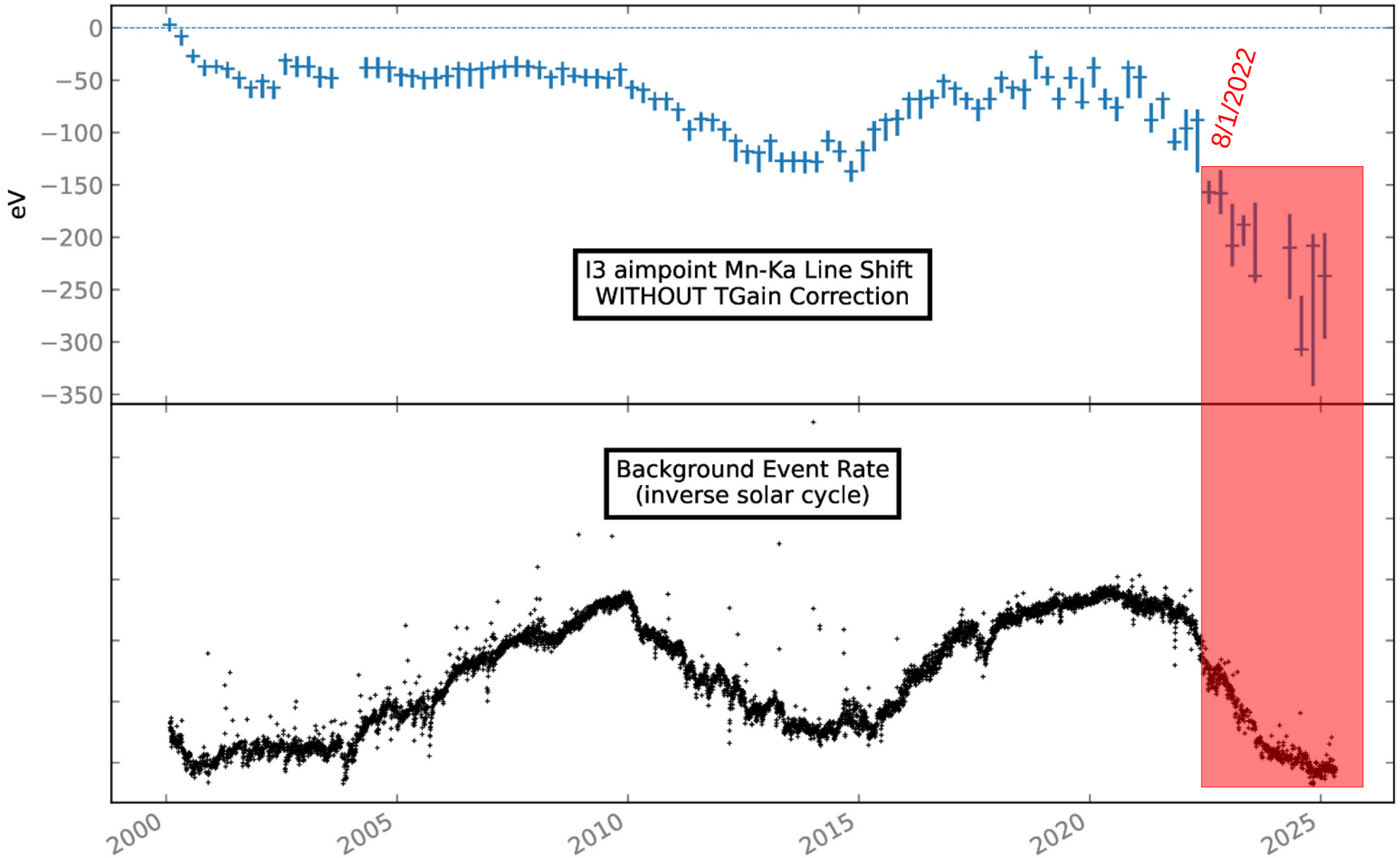
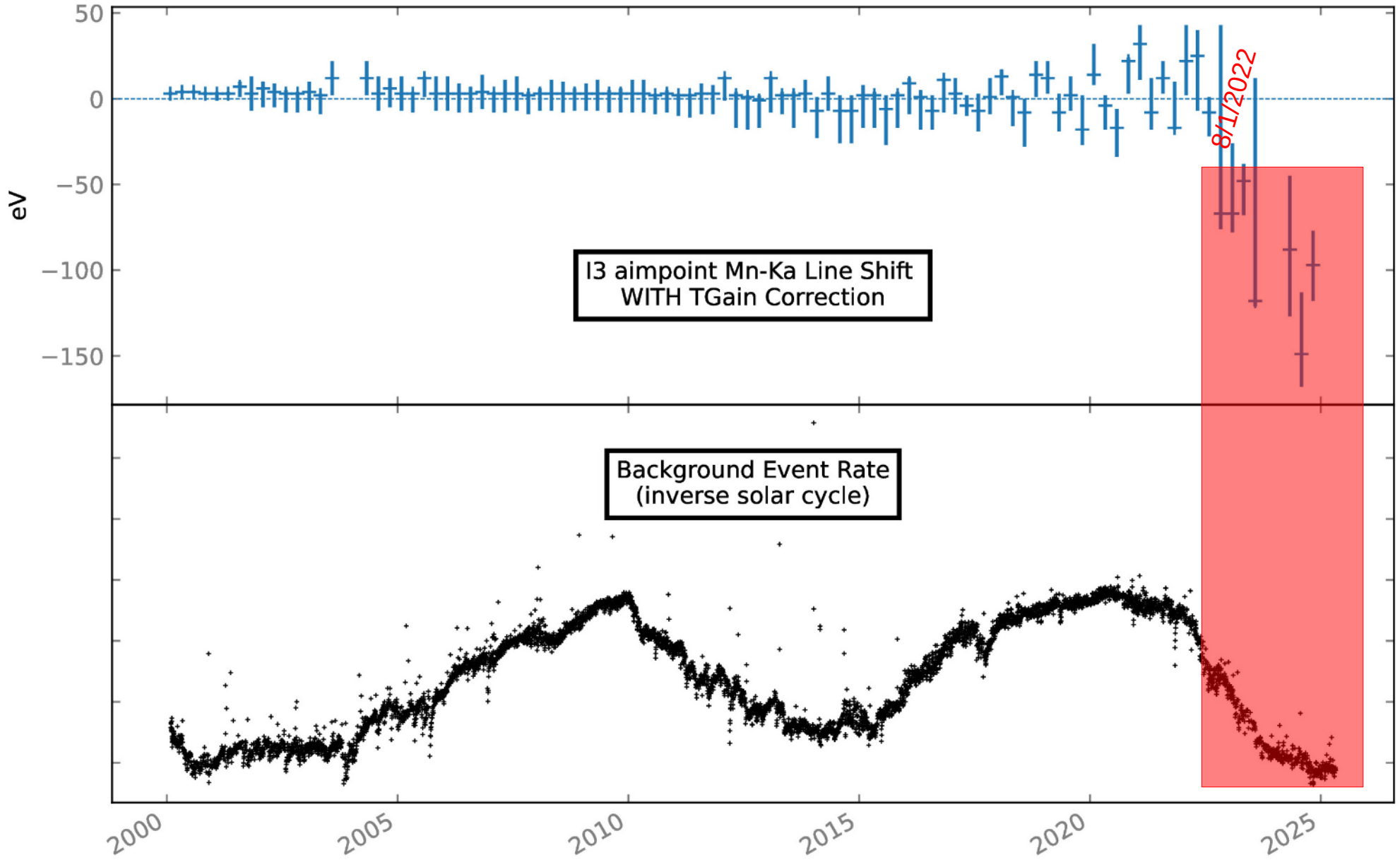
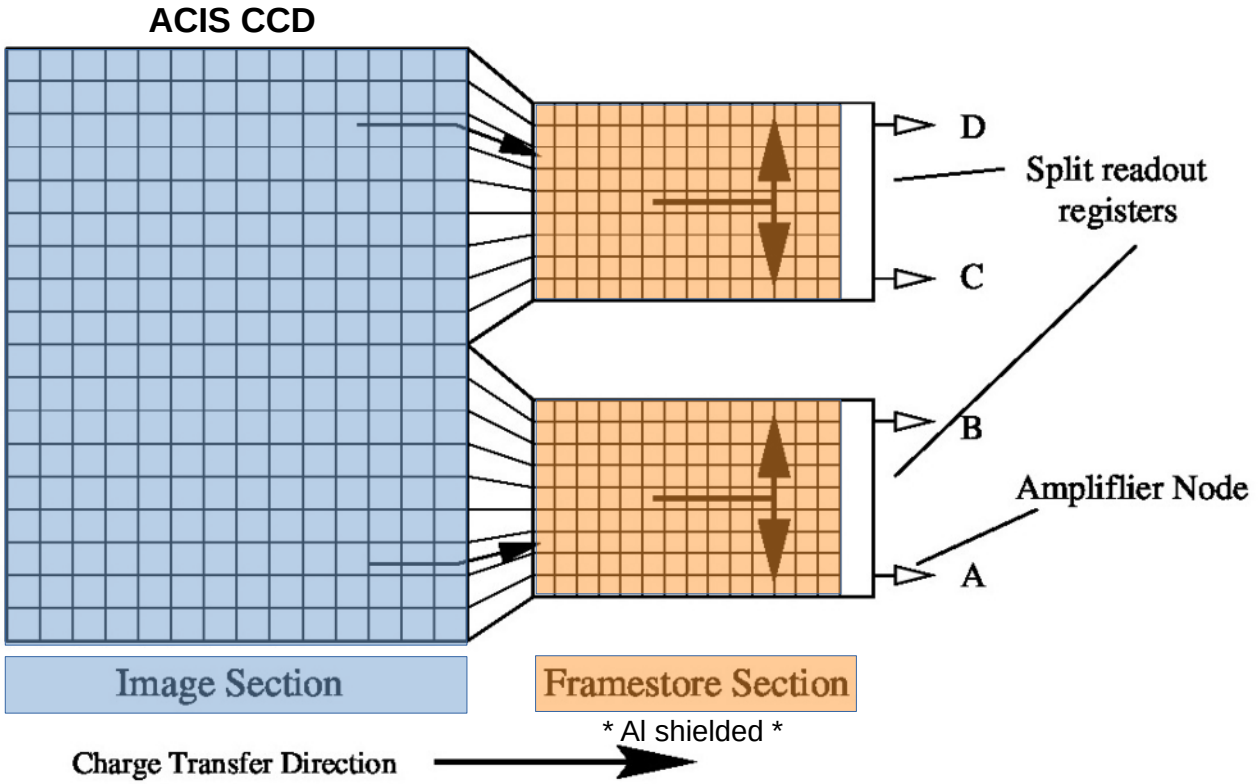
Chandra ACIS Gain During Solar Max

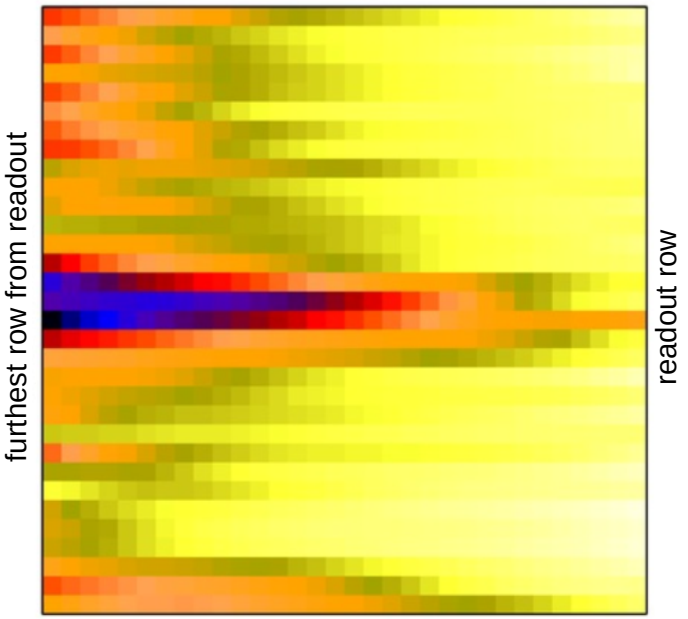


Chandra ACIS Gain During Solar Max



Charge Transfer Inefficiency [CTI]





TGain Correction Map
Typical Front Illuminated CCD Pattern
[darker = more correction]

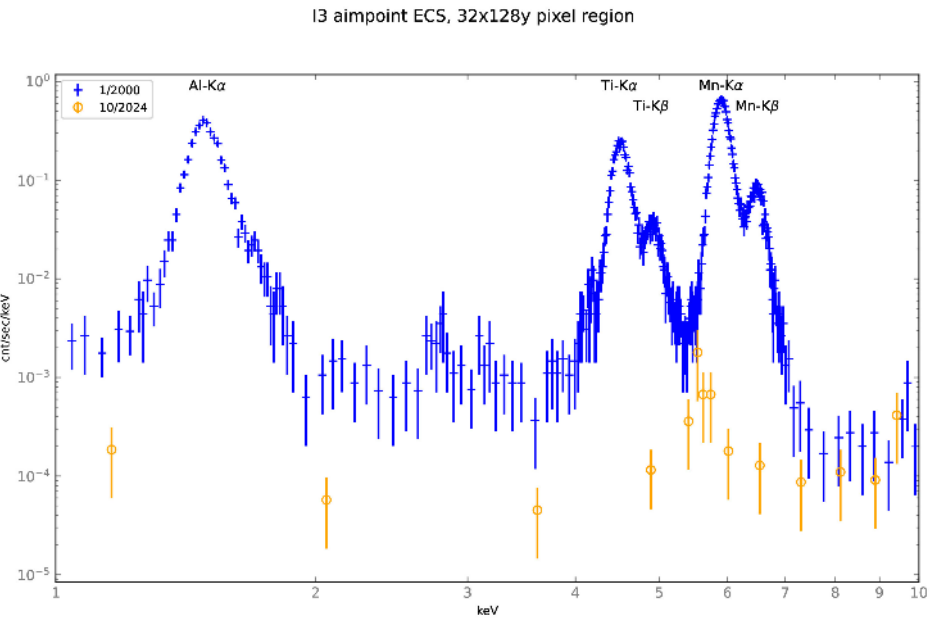
Soft Protons → Imaging Section Damage Creates:
- Charge Traps → Partially reduces charge cloud if packet is transferred before captured charge is re-emitted

Solar Cycle Effect:
- X-ray Sky Background provides “sacrificial charge” to traps
- Solar Max → Reduced sky BKG → less sacrificial charge → photon energy shift LOWER

CTI always increasing with time,
- but Time-Dependent Gain Calibration restores measured photon energy accuracy

If you have a calibration source...

Fe55 External Cal Source [ECS]
2.7 year ½ life



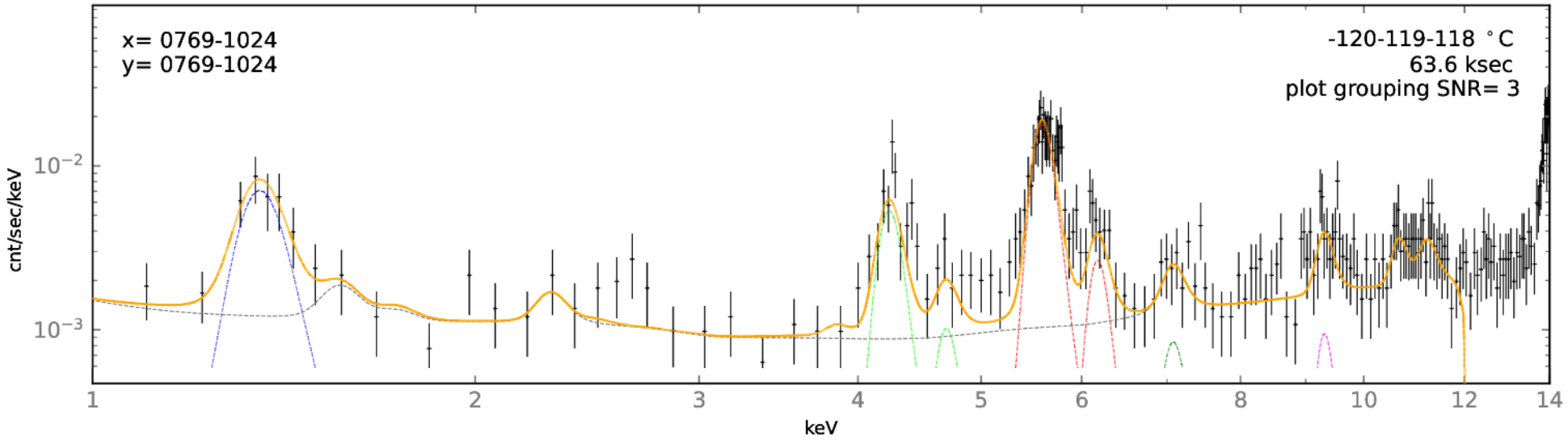
32x128y pixel gain correction no longer possible with ECS

256x256 pixel ECS measurements used to constrain gain shift

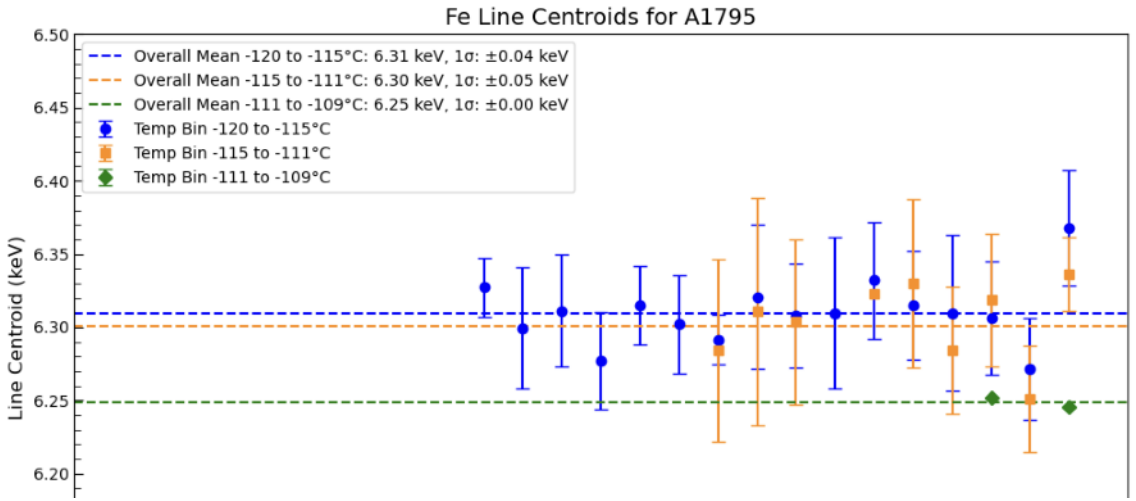
Instrumental lines:

Ni-Kα ~7.5 keV, Au-Lα ~9.7 keV

^ present in ***all*** ACIS Obs



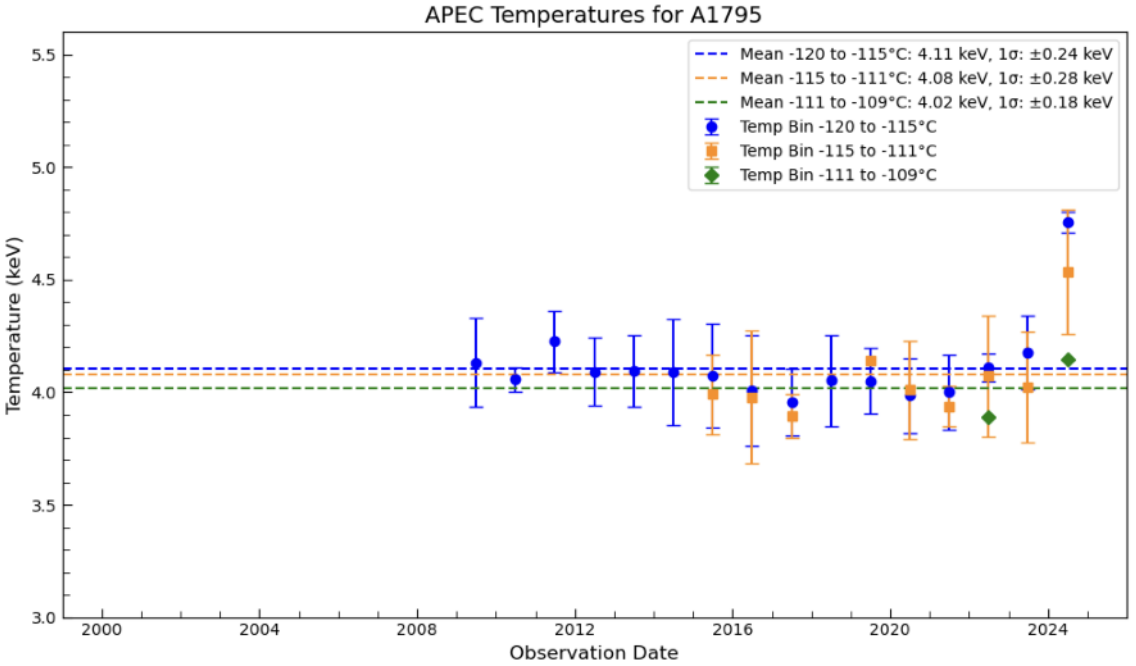
More Calibration Sources

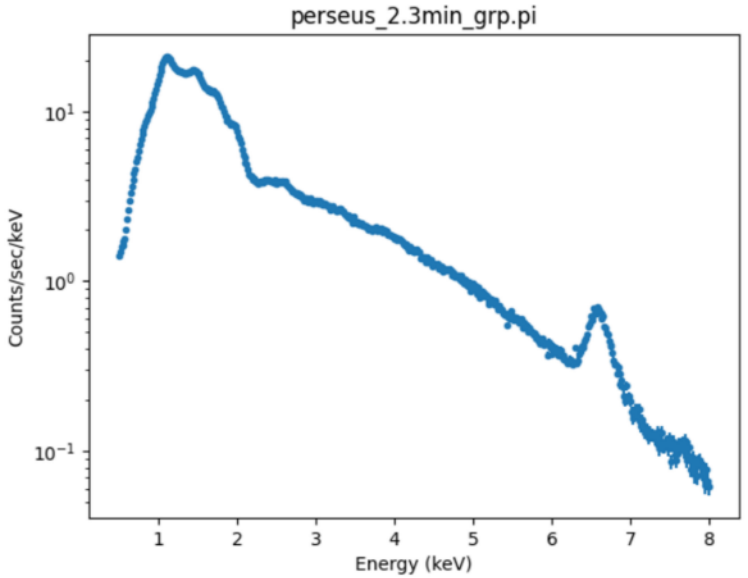


A1795 → Fe-K, 2-7 keV temperature
Perseus → Fe-K
A2029 → 1-4 keV temperature
A2319 → temperature
IRAS 09104+4109 → Fe-K + temperature
G21.5-09 → 1-8 keV continuum

Instrumental Ni-Kα, Au-Lα

...Cas A → Si, S, Ar, Ca, Fe + continuum



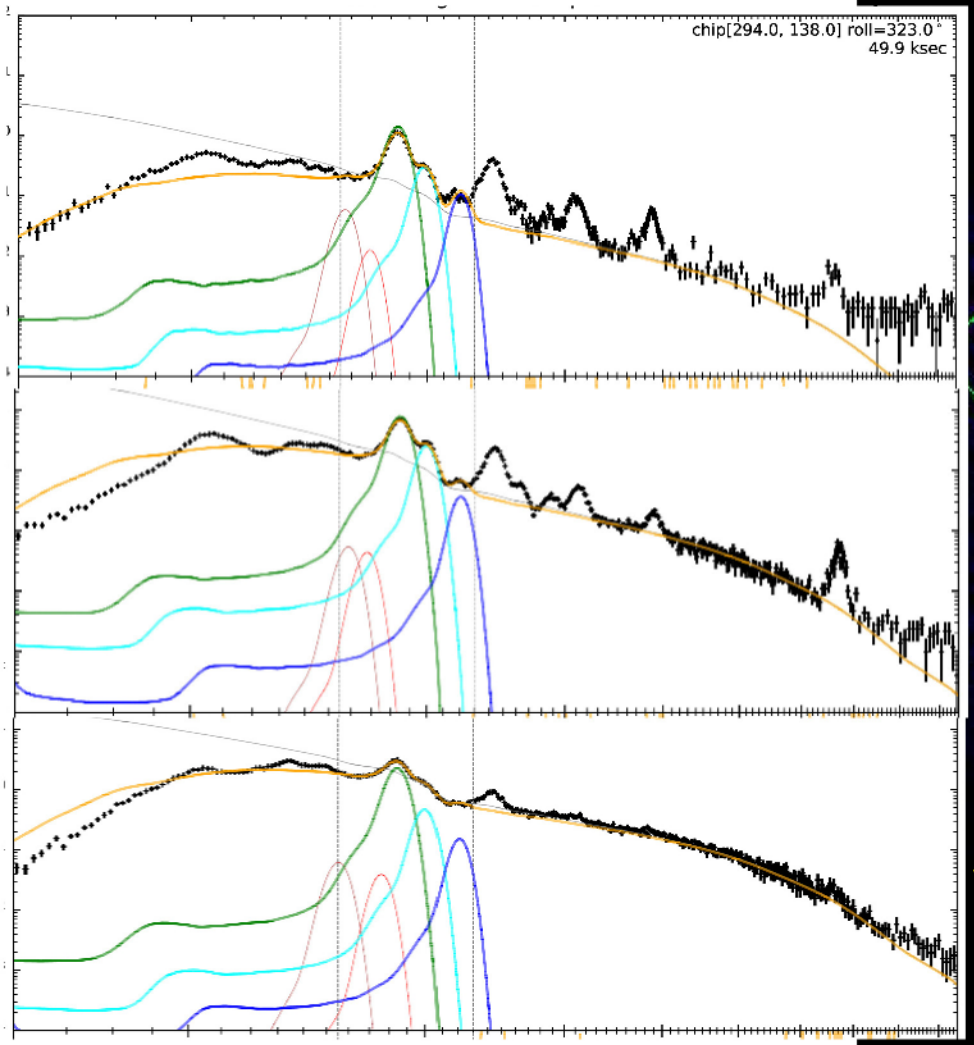


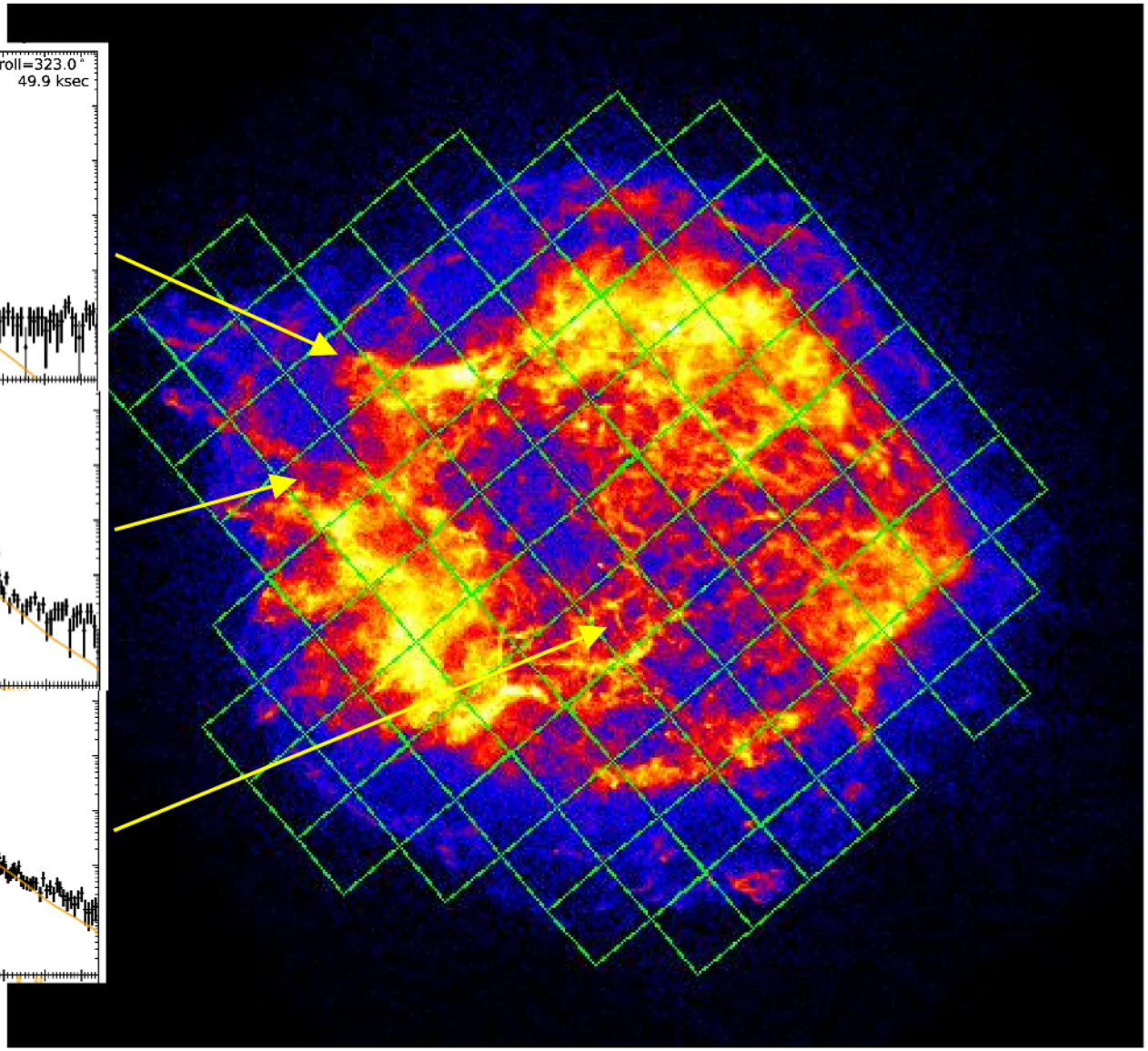
ACIS Cas A “Little” Model(s) ~ 1.5-2.3keV

64x64 pixels (~32x32 arcsec) x101 regions

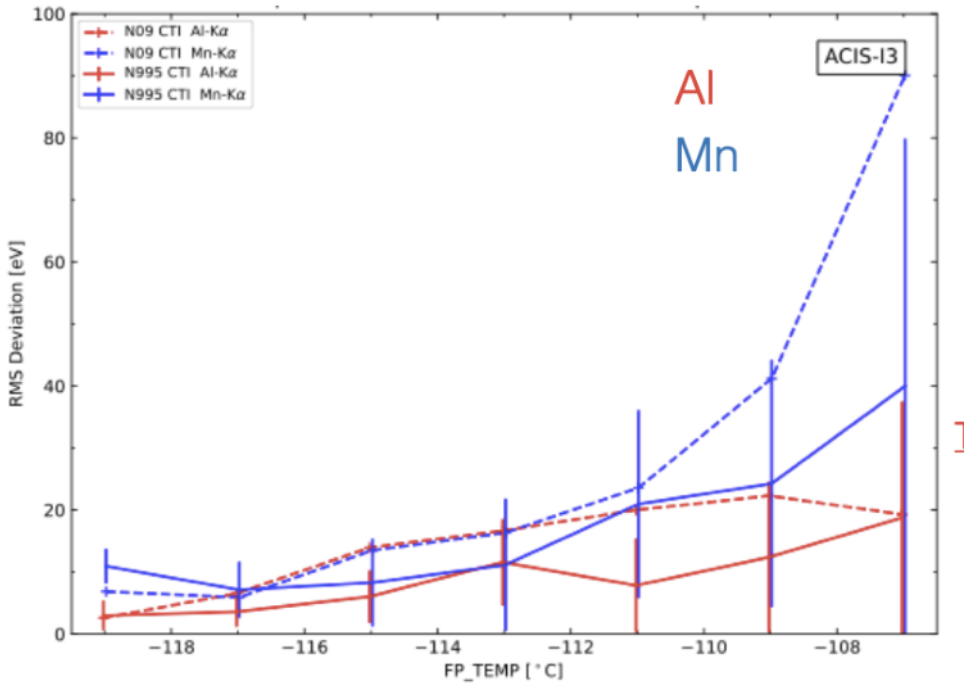
tbabs * (powlaw + 5 gaussians)

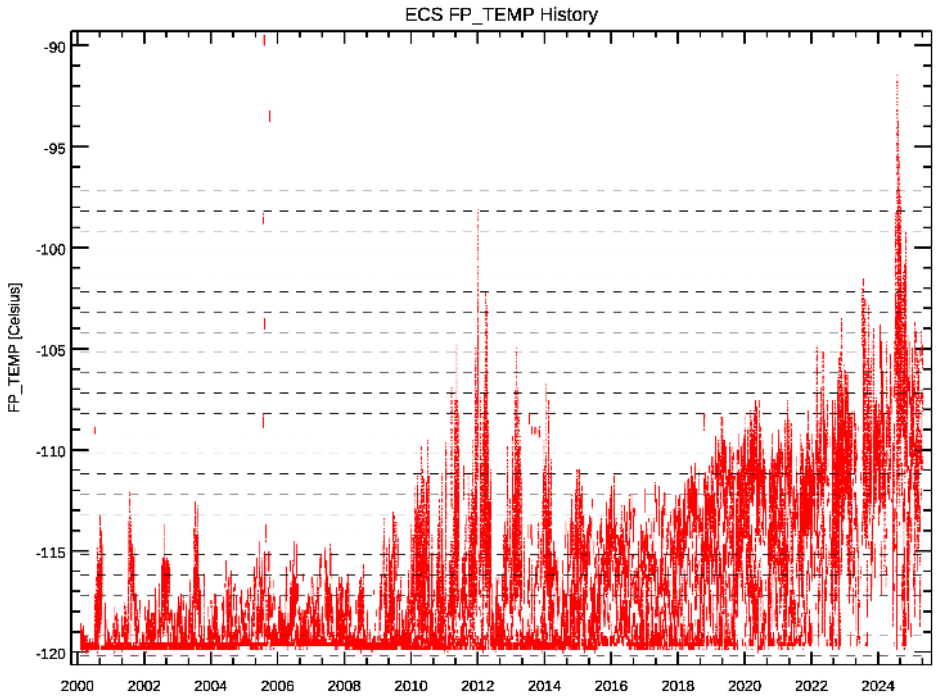
Preliminary

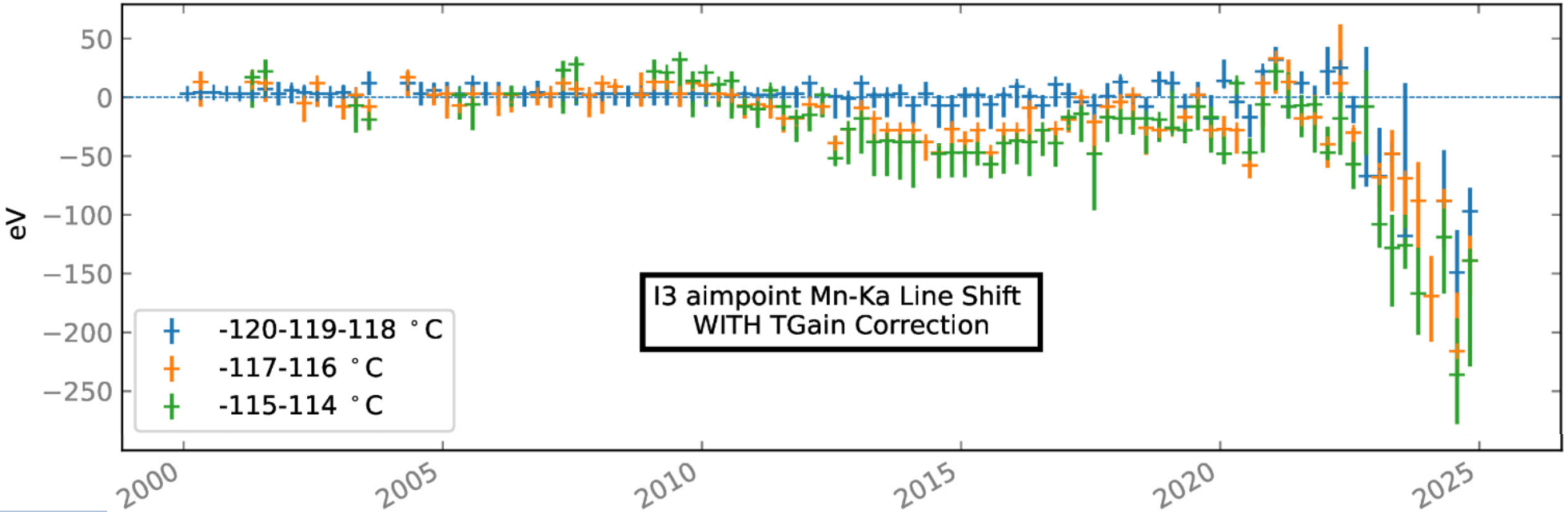




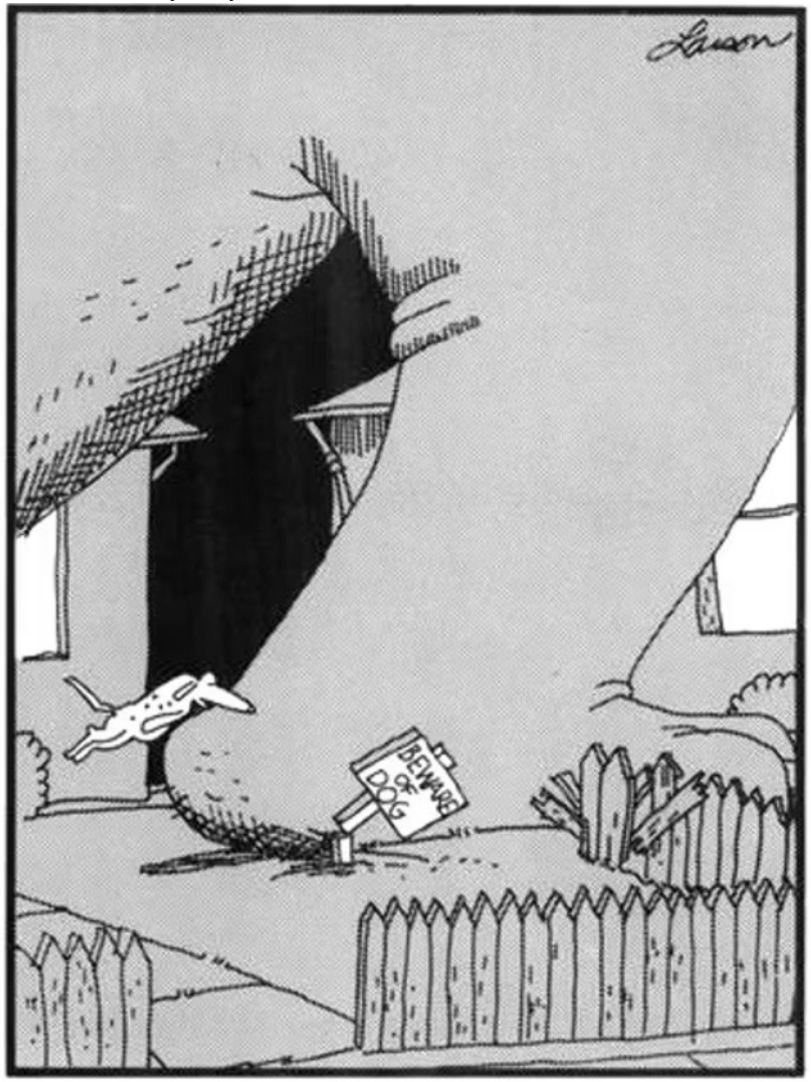
Focal Plane Temperature Component







The Far Side by Gary Larson



~~Toby vs. Godzilla~~

Cal vs. CTI

→ Gain updates **imminent** for 2021+ data

→ Warm Focal Plane temperature gain updates coming after

→ Further improvements to <2021 gain in the future