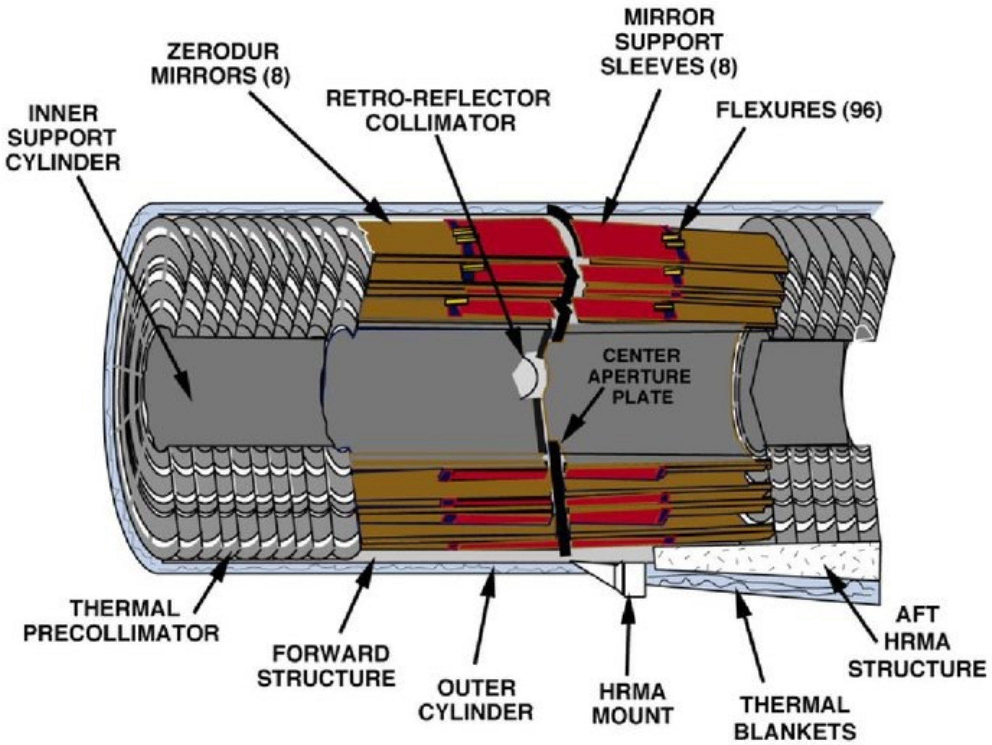
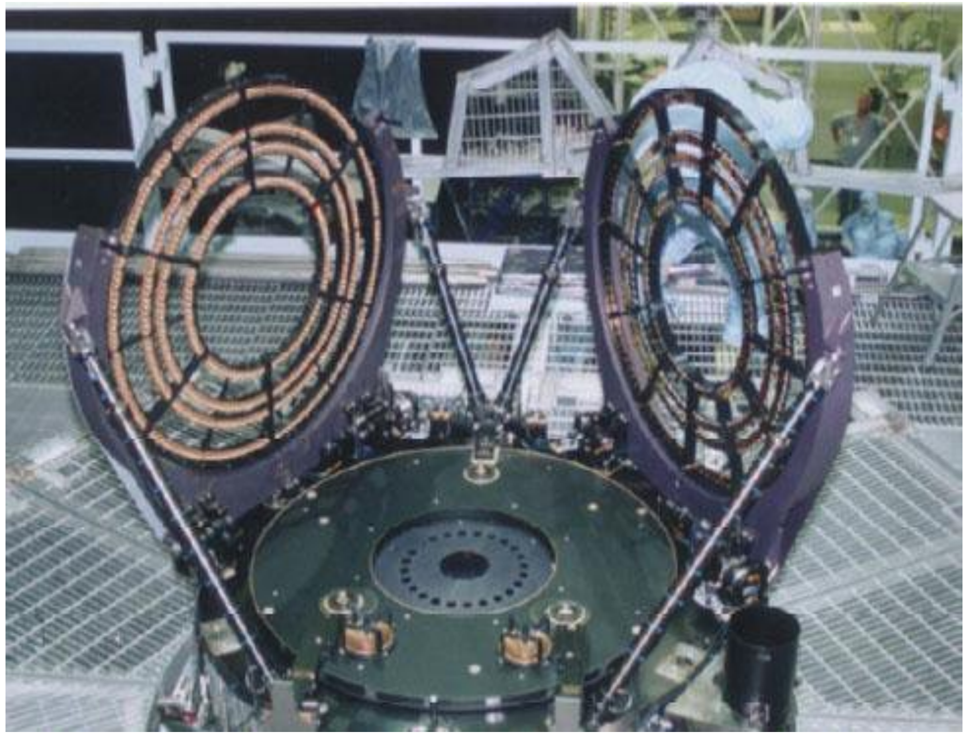
JEREMY J. DRAKE, HERMAN L. MARSHALL AND THE CXC CALIBRATION GROUP

CHANDRA CALIBRATION STATUS

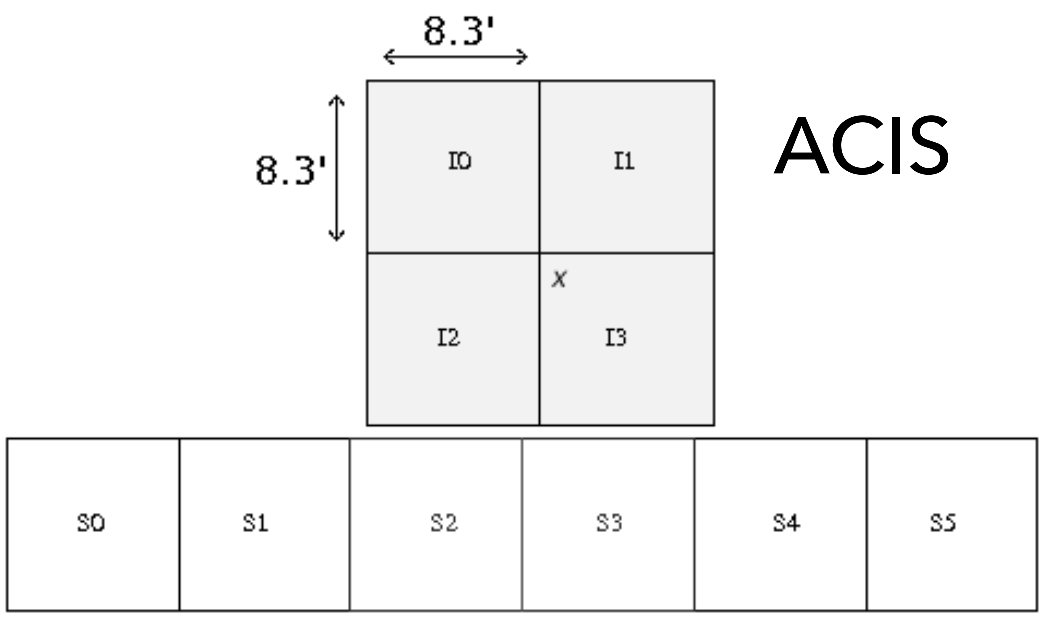
Great waves IACHEC
Buoys us through calibrating
To bring our fish home

REMINDER OF CHANDRA HARDWARE COMPONENTS

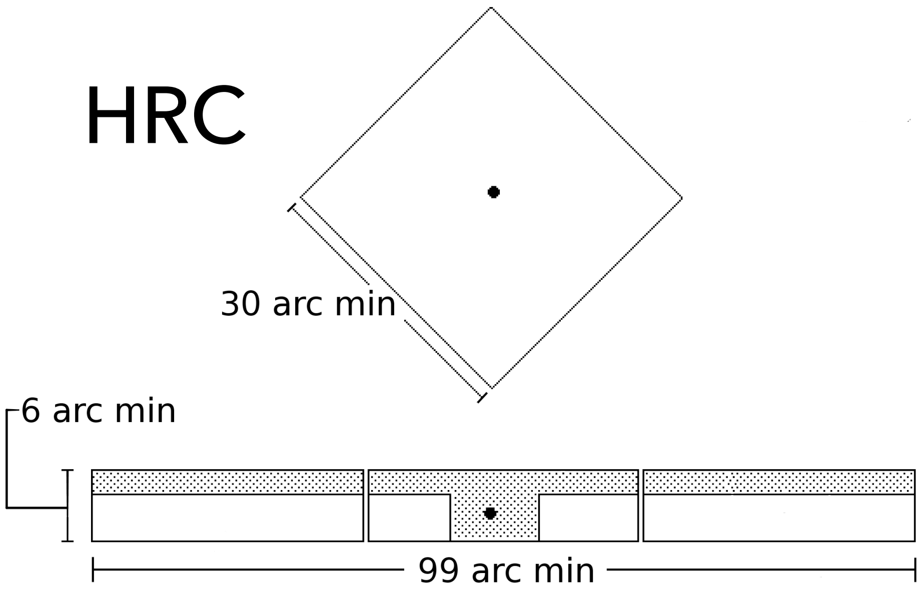




ACIS



HRC



OUTLINE

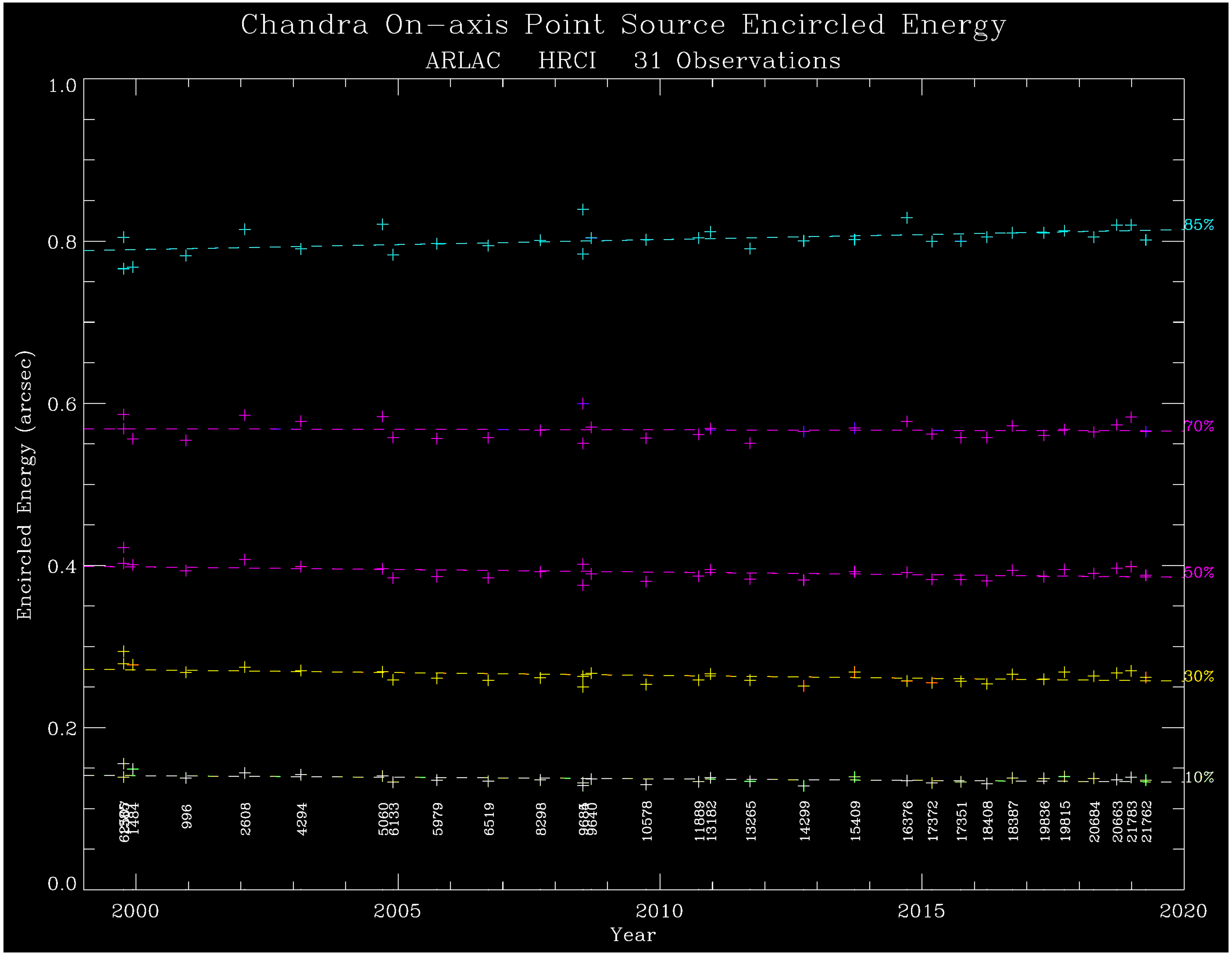
- Point Spread Function
    - Secular trend or worsening PSF in HRC-S
- ACIS
    - mid-chip gain droop; contamination
- HRC-S,I
    - QE decline; gain decline
- HETG
    - 0th to 1st order relative calibration

POINT SPREAD FUNCTION

HRC PSF (V. KASHYAP, P. ZHAO, D. JERIUS)

- The HRC-I PSF has remained stable over the mission
- HRC-S PSF is steadily increasing in width and appears about 10% larger now that at the start of the mission
- Degradation is possibly related to decline in gain
  - Intrinsic detector psf?
  - Degap drift?

PSF MONITORING



85% EE

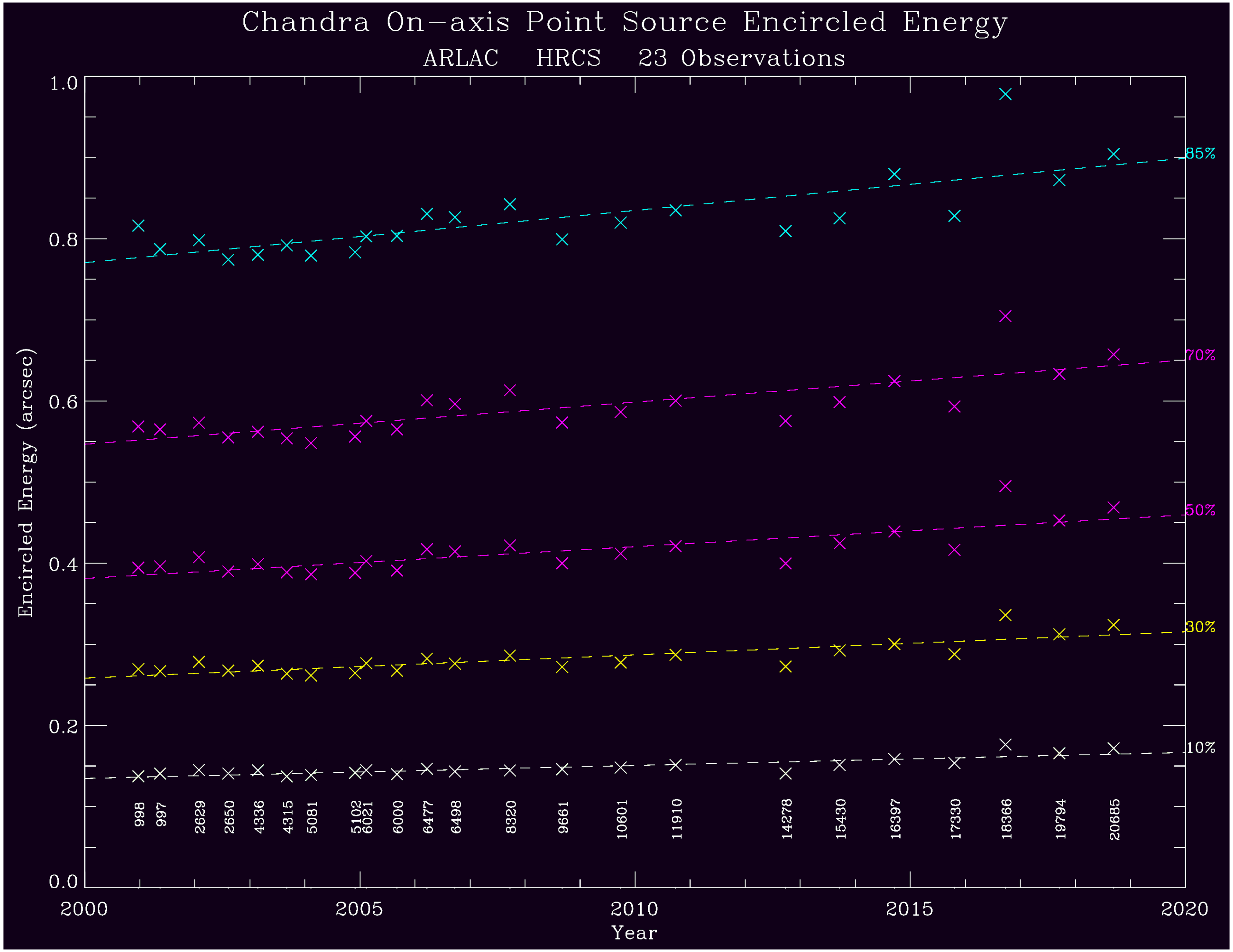
70% EE

50% EE

30% EE

10% EE

PSF MONITORING



85% EE

70% EE

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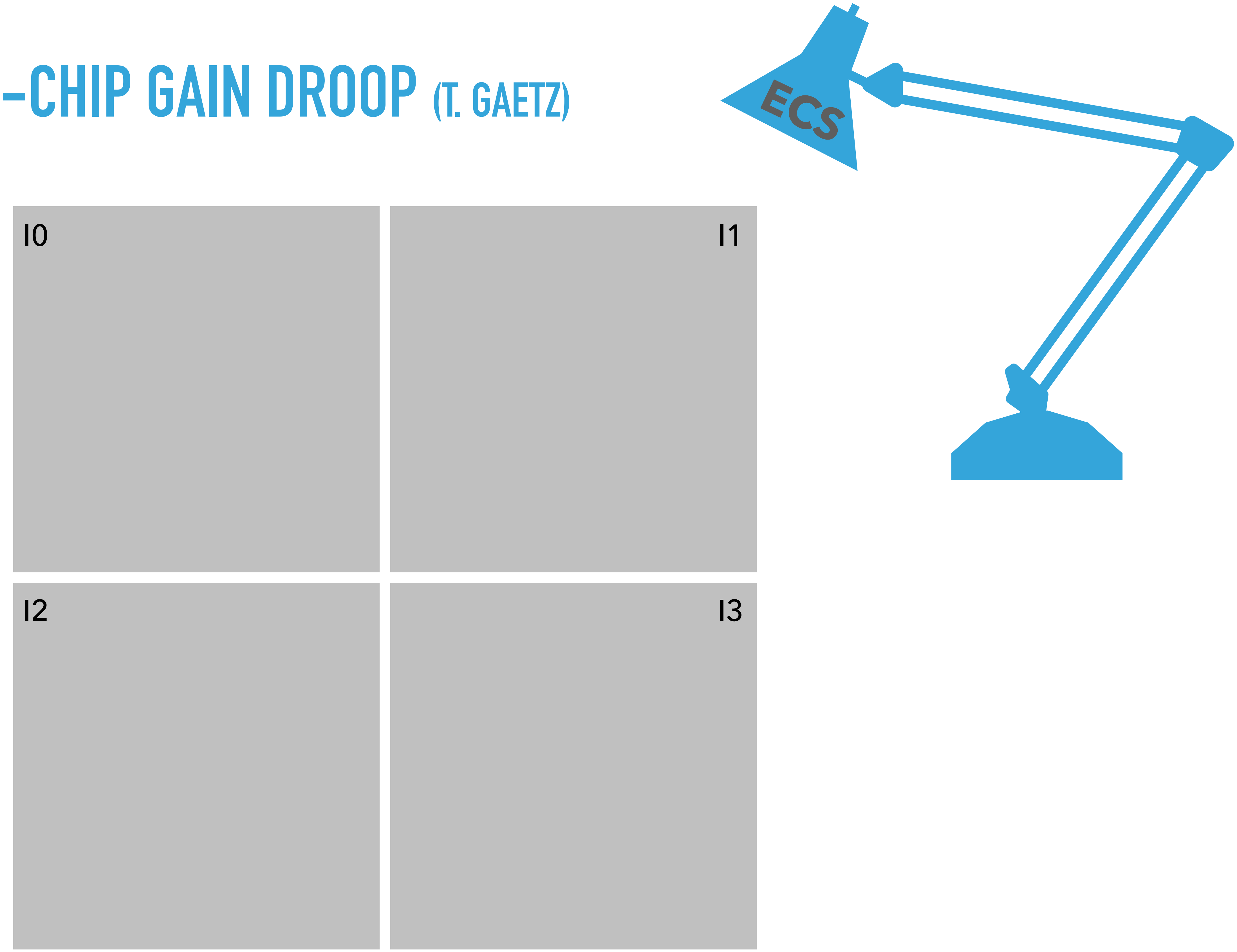
30% EE

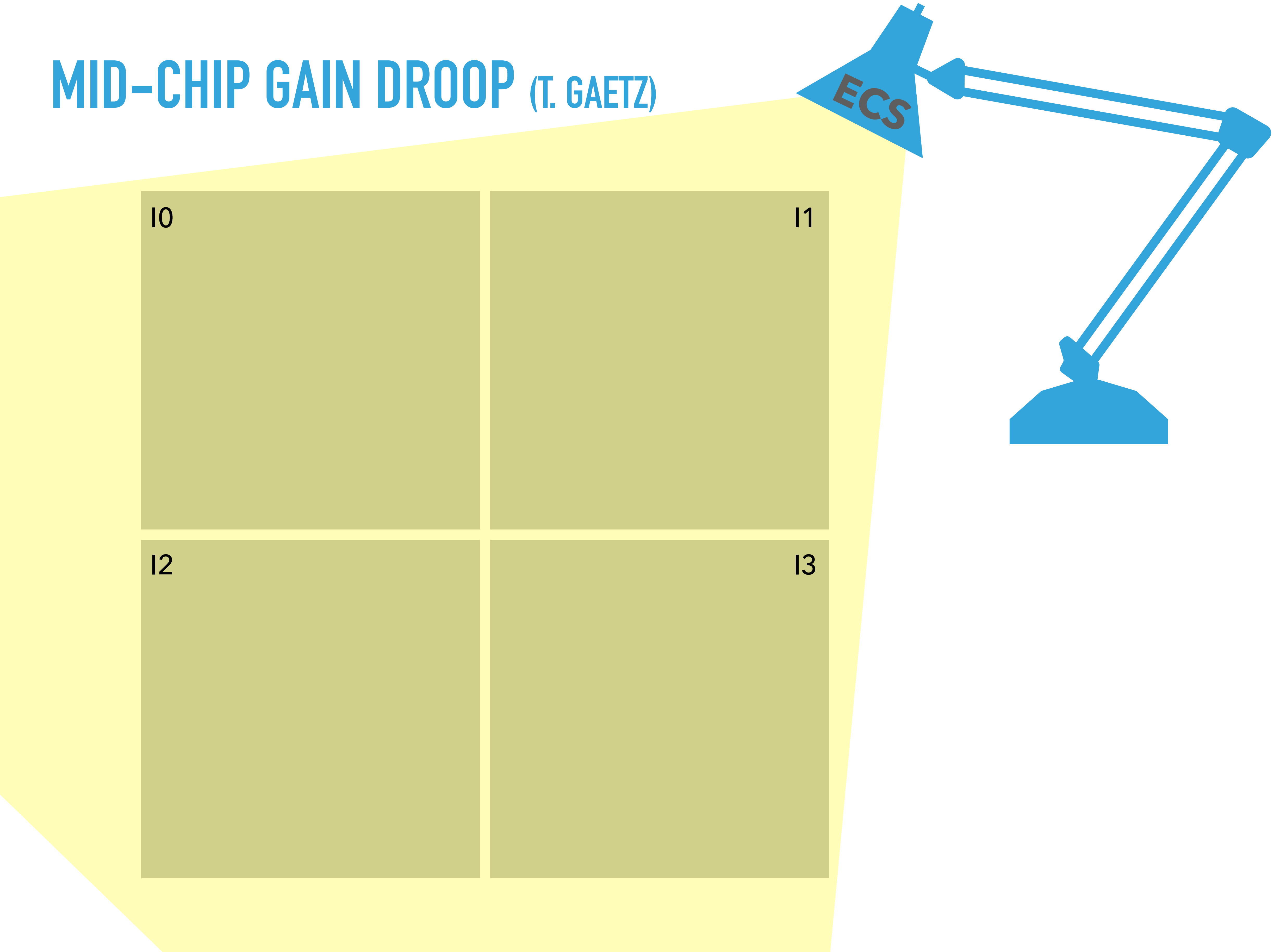
10% EE

ADVANCED CCD IMAGING SPECTROMETER (ACIS)

MID-CHIP GAIN DROOP (T. GAETZ)

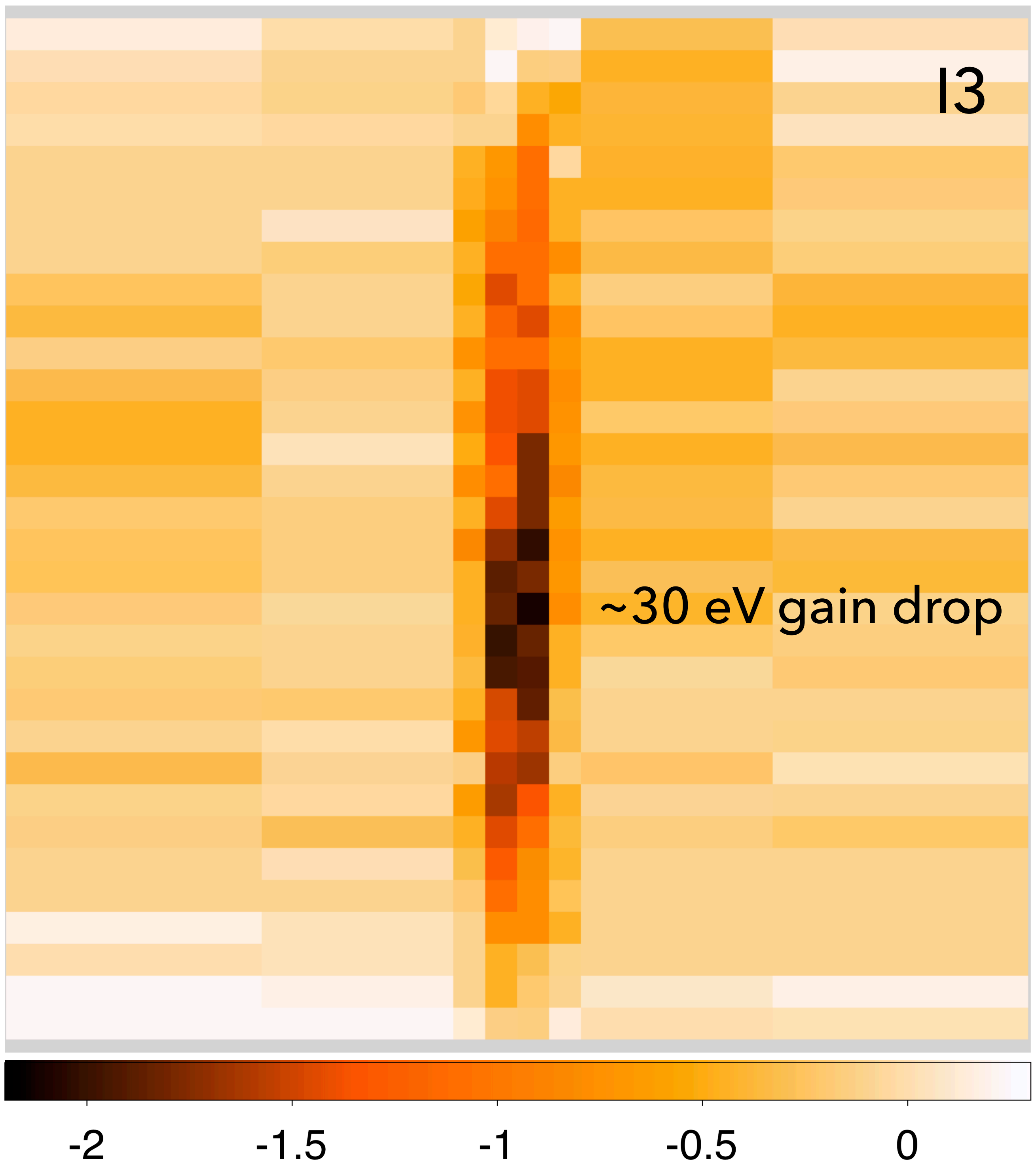


MID-CHIP GAIN DROOP (T. GAETZ)

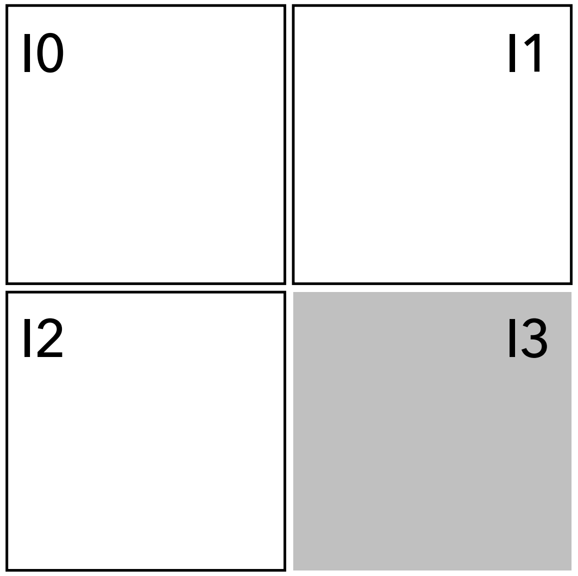


MID-CHIP GAIN DROOP FIX (T. GAETZ)

Al K



Before correction



MID-CHIP GAIN DROOP FIX (T. GAETZ)

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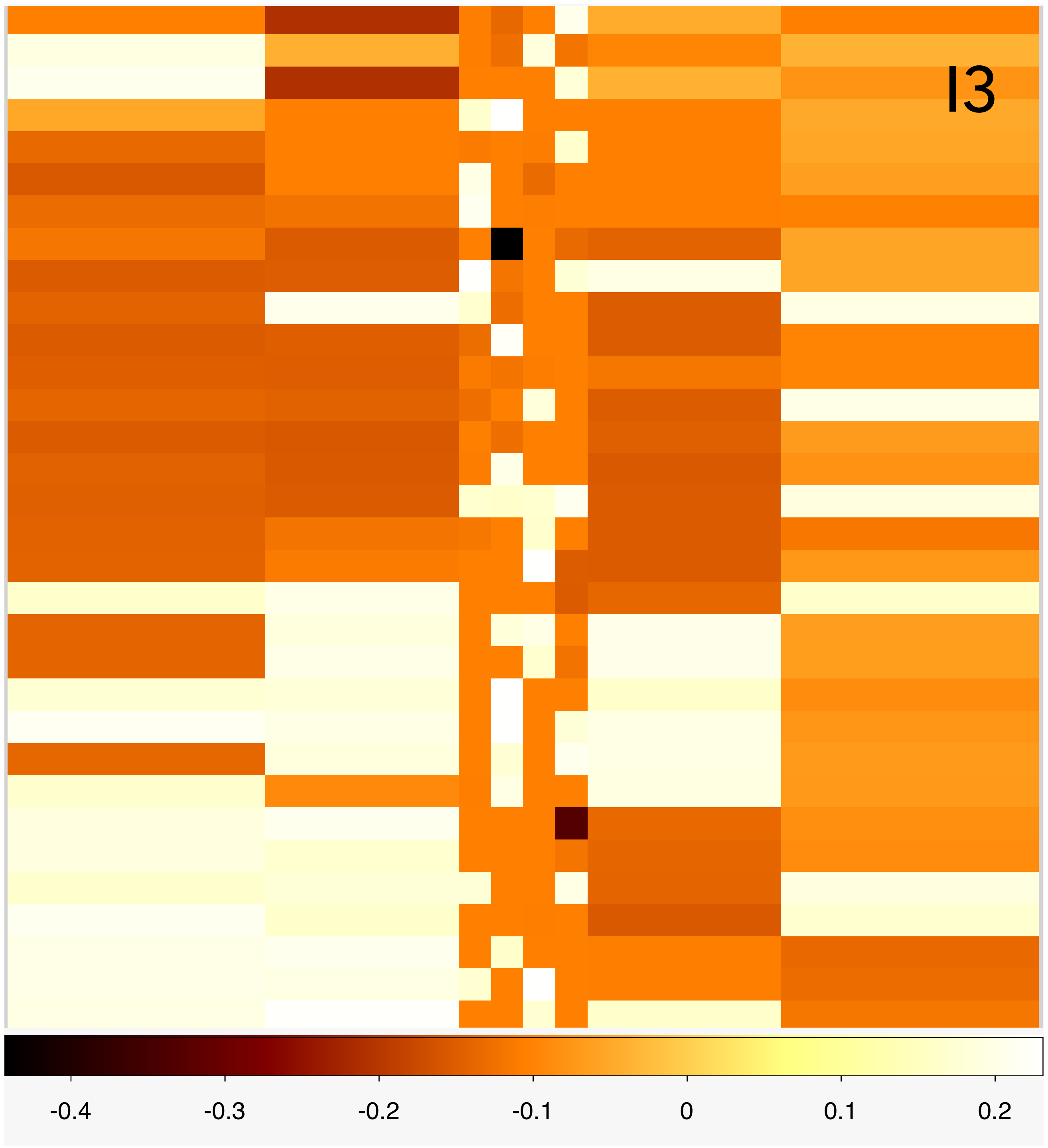
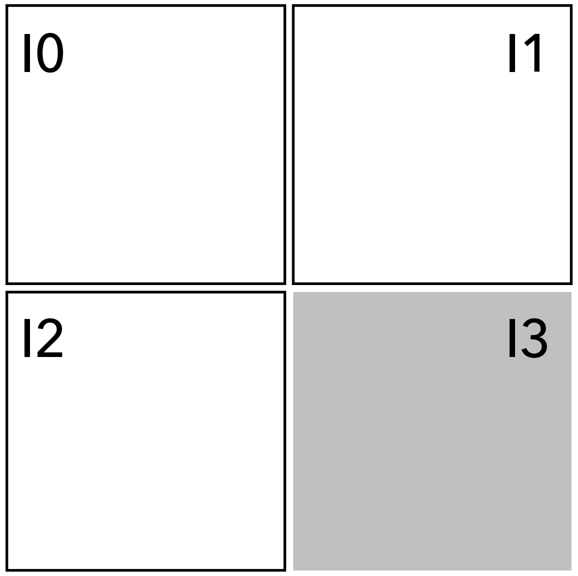
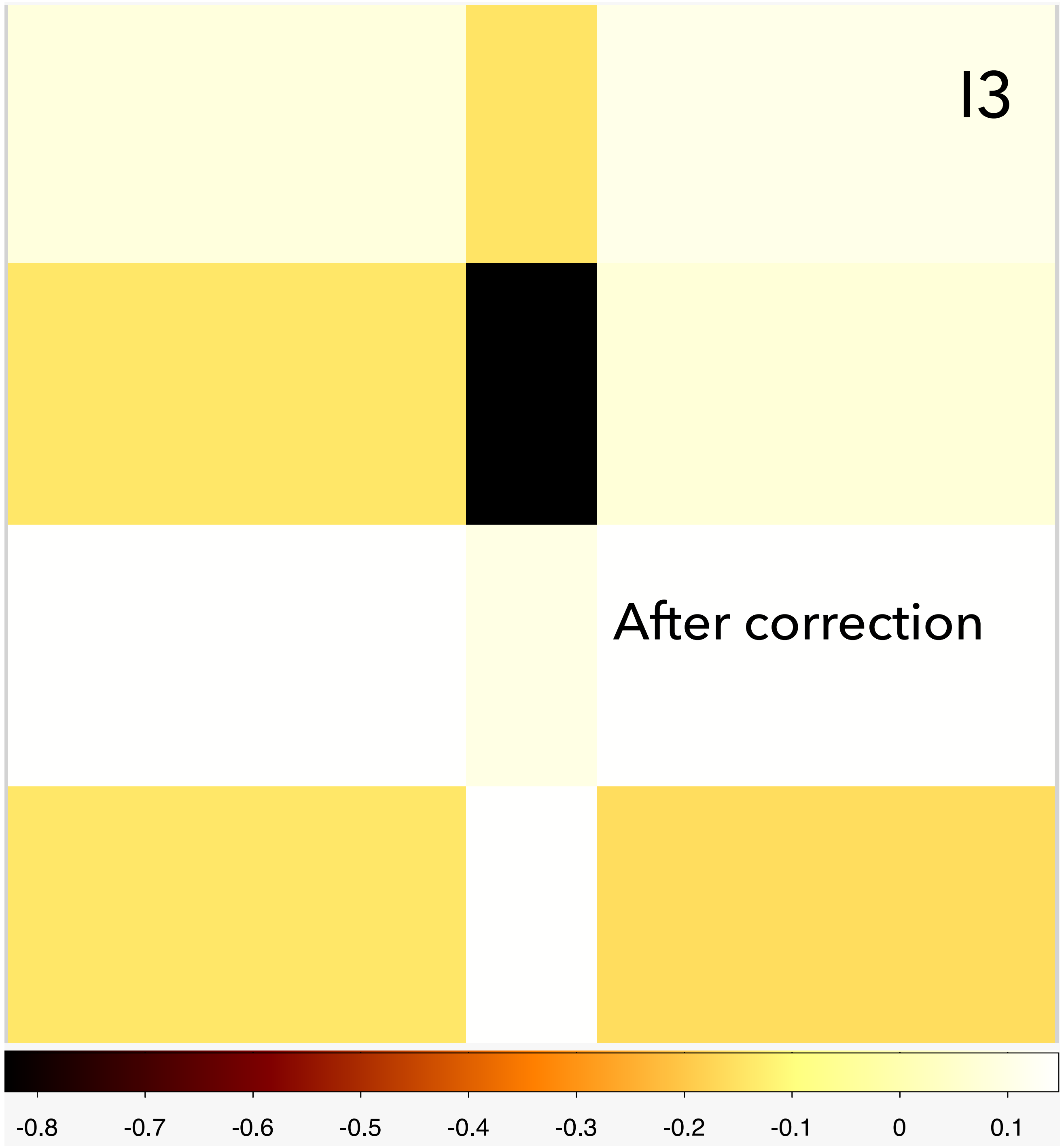


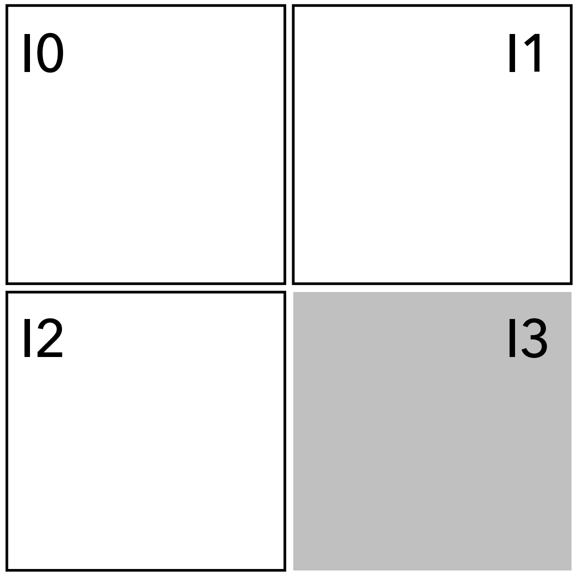
After correction



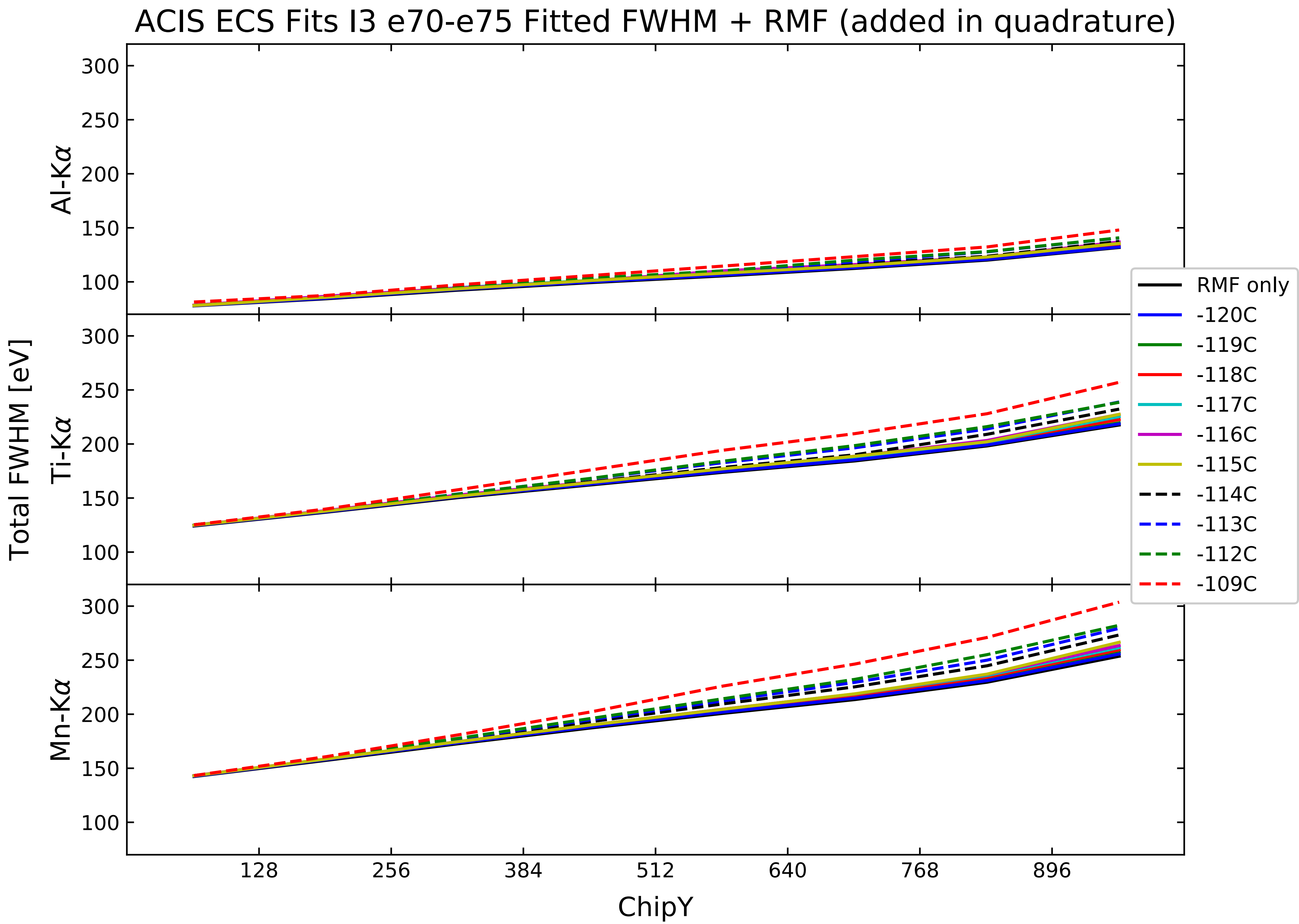
MID-CHIP GAIN DROOP (T. GAETZ)

Mn K (lower S/N)

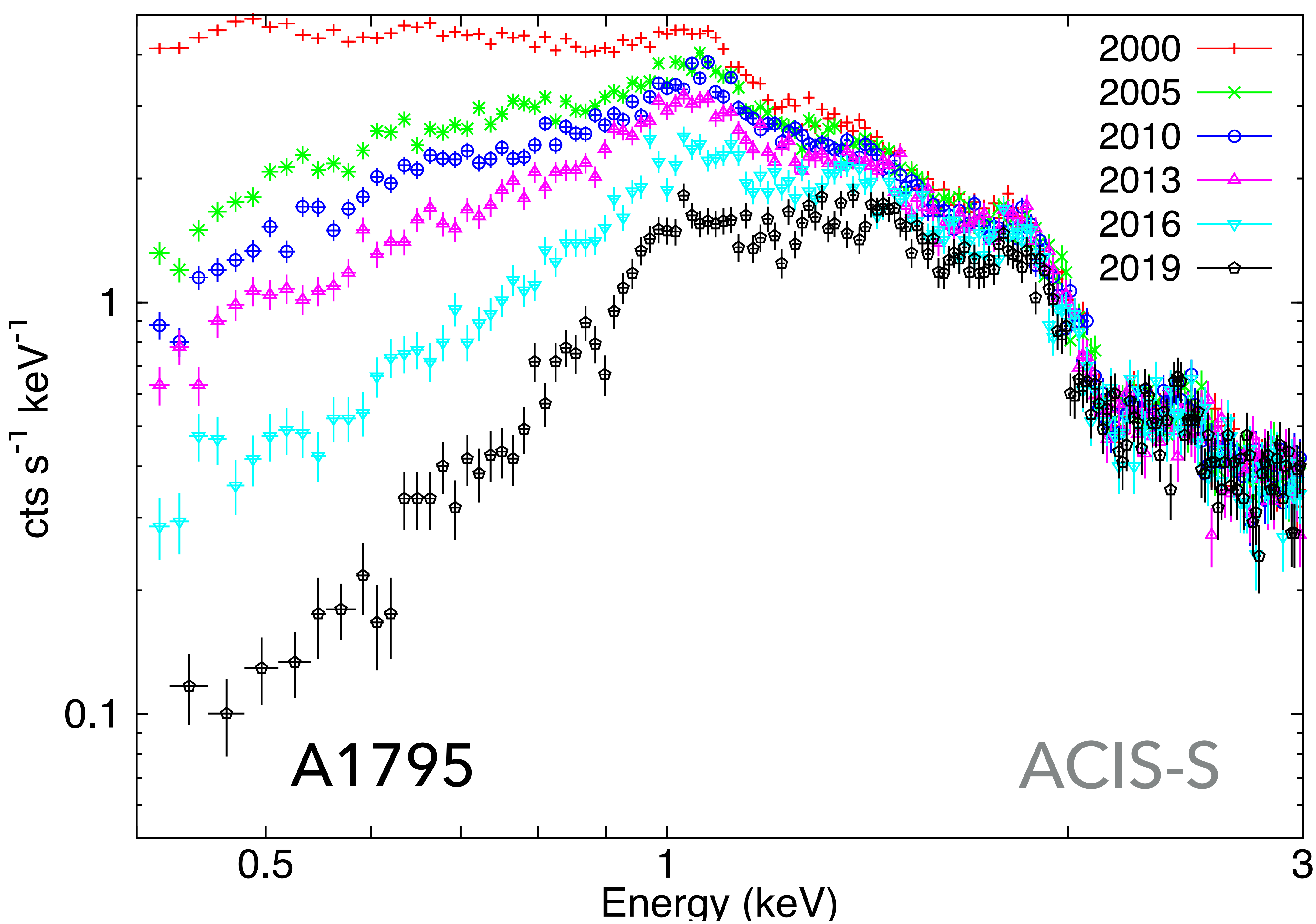




PROGRESS WITH TIME-DEPENDENT GAIN (R. DURHAM, P. PLUCINSKY)



FILTER CONTAMINATION LAYER (A, BOGDAN, H. MARSHALL, P. PLUCINSKY ET AL)



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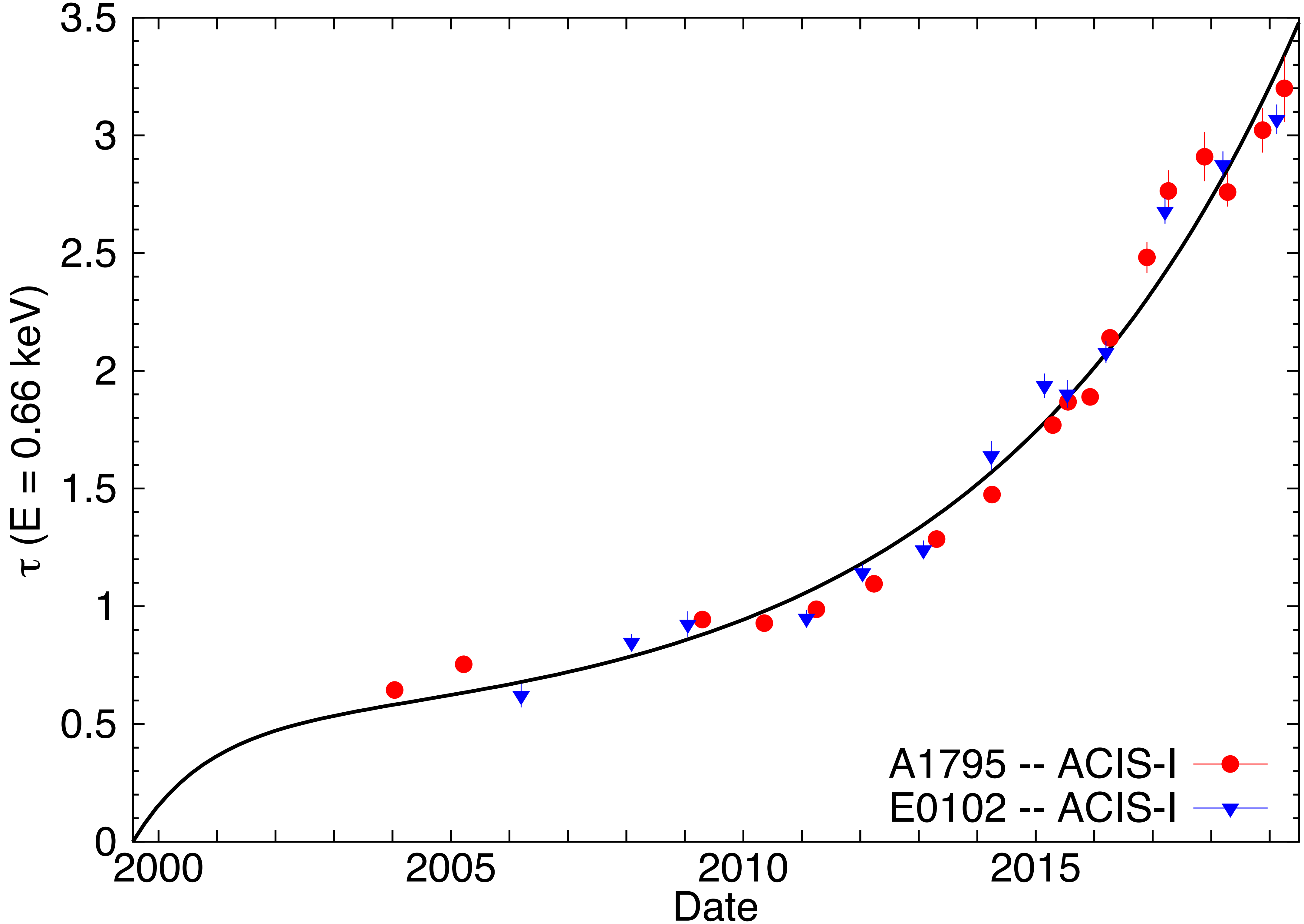
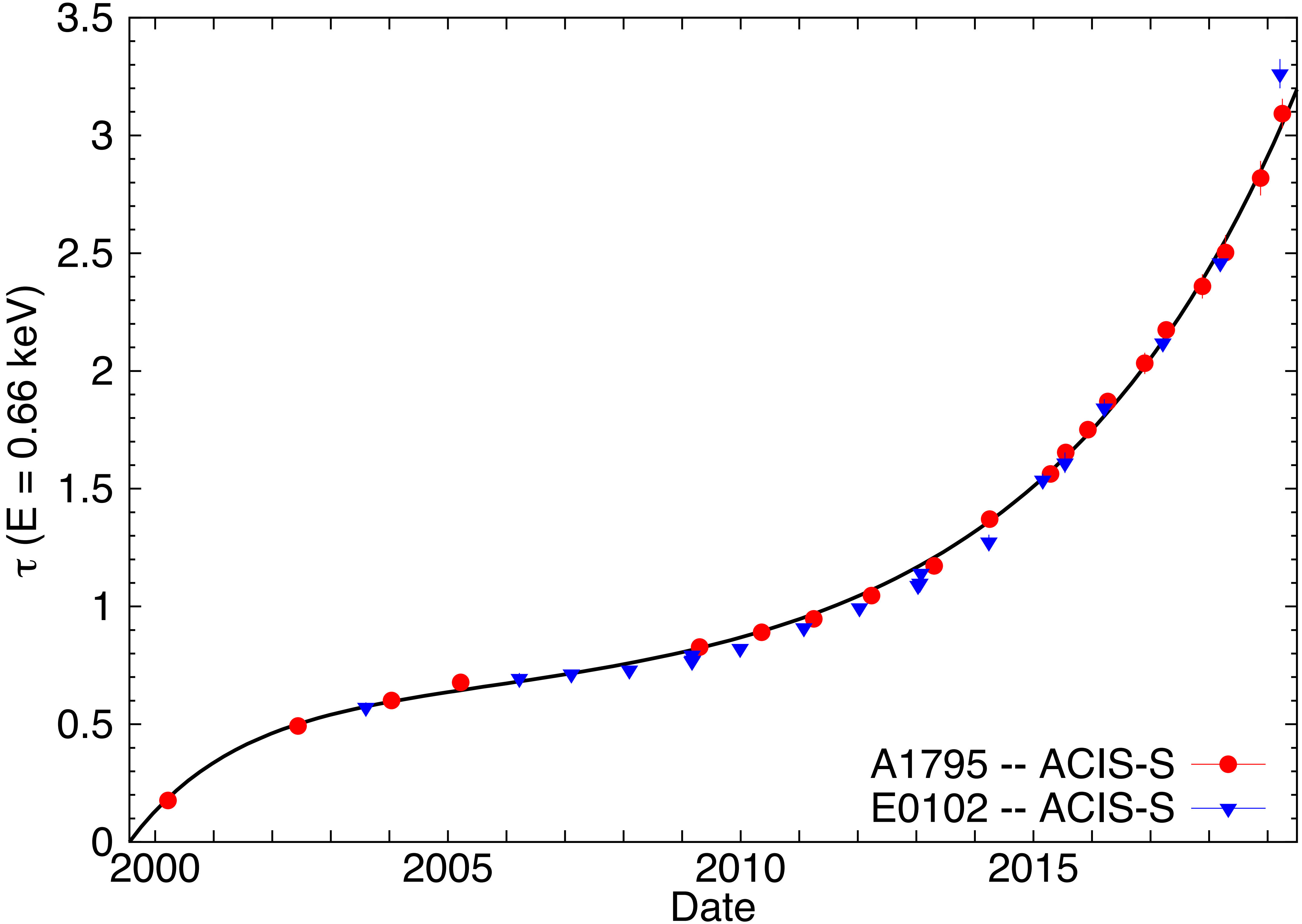
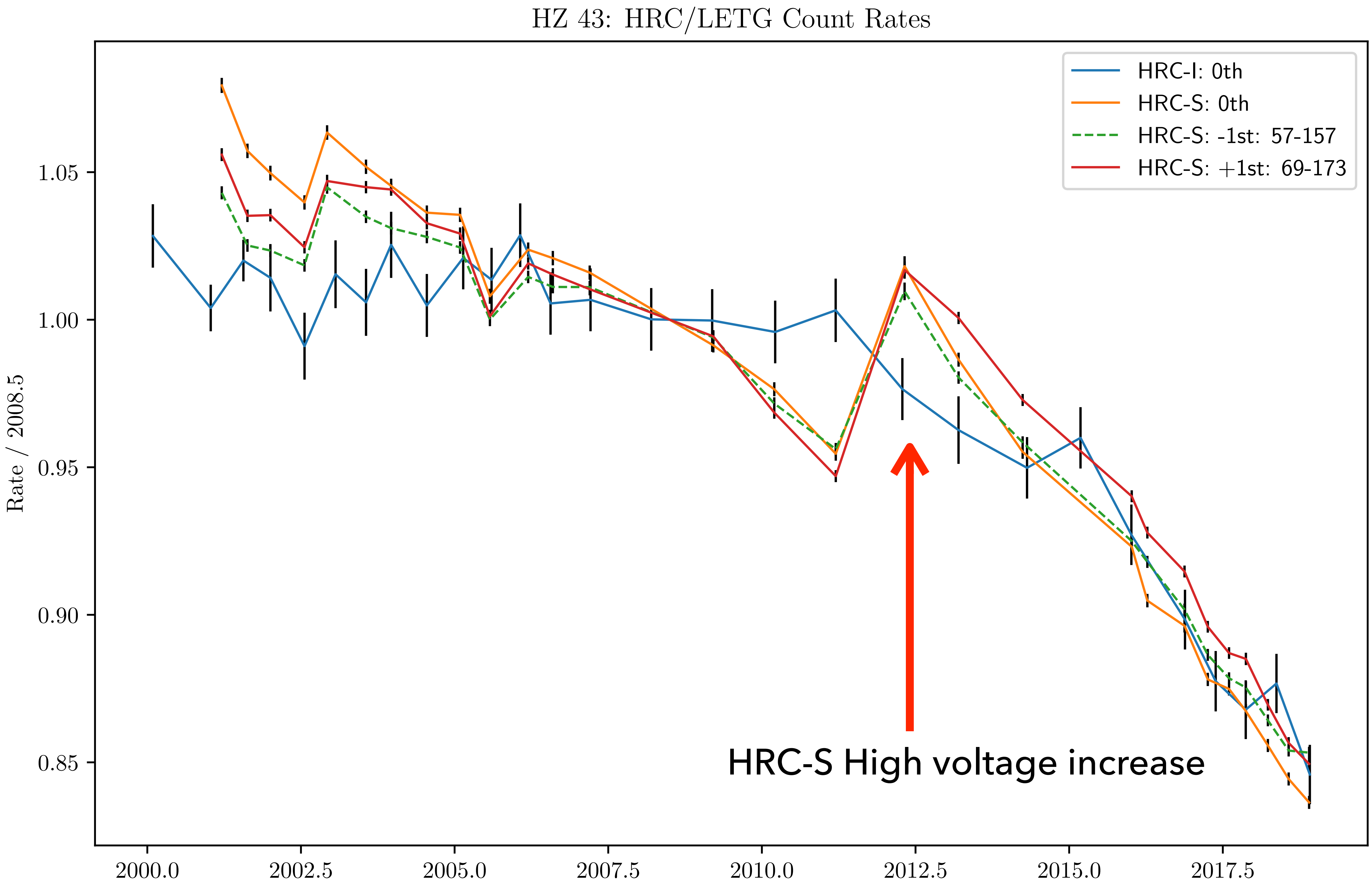


FILTER CONTAMINATION LAYER (A, BOGDAN, H. MARSHALL, P. PLUCINSKY ET AL)



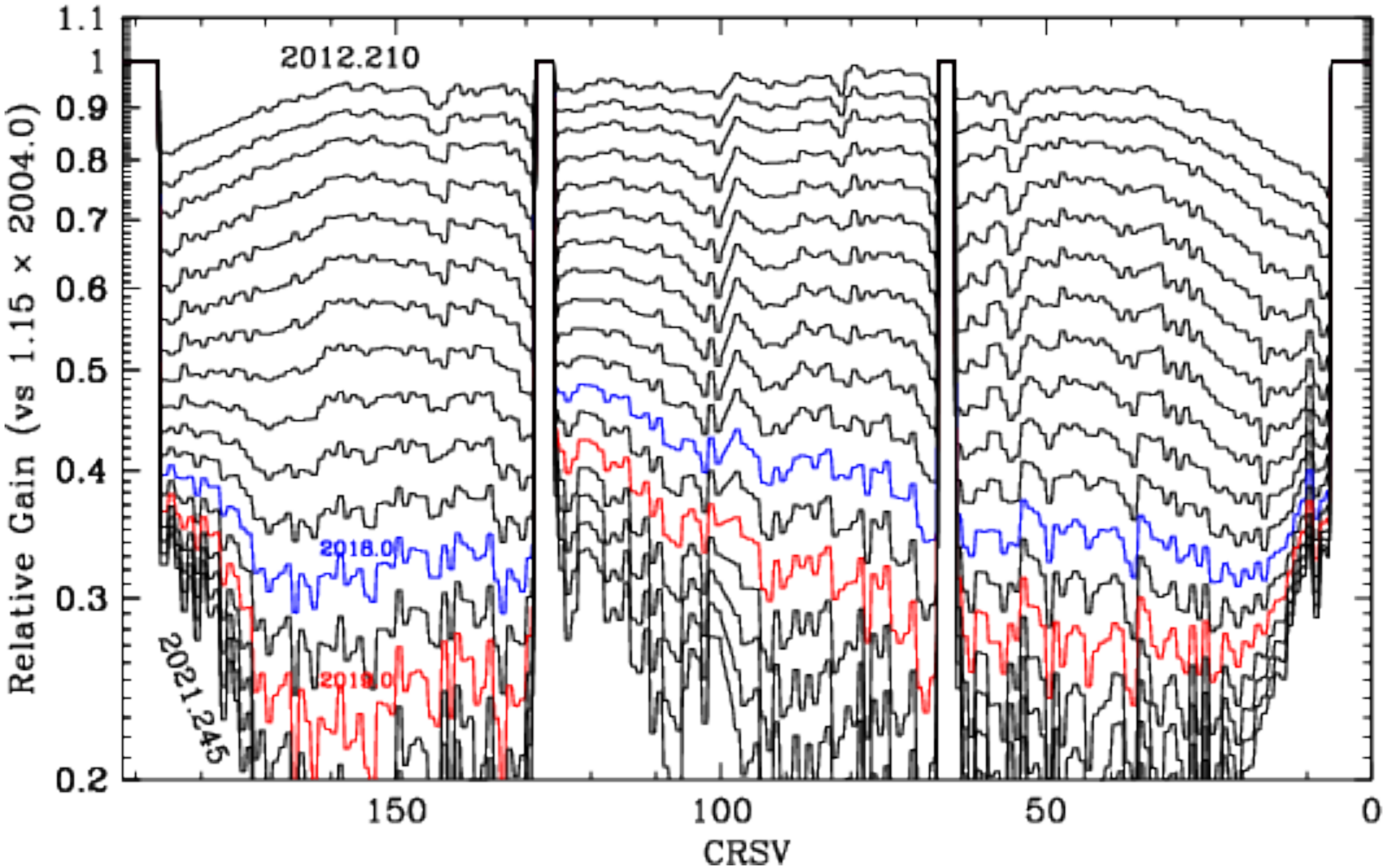
HIGH RESOLUTION CAMERA

QUANTUM EFFICIENCY DECLINE (P. RATZLAFF, J. DRAKE, V. KASHYAP, B. WARGELIN)



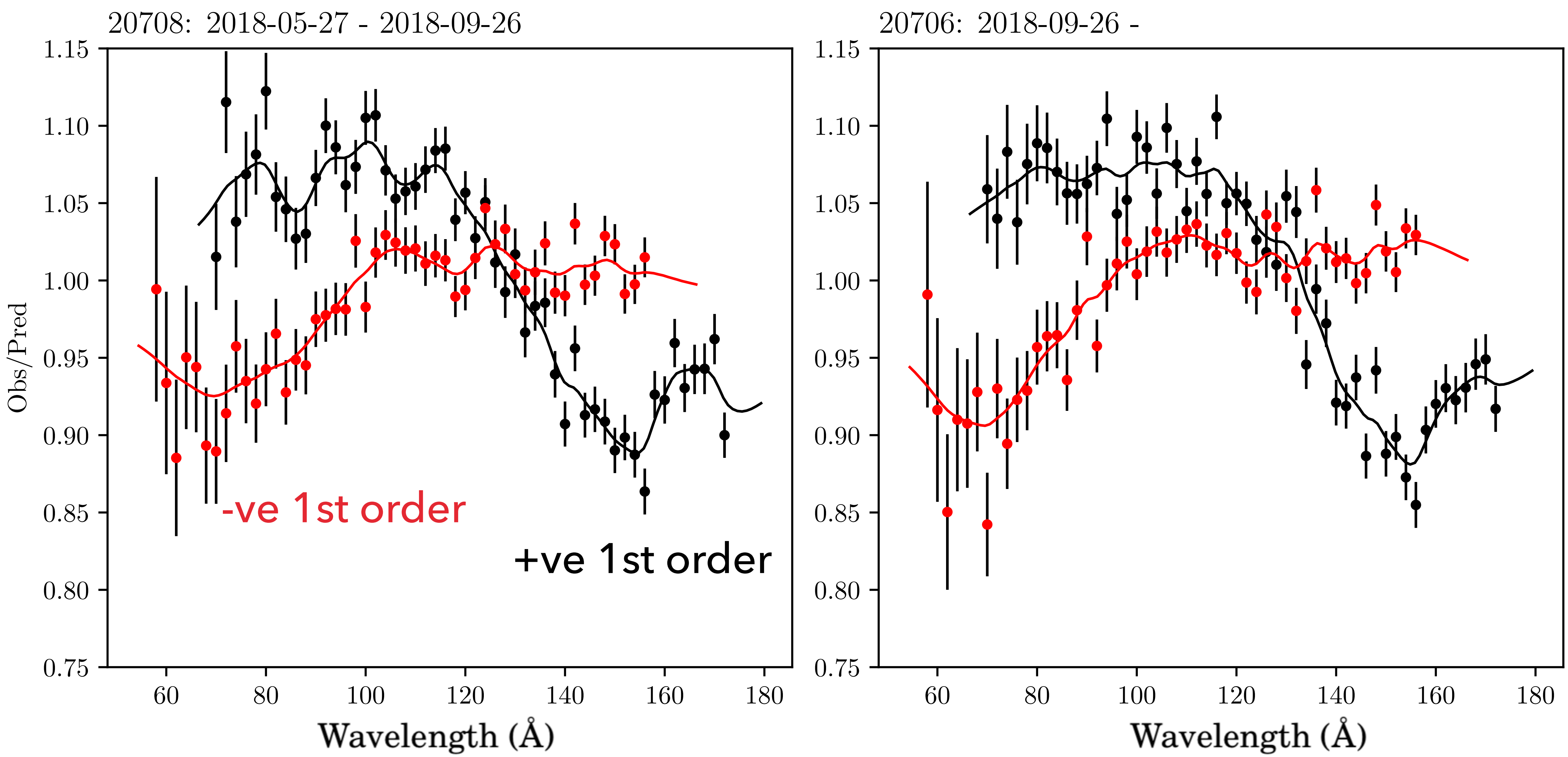
QUANTUM EFFICIENCY DECLINE (P. RATZLAFF, J. DRAKE, V. KASHYAP, B. WARGELIN)

HRC-S Gain Decline



QUANTUM EFFICIENCY DECLINE (P. RATZLAFF, J. DRAKE, V. KASHYAP, B. WARGELIN)

HZ43 LETG+HRC-S Empirical QEU Corrections

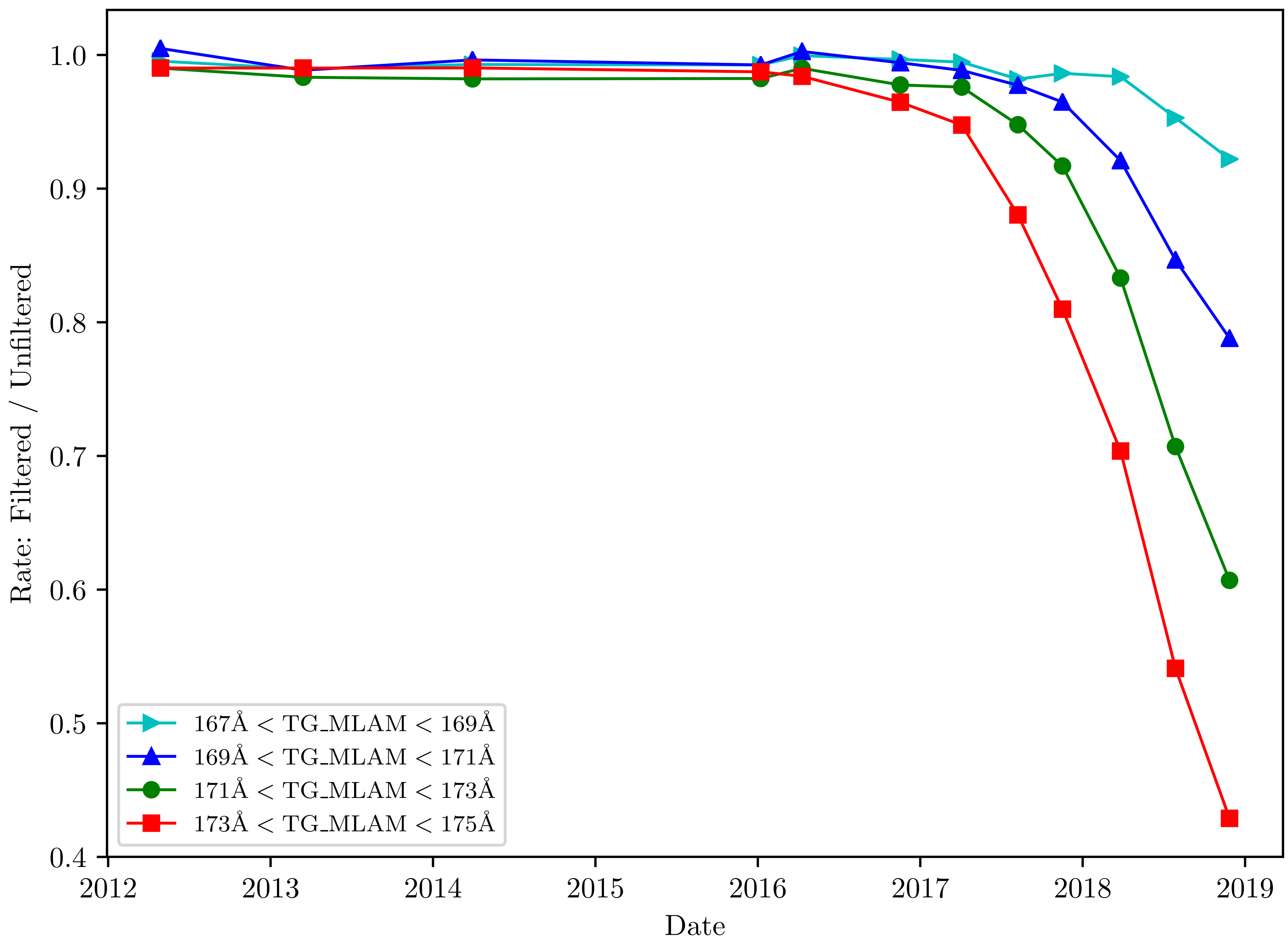


Corrections expressed relative to 2.35%/yr grey decline

QUANTUM EFFICIENCY DECLINE (P. RATZLAFF, J. DRAKE, V. KASHYAP, B. WARGELIN)

Gain-related problems for PI-base background filtering

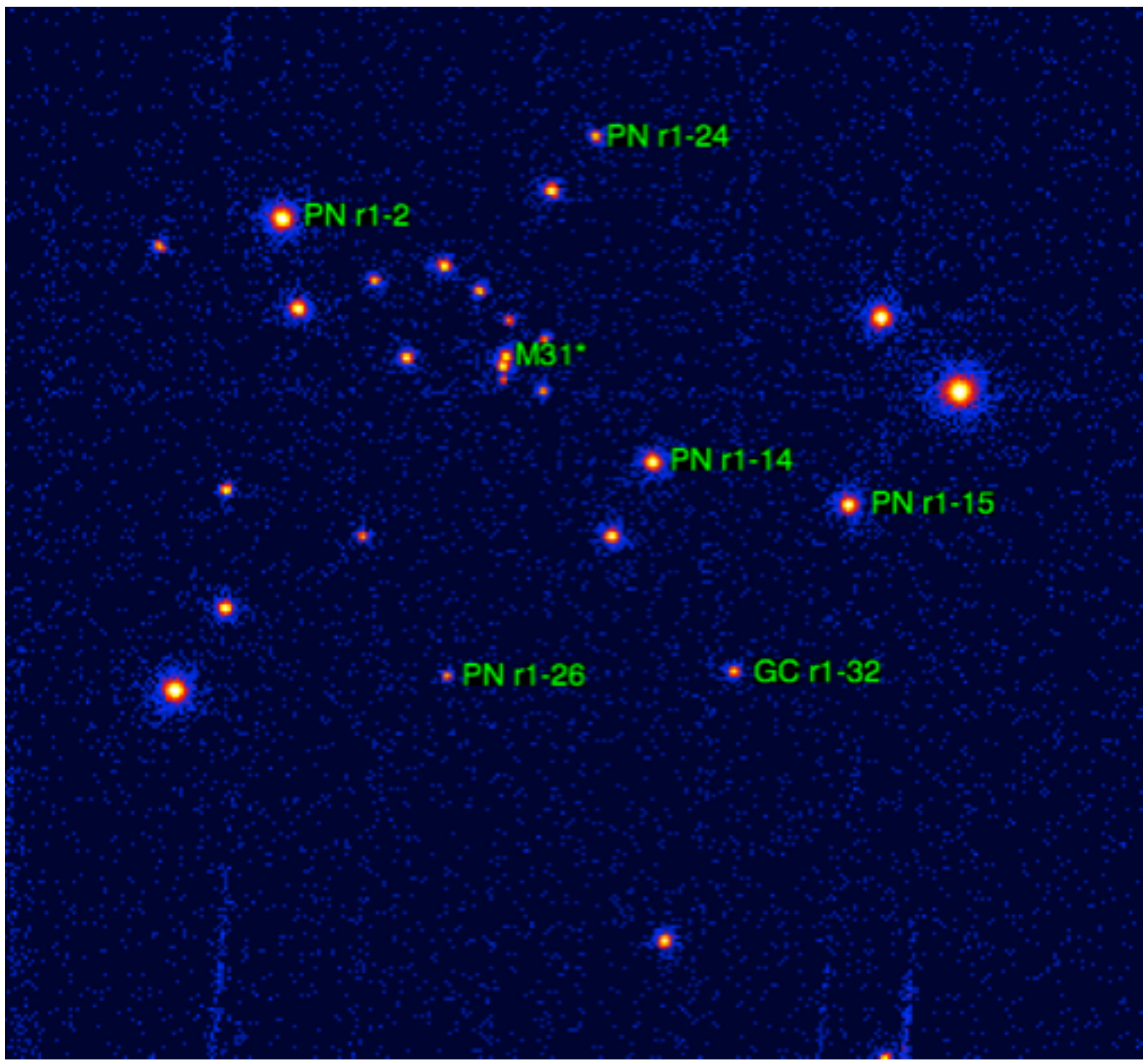
- +ve order long wavelength source signal now same PI as lowest PI background events
- PI-base bg filtering removes significant signal



HETG

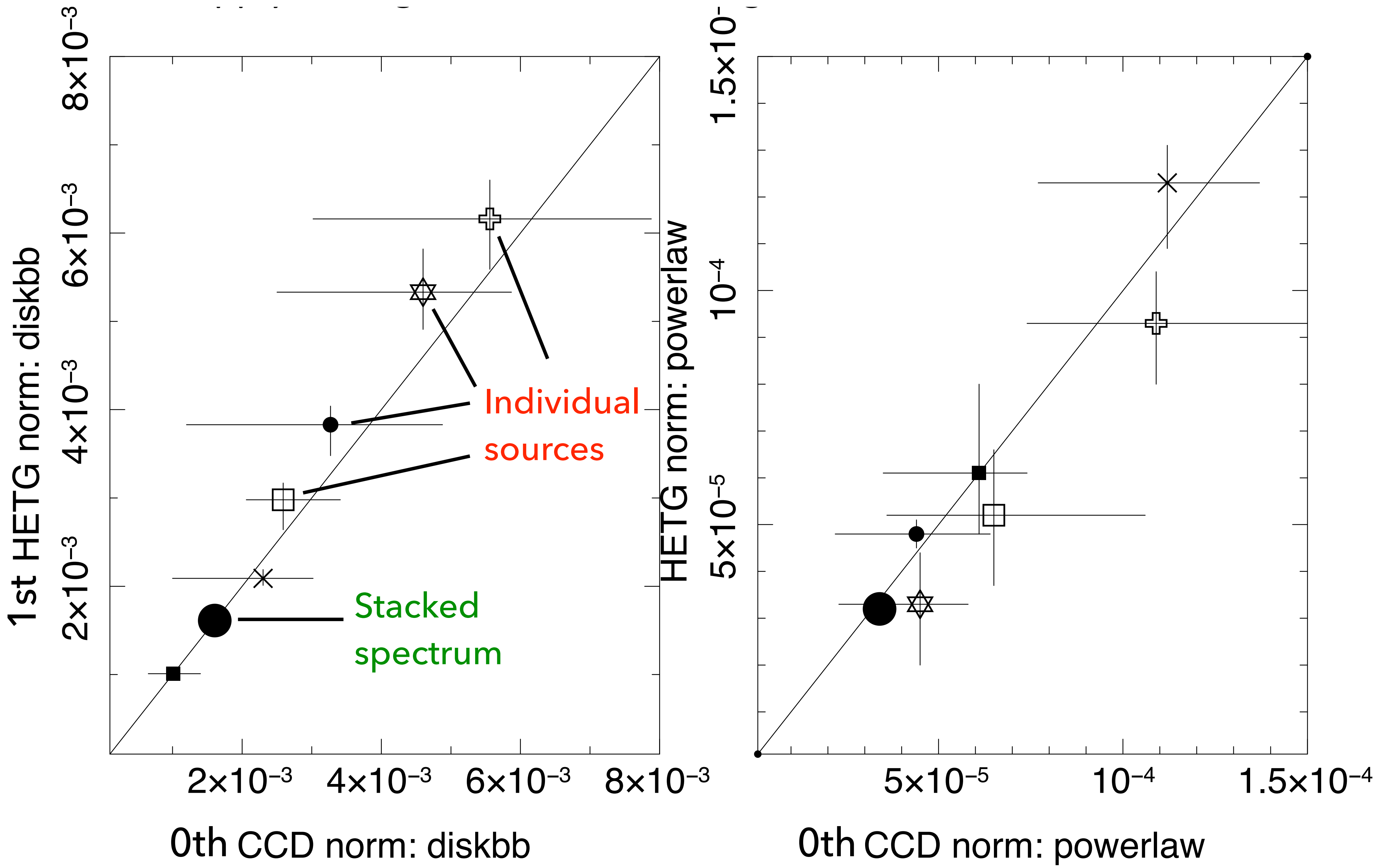
0TH:1ST ORDER CALIBRATION (N. SCHULZ)

M31 center with Chandra HETG:



- Use multiple HETG+ACIS-S sources in M31 that are not piled up in 0th order to calibrate 0th relative to first order
- Simultaneous diskbb+powerlaw model fits

0TH:1ST ORDER CALIBRATION (N. SCHULZ)



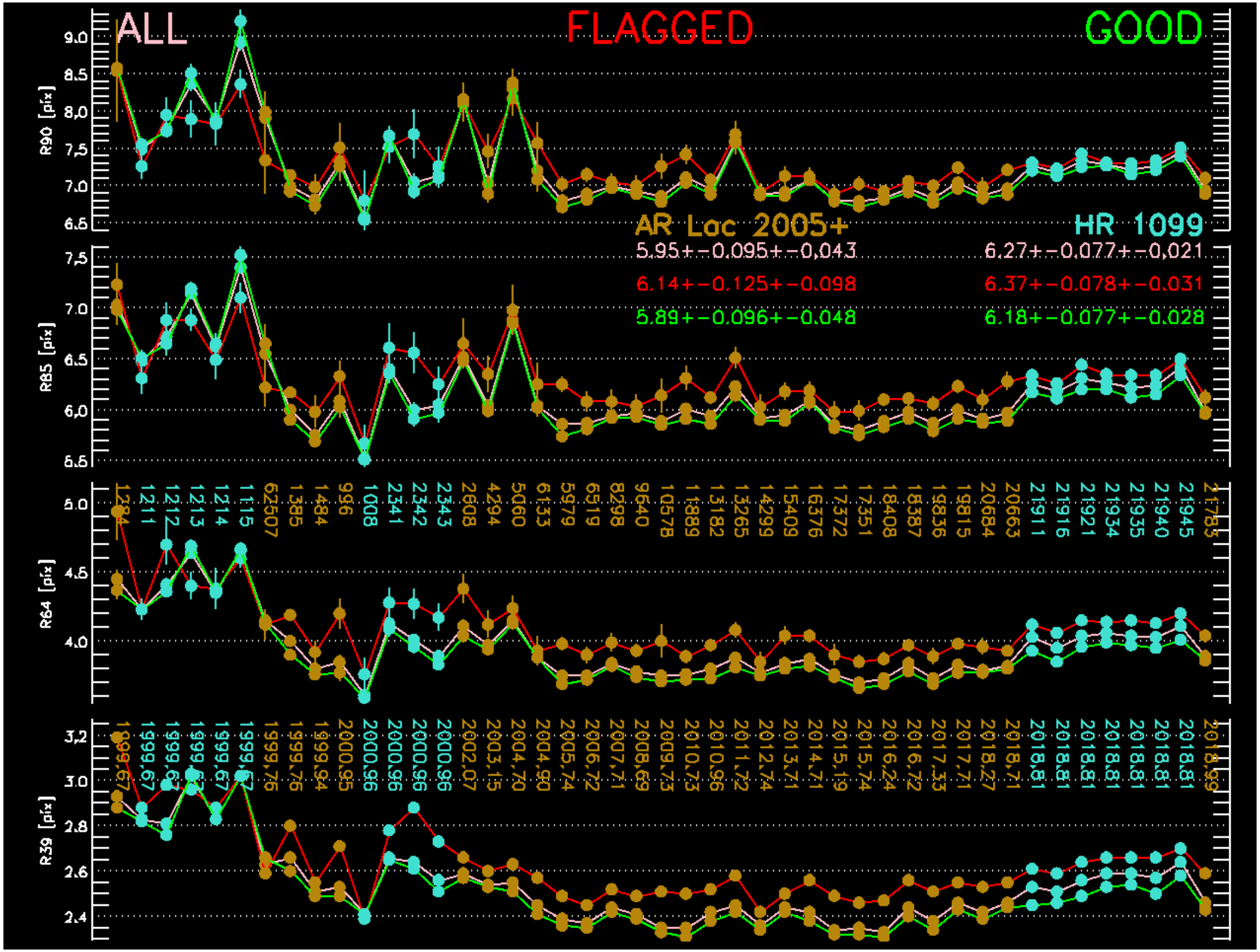
Agreement to 8% from individual sources, 2-3% from stacked

SUMMARY

- Chandra calibration challenges are as a result of aging and decline of instrument performance and accumulation of contamination on ACIS
- HRC-S PSF is increasing and this behavior is not currently understood.
- ACIS mid-chip gain droop calibration coming shortly
- ACIS contamination model is being regularly updated: slower rate of increase seen last year is not born out in newer data.
- Continuing HRC-S QE secular changes are being calibrated (HV increase on HRC-S is only a matter of time).
- HETG 0th vs 1st order calibration is looking good - few % - at energies above 1.5 keV; need more data for lower E.

SUPPLEMENTARY MATERIAL

PSF MONITORING: WARM HRMA



0TH:1ST ORDER CALIBRATION (N. SCHULZ)