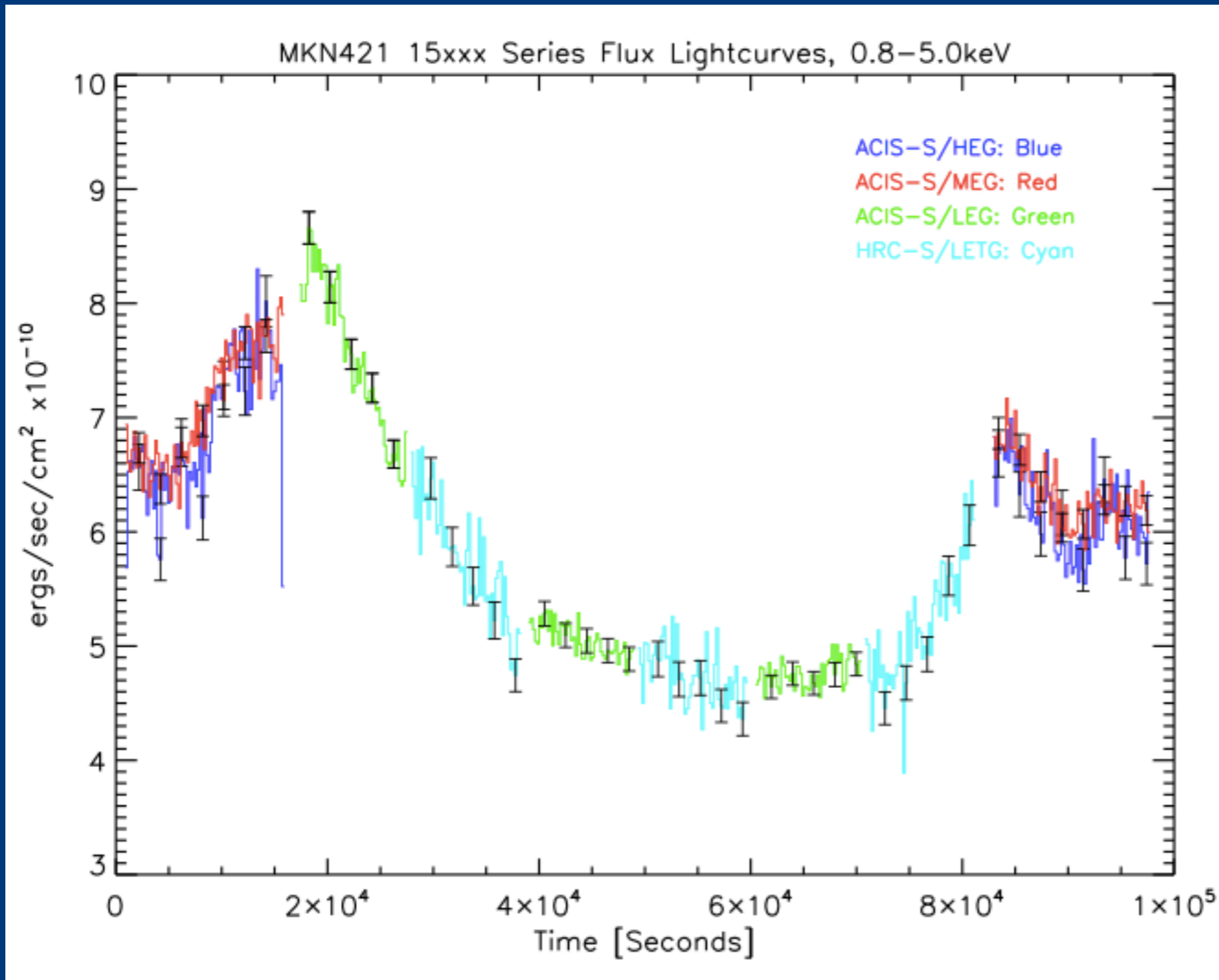
- Old LETG EFFRAC file

- Old ACIS-S1 gain

Adjustments Required to Preserve Cross-Calibration
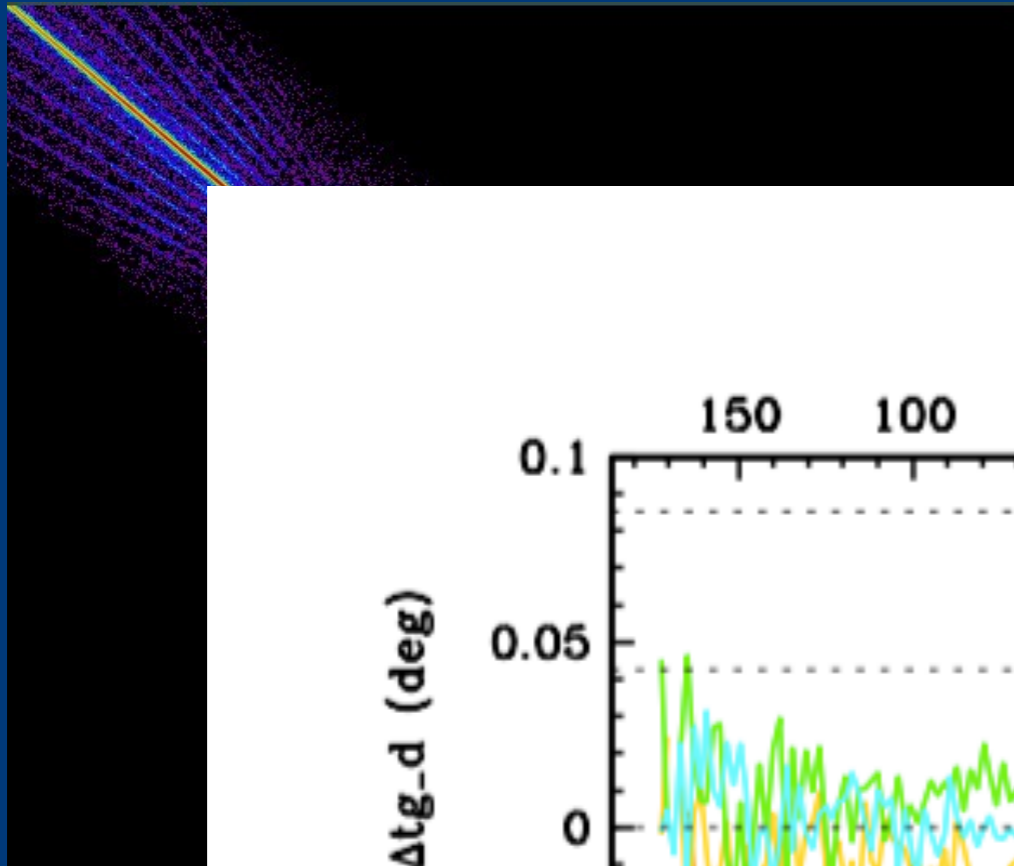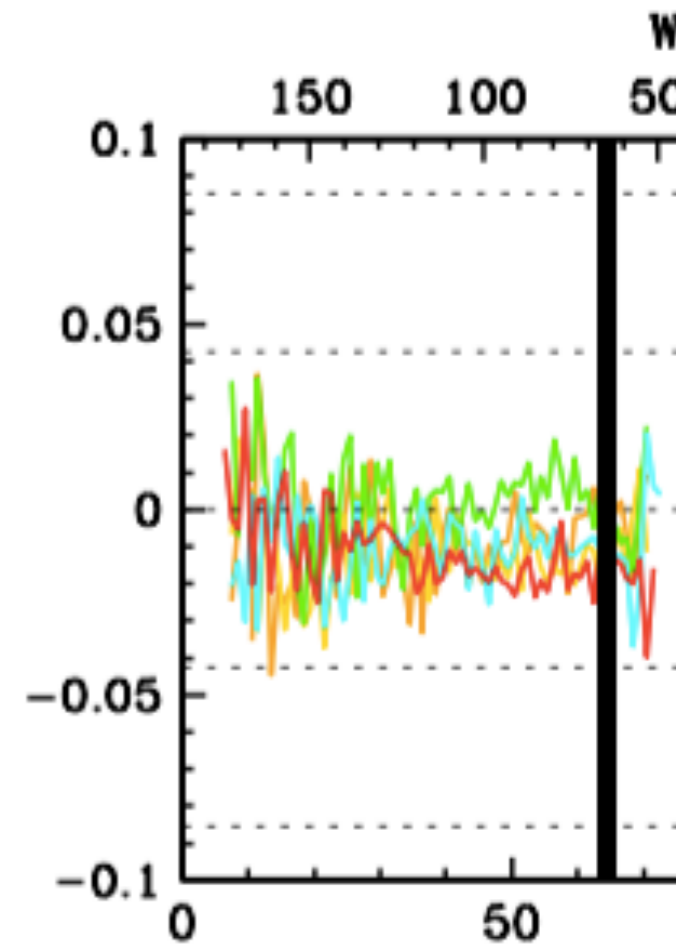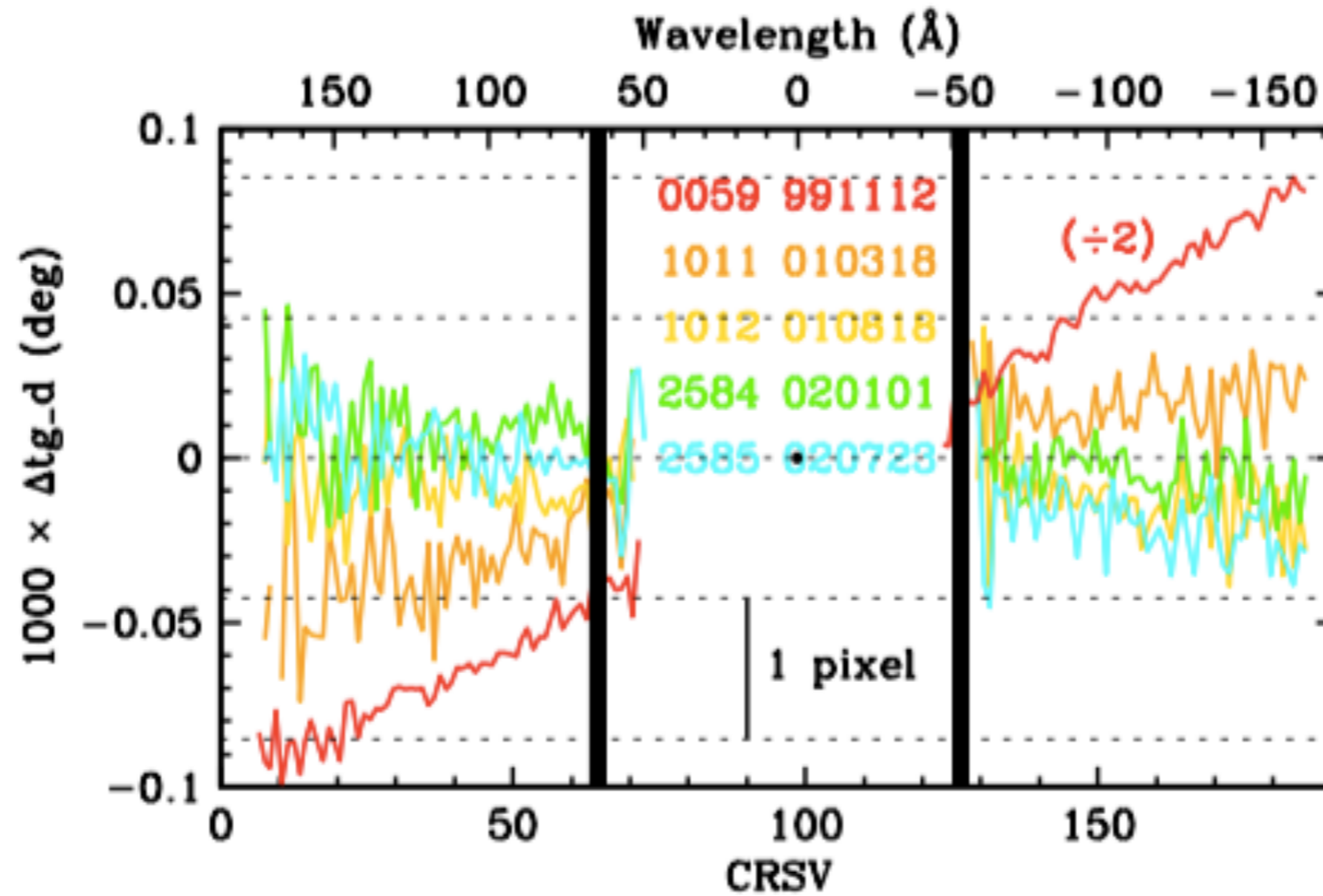
- **New ACIS-S1 gain file improves the cross-calibration between LETG/HRC-S and LETG/ACIS-S data**

- **New LETG/HRC-S EEFRACS file requires an adjustment to the HRC-S QE to maintain LETG/HRC-S vs. LETG/ACIS-S cross-calibration**

- **New HRC-S QE requires an adjustment to the HRC-I QE to maintin HRC-S vs. HRC-I cross-calibration**

Adjustments Required to Preserve Cross-Calibration

- Ne
  LE

- Ne
  m
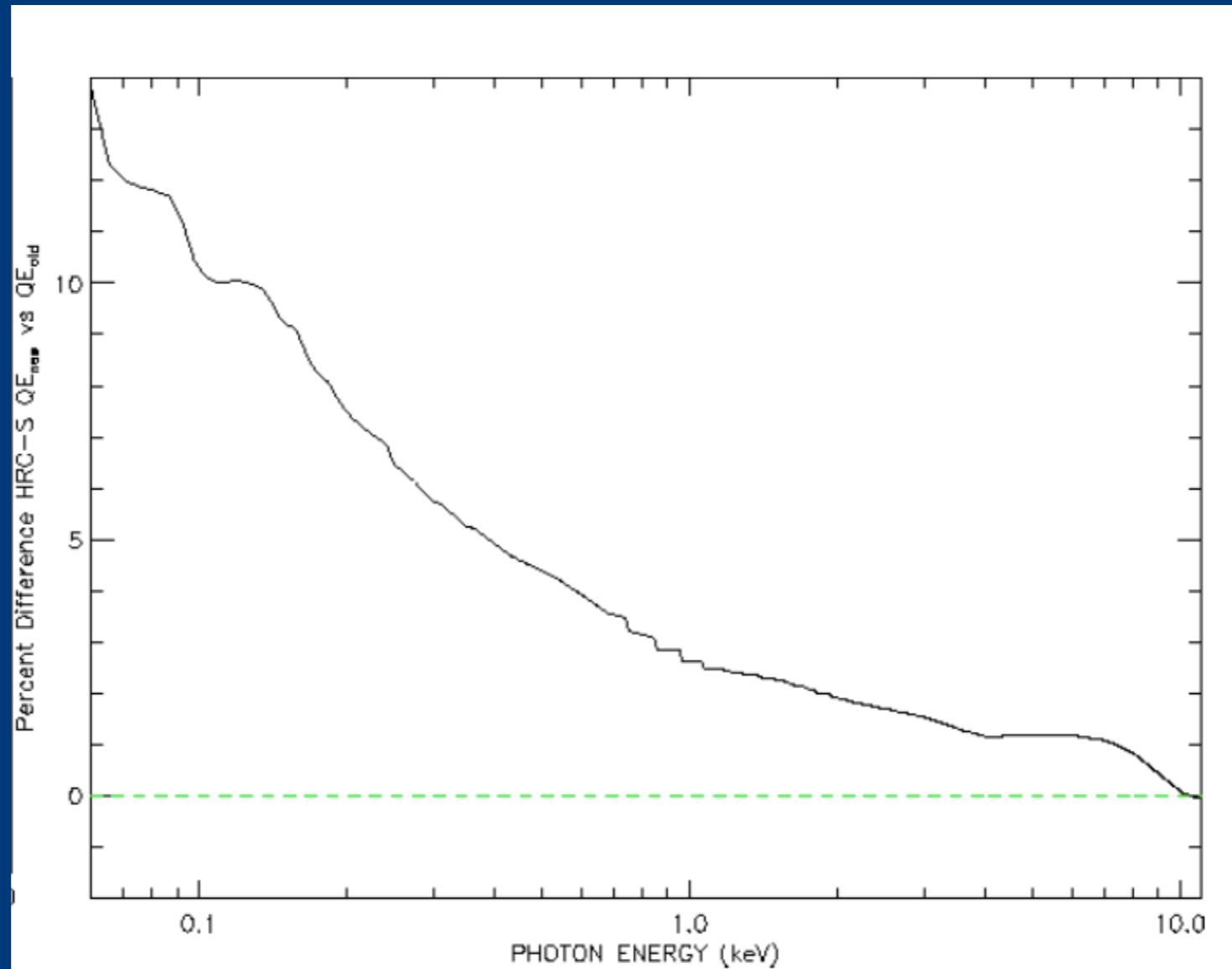
- Ne   -l
  cr
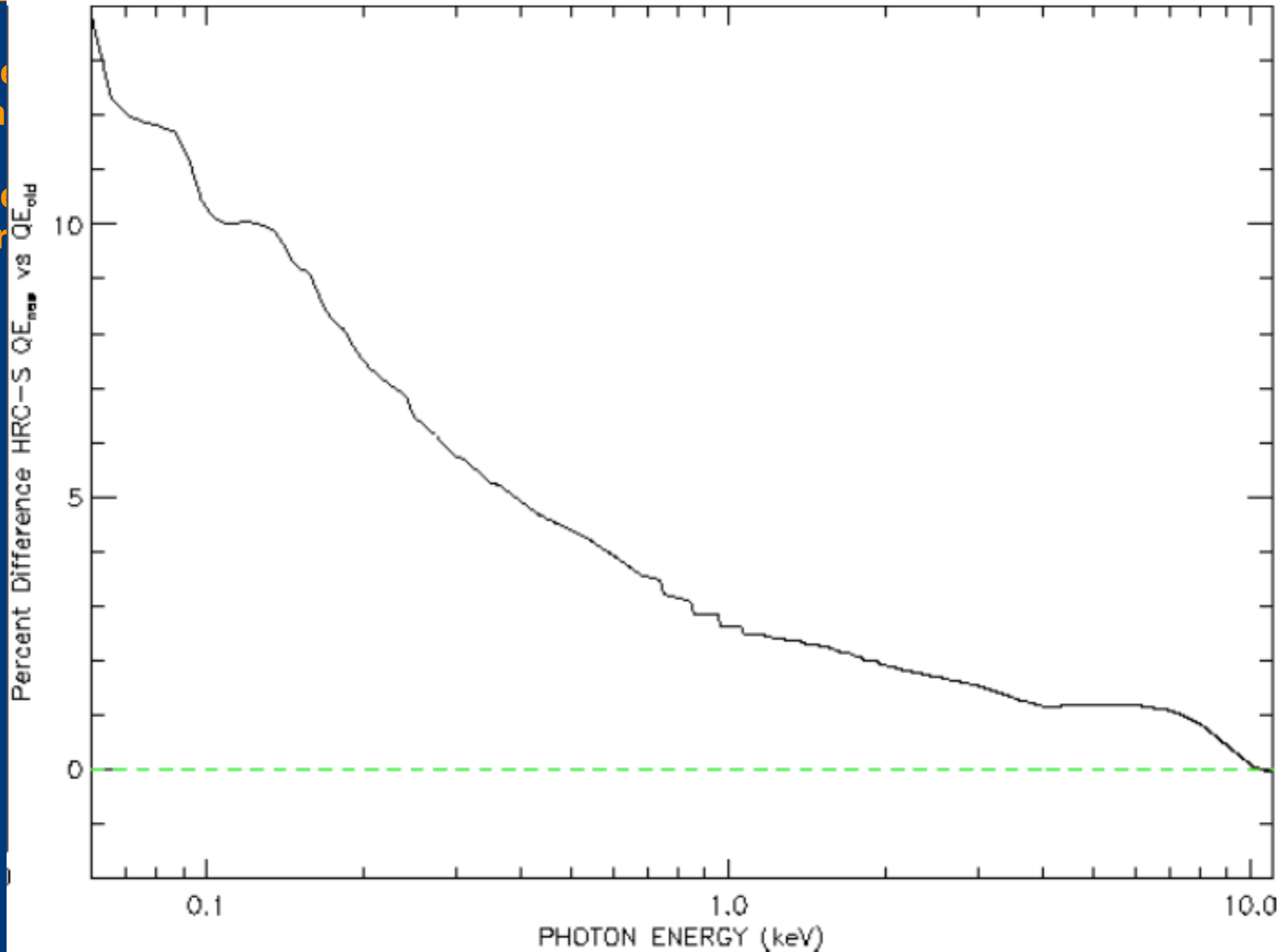
Calibration Schedule

ACIS

- Release revised ACIS contamination model with updated elemental ratios, time-dependence and spatial distribution.
- Release a set of time-dependent scatter matrices.
- Release new ACIS QE maps (these are generated about every two years).
- Release a set (Epoch G) of ACIS blank sky background images for the period 2012-2015.

Gratings

- Release updates to the HEG and MEG 0th order transmission efficiencies.
- Perform a cross-calibration study between LEG, HEG and MEG gratings data.
- Perform a cross-calibration study of the higher order transmission efficiencies of HEG and MEG.

HRC

- Release updates to the time-dependence of the HRC-S and HRC-I QE.
- Release a revised HRC-I QE map using recent calibration observations of the Coma cluster.