

Chandra ACIS Background Nonuniformity

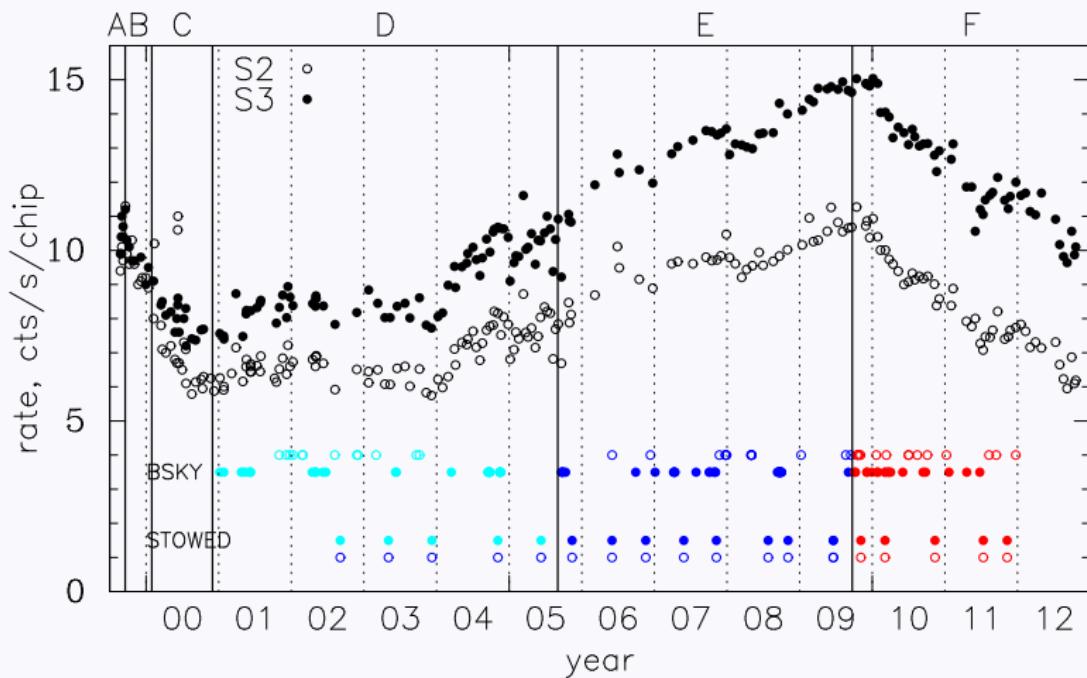
Terry Gaetz

Chandra X-ray Center/Smithsonian Astrophysical Observatory

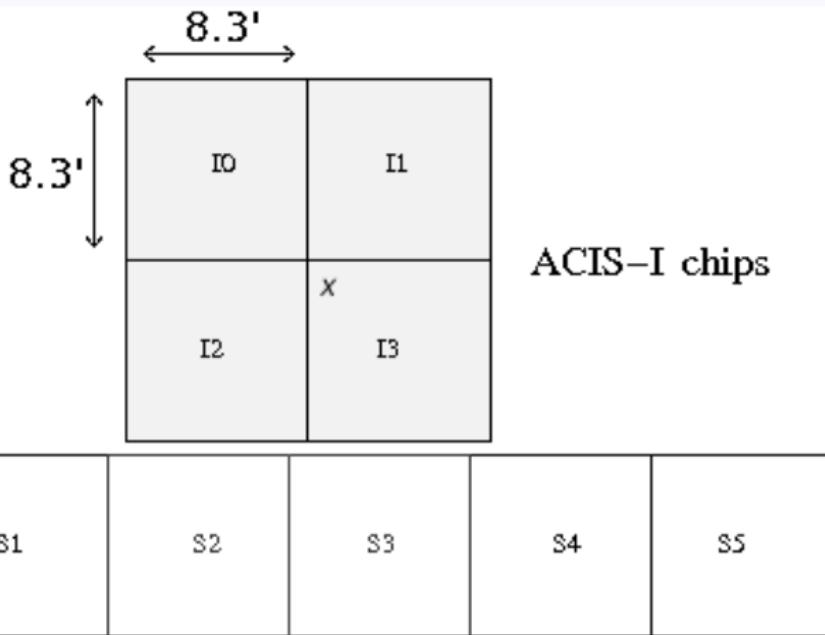
IACHEC 2014

Introduction

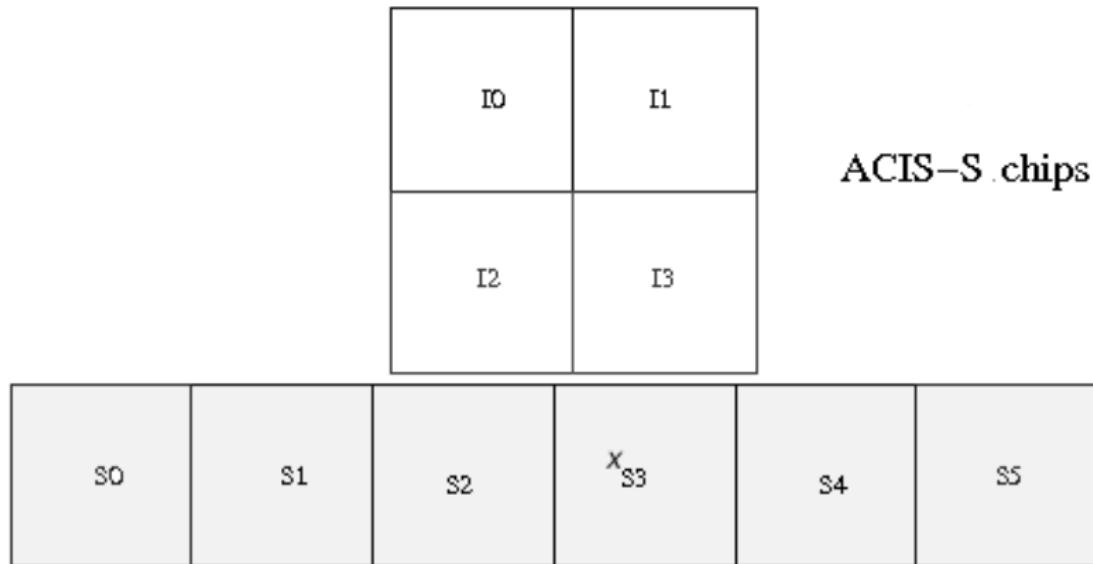
ACIS Background Rates & Observations



ACIS Focal Plane Layout



ACIS Focal Plane Layout

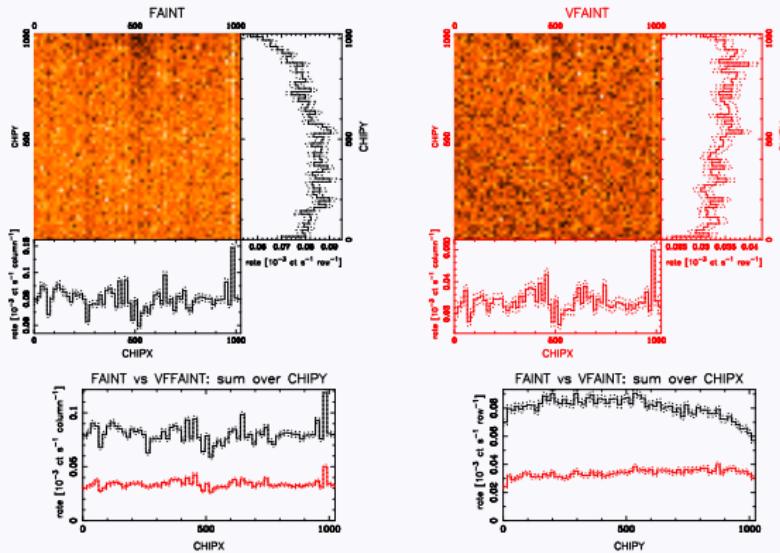


Background Spatial Variation (ACIS “stowed”)

FI Chips – example I3

I0+I2+I3 Background Spatial Variation: 0.3-0.7 keV

ACIS-I023: 0.300–0.700 keV: 2002–09 – 2011–11

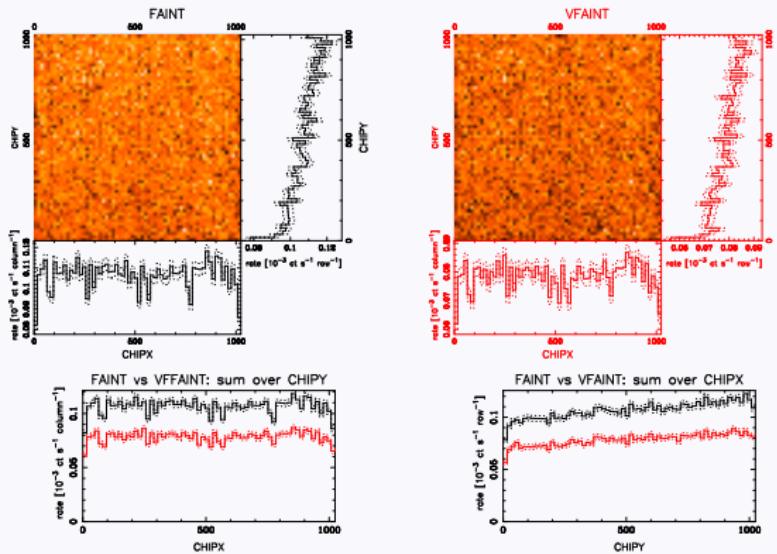


Background Spatial Variation (ACIS “stowed”)

FI Chips – example I3

I0+I2+I3 Background Spatial Variation: 1.0-2.0 keV

ACIS-I023: 1.000–2.000 keV: 2002–09 – 2011–11

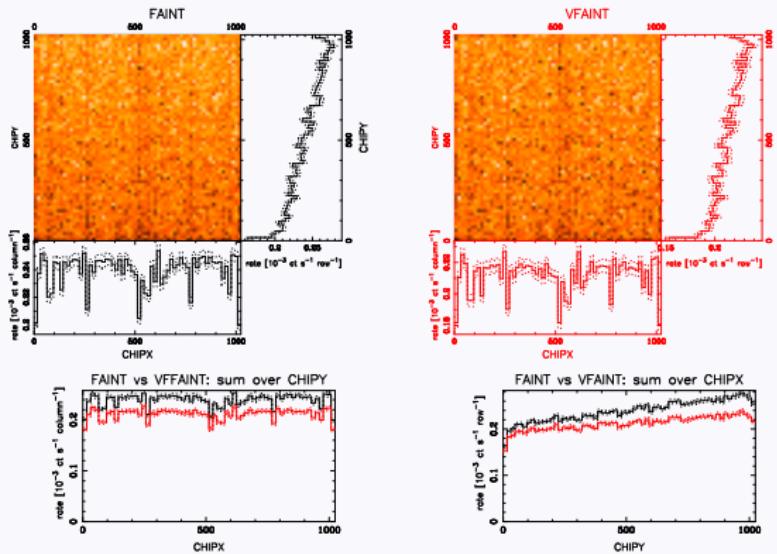


Background Spatial Variation (ACIS “stowed”)

FI Chips – example I3

I0+I2+I3 Background Spatial Variation: **2.0-5.0 keV**

ACIS-I023: 2.000–5.000 keV: 2002–09 – 2011–11

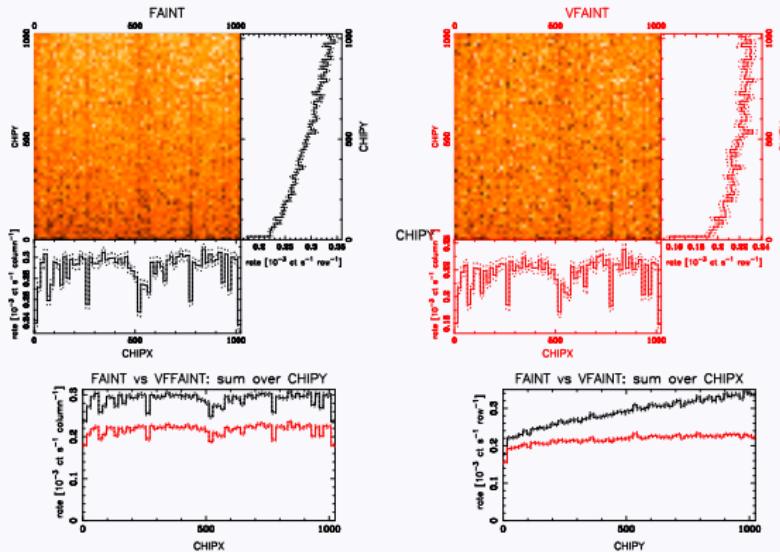


Background Spatial Variation (ACIS “stowed”)

FI Chips – example I3

I0+I2+I3 Background Spatial Variation: 5.0-8.0 keV

ACIS-I023: 5.000–8.000 keV: 2002–09 – 2011–11

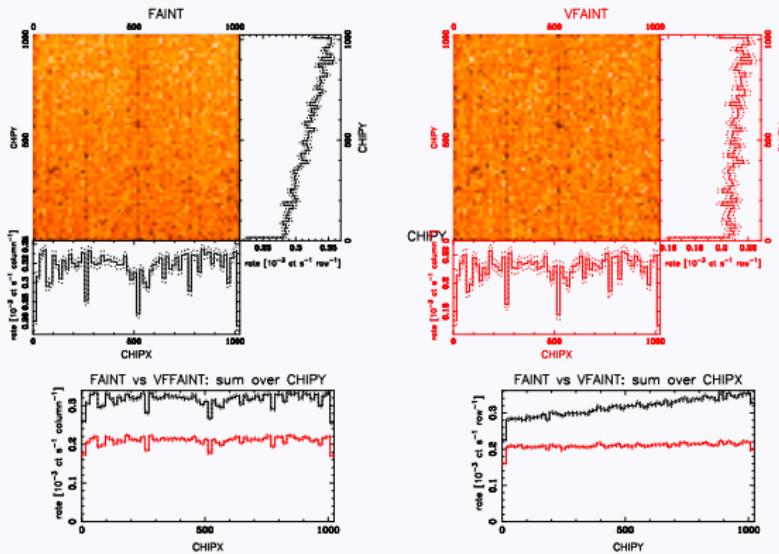


Background Spatial Variation (ACIS “stowed”)

FI Chips – example I3

I0+I2+I3 Background Spatial Variation: 8.0-10.0 keV

ACIS-I023: 8.000–10.000 keV: 2002–09 – 2011–11

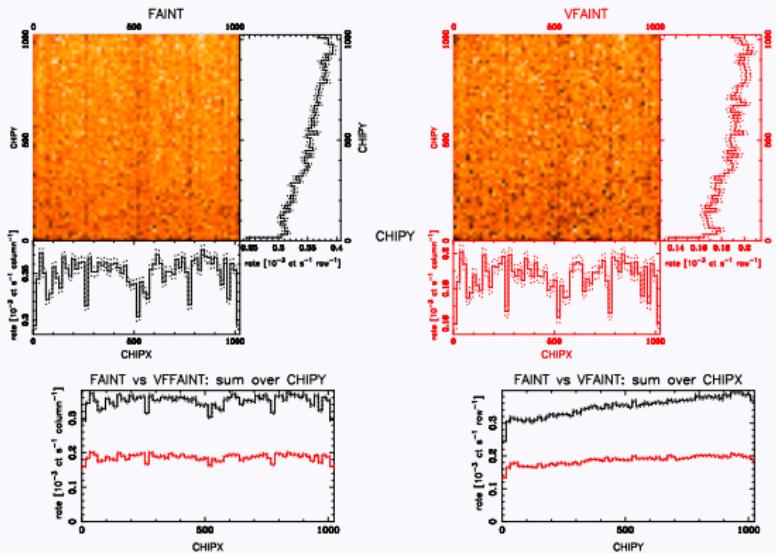


Background Spatial Variation (ACIS “stowed”)

FI Chips – example I3

I0+I2+I3 Background Spatial Variation: **10.0-12.0 keV**

ACIS-I023: 10.000–12.000 keV: 2002–09 – 2011–11

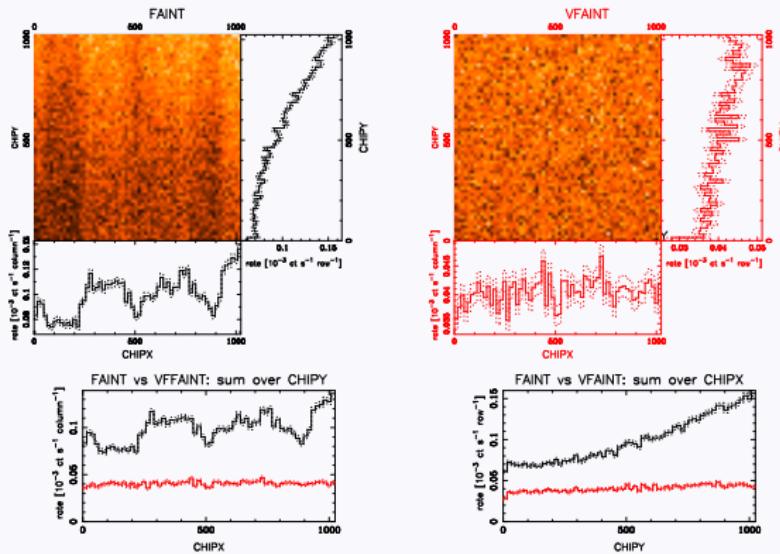


Background Spatial Variation (ACIS “stowed”)

BI Chip – S3

S3 Background Spatial Variation: 0.3–0.7 keV

ACIS-S3: 0.300–0.700 keV: 2002–09 – 2011–11

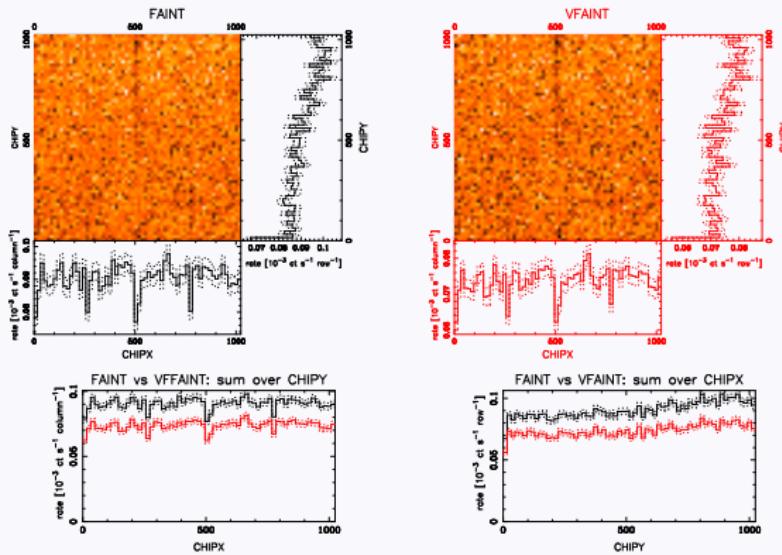


Background Spatial Variation (ACIS “stowed”)

BI Chip – S3

S3 Background Spatial Variation: 1.0-2.0 keV

ACIS-S3: 1.000–2.000 keV: 2002–09 – 2011–11

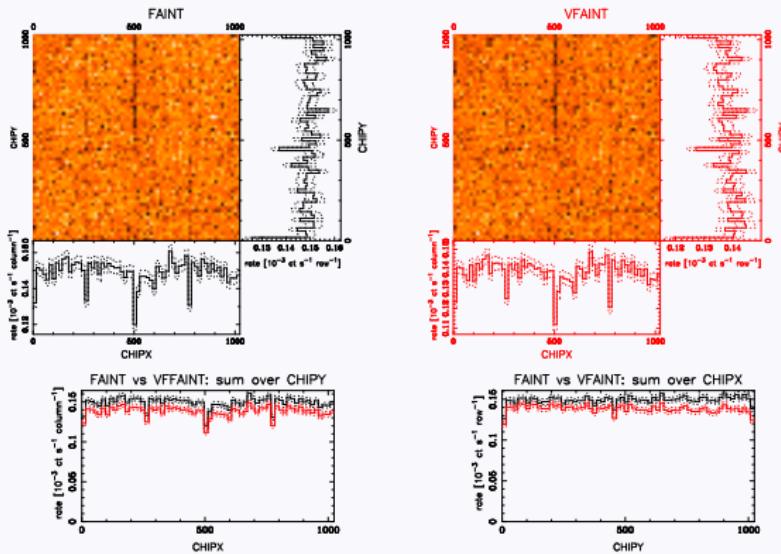


Background Spatial Variation (ACIS “stowed”)

BI Chip – S3

S3 Background Spatial Variation: 2.0-5.0 keV

ACIS-S3: 2.000–5.000 keV: 2002–09 – 2011–11

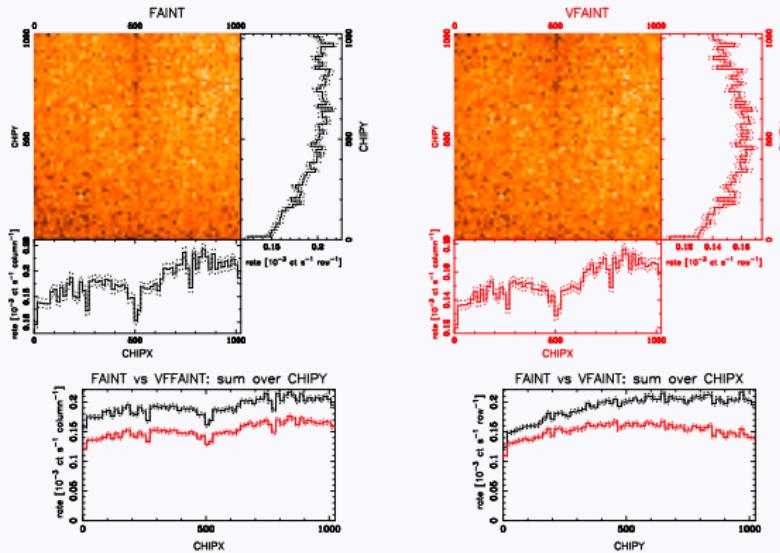


Background Spatial Variation (ACIS “stowed”)

BI Chip – S3

S3 Background Spatial Variation: 5.0–8.0 keV

ACIS-S3: 5.000–8.000 keV: 2002–09 – 2011–11

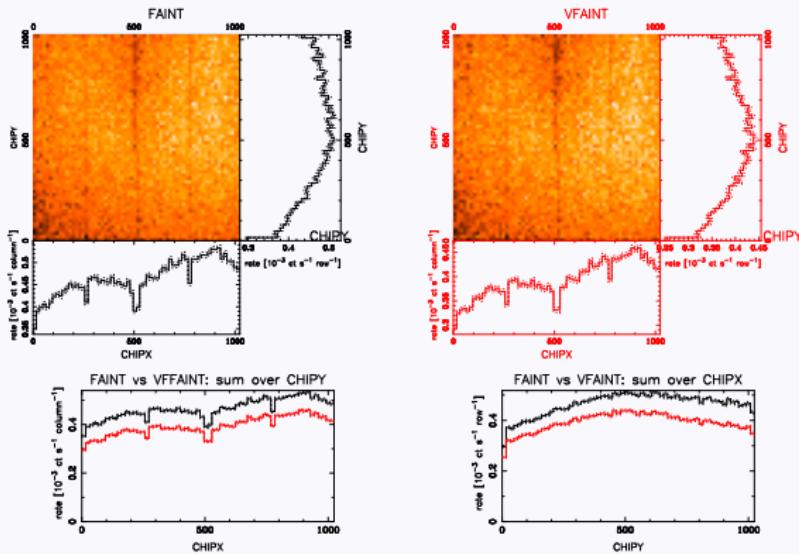


Background Spatial Variation (ACIS “stowed”)

BI Chip – S3

S3 Background Spatial Variation: 8.0–10.0 keV

ACIS-S3: 8.000–10.000 keV: 2002–09 – 2011–11

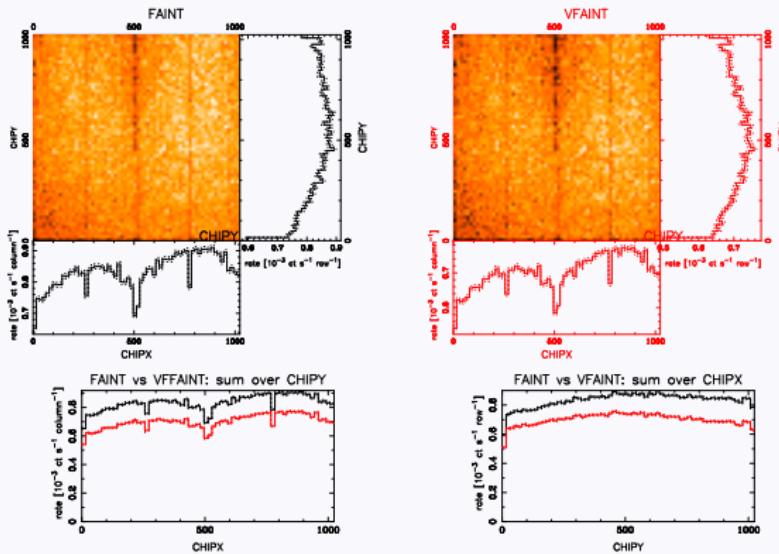


Background Spatial Variation (ACIS “stowed”)

BI Chip – S3

S3 Background Spatial Variation: 10.0–12.0 keV

ACIS–S3: 10.000–12.000 keV: 2002–09 – 2011–11

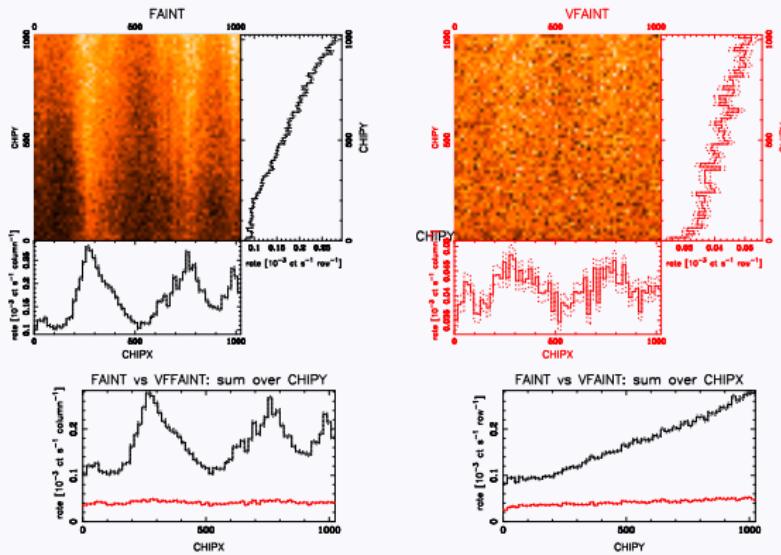


Background Spatial Variation (ACIS “stowed”)

BI Chip – S1

S1 Background Spatial Variation: 0.3–0.7 keV

ACIS-S1: 0.300–0.700 keV: 2002–09 – 2011–11

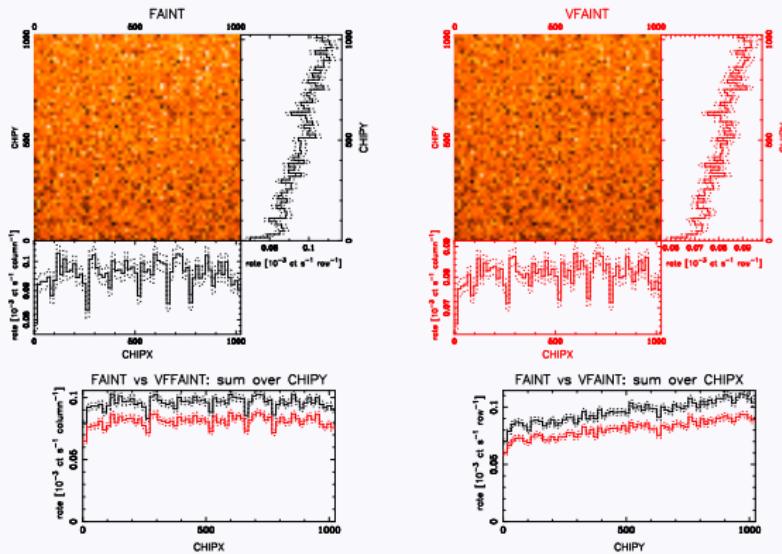


Background Spatial Variation (ACIS “stowed”)

BI Chip – S1

S1 Background Spatial Variation: 1.0-2.0 keV

ACIS-S1: 1.000–2.000 keV: 2002–09 – 2011–11

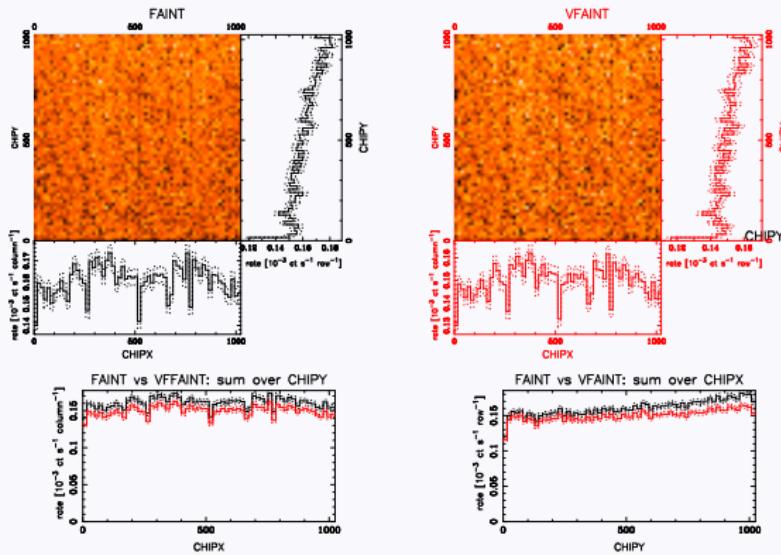


Background Spatial Variation (ACIS “stowed”)

BI Chip – S1

S1 Background Spatial Variation: 2.0-5.0 keV

ACIS-S1: 2.000–5.000 keV: 2002–09 – 2011–11

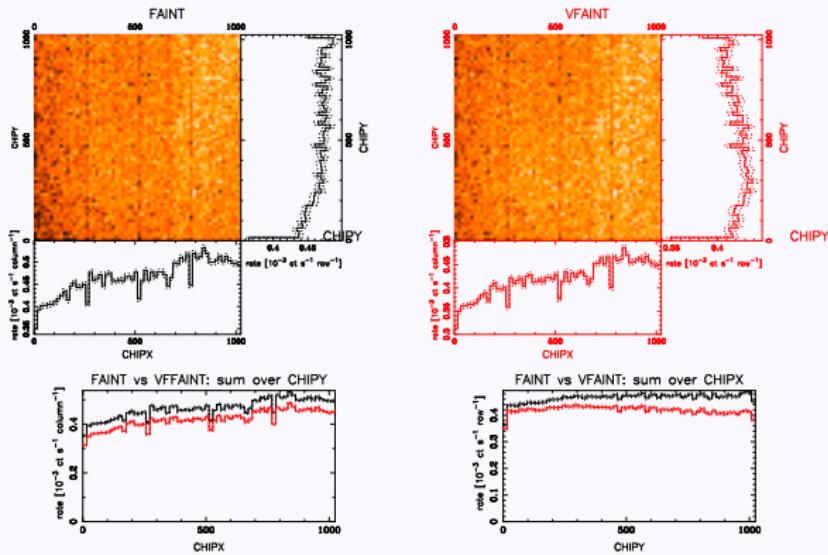


Background Spatial Variation (ACIS “stowed”)

BI Chip – S1

S1 Background Spatial Variation: 5.0–8.0 keV

ACIS-S1: 5.000–8.000 keV: 2002–09 – 2011–11

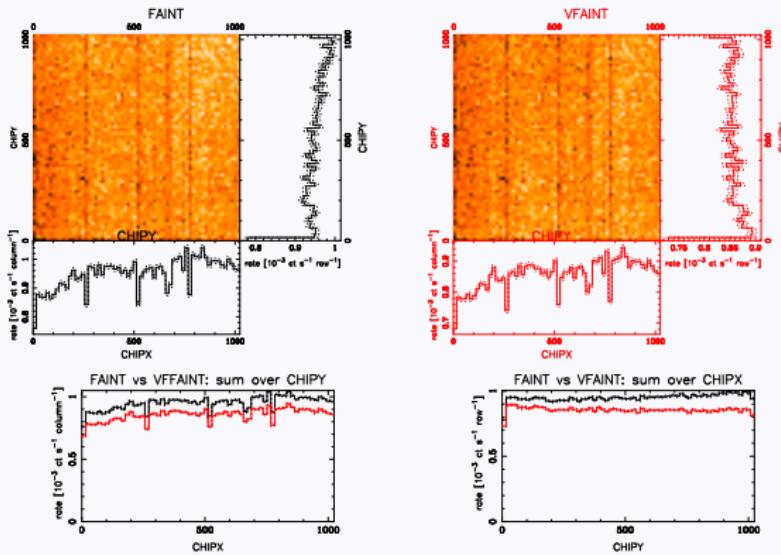


Background Spatial Variation (ACIS “stowed”)

BI Chip – S1

S1 Background Spatial Variation: 8.0–10.0 keV

ACIS-S1: 8.000–10.000 keV: 2002–09 – 2011–11

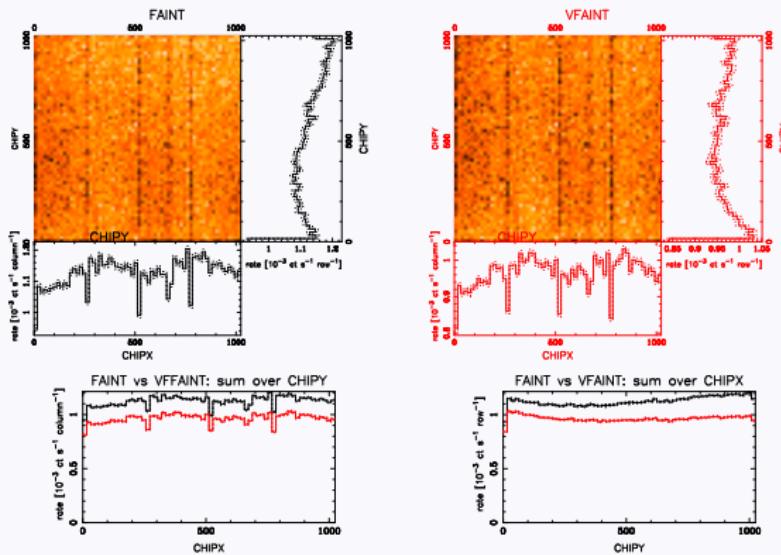


Background Spatial Variation (ACIS “stowed”)

BI Chip – S1

S1 Background Spatial Variation: 10.0–12.0 keV

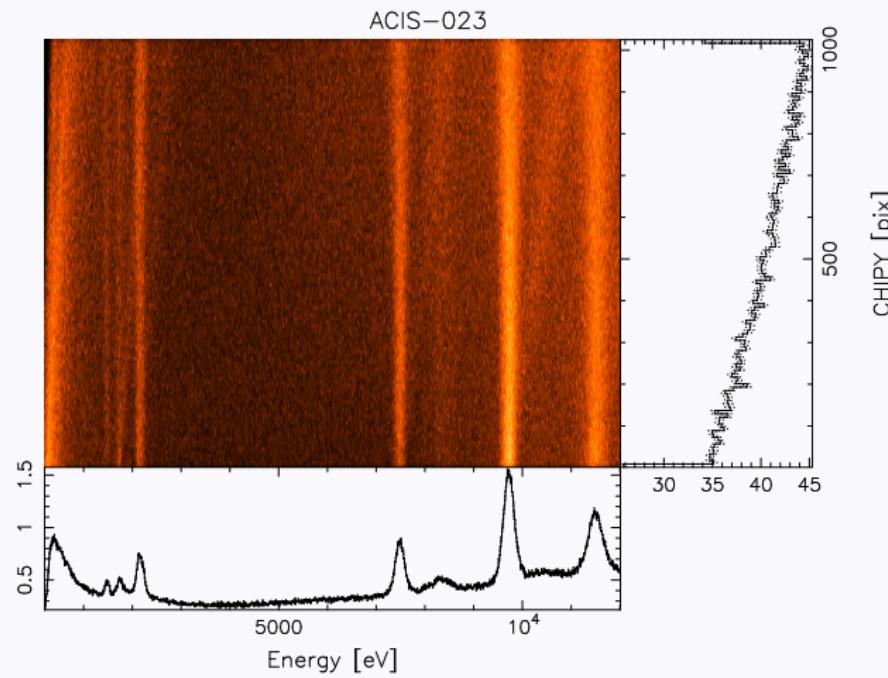
ACIS-S1: 10.000–12.000 keV: 2002–09 – 2011–11



Background Spatial/Spectral Variation (ACIS “stowed”)

FI Chips – I0, I2, I3

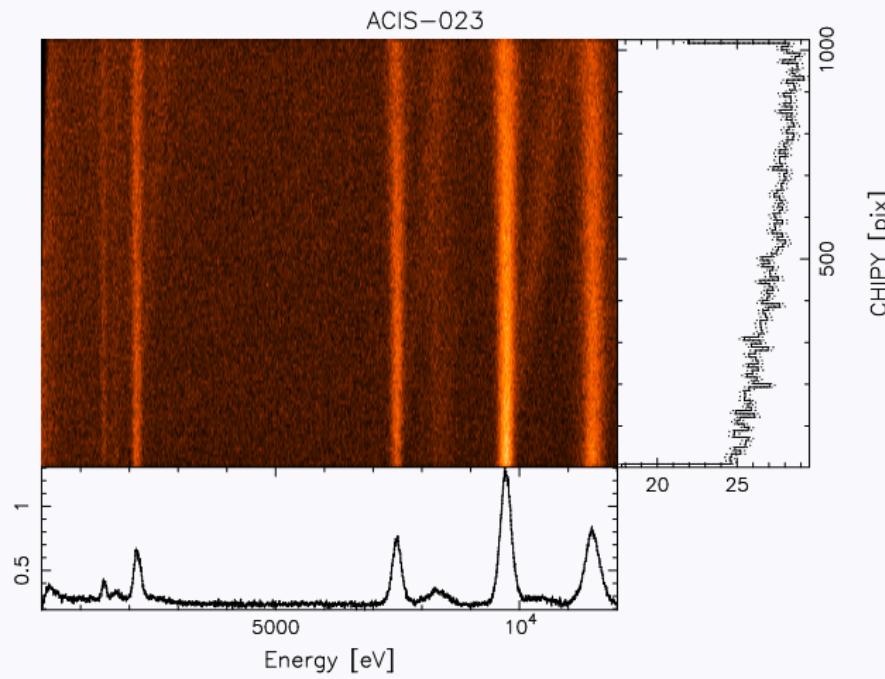
ACIS-I023 Background Spectrum: chipy Variation (no VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

FI Chips – I0, I2, I3

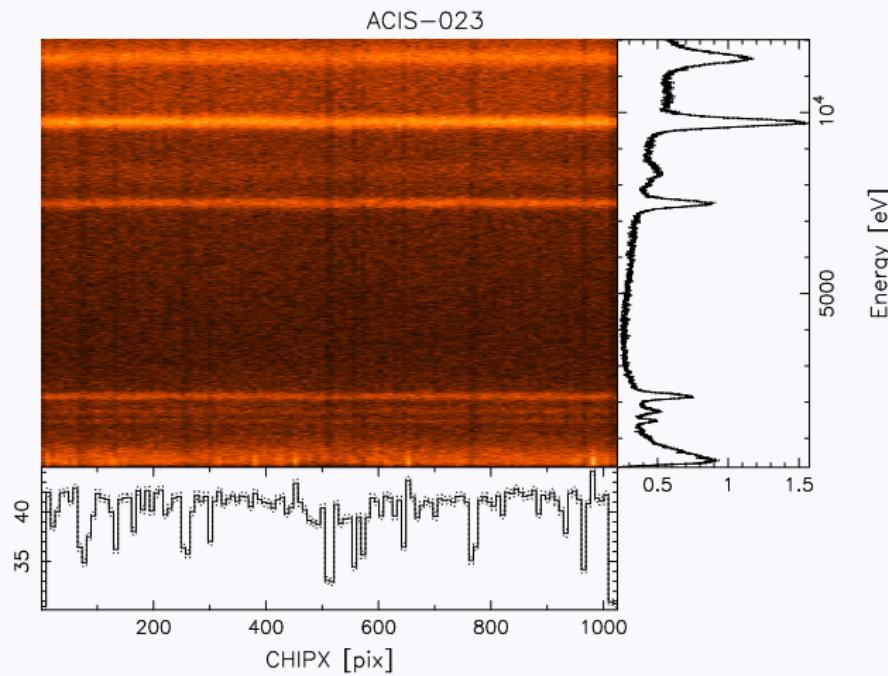
ACIS-I023 Background Spectrum: chipy Variation (with VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

FI Chips – I0, I2, I3

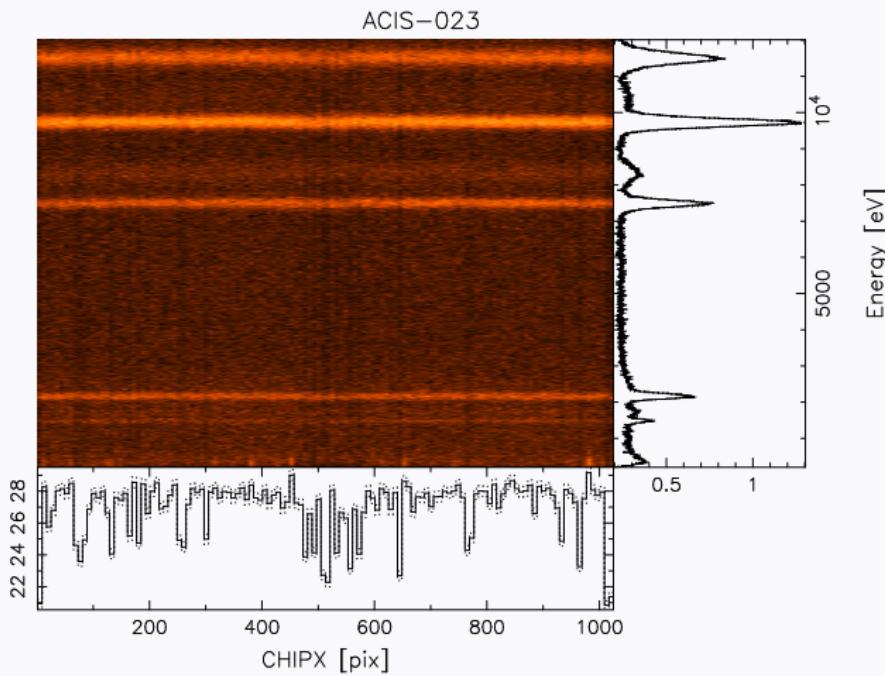
ACIS-I023: chipx Variation (no VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

FI Chips – I0, I2, I3

ACIS-I023: chipx Variation (with VF cleaning)



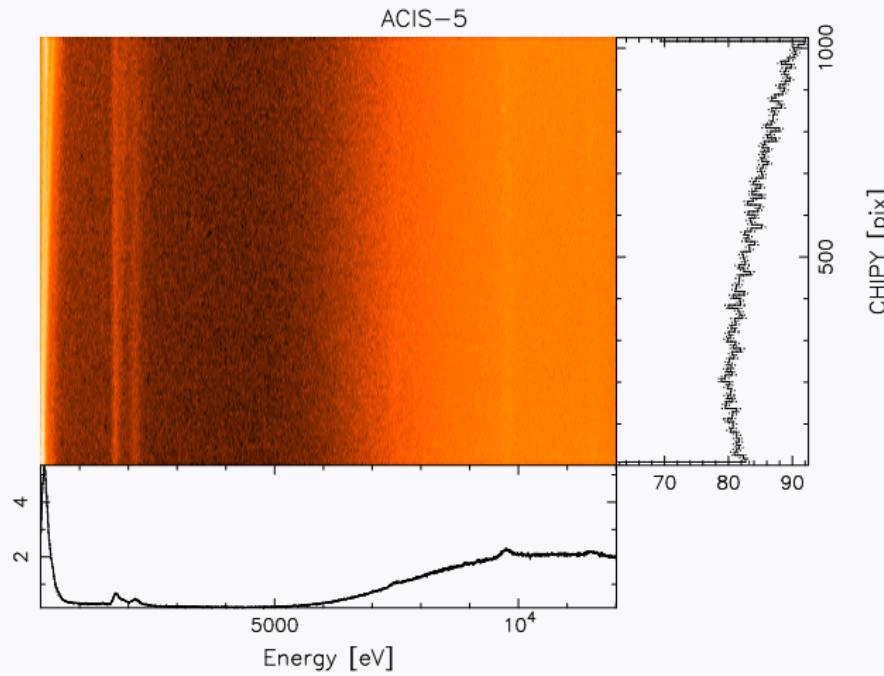
Spatial/Spectral Model

- Bartalucci *et al.* 2014 (arXiv:1404.3587v1)
 - analytic model for ACIS-I chips; 0.3-11 keV band
 - VFAINT mode only; based on Phase D+E ACIS “stowed” backgrounds
 - includes “position independent” and “position dependent” lines
 - “position dependent”: lines with "frame store" counterparts
- Additional coverage needed:
 - extend to remaining chips: S3, S2, (maybe not S1)
 - VFAINT mode only; extend to FAINT mode
 - treat 11.6 keV line
 - extend to complete data set (add in Phase F)

Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chip – S1

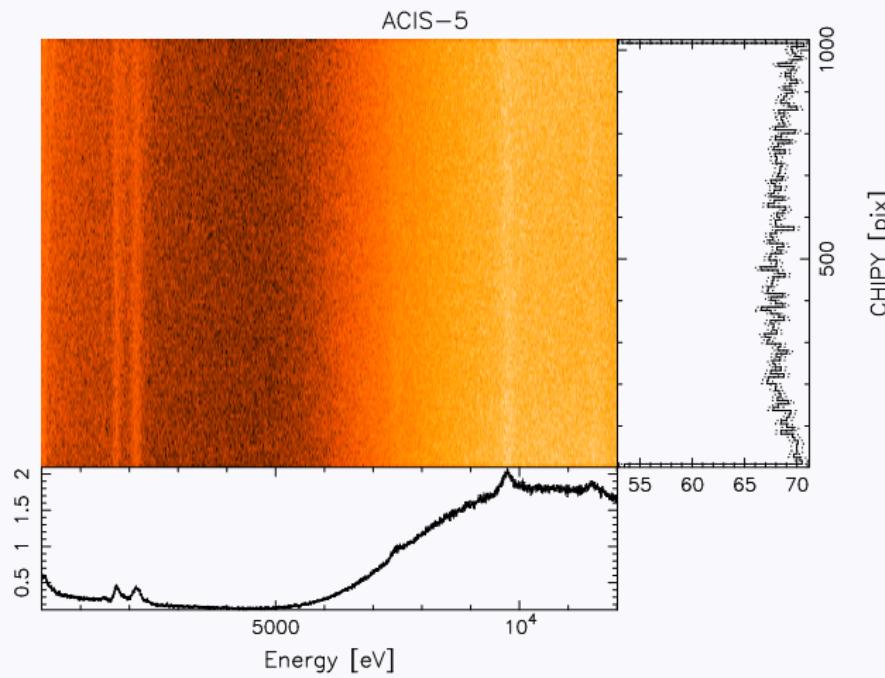
ACIS-S1: chipy Variation (no VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chip – S1

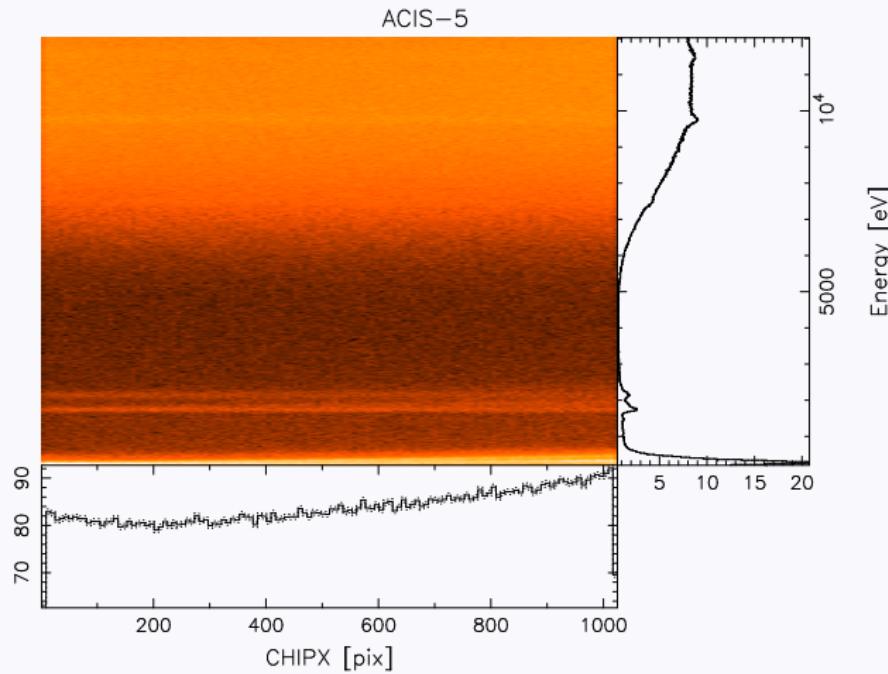
ACIS-S1: chipy Variation (with VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chips – S1

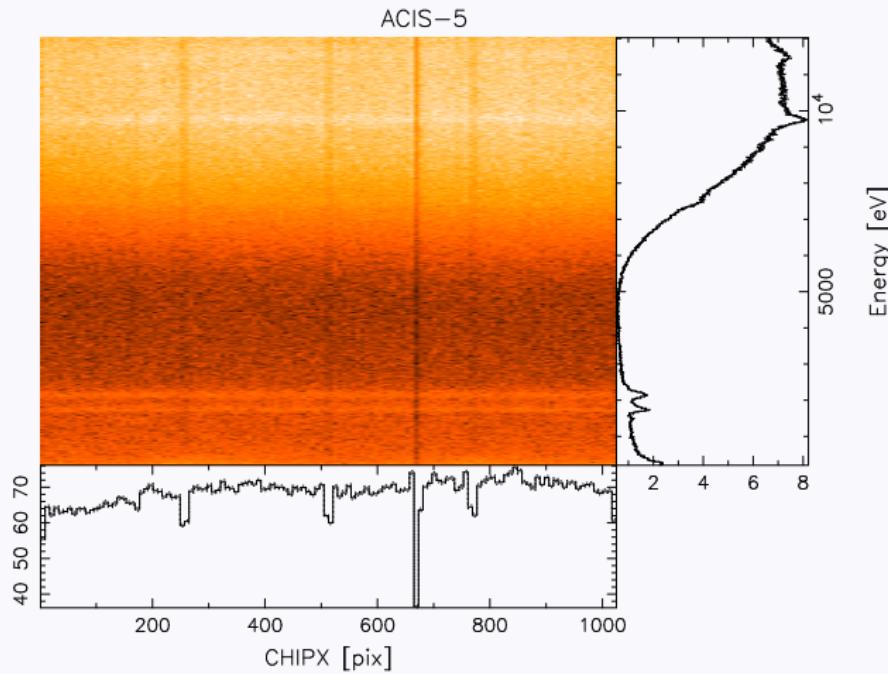
ACIS-S1: chipx Variation (no VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chips – S1

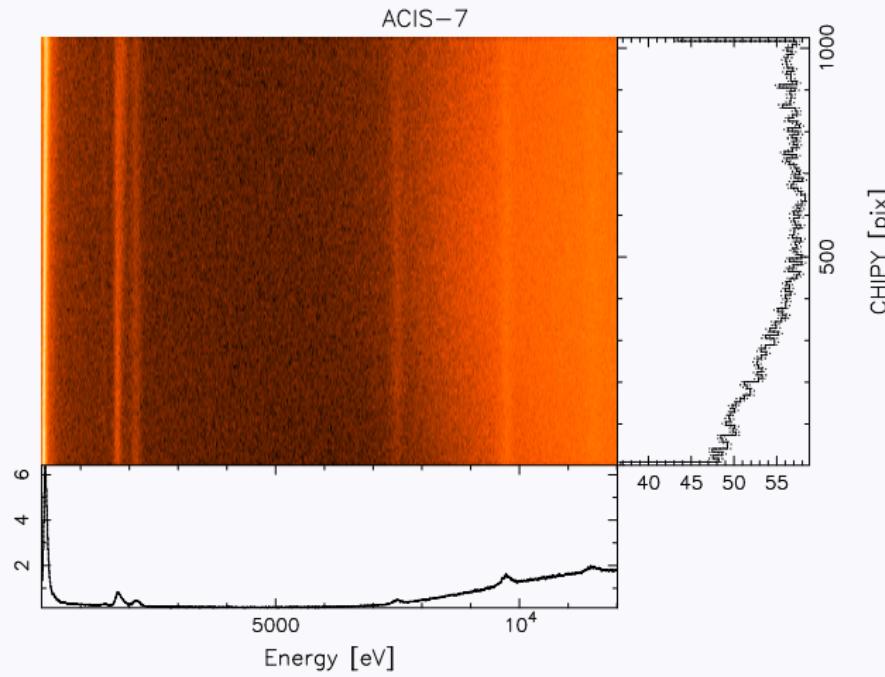
ACIS-S1: chipx Variation (with VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chip – S3

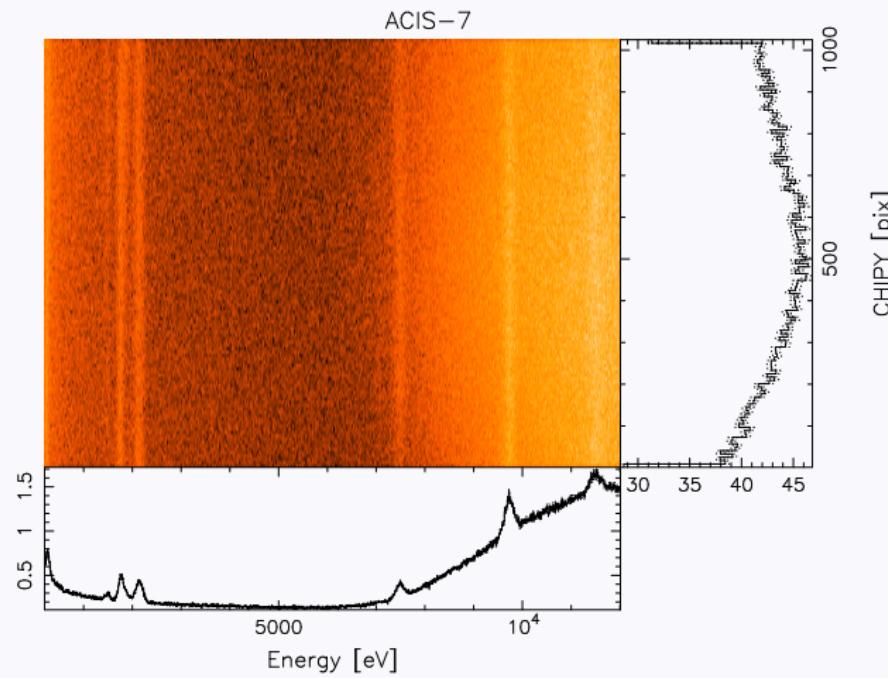
ACIS-S3: chipy Variation (no VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chip – S3

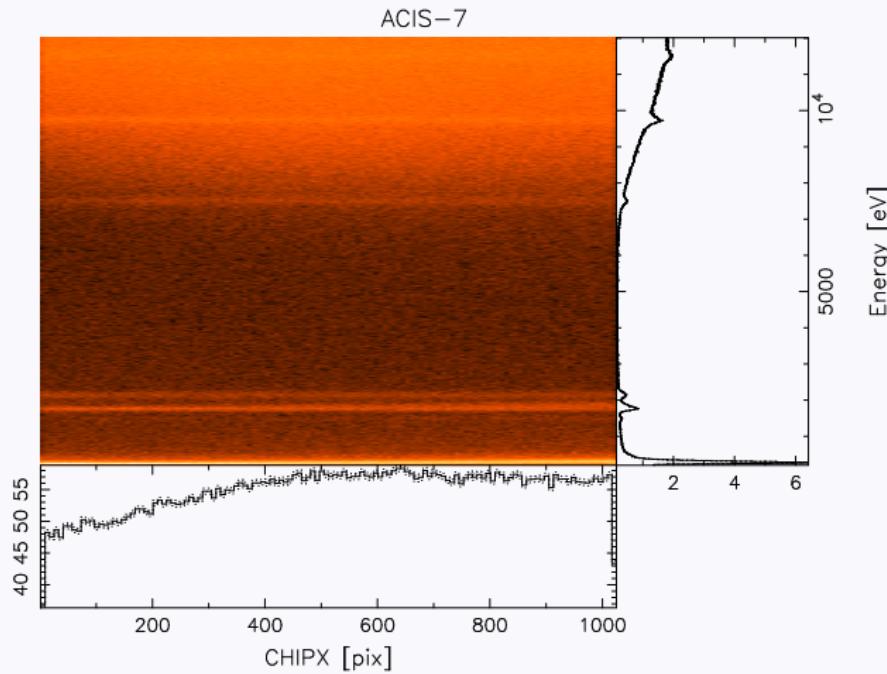
ACIS-S3: chipy Variation (with VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chips – S3

ACIS-S3: chip_x Variation (no VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chips – S3

ACIS-S3: chip_x Variation (with VF cleaning)

