Chandra Observatory Status

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Herman Marshall, **Paul Plucinsky**, Pete Ratzlaff, Bradford Wargelin

18th IACHEC meeting — Pelham, Germany — April 20, 2026

ACIS Calibration

1. Releasing tgain files to account for gain loss in the ACIS CCDs

2. Developing and releasing a new ACIS contamination file

3. Generating a set of temperature-dependent response files for ACIS

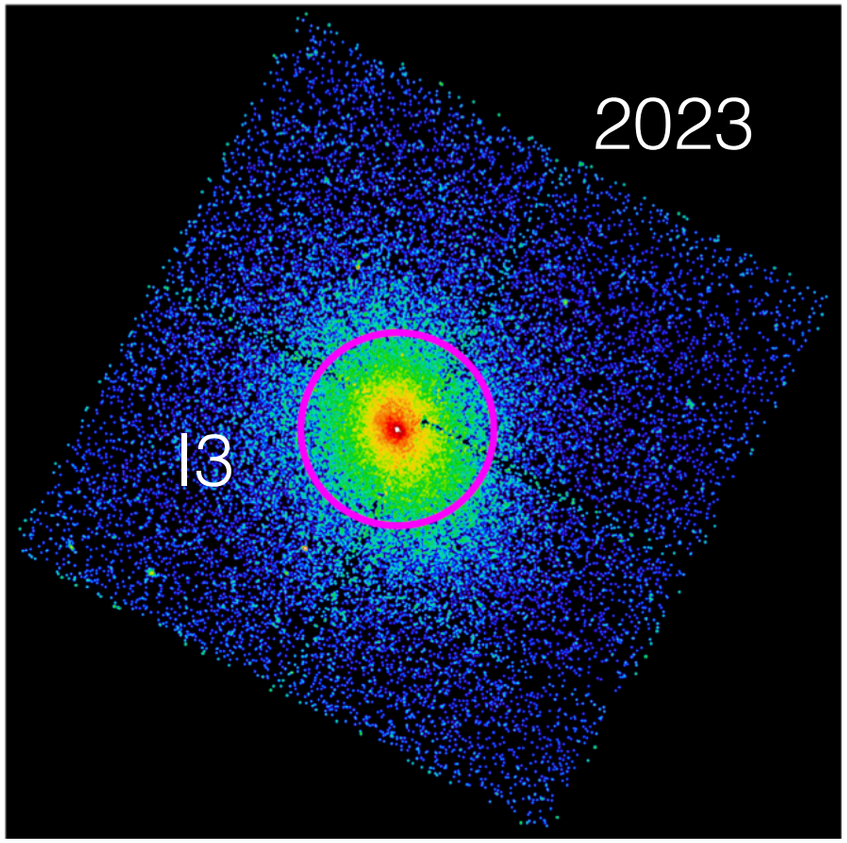
HRC Calibration

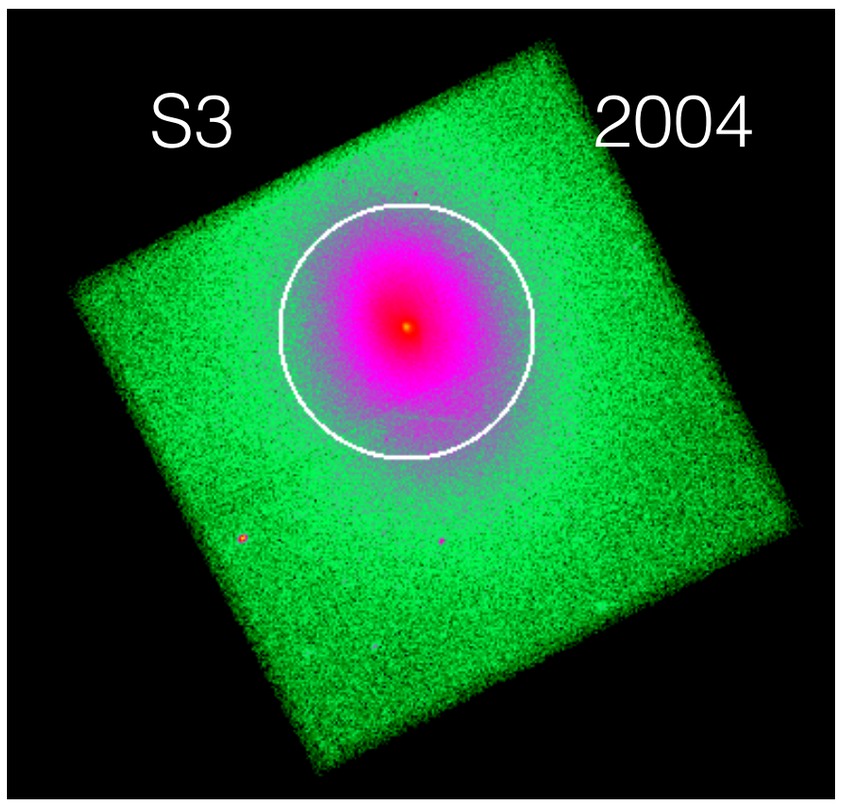
1. Release of HRC-I QE and HRC-S QEU (QE map)

HRMA PSF monitoring

1. Monitoring the Chandra PSF with observations of AR Lac

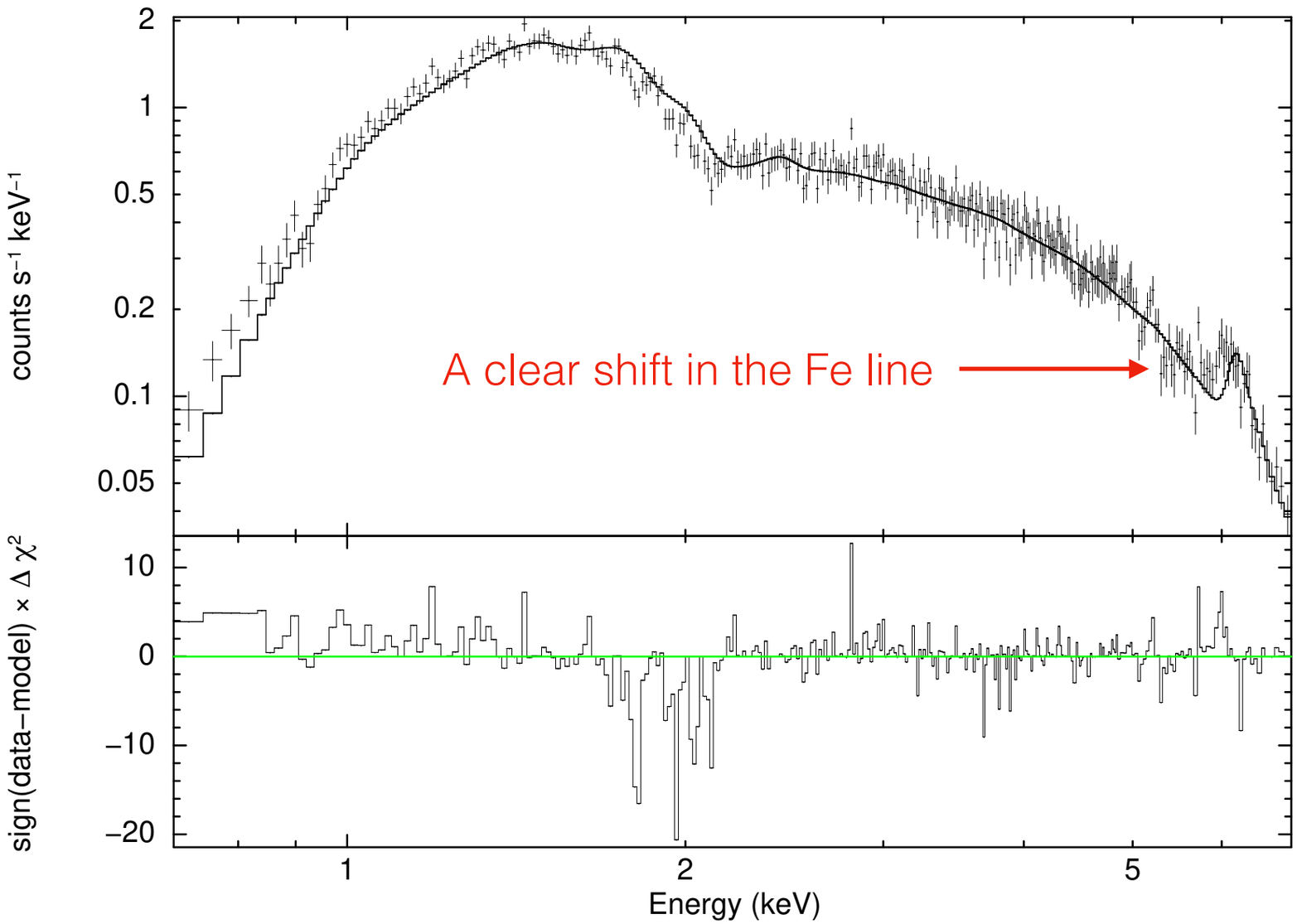
Gain loss in the ACIS CCDs





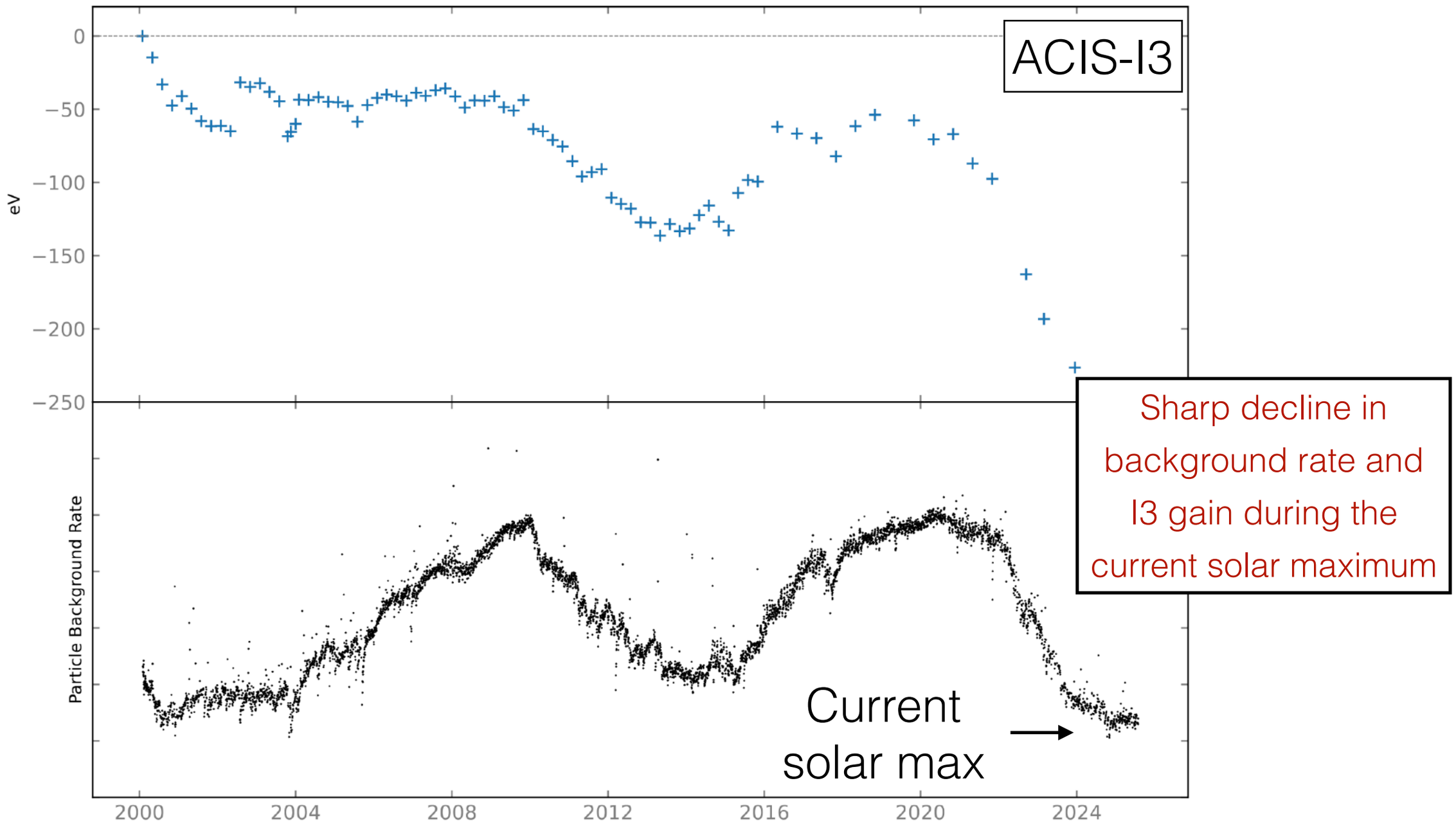
This issue was first reported in a 2023 ACIS-I observation of the Abell 2029 galaxy cluster

Best-fit model to the early ACIS-S data shown with the 2023 ACIS-I data



Charged particle background rate on ACIS-I3

Background rate vs ACIS-I3 gain. The gain loss on S3 is about half of that of I3.



Time-dependent changes to the ACIS gain are calibrated through a set of gain correction files (tgain) in the CALDB. During periods of high background, the traps in the CCDs are partially filled, which reduces the CTI. During periods of low background (as in the current solar maximum), the CTI increases and reduces the gain.

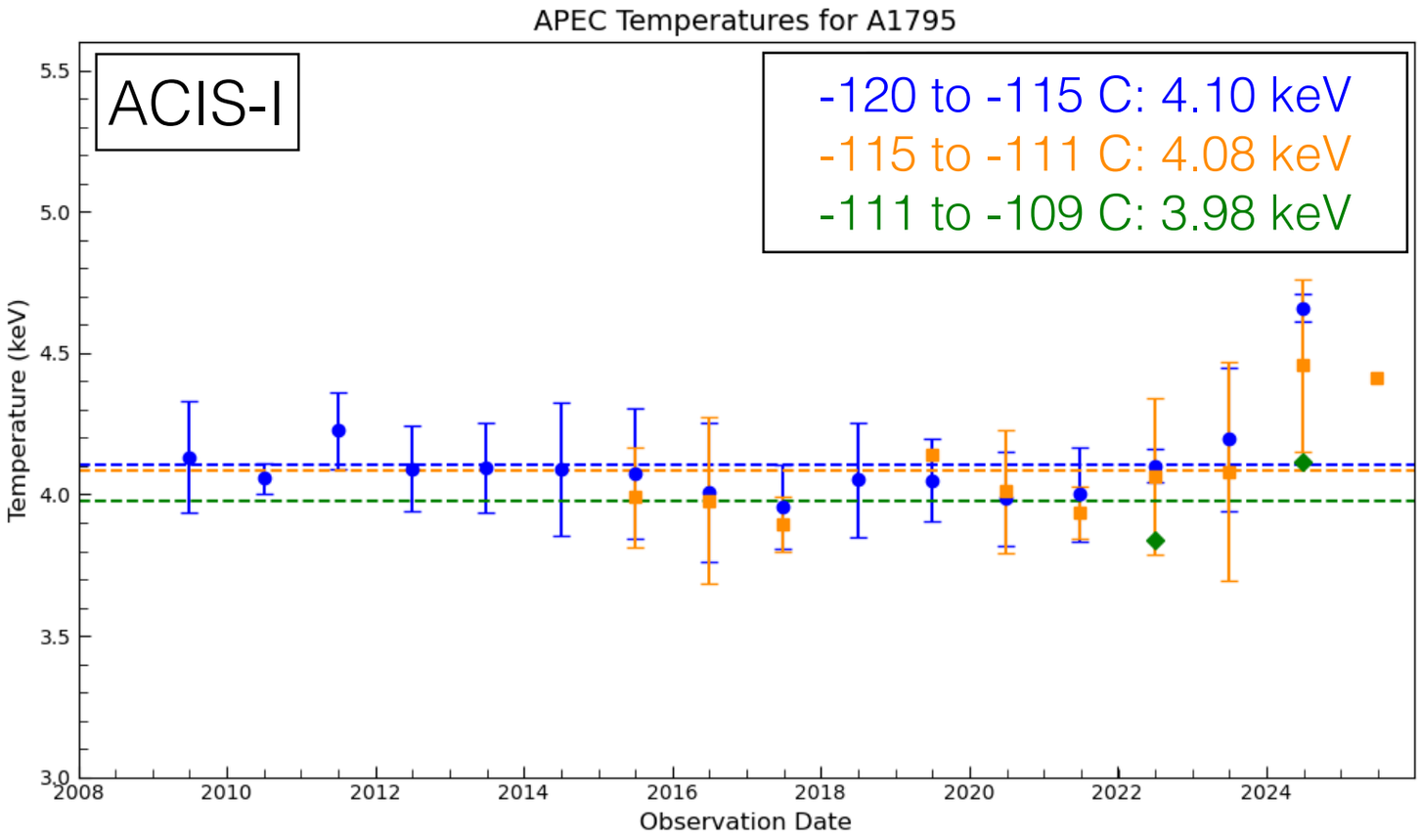
Generating new tgain files

Larry David

See Nick Durham's talk on Thursday

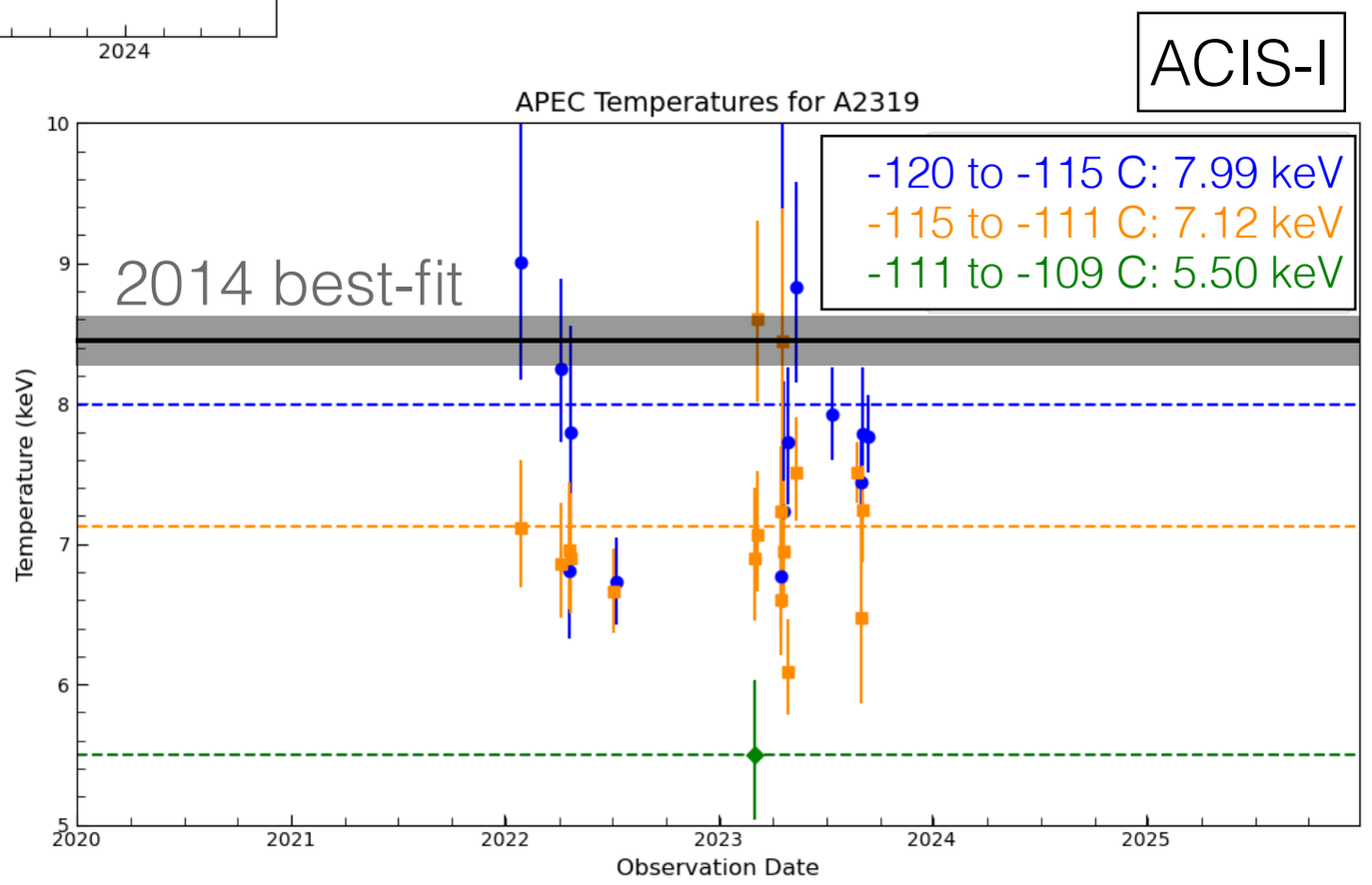
A set of new time dependent gain files were introduced that affect observations from mid-2022 and correct for the observed gain shift on ACIS-I and ACIS-S

Remaining issues with hot clusters



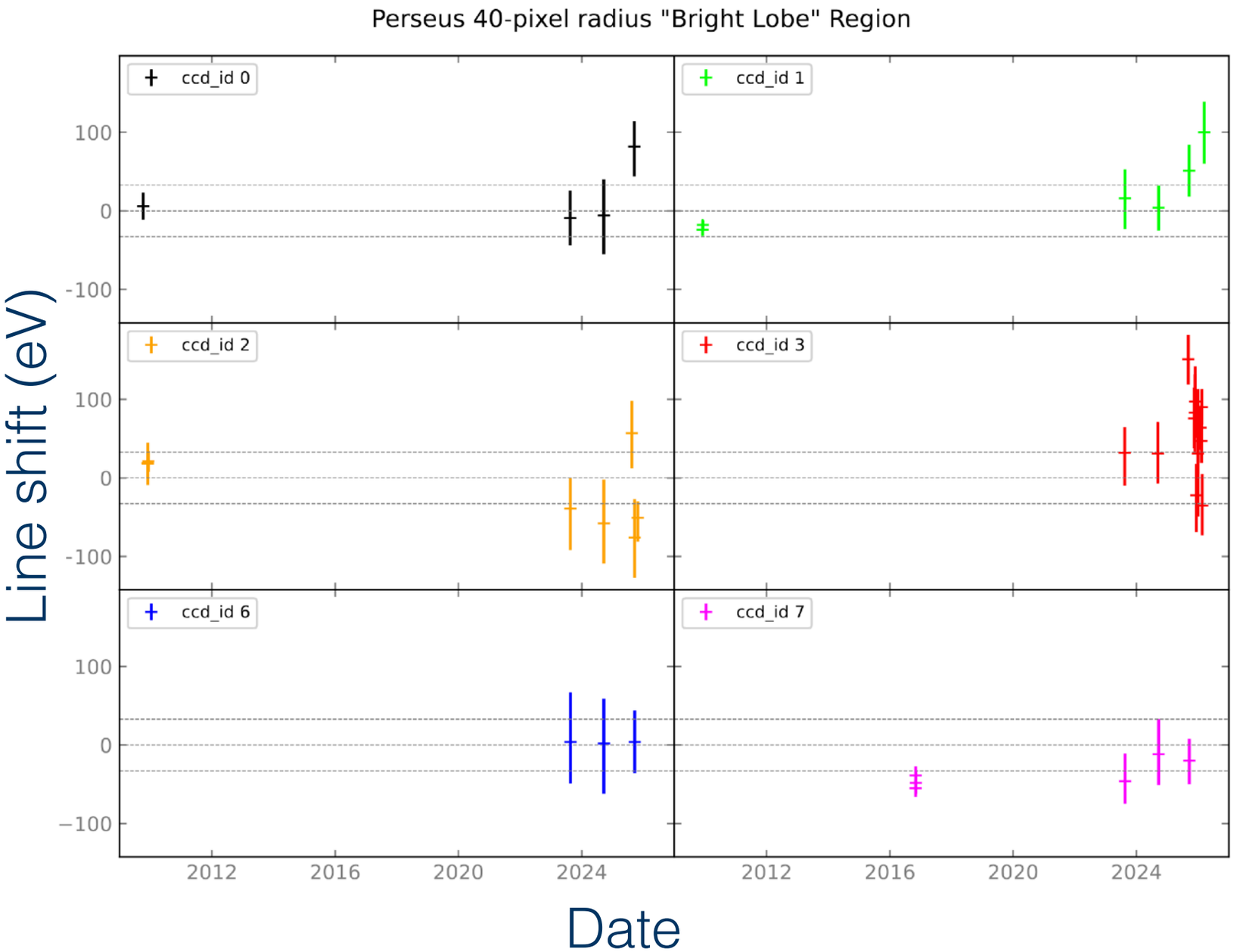
A1795: Moderate temperate cluster provides good fits

A2319: Hot cluster provides too low temperatures

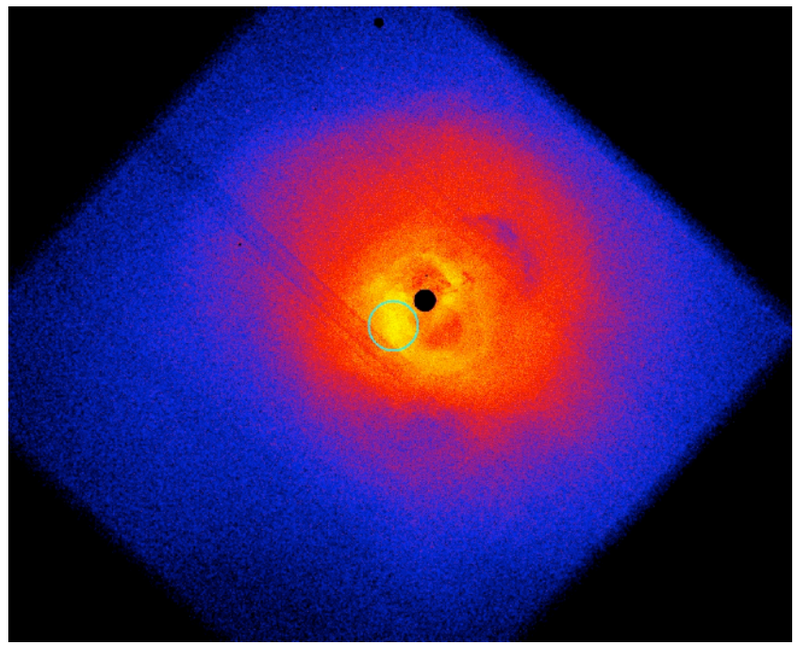


Updating the high-energy tgain and the tgain for observations taken from mid-2024 to 2025 is in progress

Monitoring the tgain files with Perseus

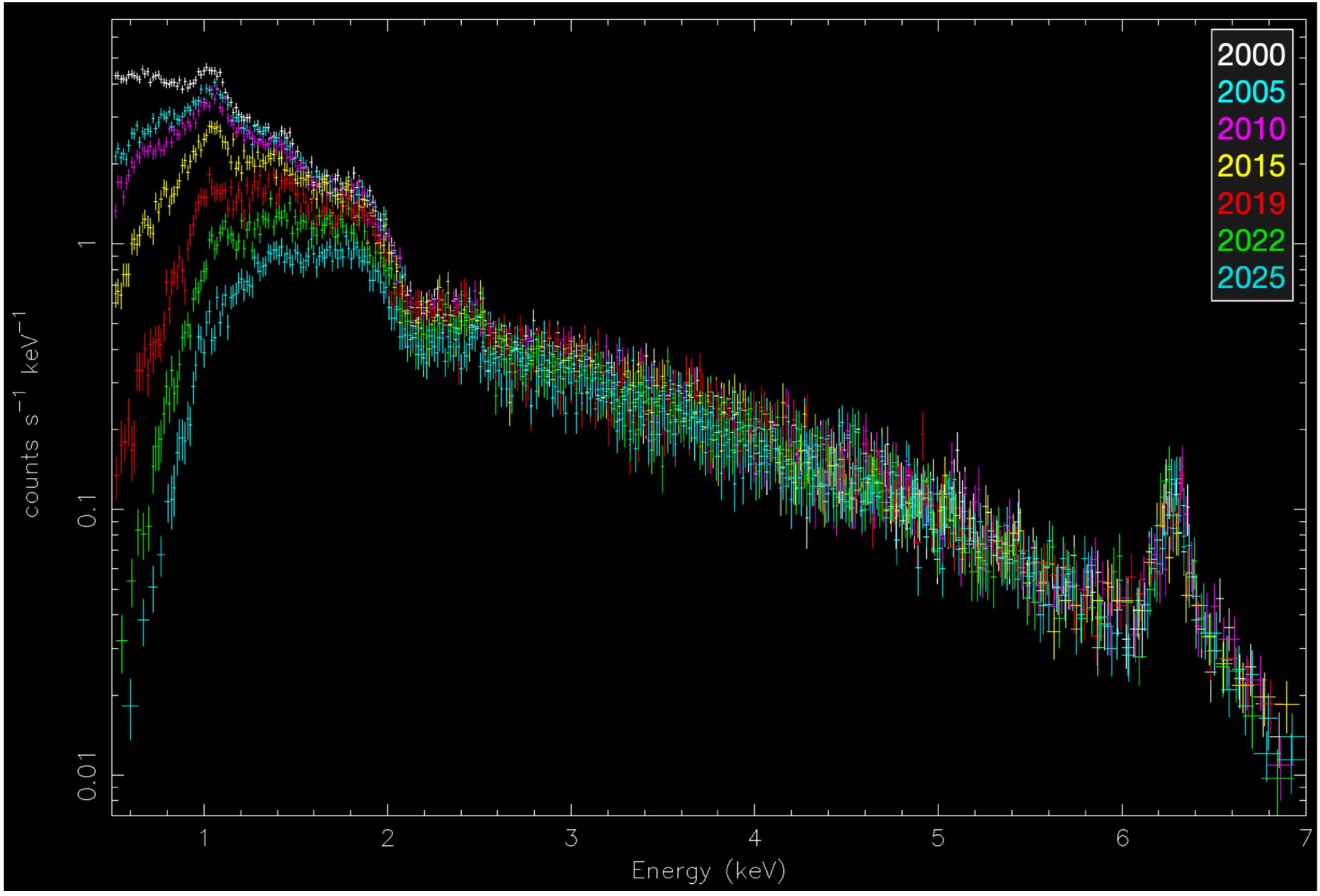


Perseus cluster



The Fe line in the Perseus spectrum can be used to monitor the ACIS gain. Fe line centroid in the ACIS observations of Perseus using the new CALDB tgain files.

Contamination on the ACIS Optical Blocking Filters

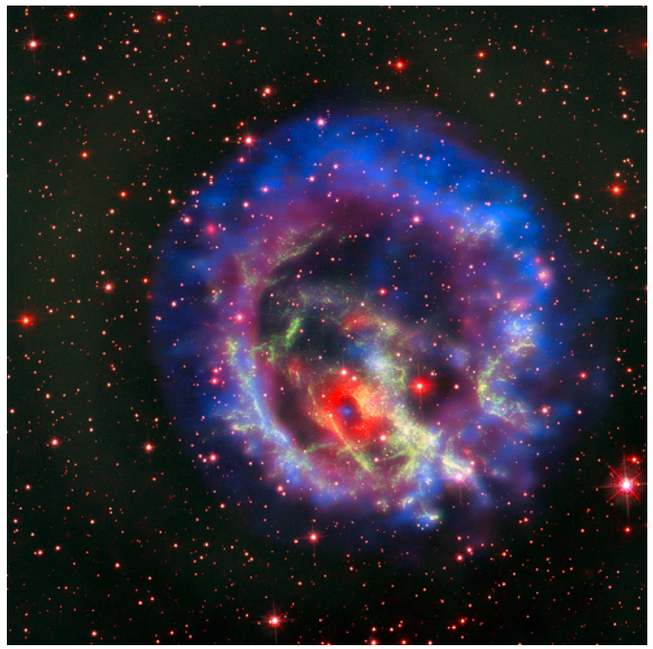


ACIS-S3 spectra of Abell 1795 over the course of the mission

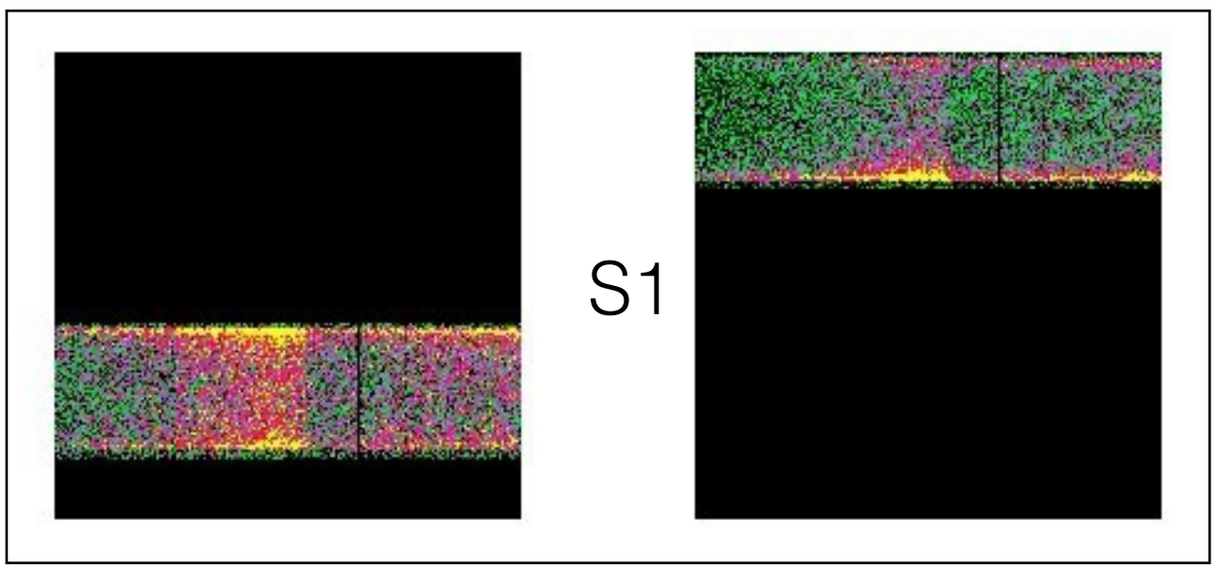
Monitoring the molecular contamination

Abell 1795 galaxy cluster

E0102-72 supernova remnant

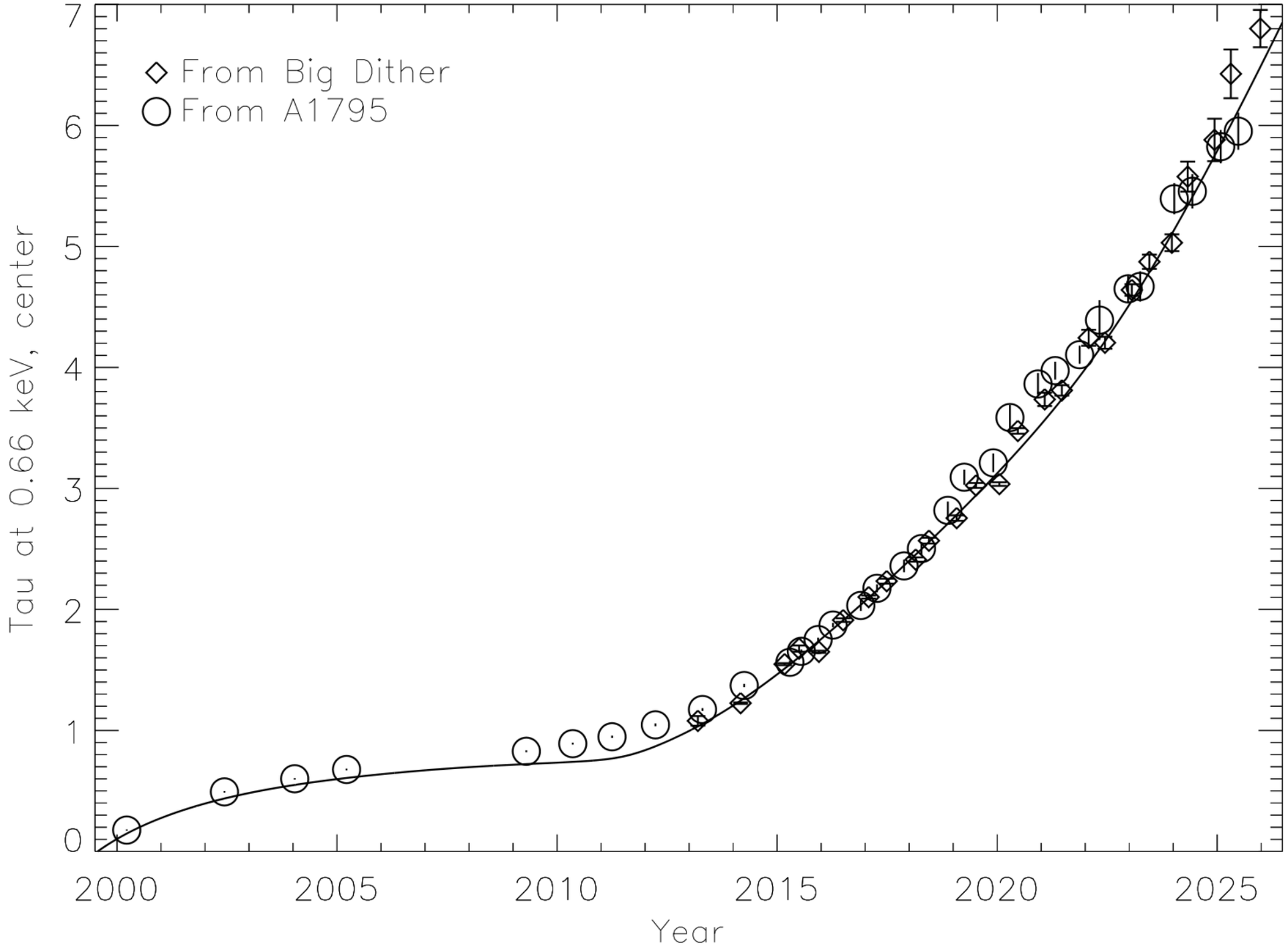


Big Dither LETG/ACIS-S observations of Mkn 421 - measures the optical depth at the K shell edges of C, O, and F



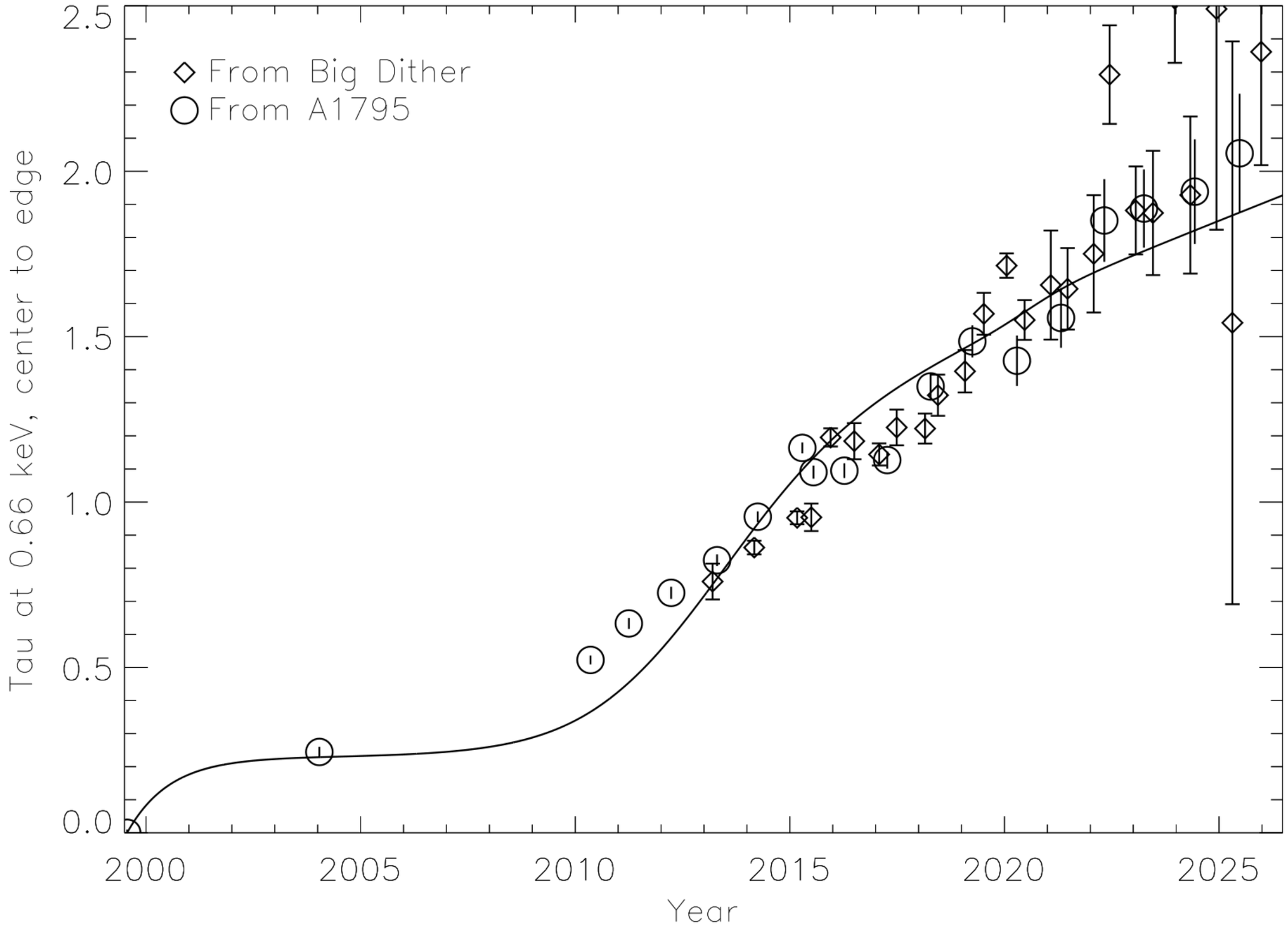
Released a new model (N0016) in Dec 2025

Herman Marshall
Contamination WG
on Thursday



Optical depth of the contaminant at 0.66 keV on the ACIS-S measured from “Big Dither” LETG/ACIS-S observations of Mkn 421 and imaging observations of Abell 1795

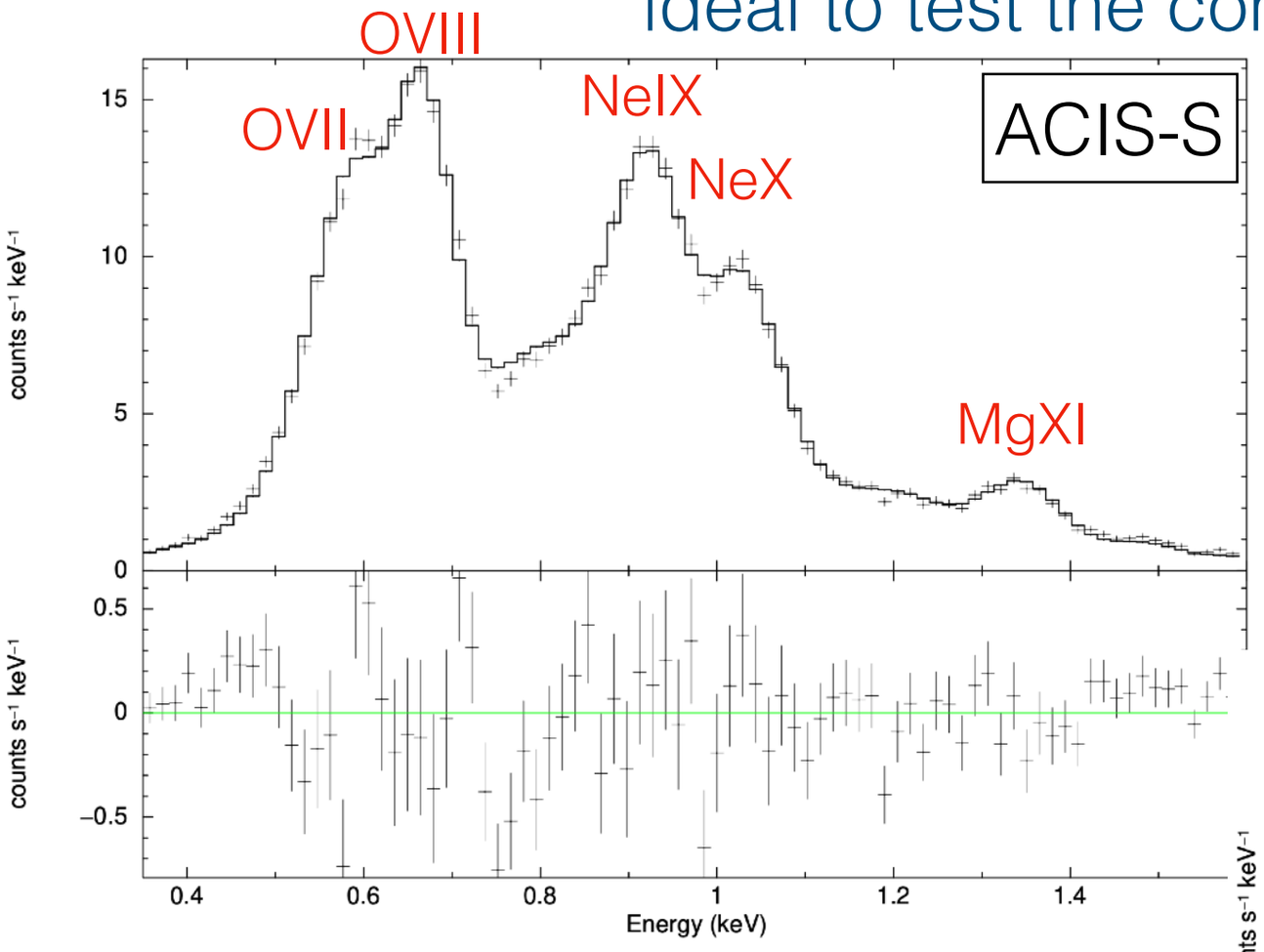
Released a new model (N0016) in Dec 2025



Difference in the optical depth between the edge to center of the ACIS-S array is well described by the current CALDB model

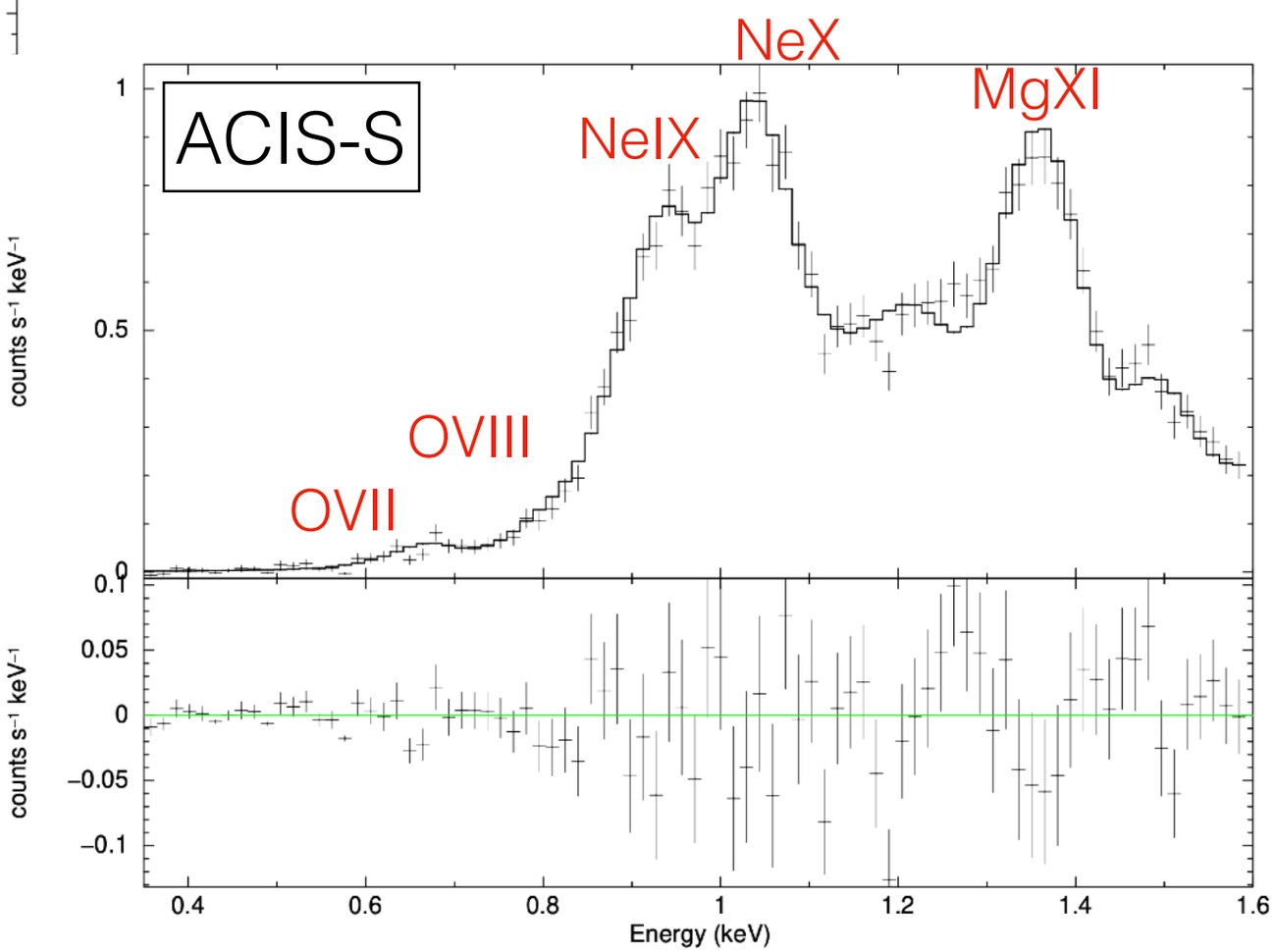
Testing the contamination model with E0102

The line rich nature of the E0102 supernova remnant makes it ideal to test the contamination model



← Data taken in 2003

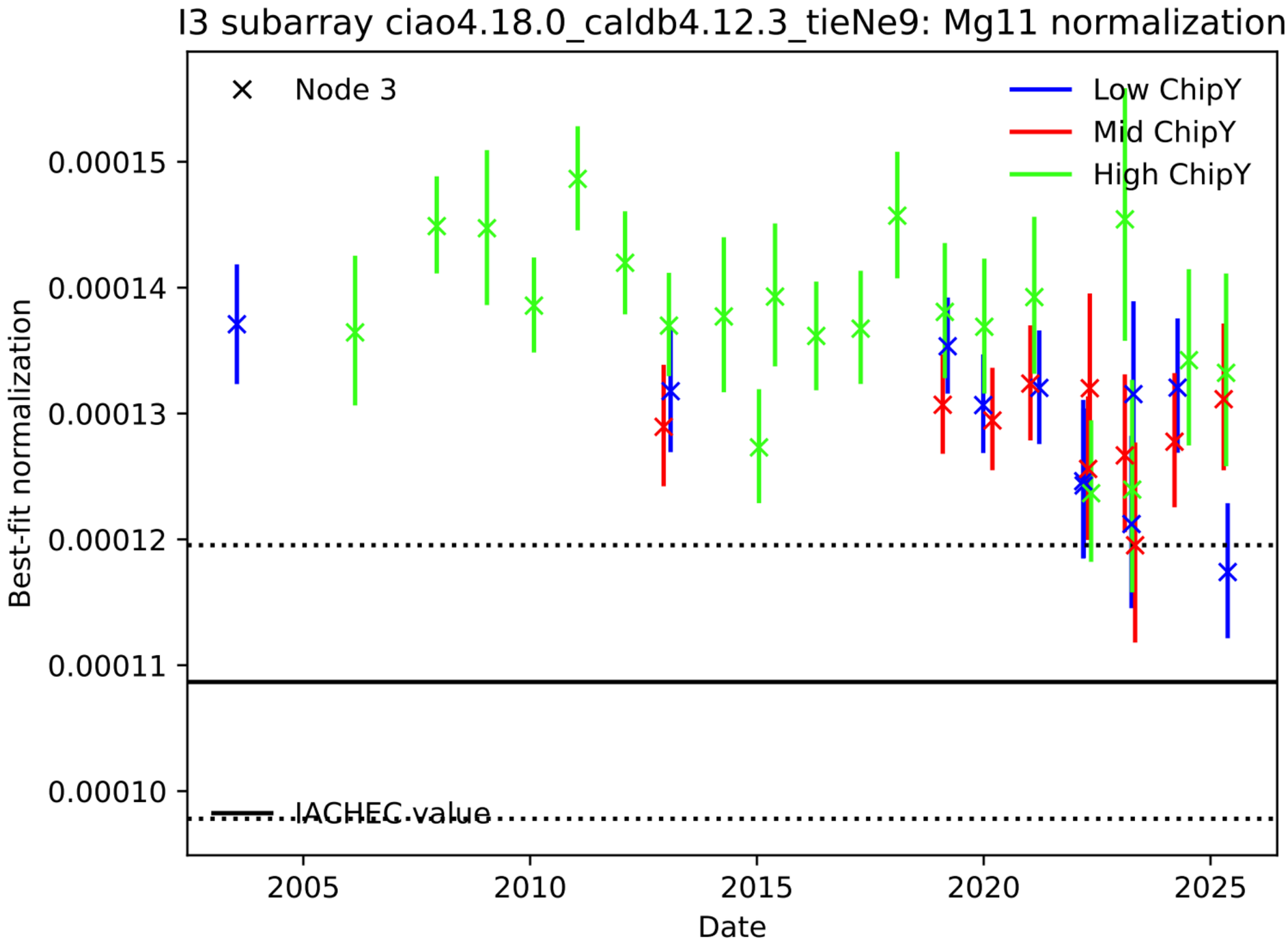
Data taken in 2024 →



Testing the contamination model with E0102

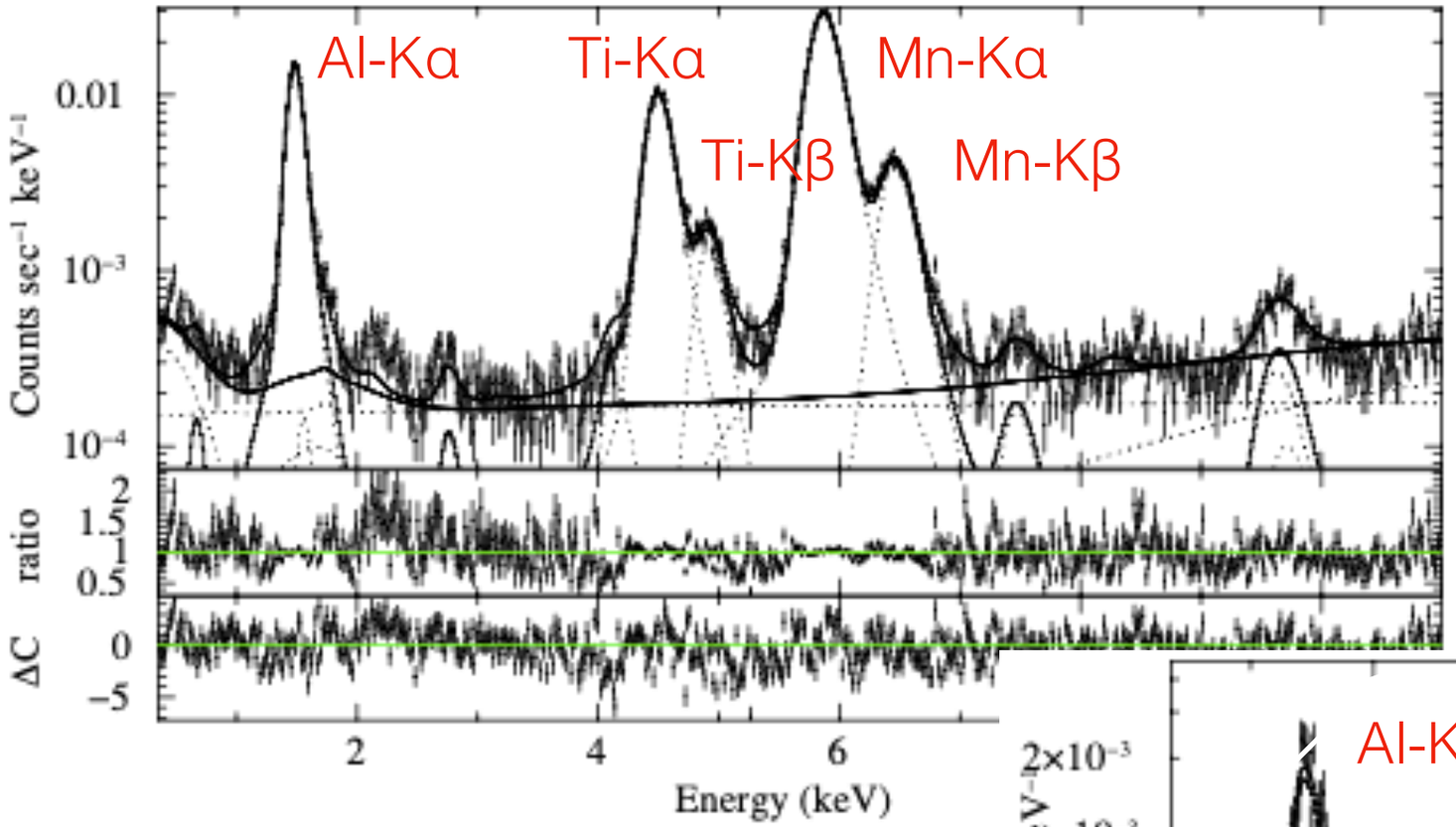
Pete Ratzlaff

Paul Plucinsky
Thermal SNR WG
— Thursday



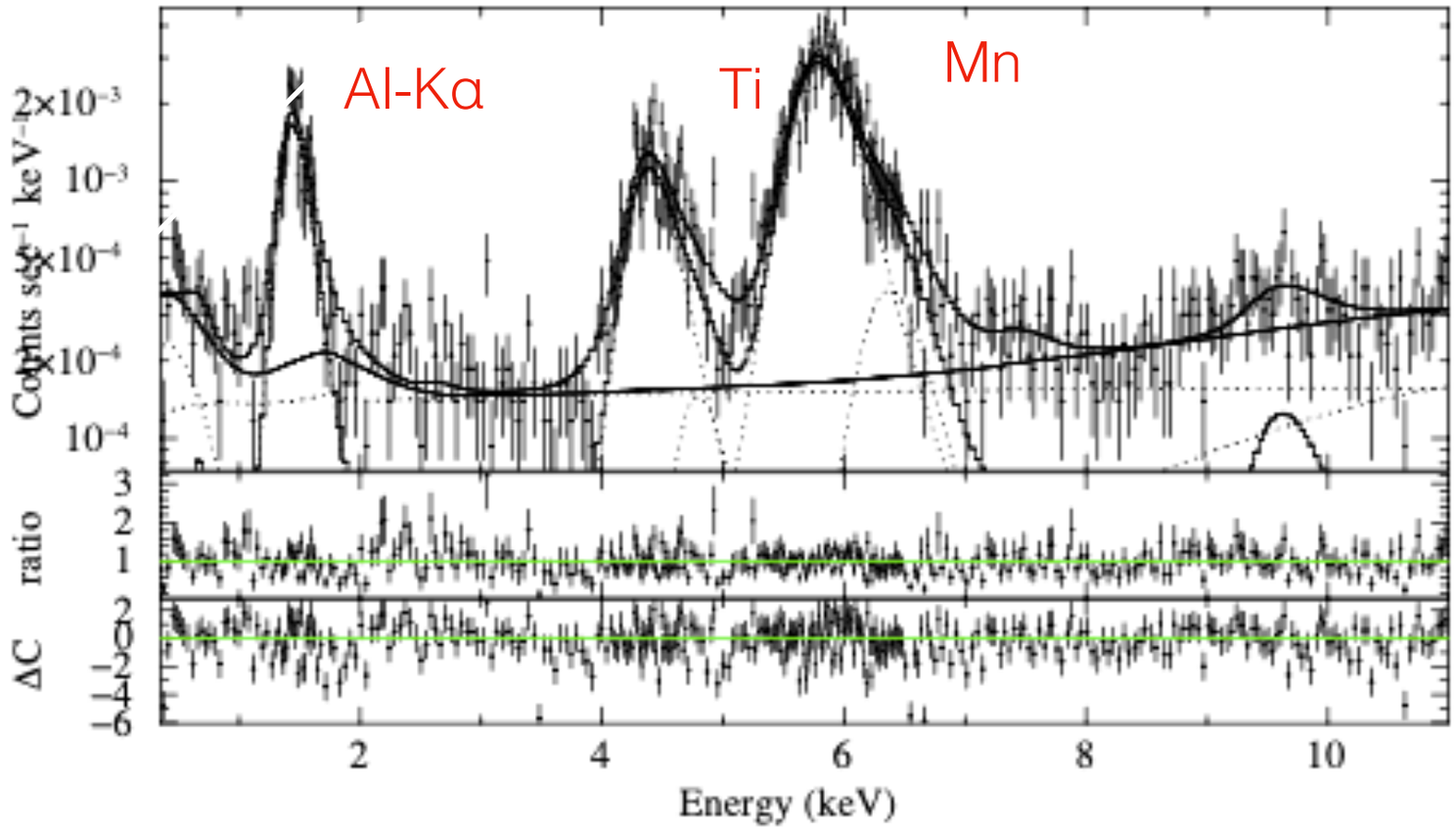
New fitting approach uses Mg XI to fit the spectrum

Generating temperature dependent response files



Focal plane temperature:
-120 C to -119 C

Focal plane temperature:
-111 C to -109 C



ACIS-I3 aimpoint ECS data fit with the N0009 temperature-dependent response files

Generating temperature dependent response files

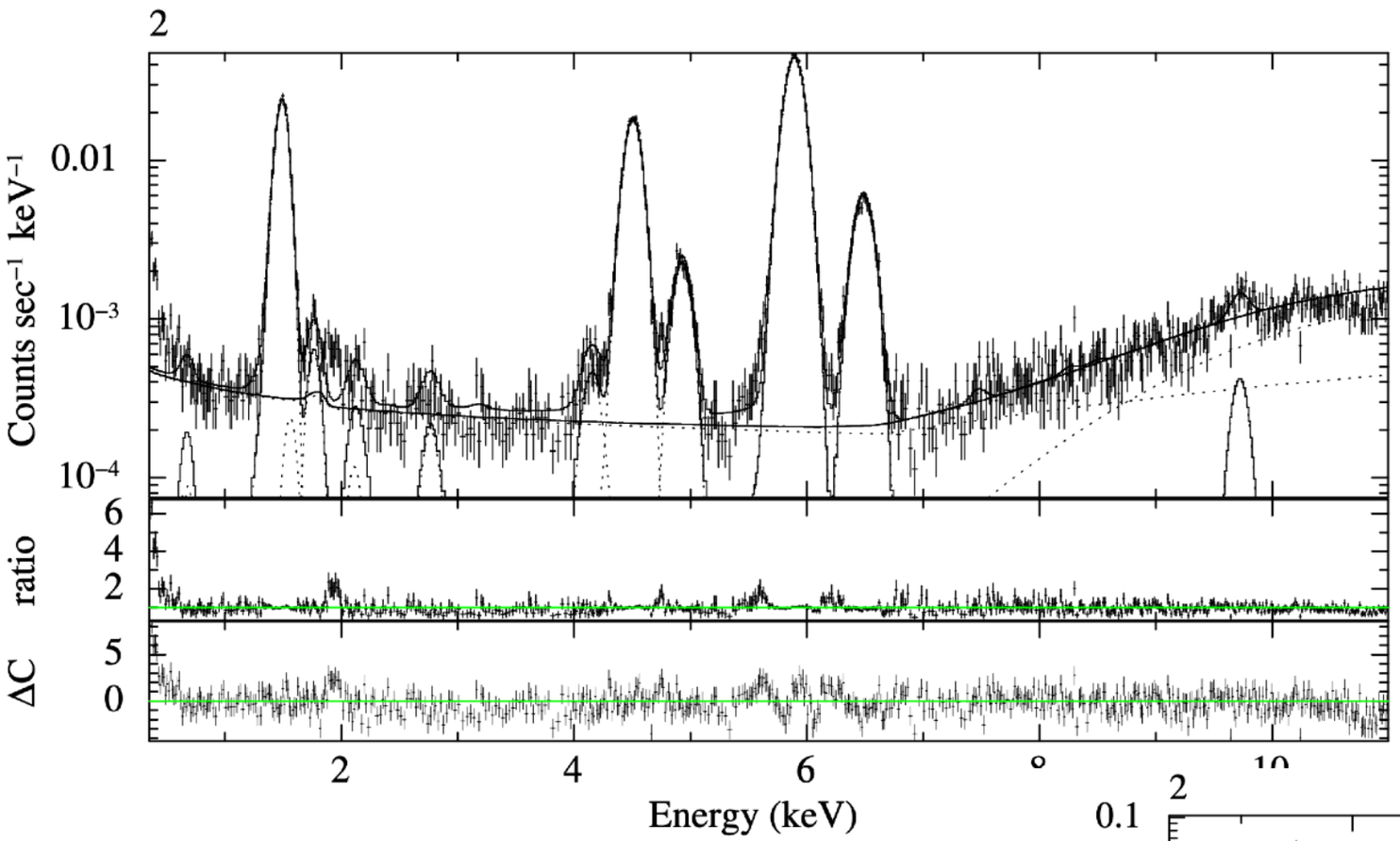
- Co-add ECS data from epochs 40-91 (approximately 13 years of data)
- Divide ECS data into 8 FP temperature intervals between -120 C and -105 C
- Bin data into 32 by 32 pixel regions
- Fit widths of Al, Ti, and Mn lines in each spatial region and temperature bin
- Released as 8 CALDB files (one for each temperature band) in CALDB release 4.12.0

Generated ACIS response files at a range of focal plane temperatures (-120 C to -105 C) for the primary FI CCDs used for imaging (I0, I1, I2, I3, and S2)

See Terry Gaetz's talk on Thursday

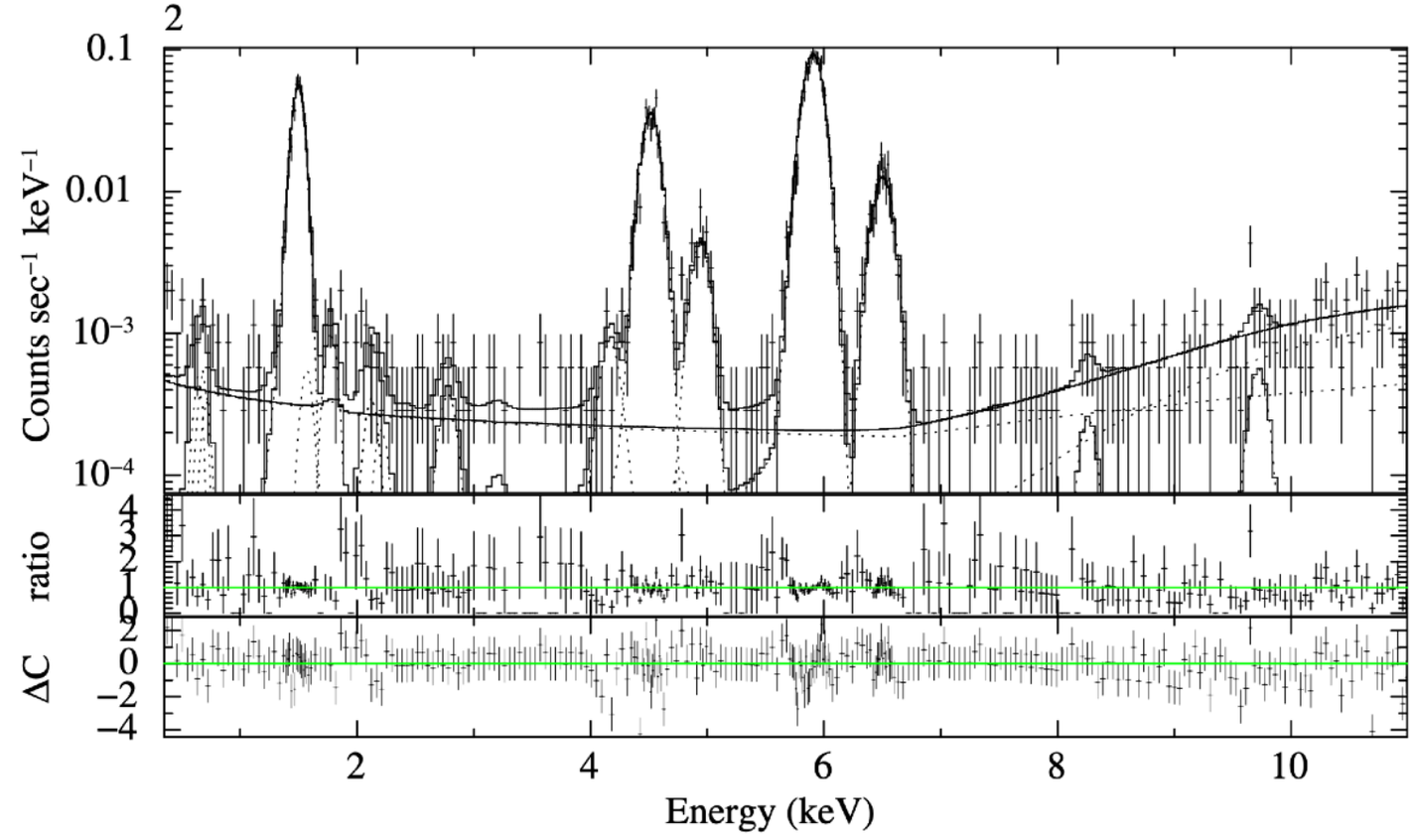
Generating temperature dependent response files

S3 aimpoint ECS data

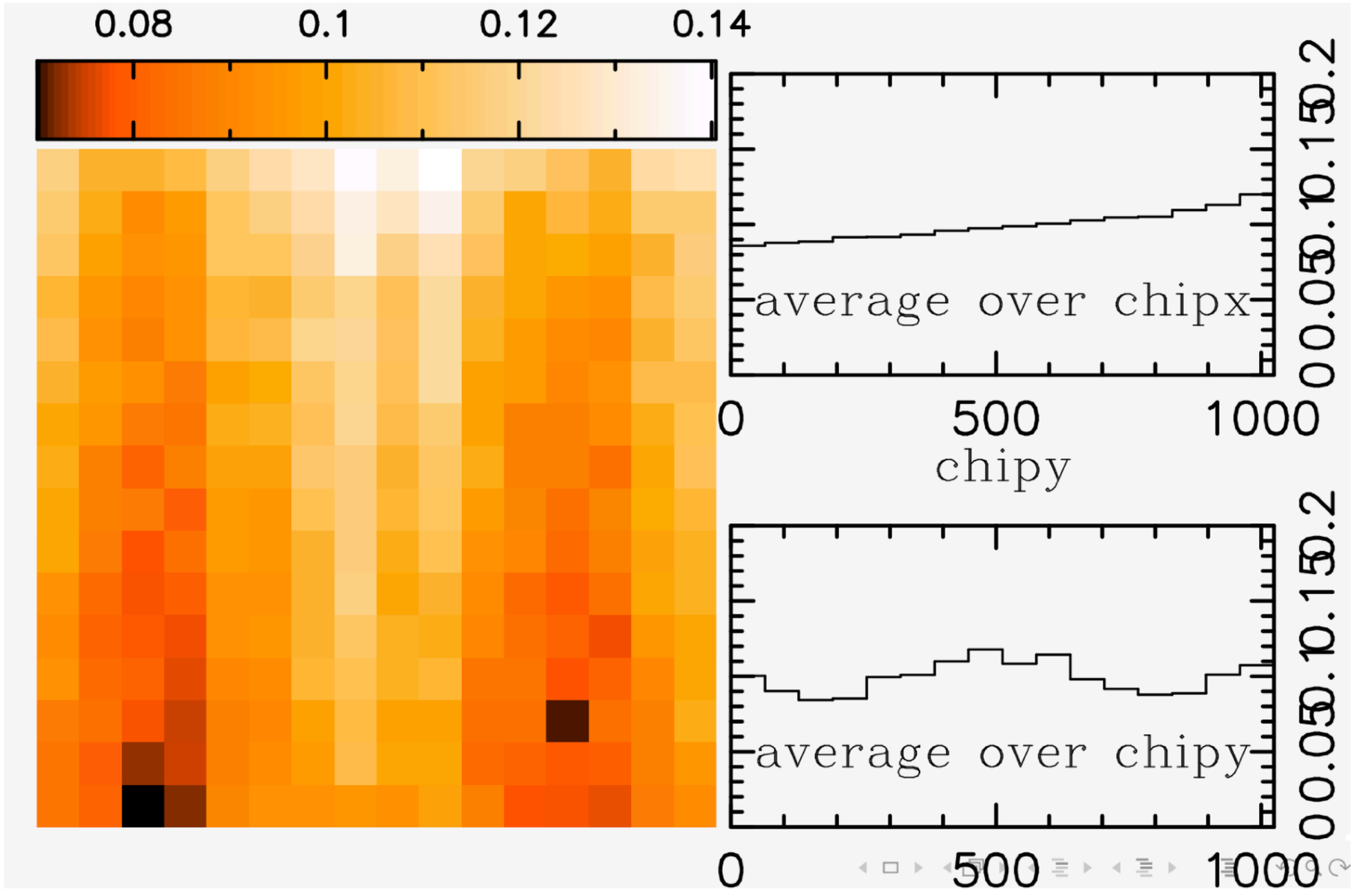


Focal plane temperature:
-120 C to -119 C

Focal plane temperature:
-109 C to -107 C

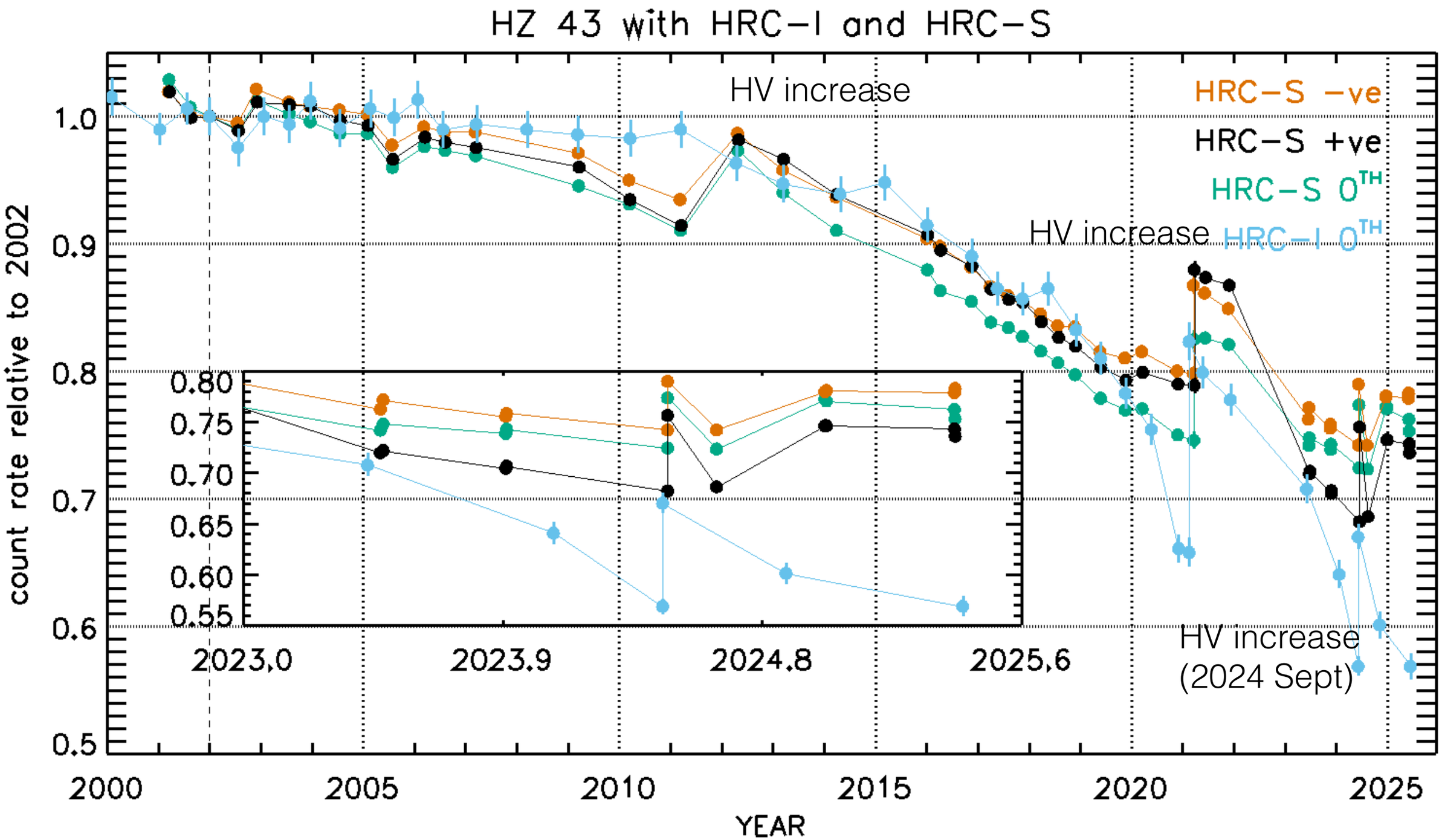


Generating temperature dependent response files



The development on ACIS-S3 temperature dependent response files is in progress.

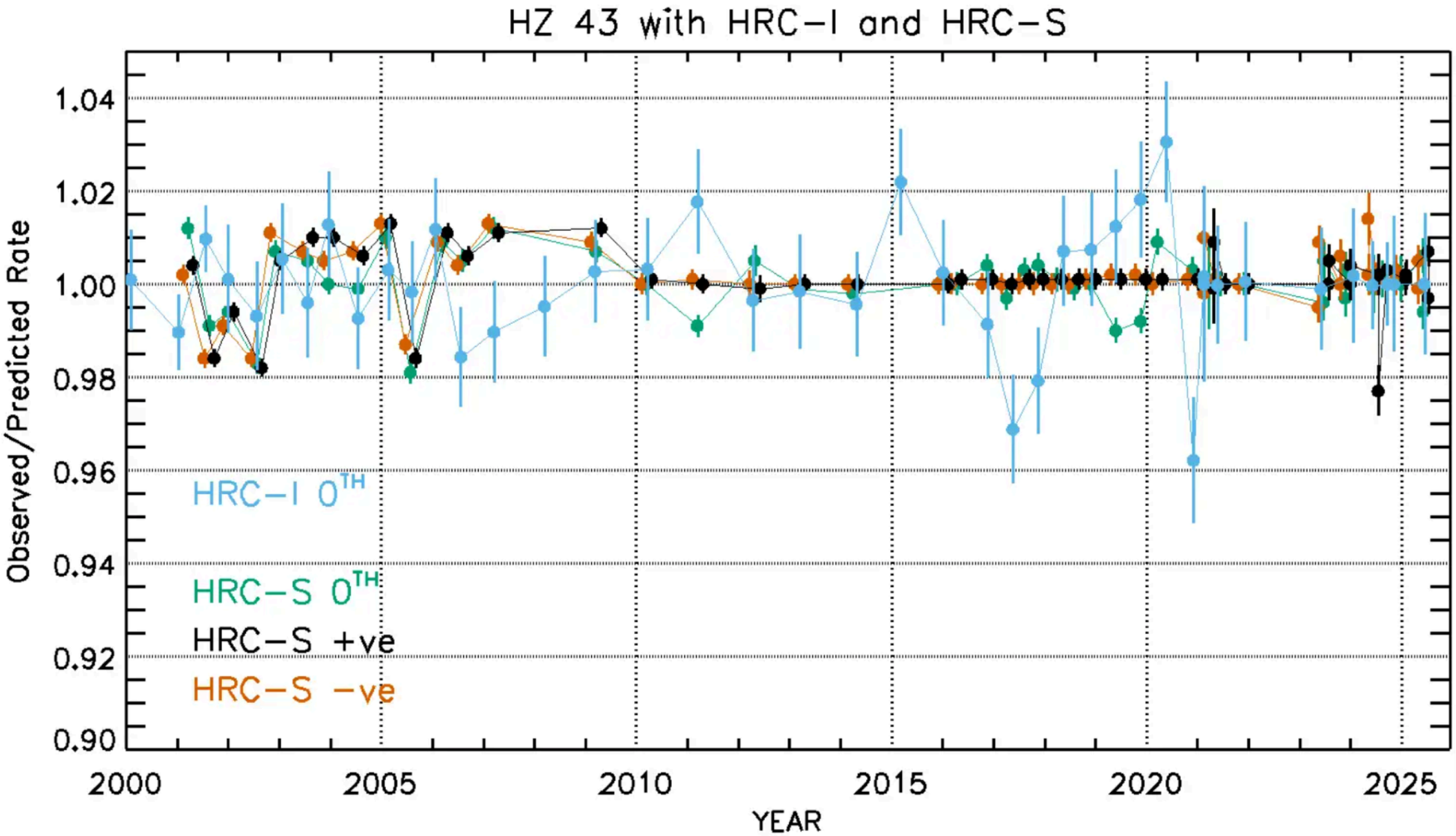
HRC Calibration



The QE of the HRC detectors has declined by ~2% per year over the course of the Chandra mission, which requires periodic increases in the operating high voltage of the HRC detectors. The latest increase in the HV occurred in Sep. 2024. The low energy QE of the HRC detectors has been monitored with LETG observations of HZ 43

HRC Calibration

Corrected LETG/HRC-I and LETG/HRC-S HZ43 count rates with the current CALDB.

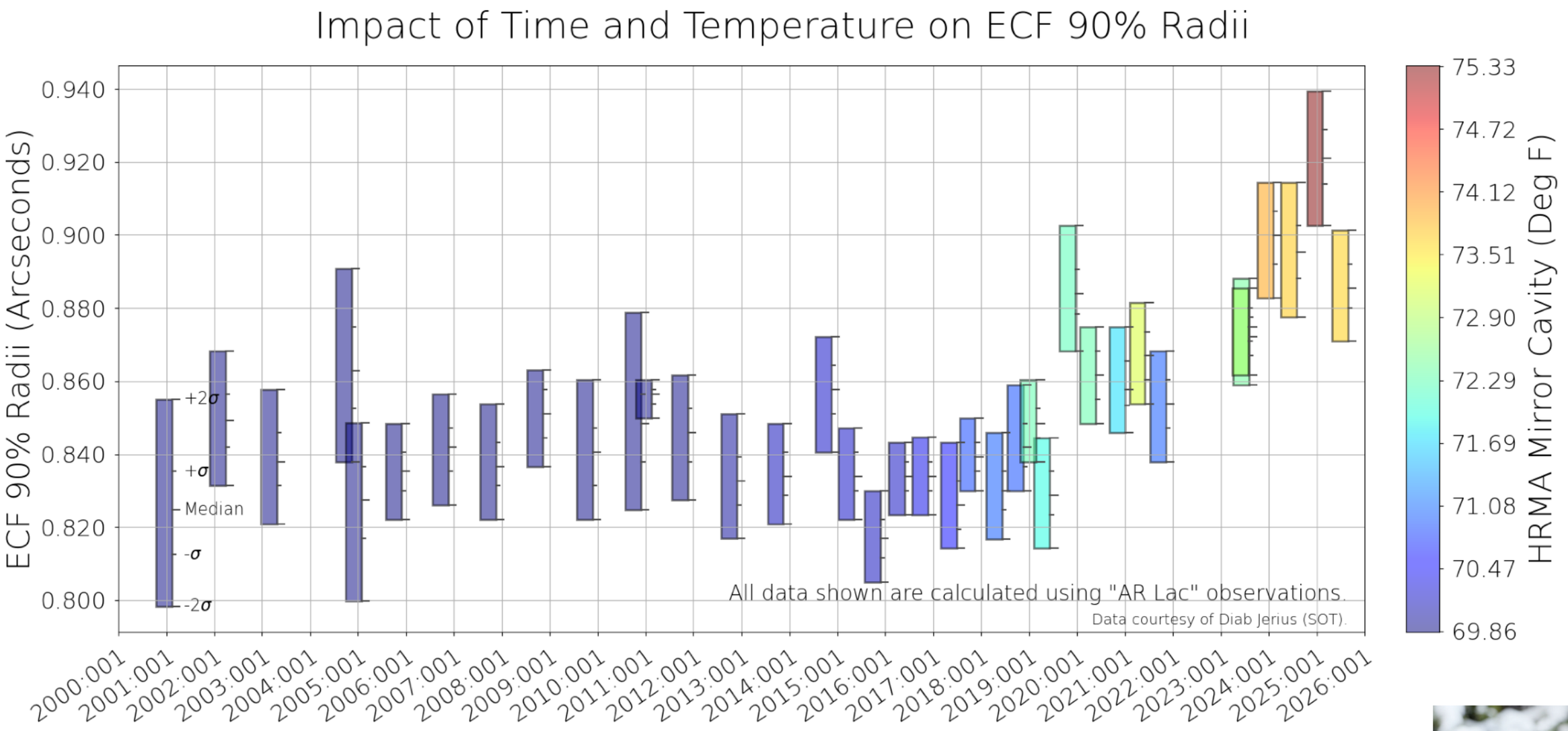


The final HRC-I QE and HRC-S QEU (QE map) with the old HV settings were released in the CALDB in June 2024 and updated HRC-I QE and HRC-S QEU files with the new HV settings were released in the CALDB in January 2025

Vinay Kashyap

HRMA PSF monitoring

AR Lac has been observed at least once per year on-axis with the HRC-I since launch.



A slight increase of ~0.01” per year over the past four years.
The cause of this increase is most likely due to detector effects.

Diab Jerius

Summary

ACIS

- Released a set of temperature-dependent S3 response files
- Released an updated ACIS contamination model
- Updated the tgain files for data taken in the 2022-2025 timeframe

HRC

- Continue to Monitor the QE and gain of the HRC-I and HRC-S

Optics

- Continue to monitor the PSF