ACIS Update

Chandra Users Committee November 5, 2026



ACIS Overview

ACIS continues to function nominally and produce high quality data

- All 10 CCDs are fully functional
- Electronics are nominal, primary units are still in use
- Flight software is nominal, latest version installed on 15 August 2025
- ~90% of GO & GTO observations use ACIS

Cycle 26 GO & GTO Observing Statistics Steiner (SAO)

Instrument	Grating	# of Obs	% of Obs	Time(ks)	% of Time
ACIS-I	NONE	355	36.6	5394	36.4
ACIS-S	NONE	452	46.6	6912	46.7
ACIS-S	HETG	89	9.2	1665	11.2
Total			92.4		94.3

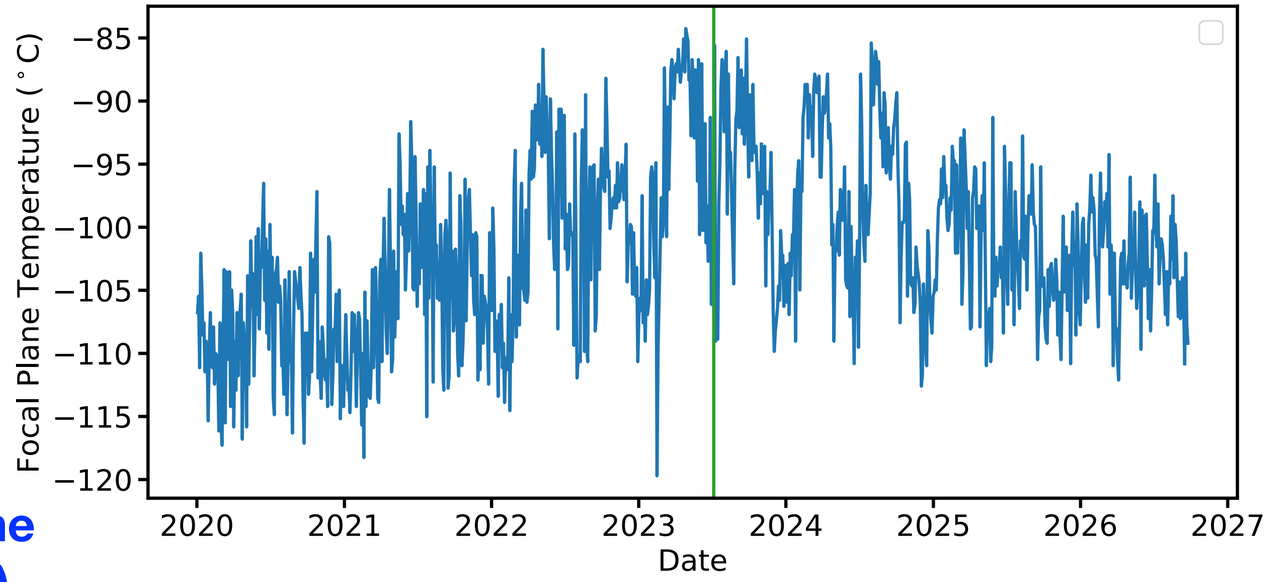
Highlights:

- No ACIS anomalies in the last year, operations has been smooth
- Minimal impact from perigee minimum during 2023, ACIS continues to function nominally
- FP temperature limits for observations have been easier to meet given relaxations of other spacecraft thermal limits
- ACIS is functioning as the radiation monitor for Chandra, a FI CCD is required to be on for every observation
- Background rates are increasing as the Sun exits Solar Maximum
- ACIS flight SW running without issue since update in August 2025

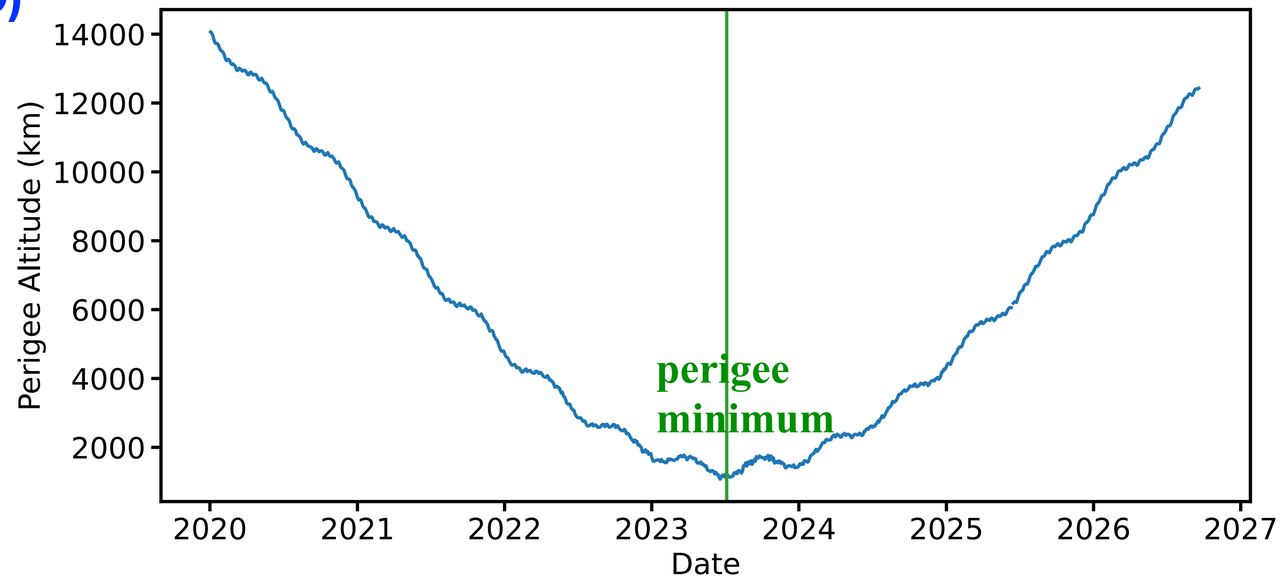
Chandra Low Perigee in 2023

- **ACIS FP temperature warms during perigee passages**
- **FP temperature was kept below the Yellow High limit of -80 C for all perigee passages**
- **It was not necessary to schedule spacecraft maneuvers to keep the FP below -80 C for this perigee minimum**
- **Maximum temperatures are expected to continue decreasing in the coming years**
- **For the perigee minimum in 2034, it is likely that spacecraft maneuvers *will be* necessary to keep the FP below -80 C**

Maximum FP temperature during perigee passages



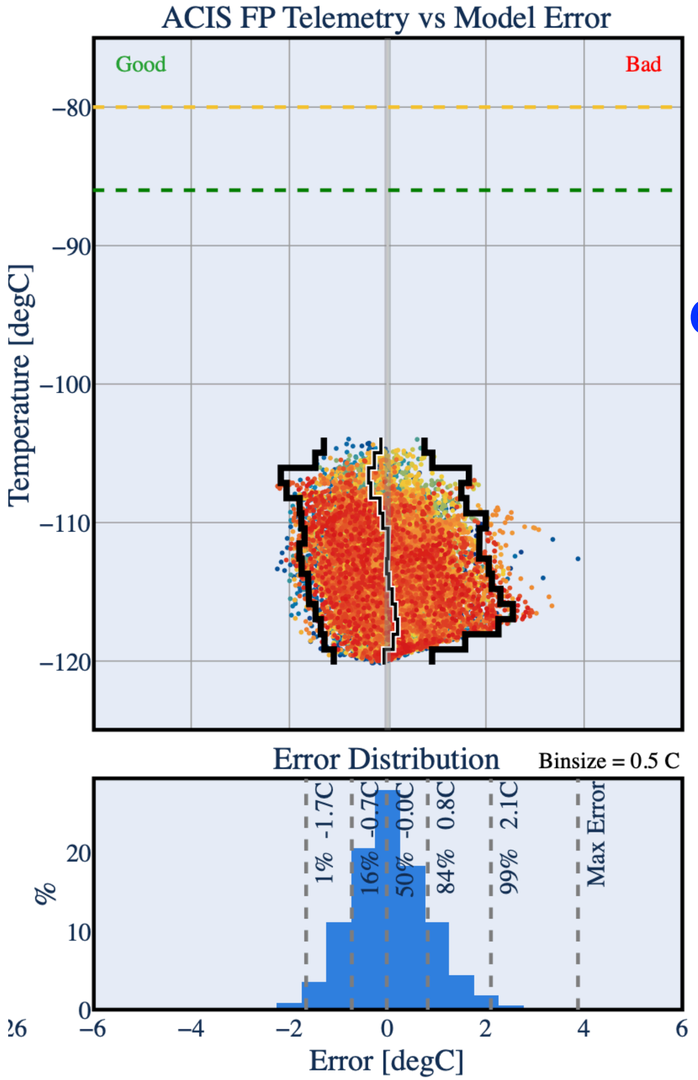
ZuHone (SAO)



ACIS FP Temperature Model Maintenance

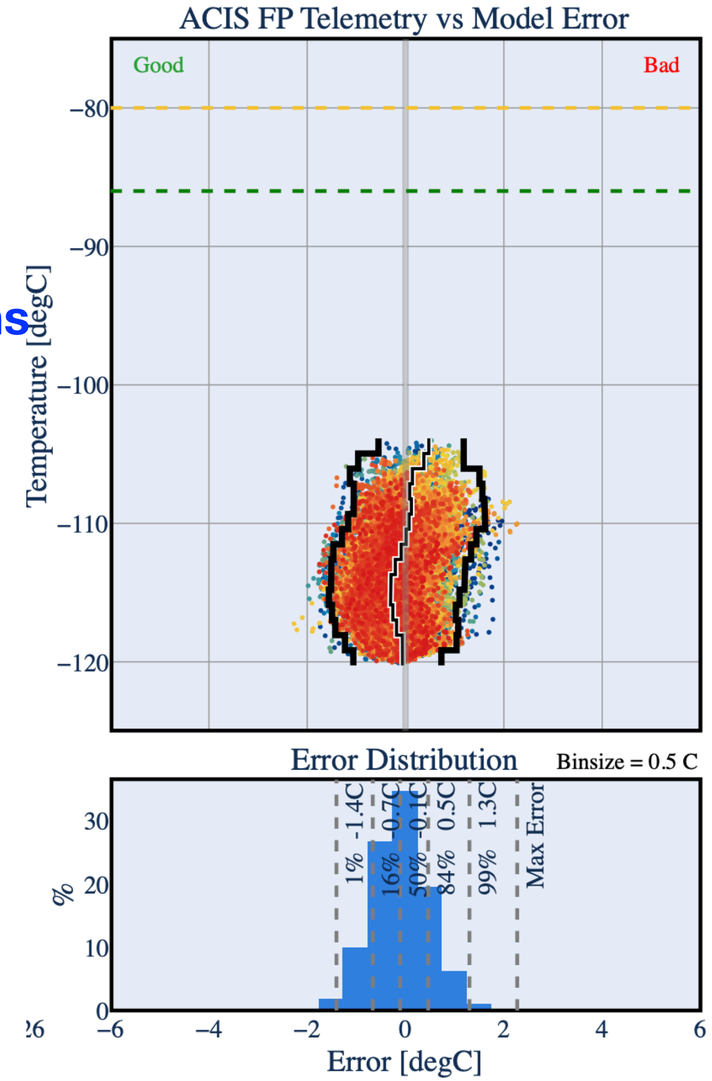
- ACIS FP temperature model is empirical and requires regular recalibrations
- J. ZuHone updated the model this year which provides a significant improvement, 1% and 99% quantiles change from -1.7/2.1 C to -1.4/1.3 C.

Old Model Science Observations



New Model Science Observations

ZuHone (SAO)

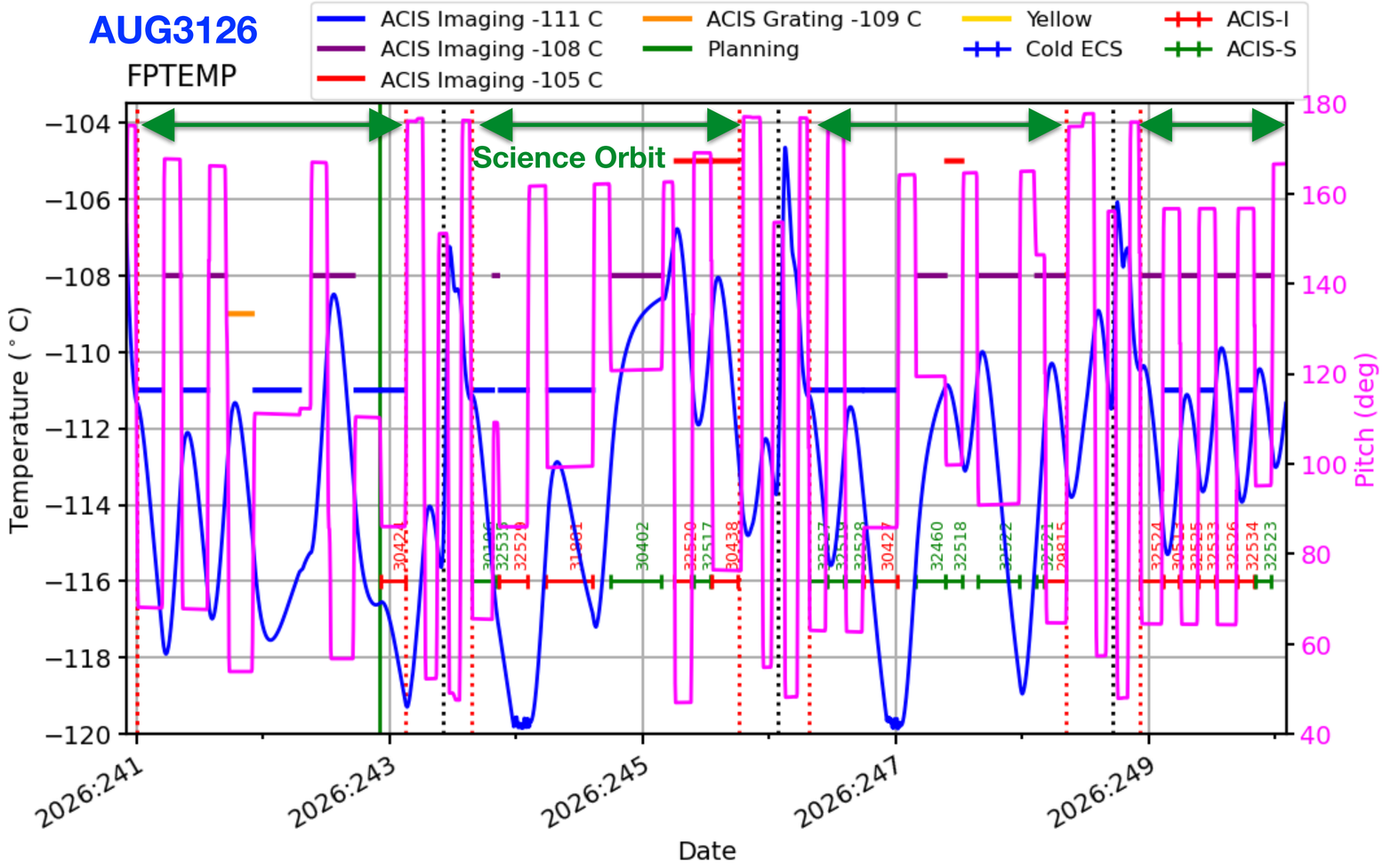


ACIS FP Temperature Limits for Observations

- **-111 C ACIS-S & ACIS-I observations that benefit from the most accurate spectral response**
- **-108 C ACIS-S & ACIS-I observations that can achieve the objectives with reduced spectral response**
- **-105 C ACIS-S & ACIS-I observations that can achieve the science objectives with even more reduced spectral response**
- **-109 C All ACIS-S/LETG and ACIS-S/HETG observations with a SIM Z offset of -6.0 mm or more positive such that the dispersed spectrum is farther from the readout**
- **-105 C ACIS-S/HETG observations with a SIM Z offset of -6.0 mm or more negative such that the dispersed spectrum is closer to the readout**

- **FP temperature is almost always increasing or decreasing**
- **KEY POINT: almost all of a GO observation will be executed with a FP temperature *less* than the limit providing higher quality data**
- **However due to the uncertainty on the model, some of a GO observation may be executed with the FP temperature *above* the limit**

ZuHone (SAO)



ACIS Background Rates

- **ACIS background rates are increasing as the Sun exits Solar Maximum.**

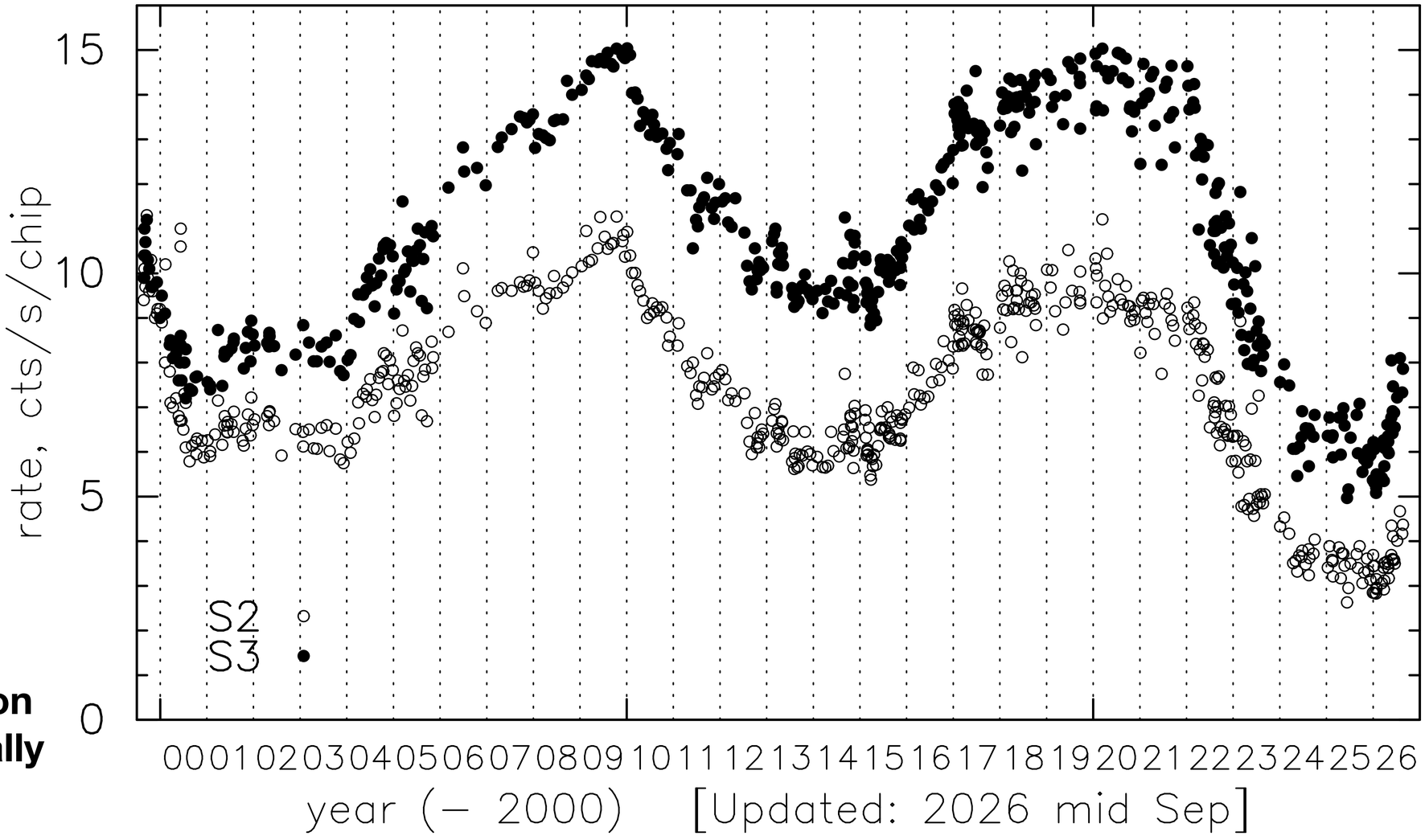
Total background rates (0.3-13.0 keV), all telemetered grades.

S3+S2 (cts/s)	I0+I1+I2+I3 (cts/s)
7.4	12.0

Telemetry Limits
VF mode 68.8 cts/s
F mode 170.2 cts/s
G mode 375.0 cts/s

GOs should check their total count rates to make sure that telemetry saturation will not be an issue, especially if VF mode is used.

Total telemetered rates for all grades with E<15.0 keV* **Gaetz (SAO)**



***Default upper energy cutoff changed in 2009 from 15.0 keV to 13.0 keV**



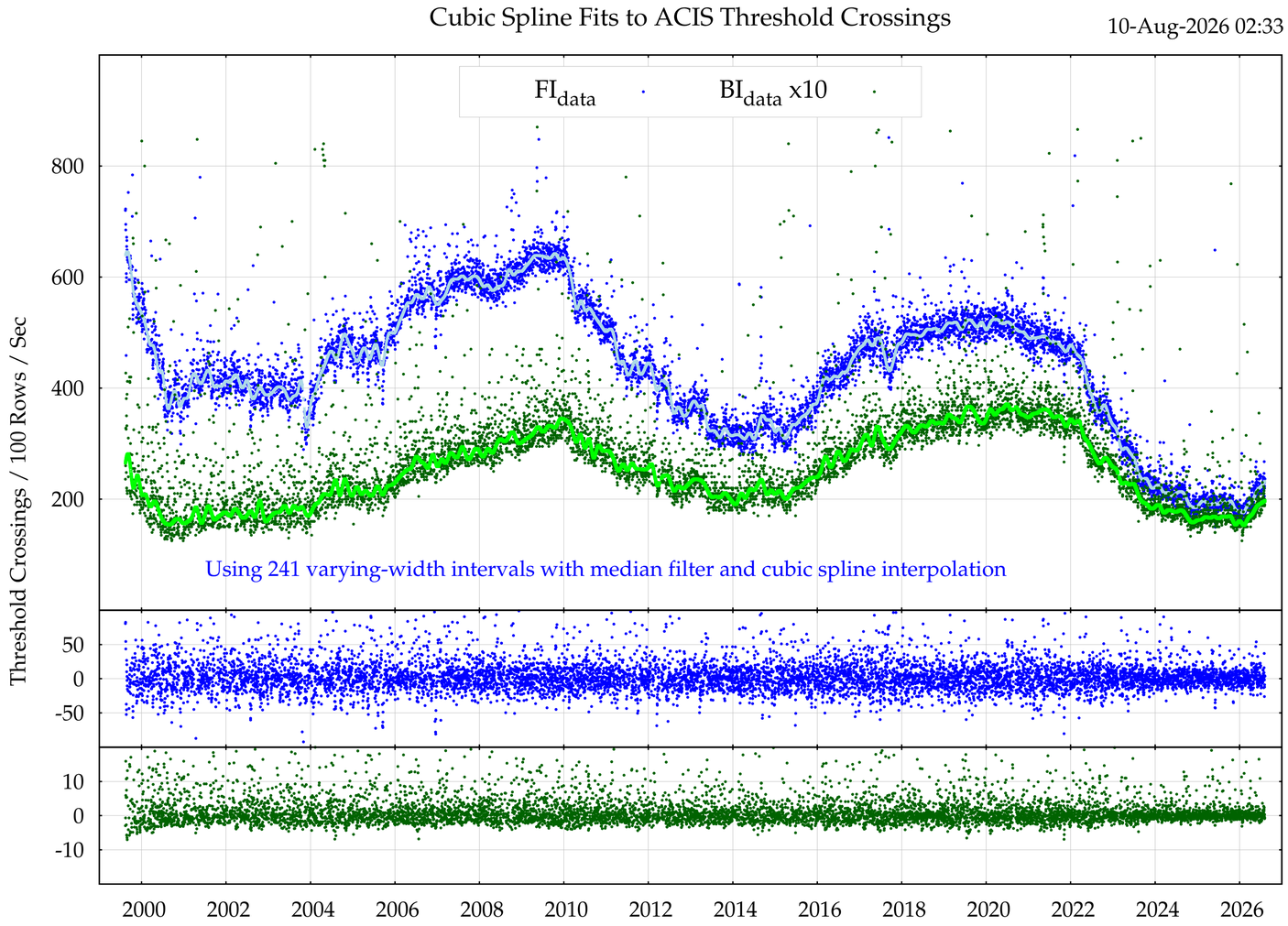
ACIS Radiation Safing and Solar Cycle Progression

"Threshold Crossing" == a pixel with charge greater than the event threshold

Ford (MIT)

- **ACIS is the *only* radiation monitor on Chandra.**
- **Autonomous safing actions are initiated by the ACIS process called "TXings".**
- **The peak of Solar Cycle 25 has passed. The possibility of strong storms remains.**
- **Observations are suspended during strong storms and ACIS is moved to a safe position.**
- **There have been 2 radiation safings in the past year (2 autonomous, 0 manual)**
- **The rapidly changing background levels require us to adjust the TXings thresholds.**
- **MIT ACIS team (Ford, Grant, Francis) monitors the background rates and recommends updates when necessary**
- **ACIS has adjusted the thresholds 4 times in the last 5 months**

ACIS Threshold Crossing Rates vs. Time





ACIS Summary

ACIS continues to function nominally and produce high quality data

- All 10 CCDs are fully functional
- Electronics are nominal, primary units are still in use
- No light leaks or damage due to micrometeorite impacts
- FP temperature is maintained within limits depending on the science objectives of the observation
- Flight software is nominal, latest version running for two months with no issues
- ~90% of GO & GTO observations use ACIS

Future Prospects:

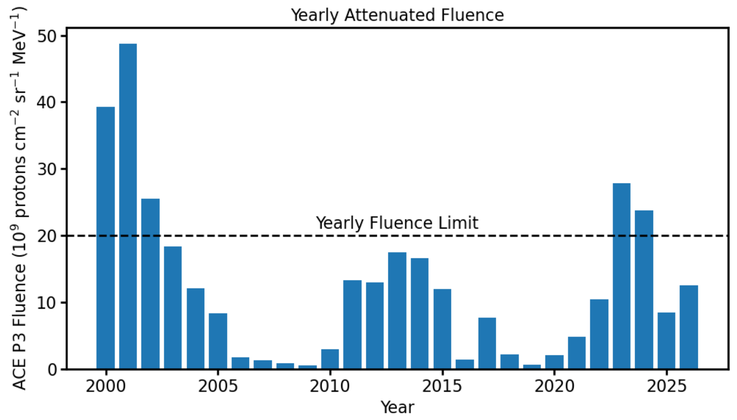
- No ACIS anomalies in the last year, flight SW updates have minimized the impact of future anomalies depending on the anomaly
- Minimal impact from perigee minimum during 2023, impacts are decreasing as the perigee altitude increases
- FP temperature limits for observations are easier to accommodate given relaxation of other constraints
- ACIS is functioning successfully as the radiation monitor for Chandra

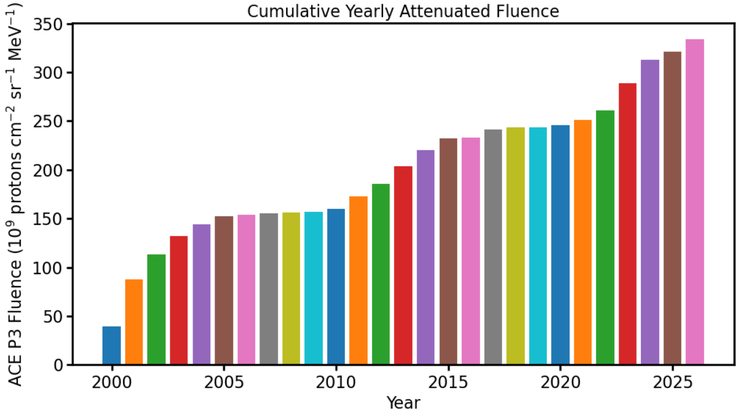
ACIS should continue as the workhorse instrument for Chandra for years to come

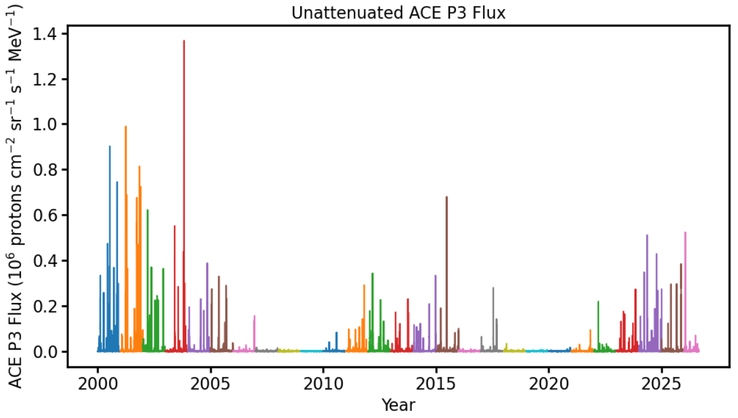
Backup Material

ACIS Radiation Safing and Solar Cycle Progression

Annual Fluence
ZuHone (SAO)







MIT ACIS TXings Monitoring Ford (MIT)

