Chandra ACIS Background Nonuniformity

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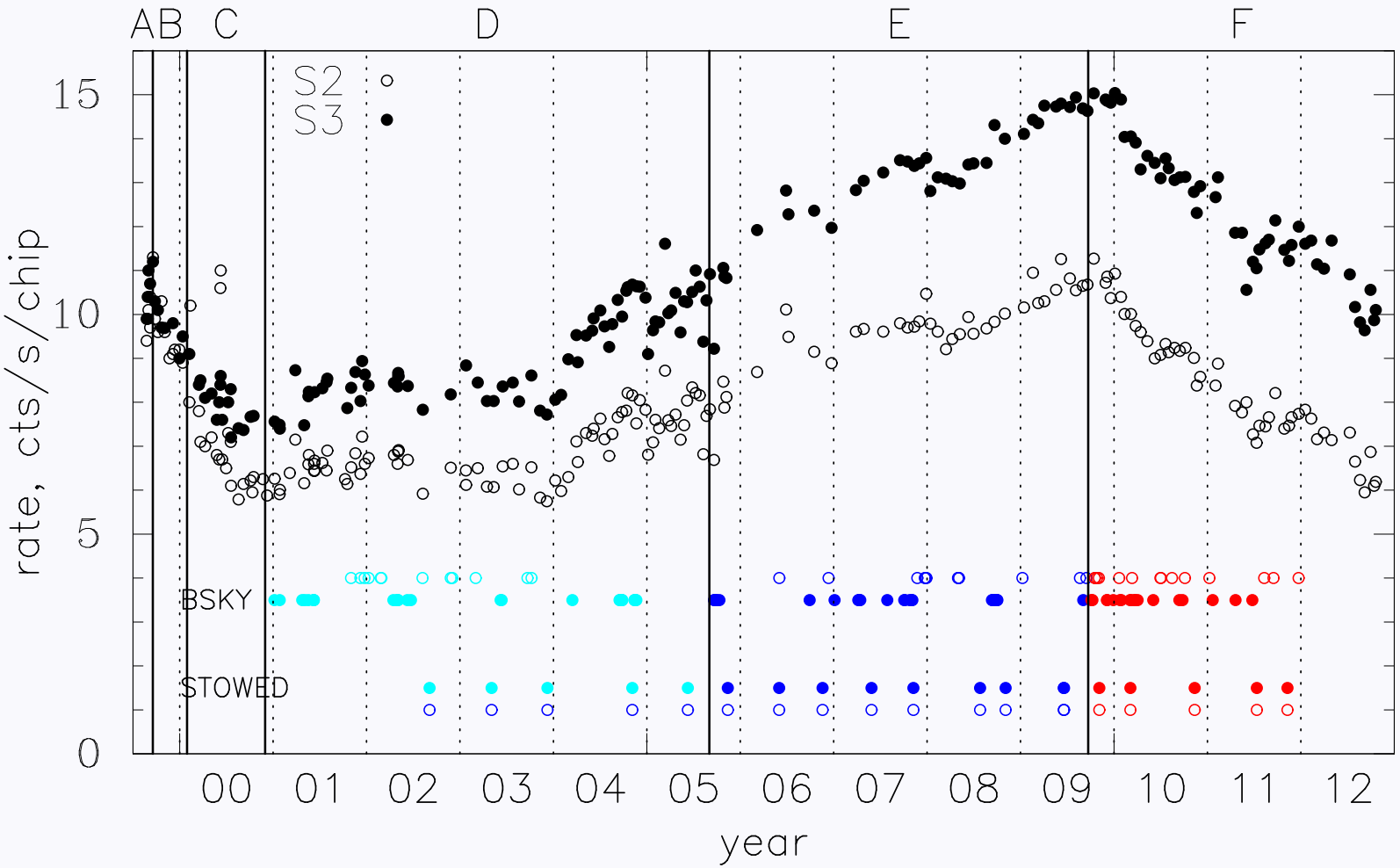
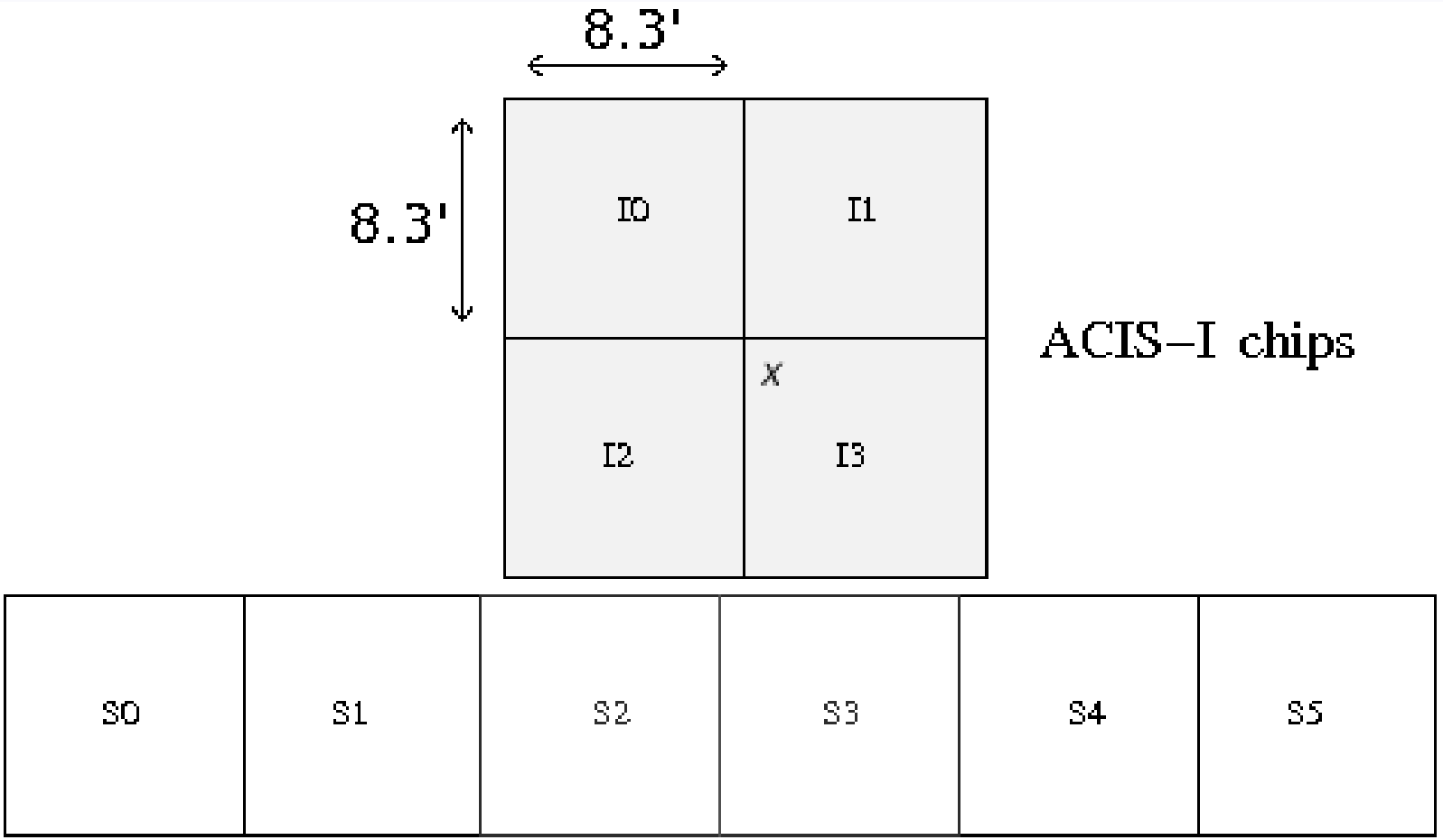
IACHEC 2014

Introduction

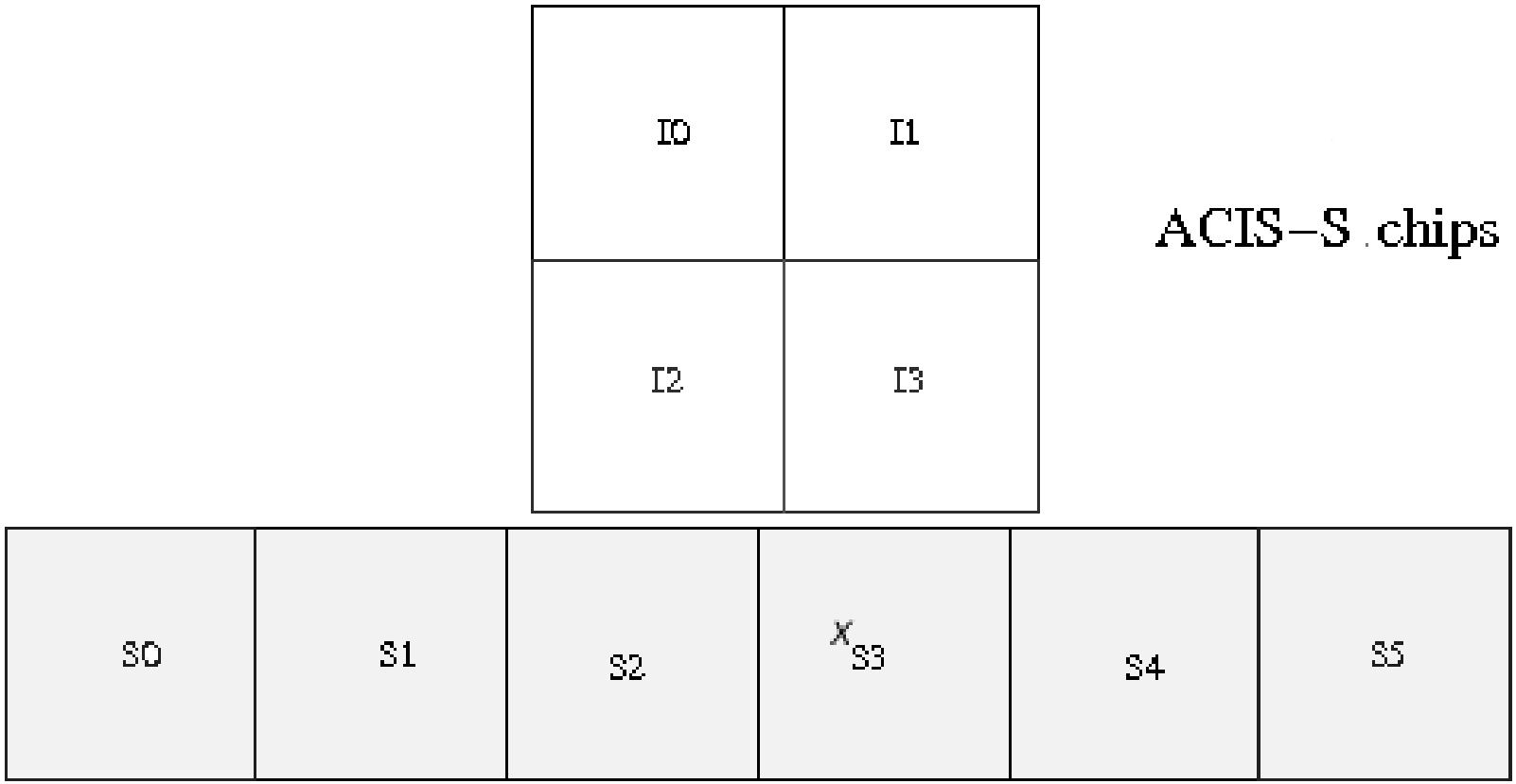
ACIS Background Rates & Observations



ACIS Focal Plane Layout



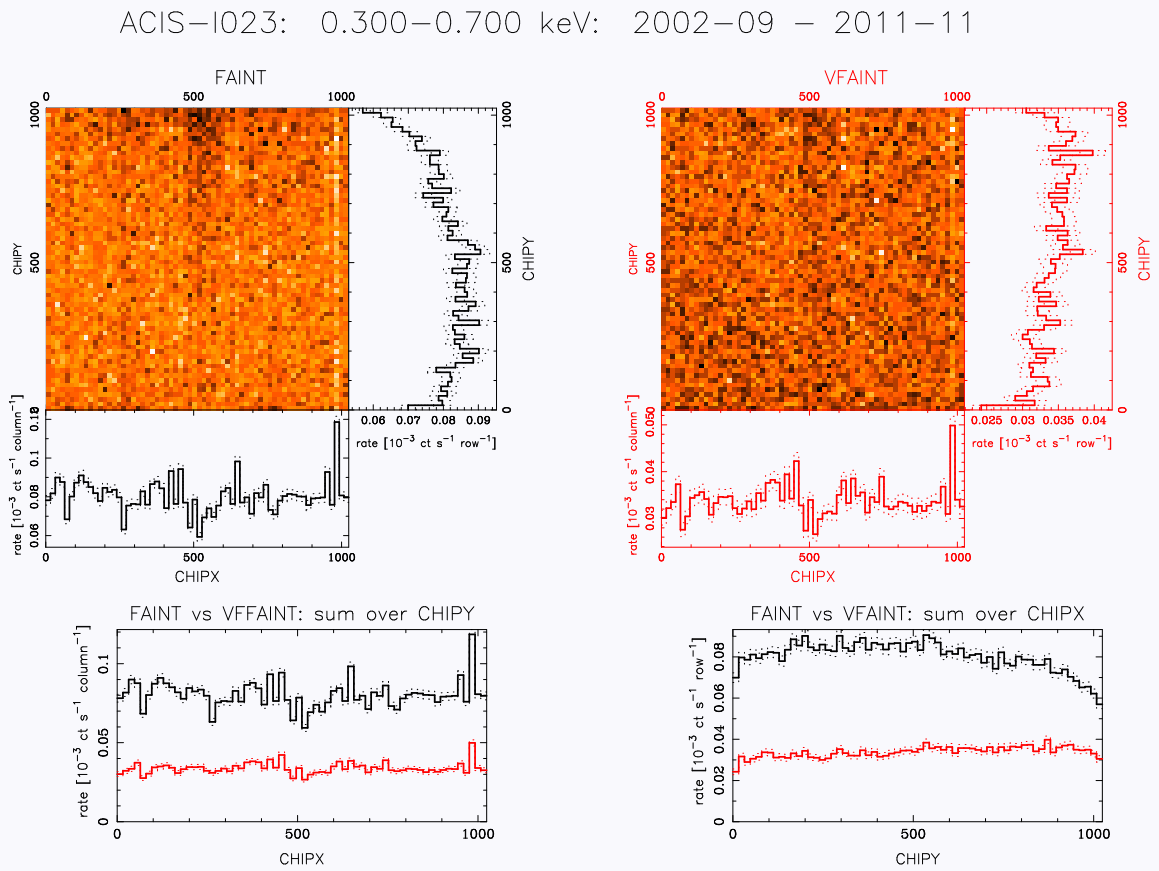
ACIS Focal Plane Layout



Background Spatial Variation (ACIS “stowed”)

FI Chips – example I3

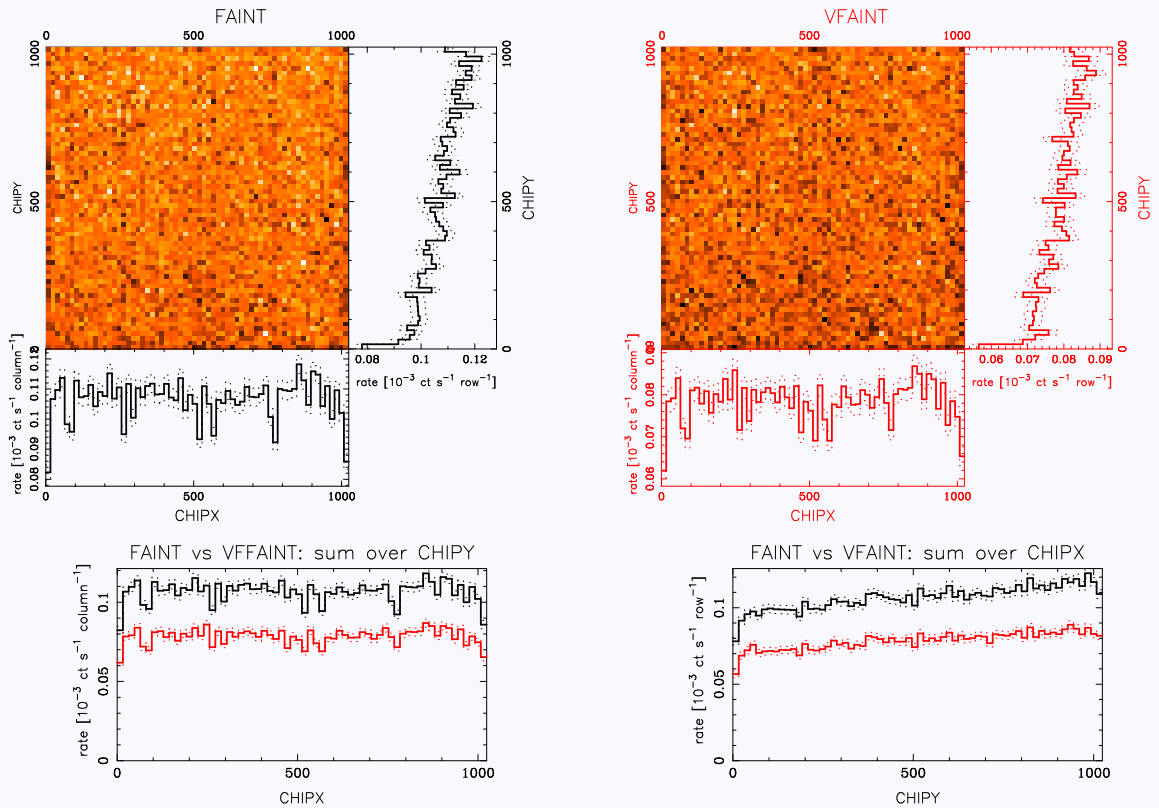
I0+I2+I3 Background Spatial Variation: 0.3-0.7 keV



Background Spatial Variation (ACIS “stowed”)

FI Chips – example I3

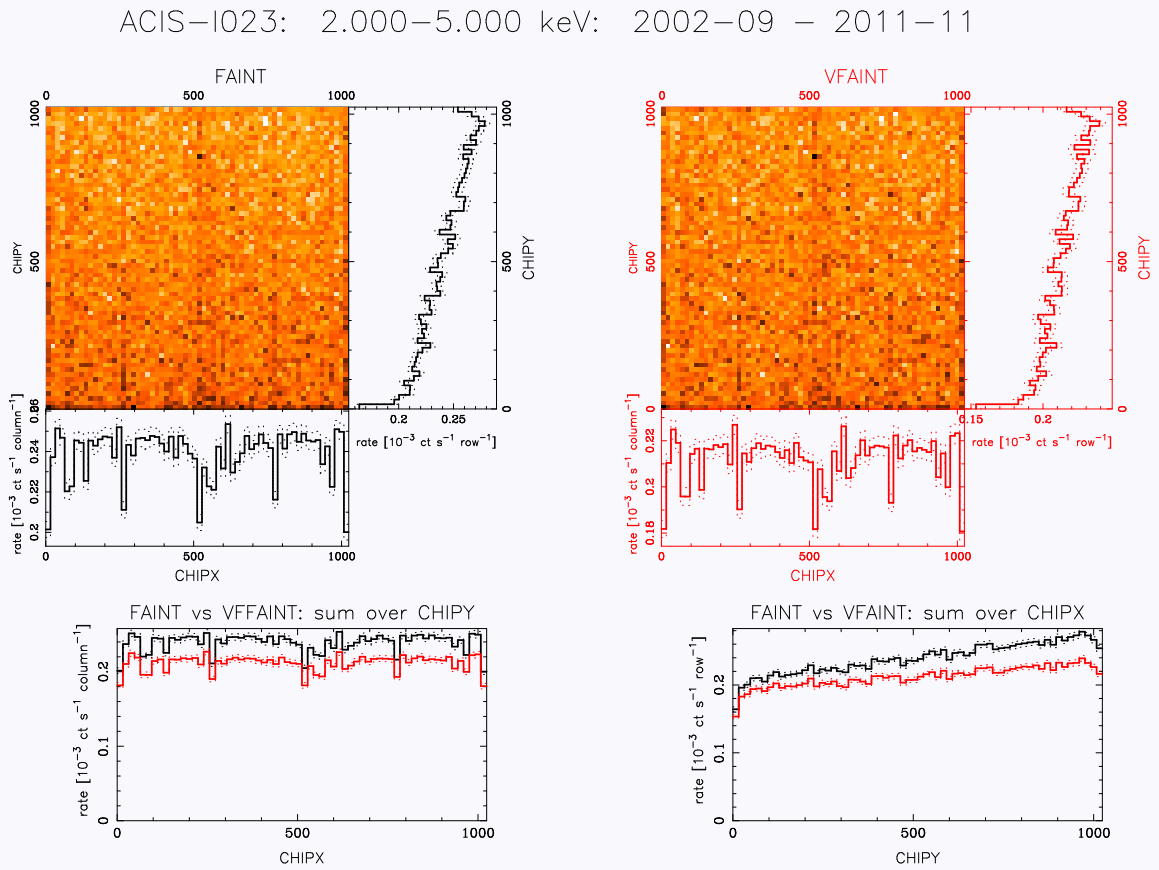
I0+I2+I3 Background Spatial Variation: 1.0-2.0 keV



Background Spatial Variation (ACIS “stowed”)

FI Chips – example I3

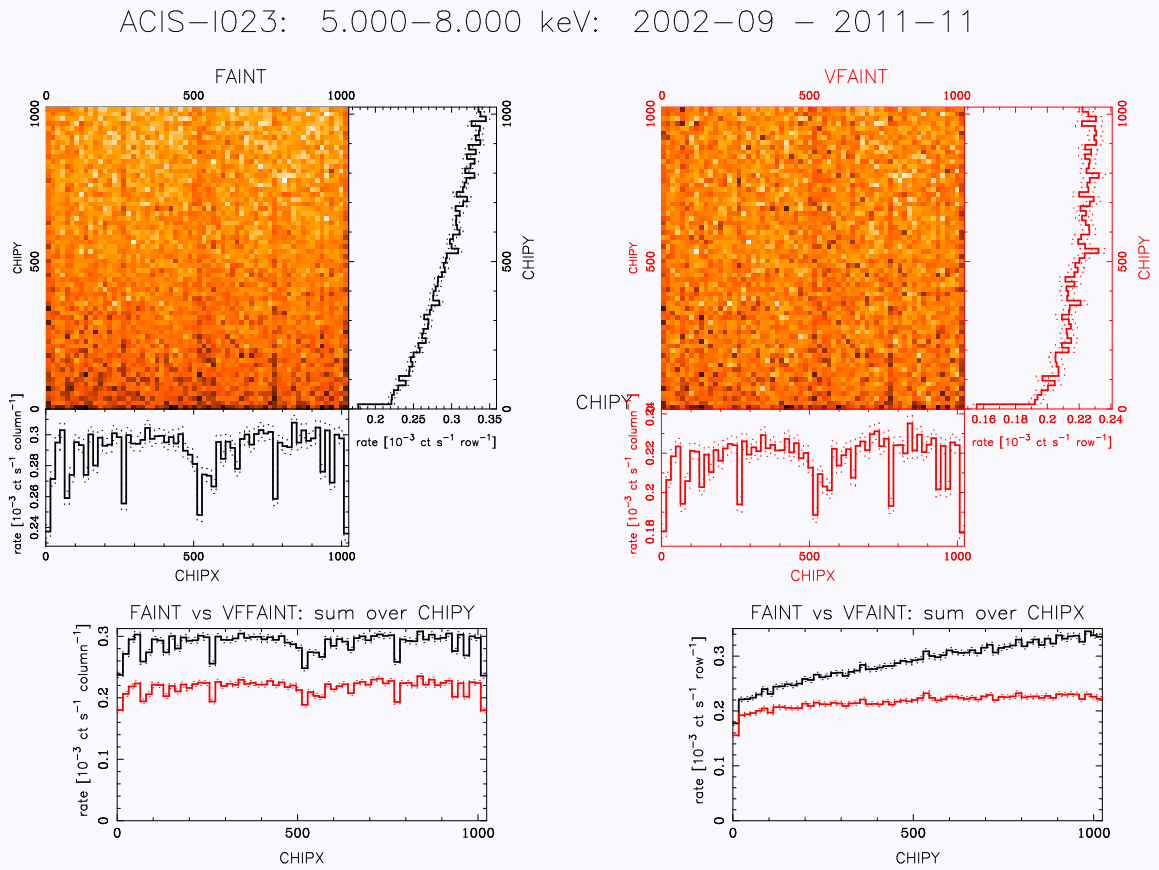
I0+I2+I3 Background Spatial Variation: 2.0-5.0 keV



Background Spatial Variation (ACIS “stowed”)

FI Chips – example I3

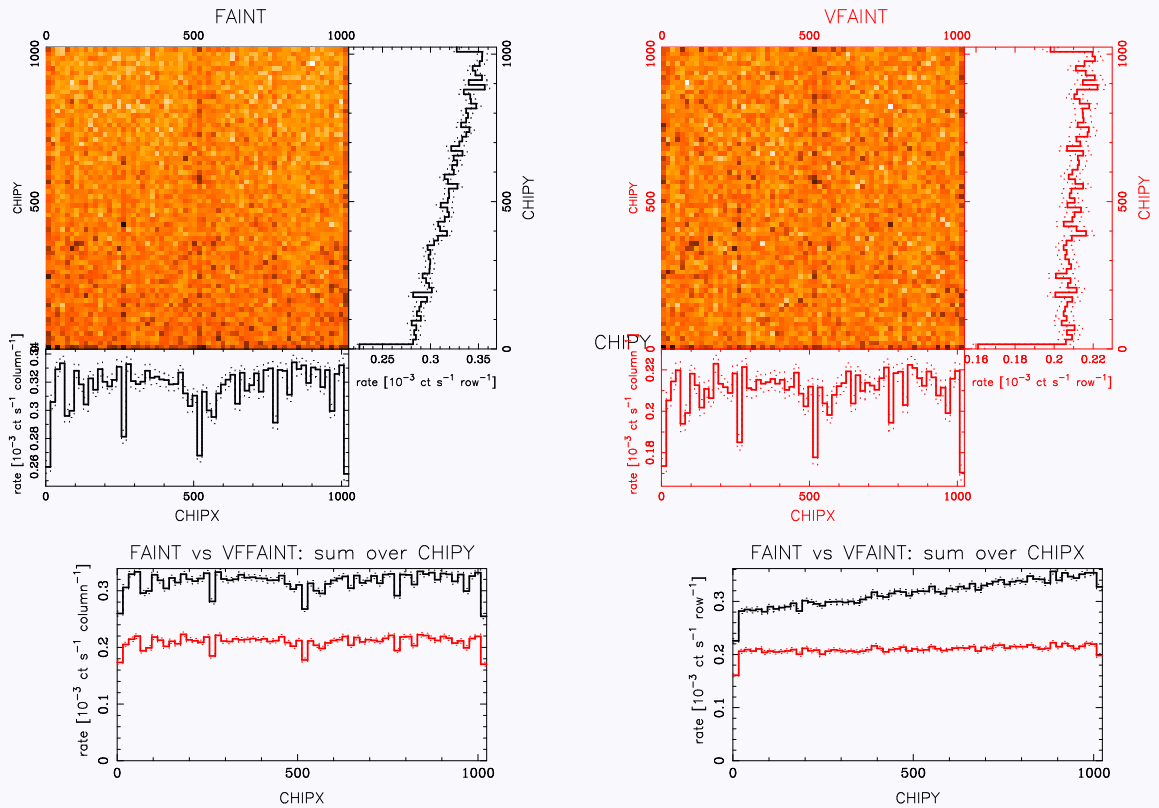
I0+I2+I3 Background Spatial Variation: 5.0-8.0 keV



Background Spatial Variation (ACIS “stowed”)

FI Chips – example I3

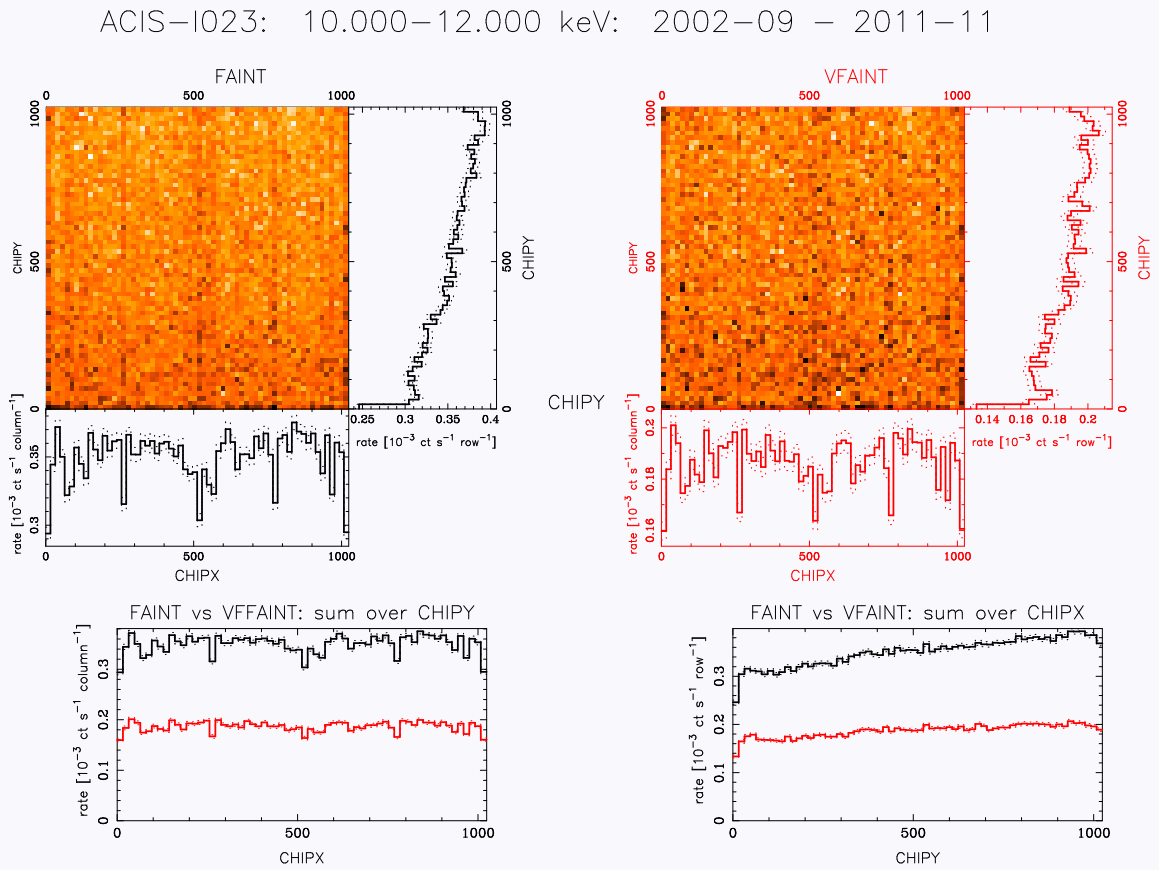
I0+I2+I3 Background Spatial Variation: 8.0-10.0 keV



Background Spatial Variation (ACIS “stowed”)

FI Chips – example I3

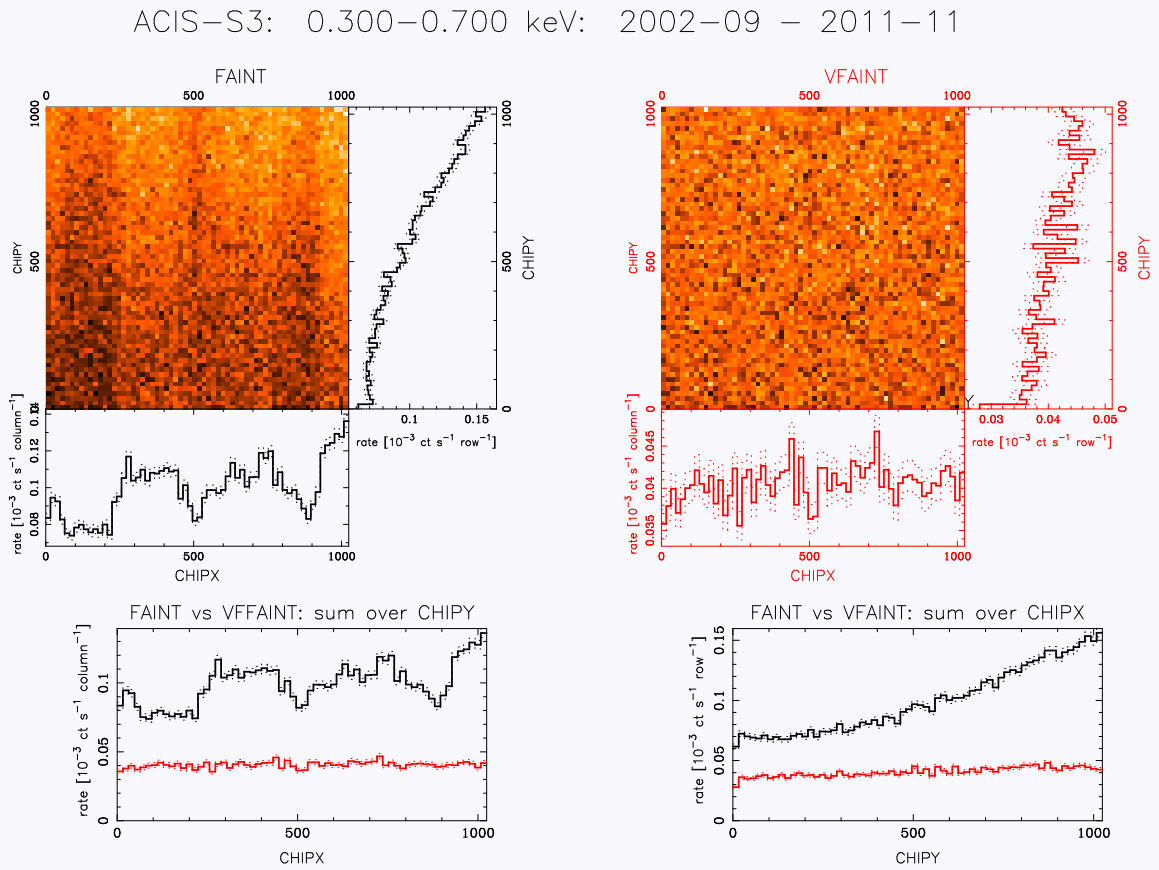
I0+I2+I3 Background Spatial Variation: 10.0-12.0 keV



Background Spatial Variation (ACIS “stowed”)

BI Chip – S3

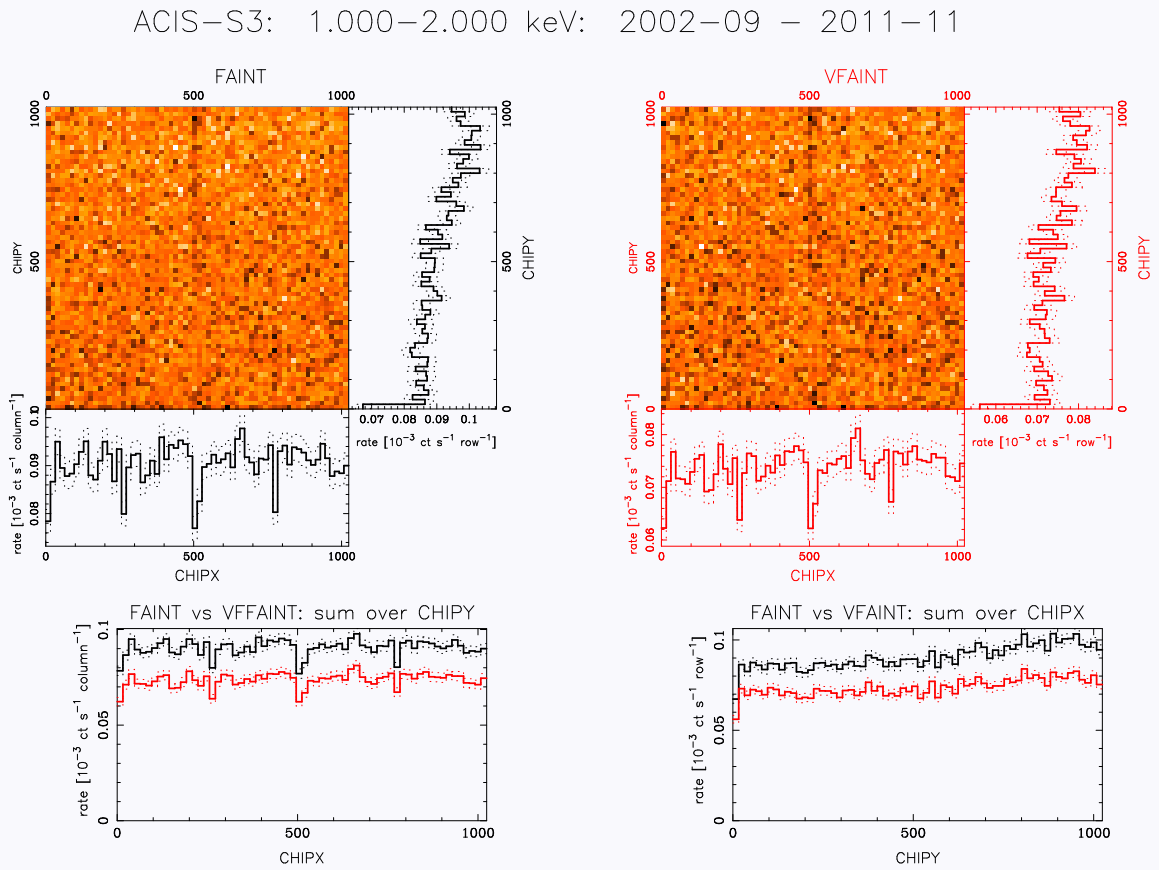
S3 Background Spatial Variation: 0.3-0.7 keV



Background Spatial Variation (ACIS “stowed”)

BI Chip – S3

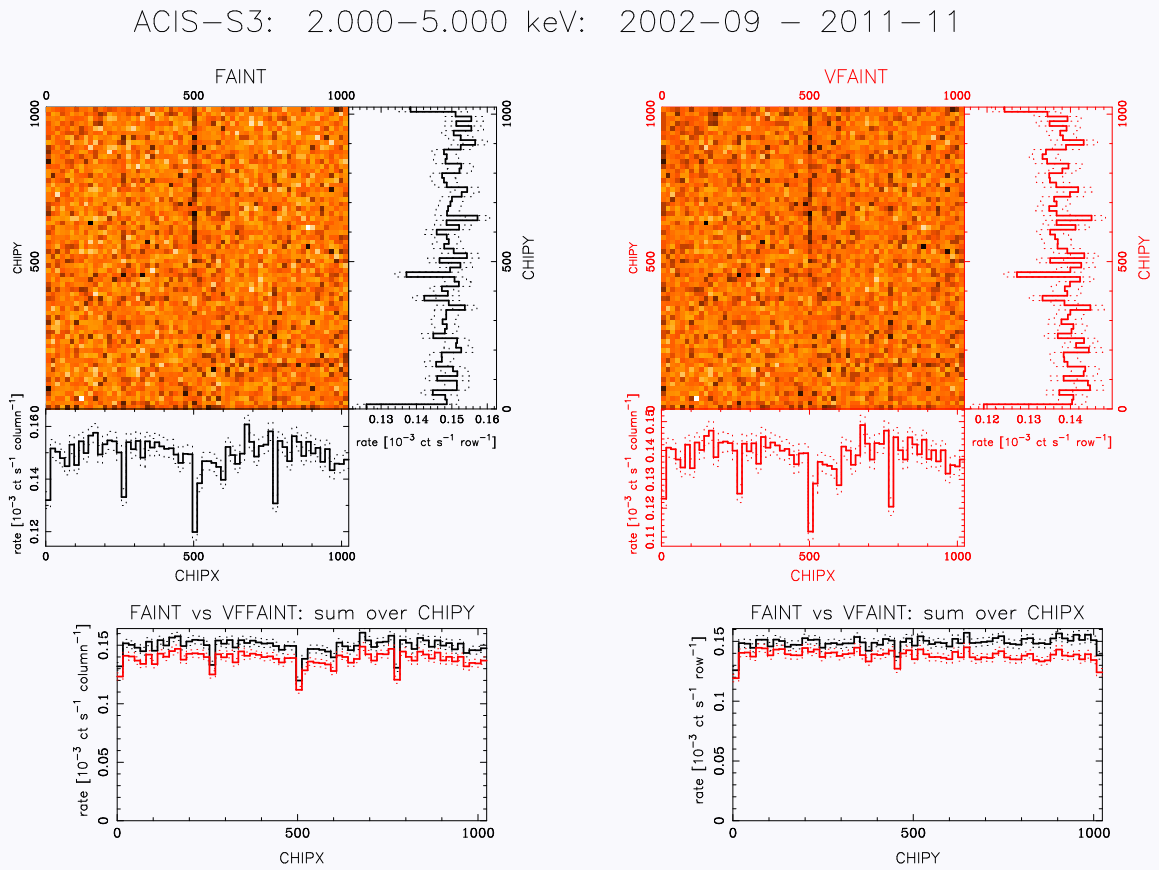
S3 Background Spatial Variation: 1.0-2.0 keV



Background Spatial Variation (ACIS “stowed”)

BI Chip – S3

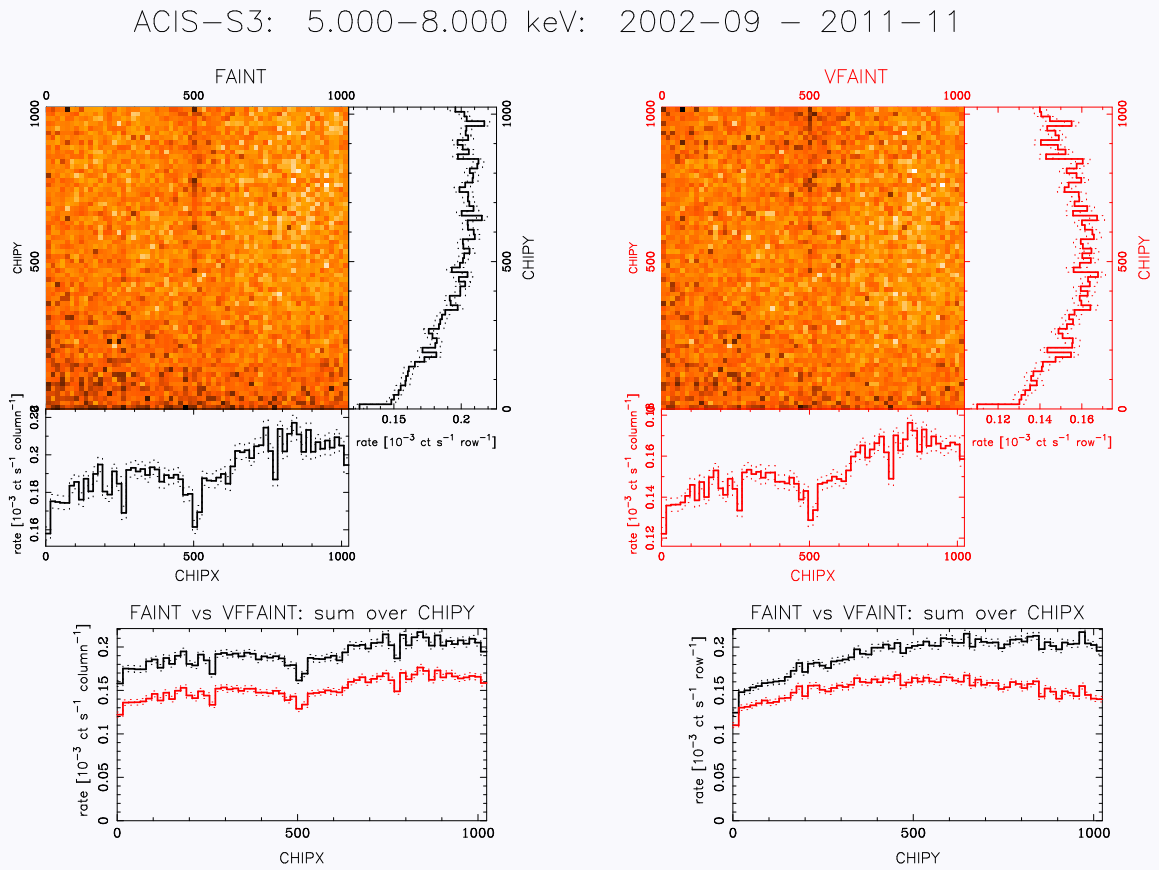
S3 Background Spatial Variation: 2.0-5.0 keV



Background Spatial Variation (ACIS “stowed”)

BI Chip – S3

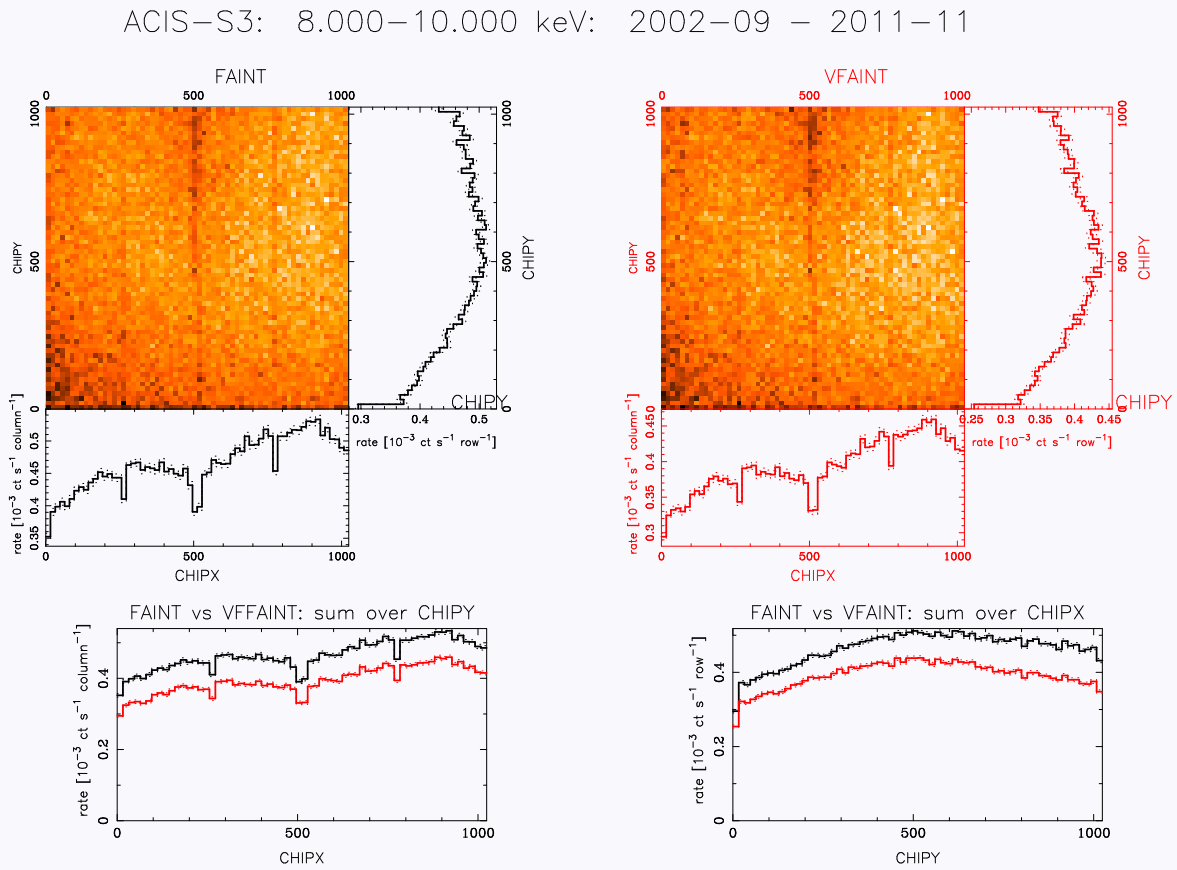
S3 Background Spatial Variation: 5.0-8.0 keV



Background Spatial Variation (ACIS “stowed”)

BI Chip – S3

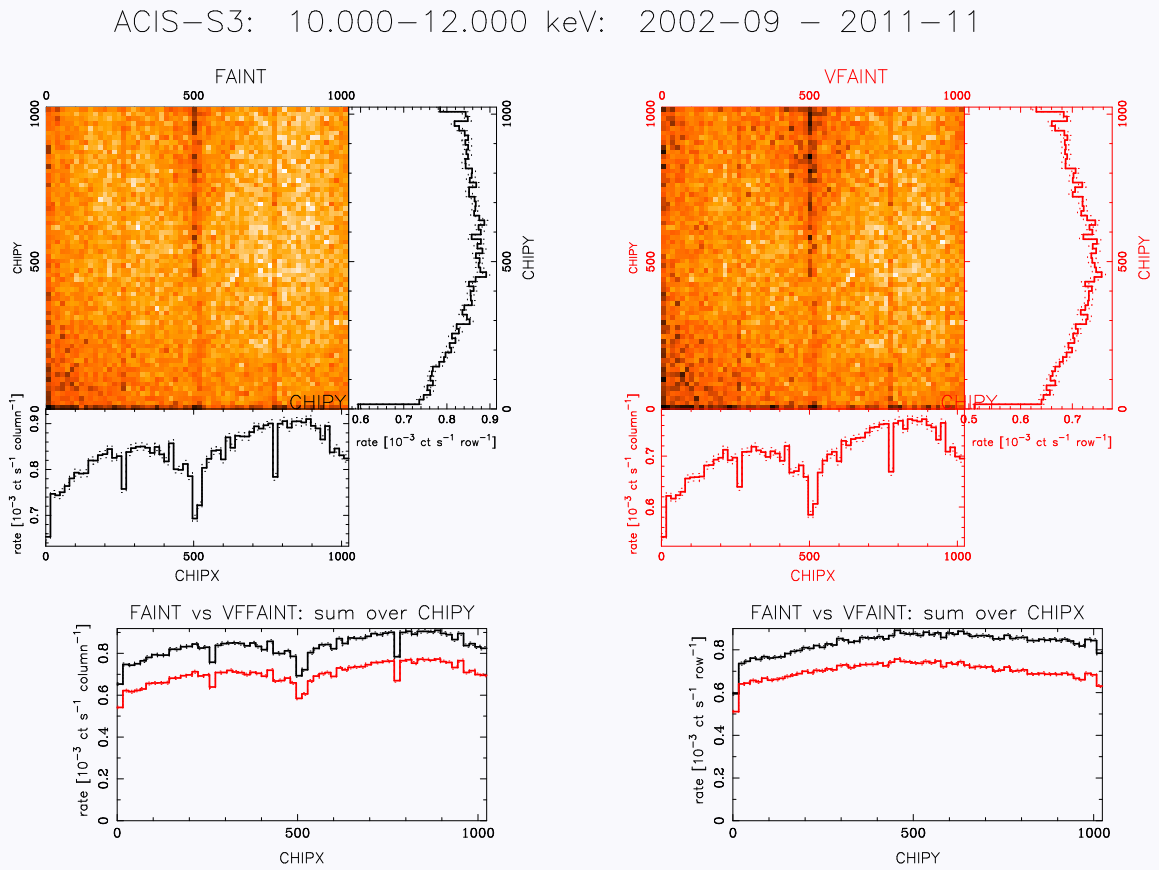
S3 Background Spatial Variation: 8.0-10.0 keV



Background Spatial Variation (ACIS “stowed”)

BI Chip – S3

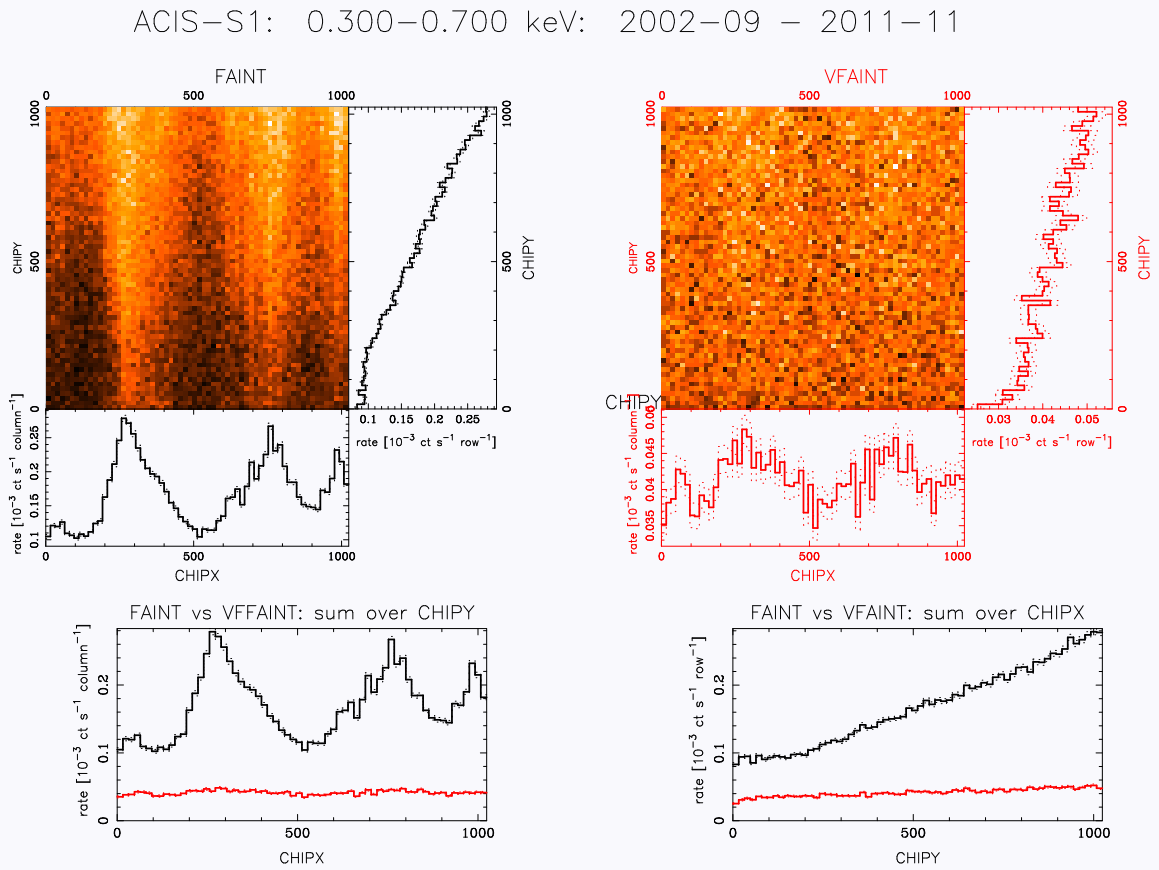
S3 Background Spatial Variation: 10.0-12.0 keV



Background Spatial Variation (ACIS “stowed”)

BI Chip – S1

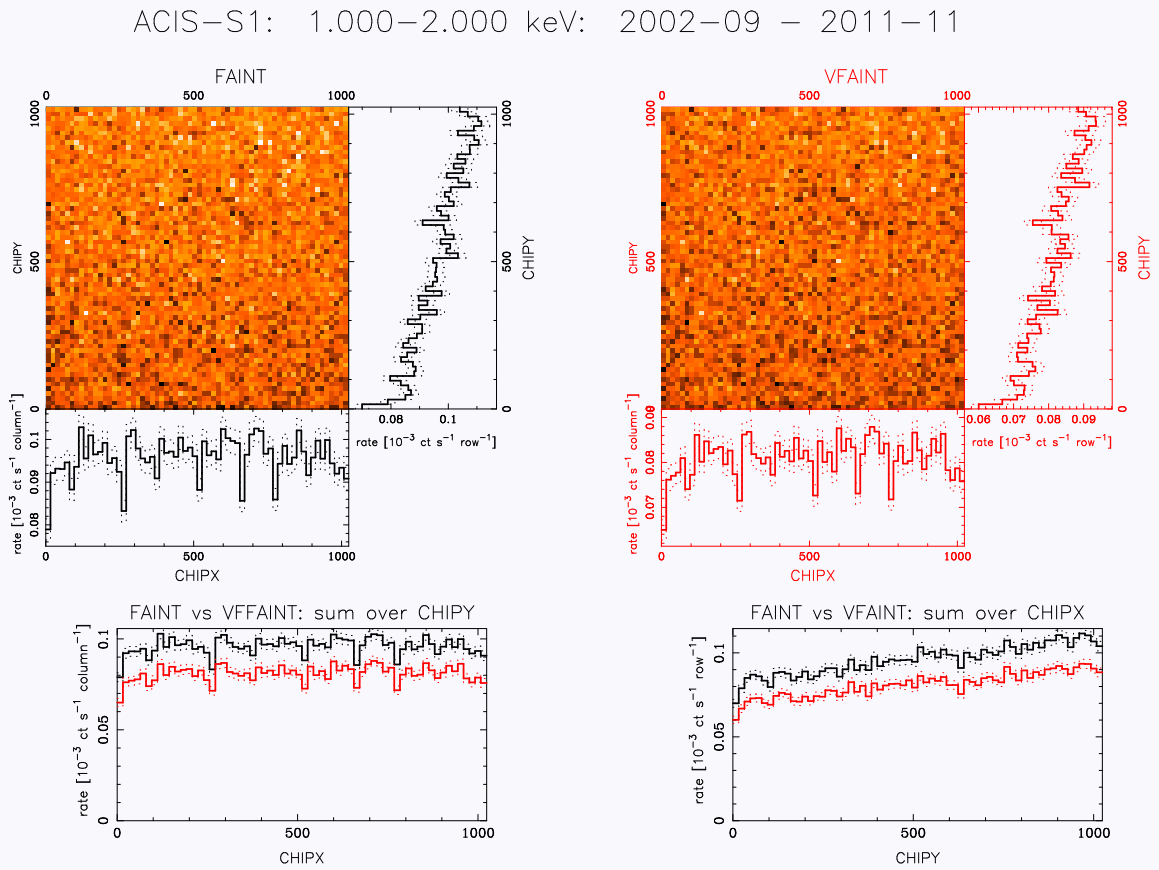
S1 Background Spatial Variation: 0.3-0.7 keV



Background Spatial Variation (ACIS “stowed”)

BI Chip – S1

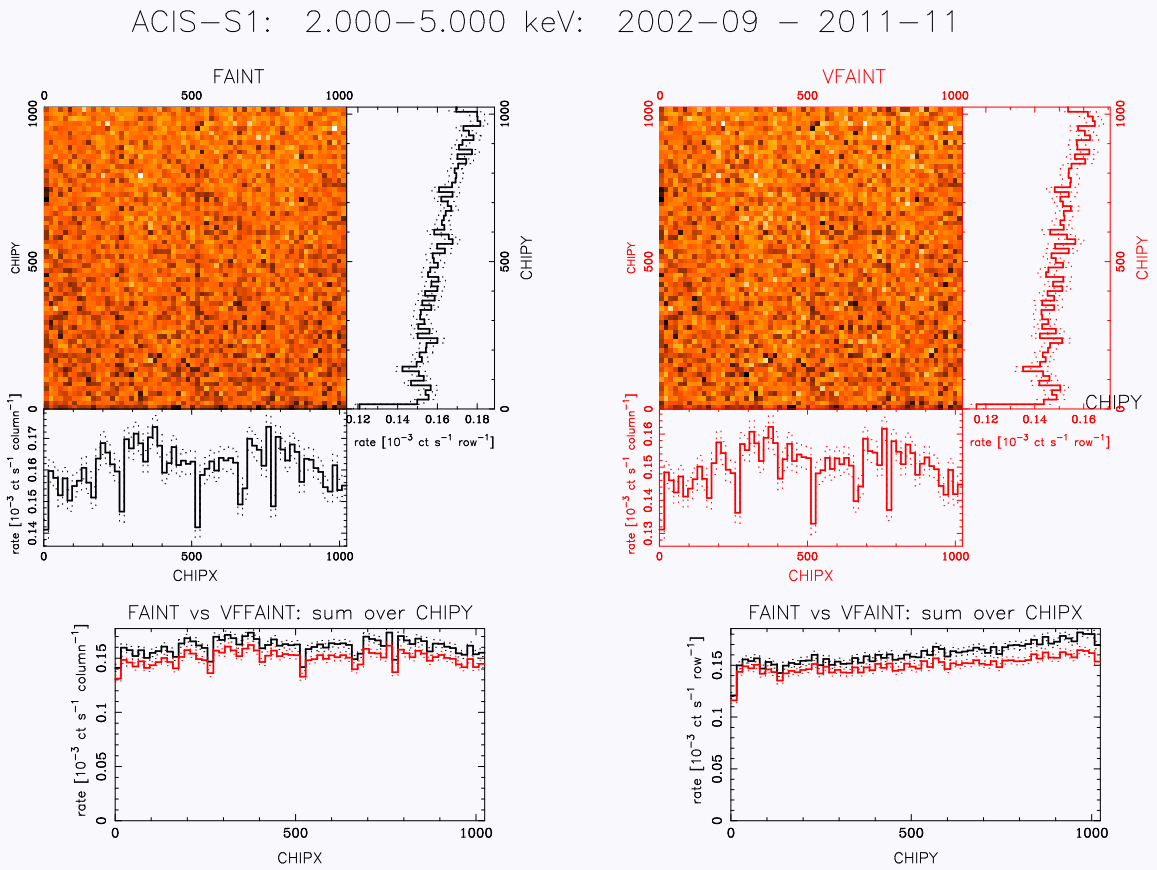
S1 Background Spatial Variation: 1.0-2.0 keV



Background Spatial Variation (ACIS “stowed”)

BI Chip – S1

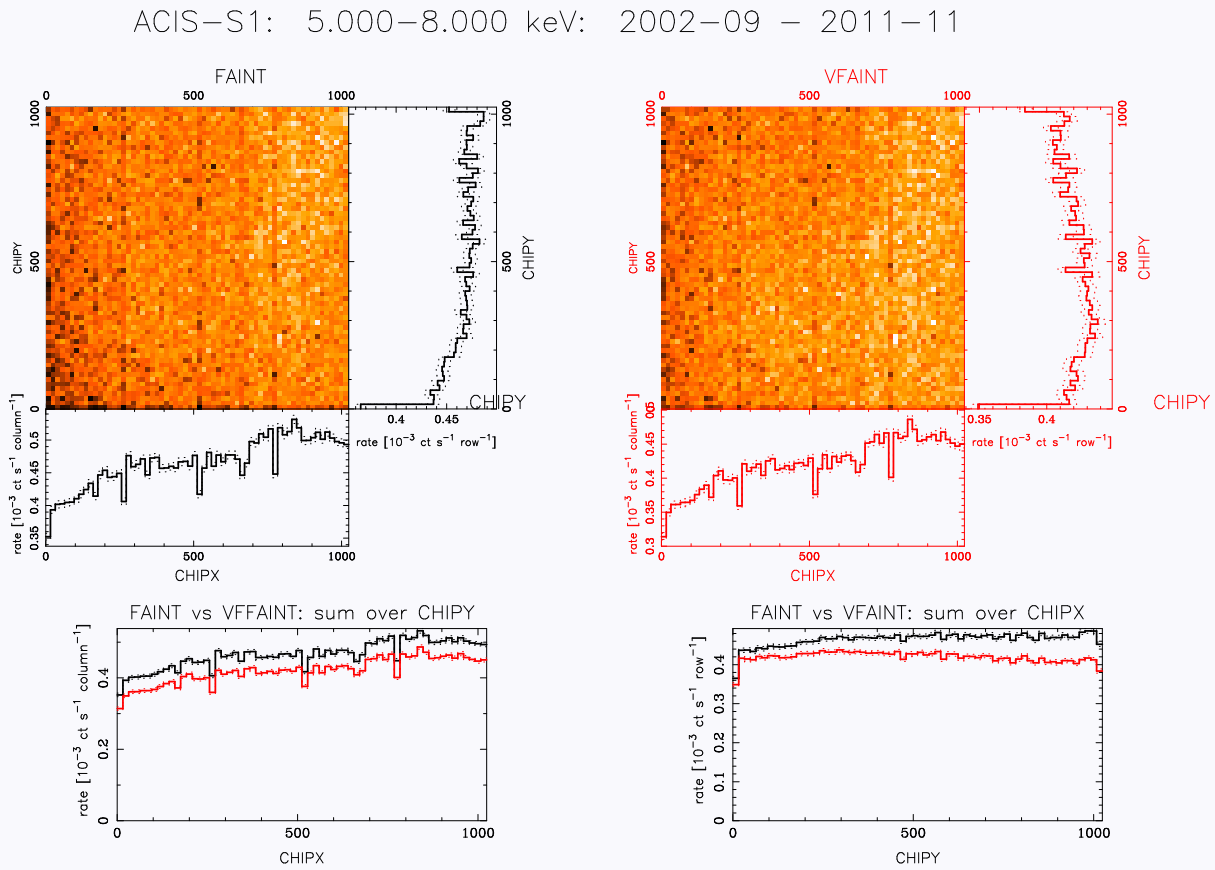
S1 Background Spatial Variation: 2.0-5.0 keV



Background Spatial Variation (ACIS “stowed”)

BI Chip – S1

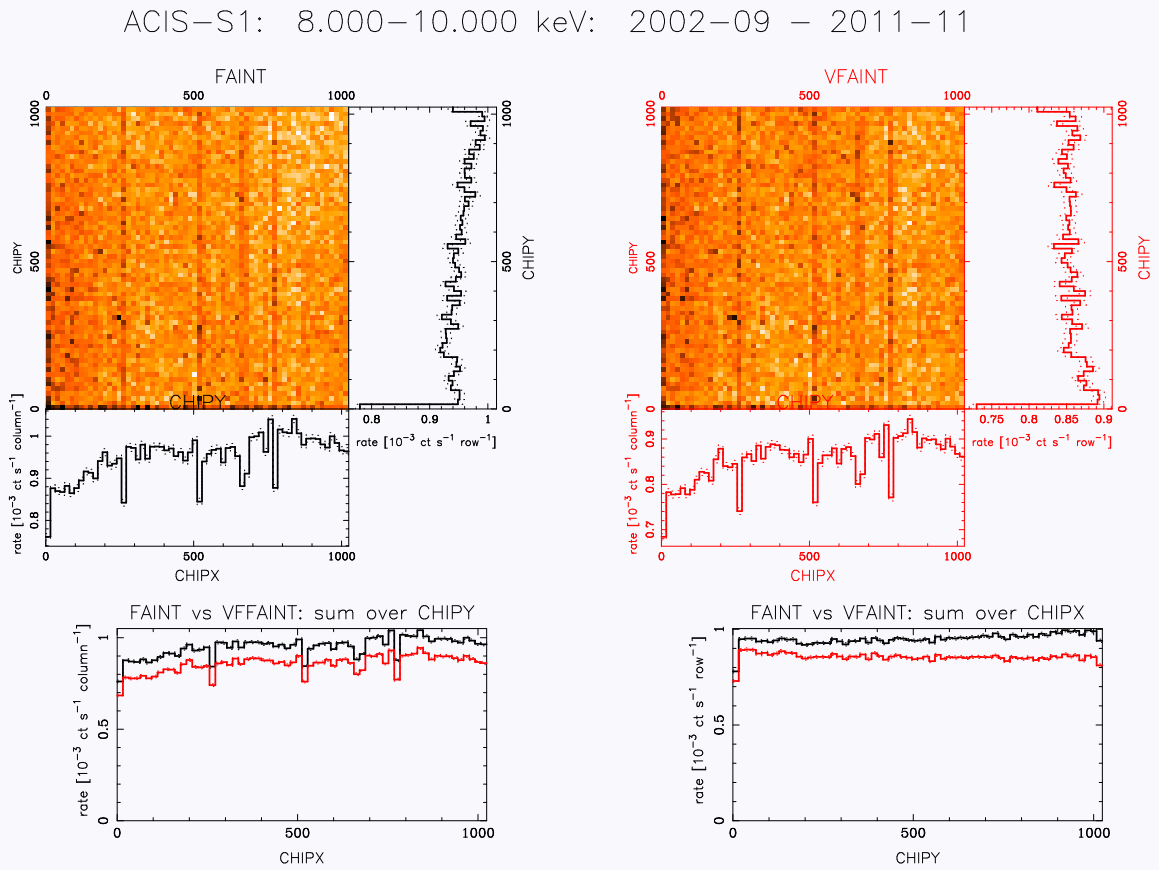
S1 Background Spatial Variation: 5.0-8.0 keV



Background Spatial Variation (ACIS “stowed”)

BI Chip – S1

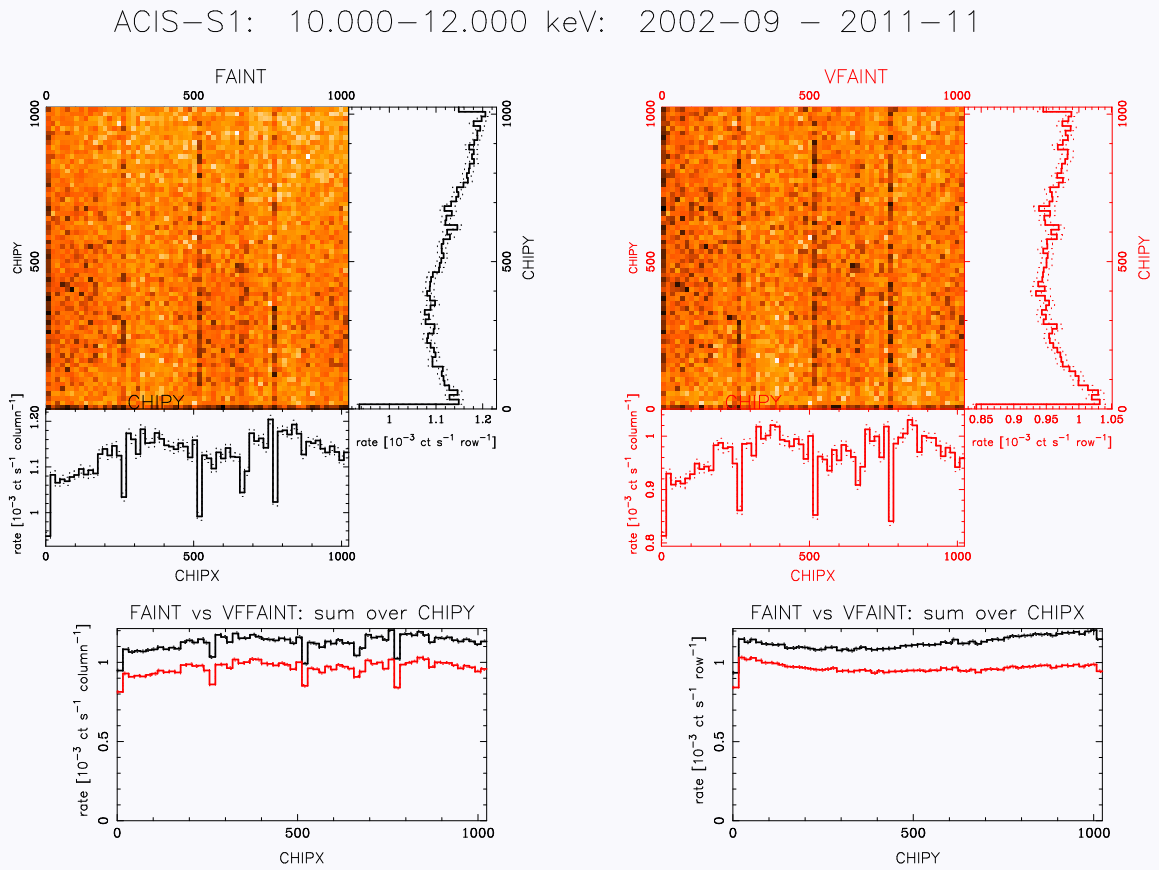
S1 Background Spatial Variation: 8.0-10.0 keV



Background Spatial Variation (ACIS “stowed”)

BI Chip – S1

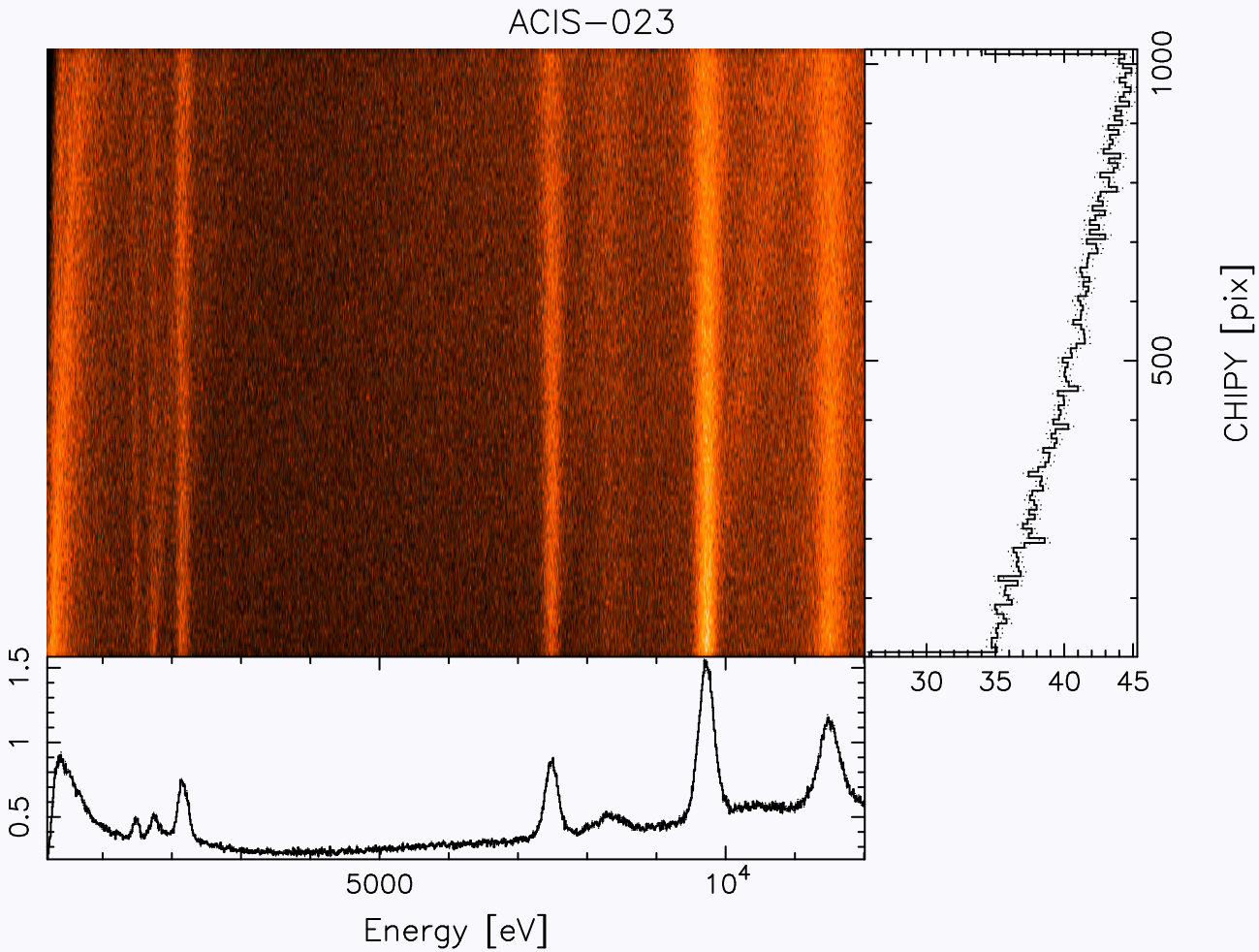
S1 Background Spatial Variation: 10.0-12.0 keV



Background Spatial/Spectral Variation (ACIS “stowed”)

FI Chips – I0, I2, I3

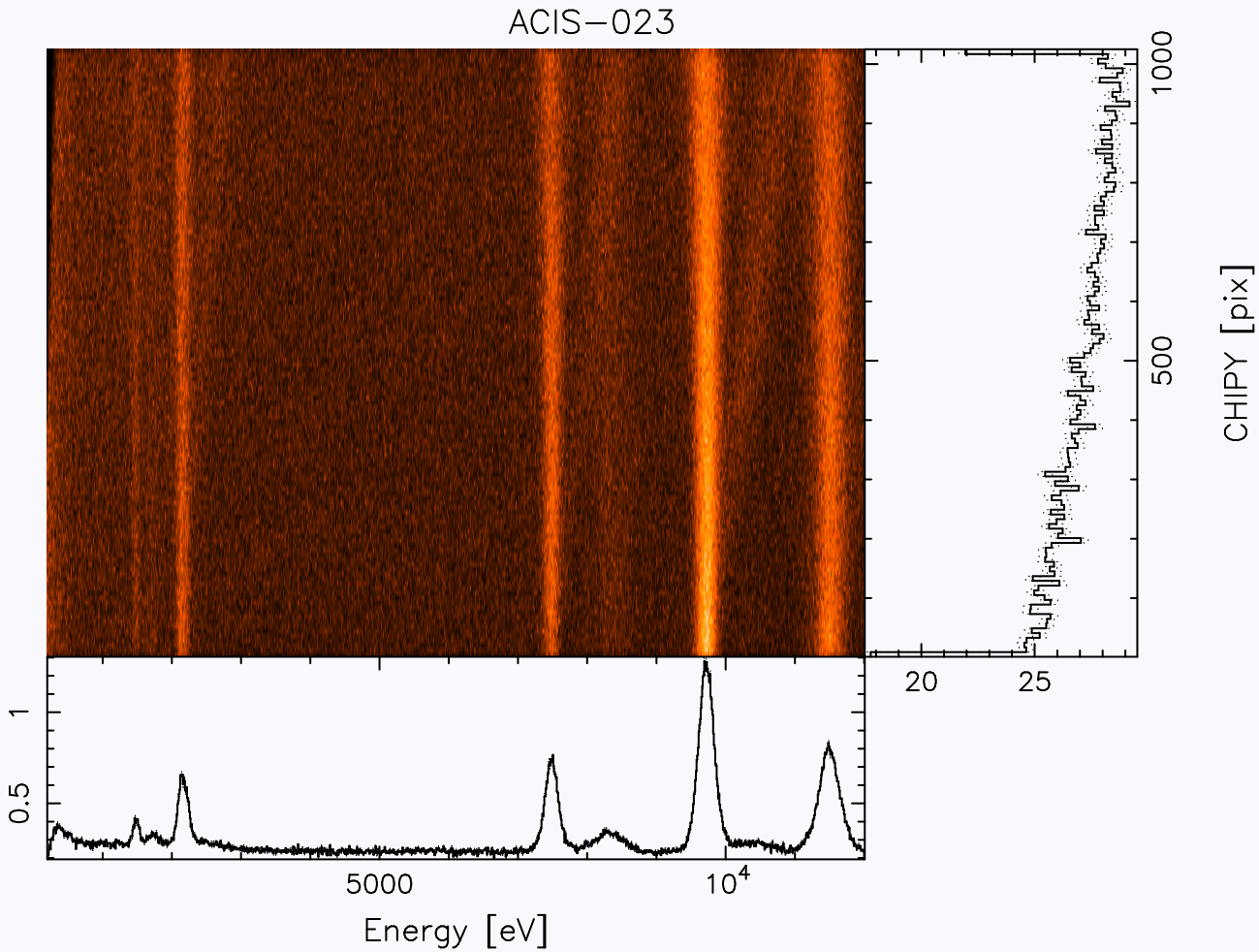
ACIS-I023 Background Spectrum: `chipy` Variation (no VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

FI Chips – I0, I2, I3

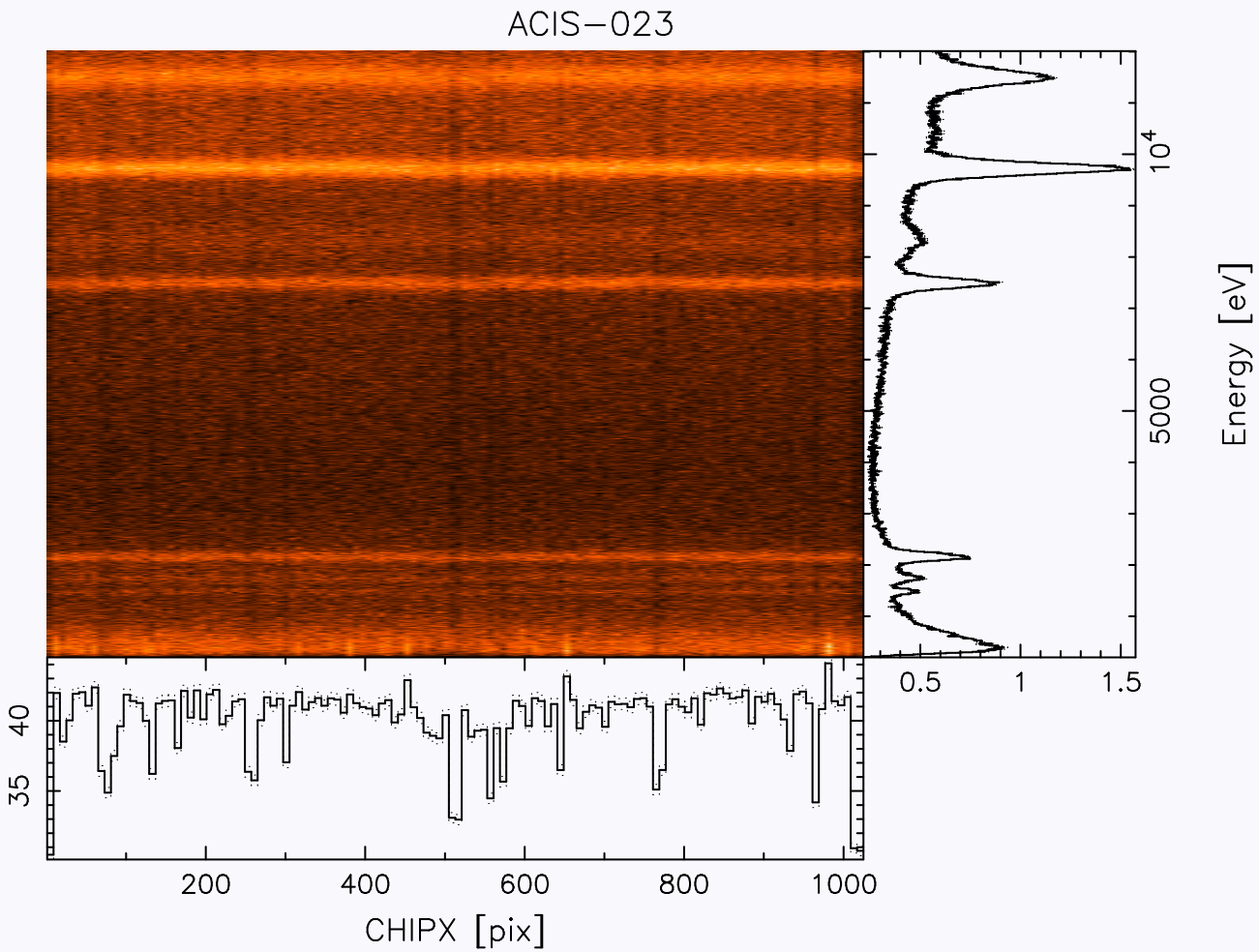
ACIS-I023 Background Spectrum: `chipy` Variation (with VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

FI Chips – I0, I2, I3

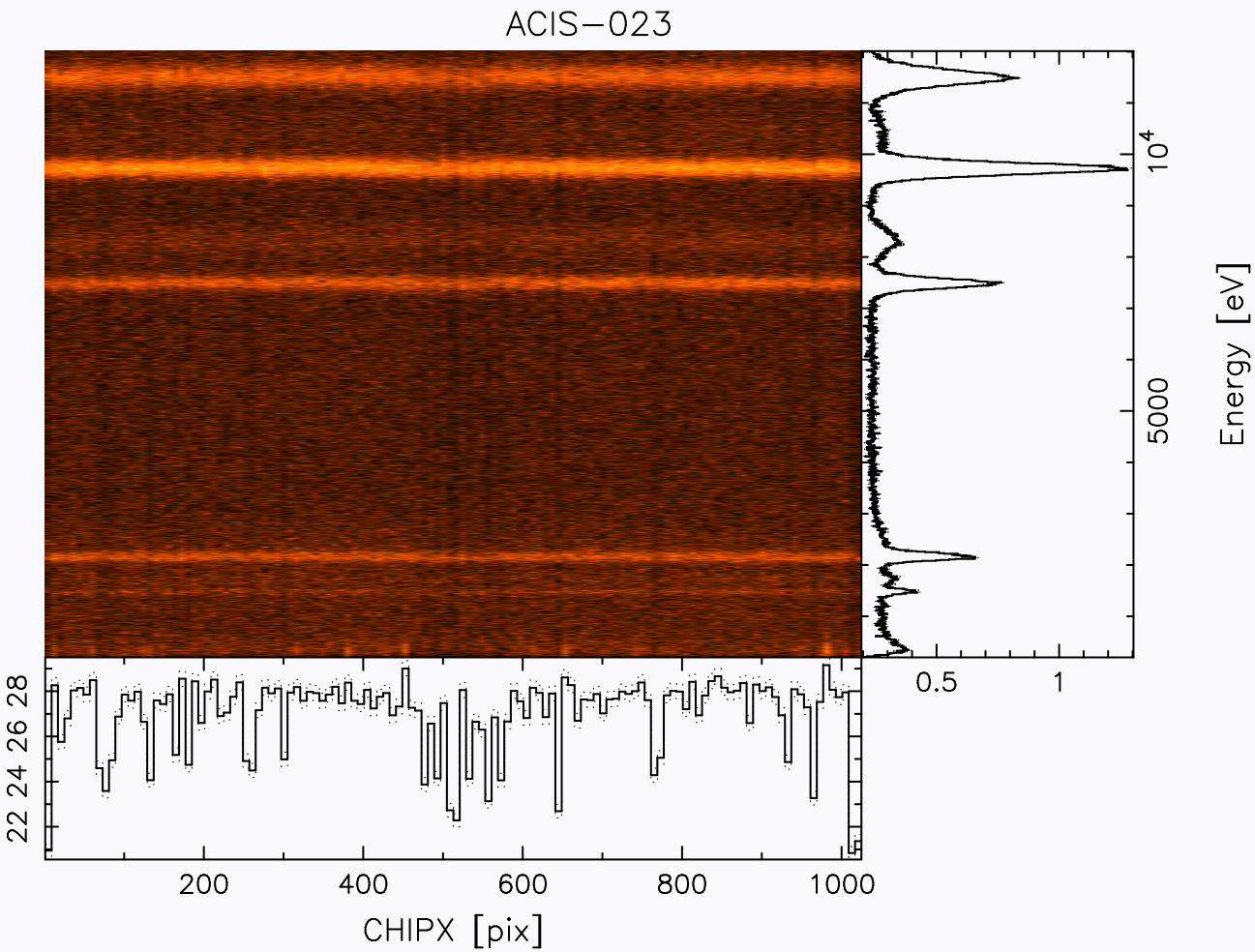
ACIS-I023: `chipx` Variation (no VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

FI Chips – I0, I2, I3

ACIS-I023: `chipx` Variation (with VF cleaning)



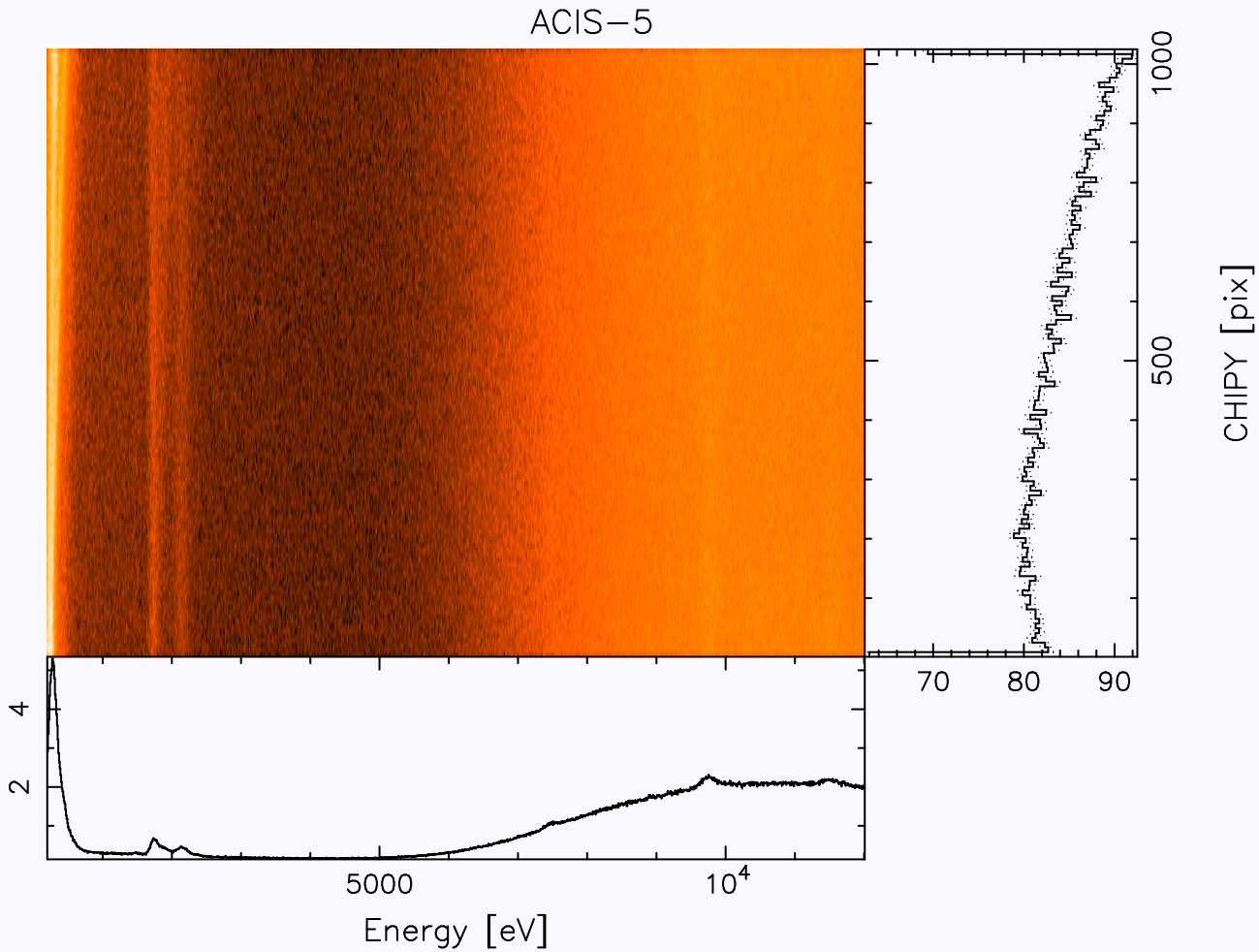
Spatial/Spectral Model

- 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

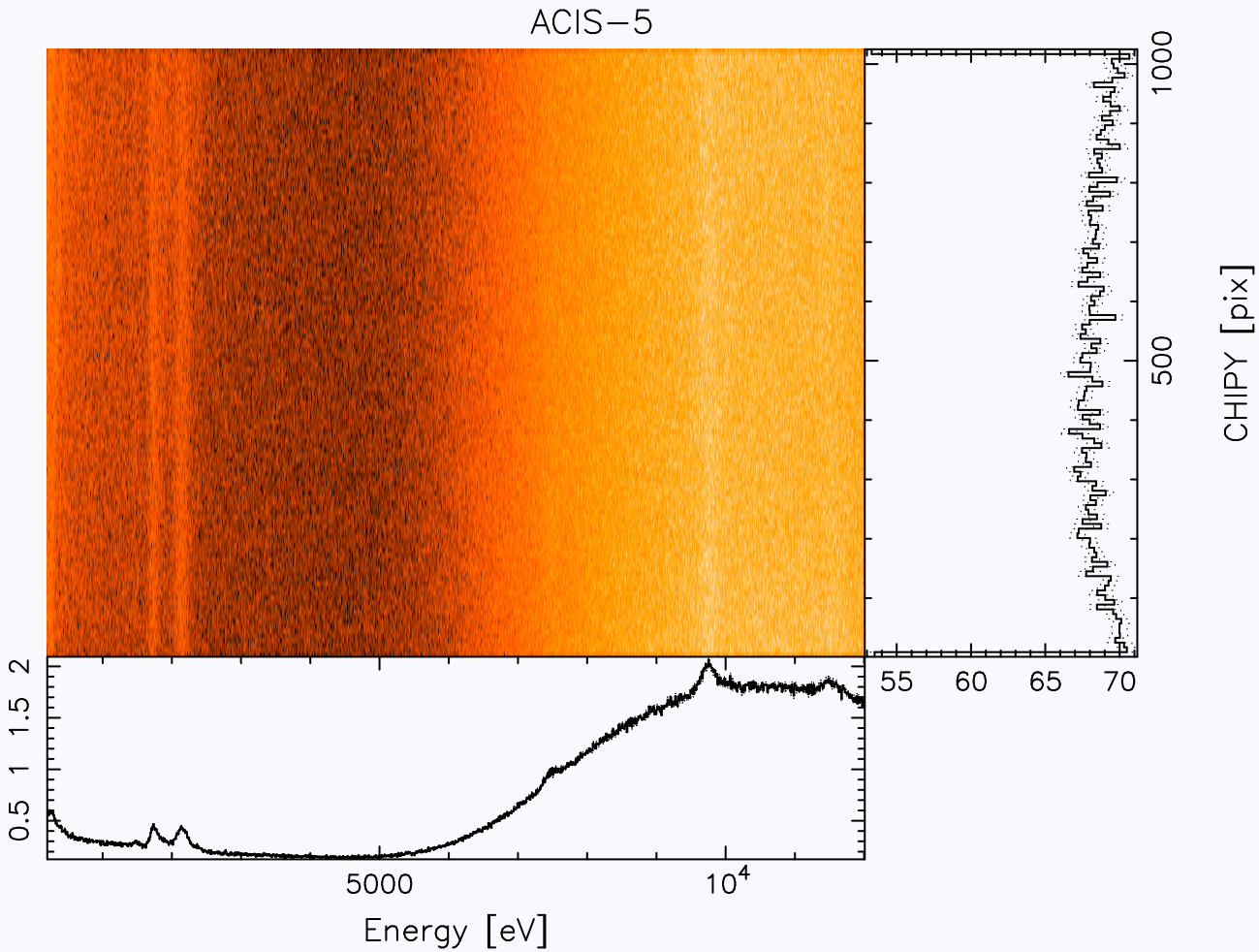
ACIS-S1: `chipy` Variation (no VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chip – S1

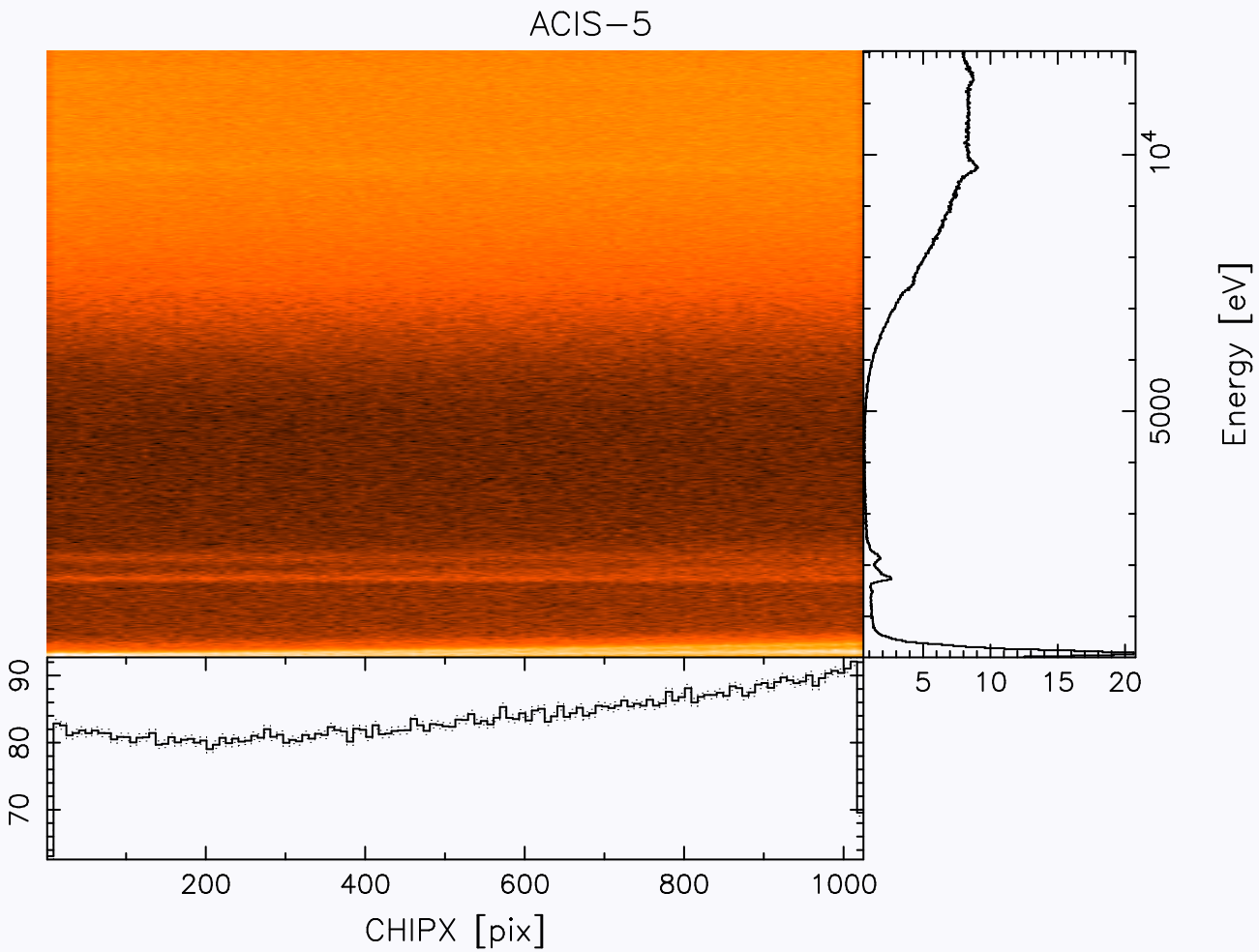
ACIS-S1: `chipy` Variation (with VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chips – S1

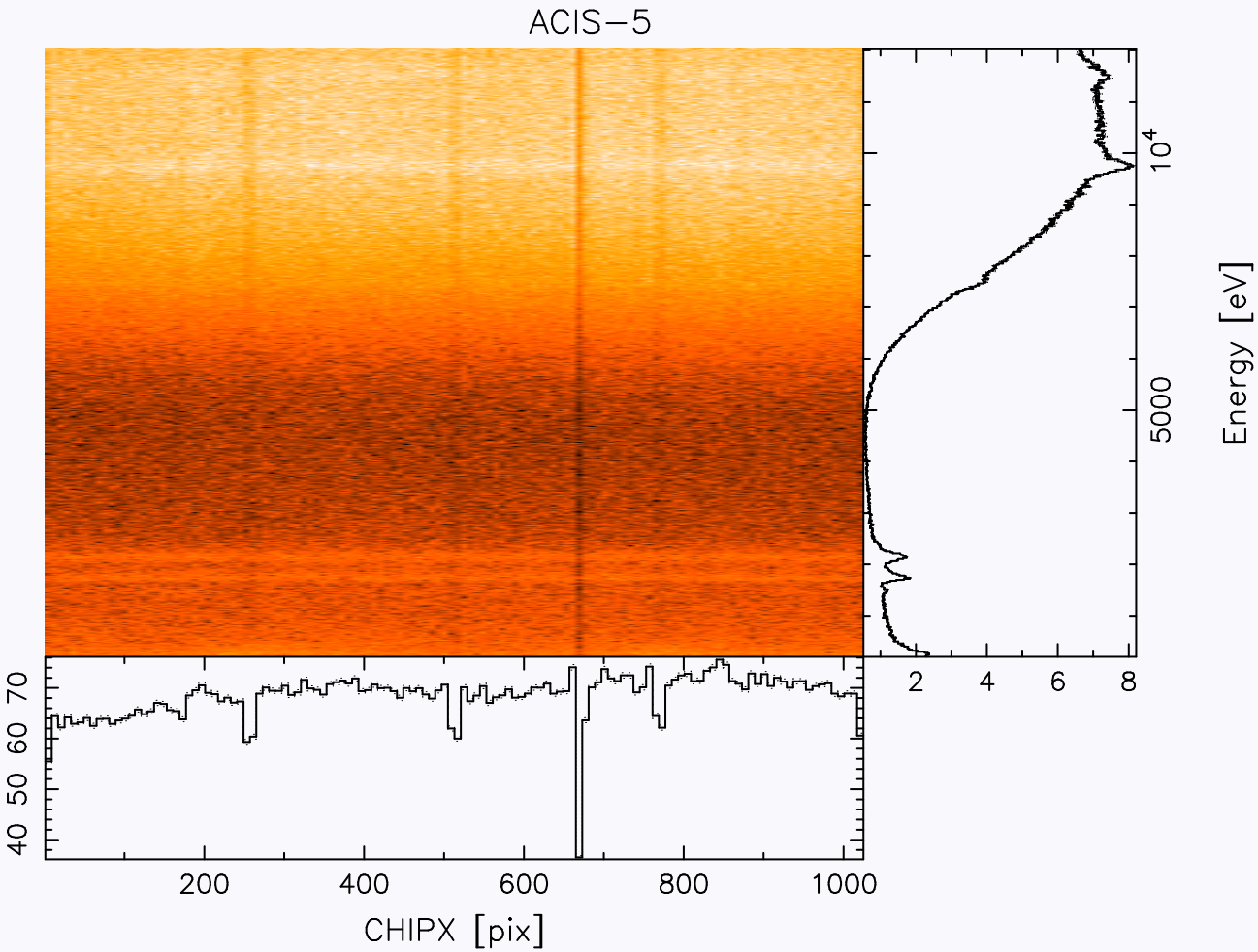
ACIS-S1: `chipx` Variation (no VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chips – S1

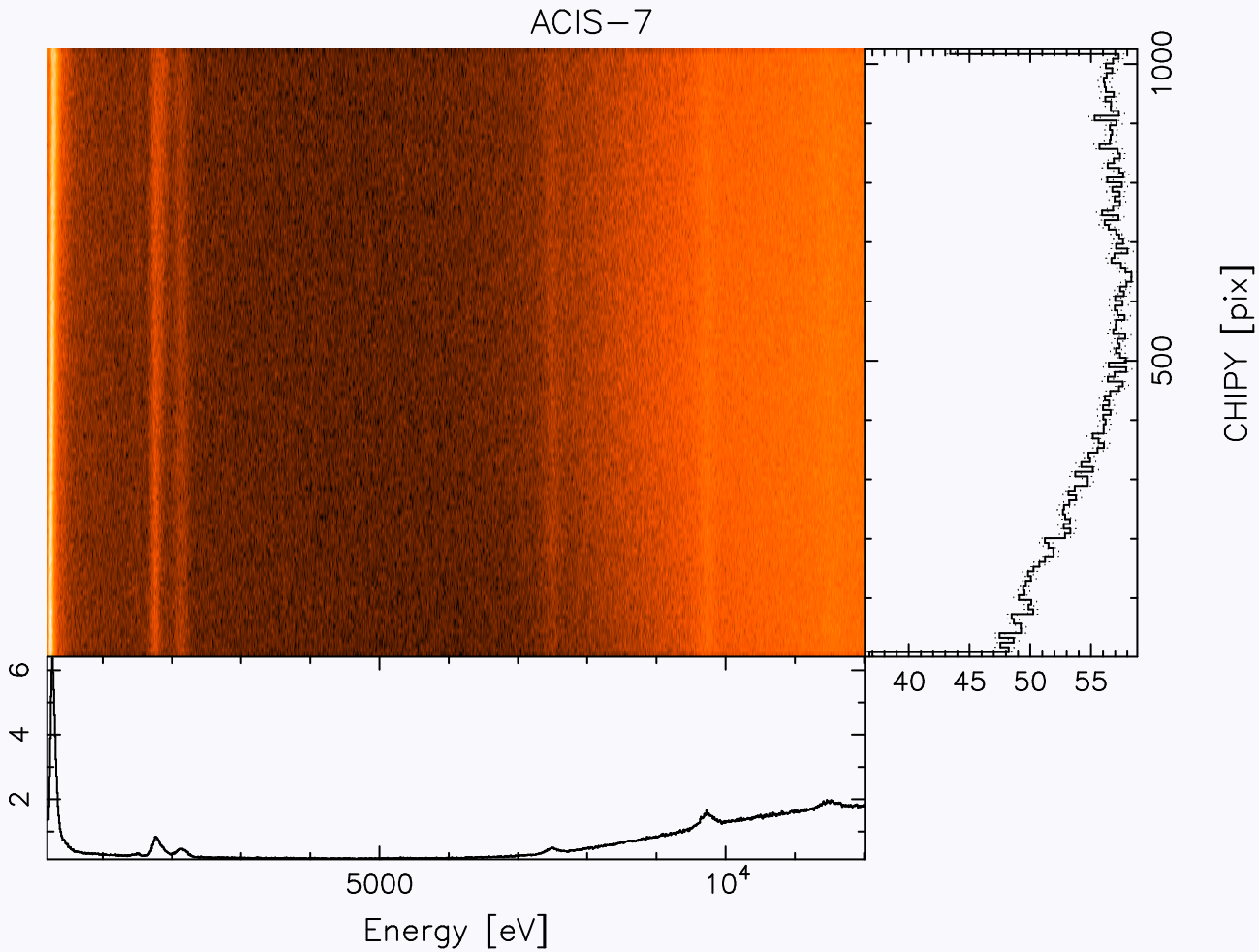
ACIS-S1: `chipx` Variation (with VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chip – S3

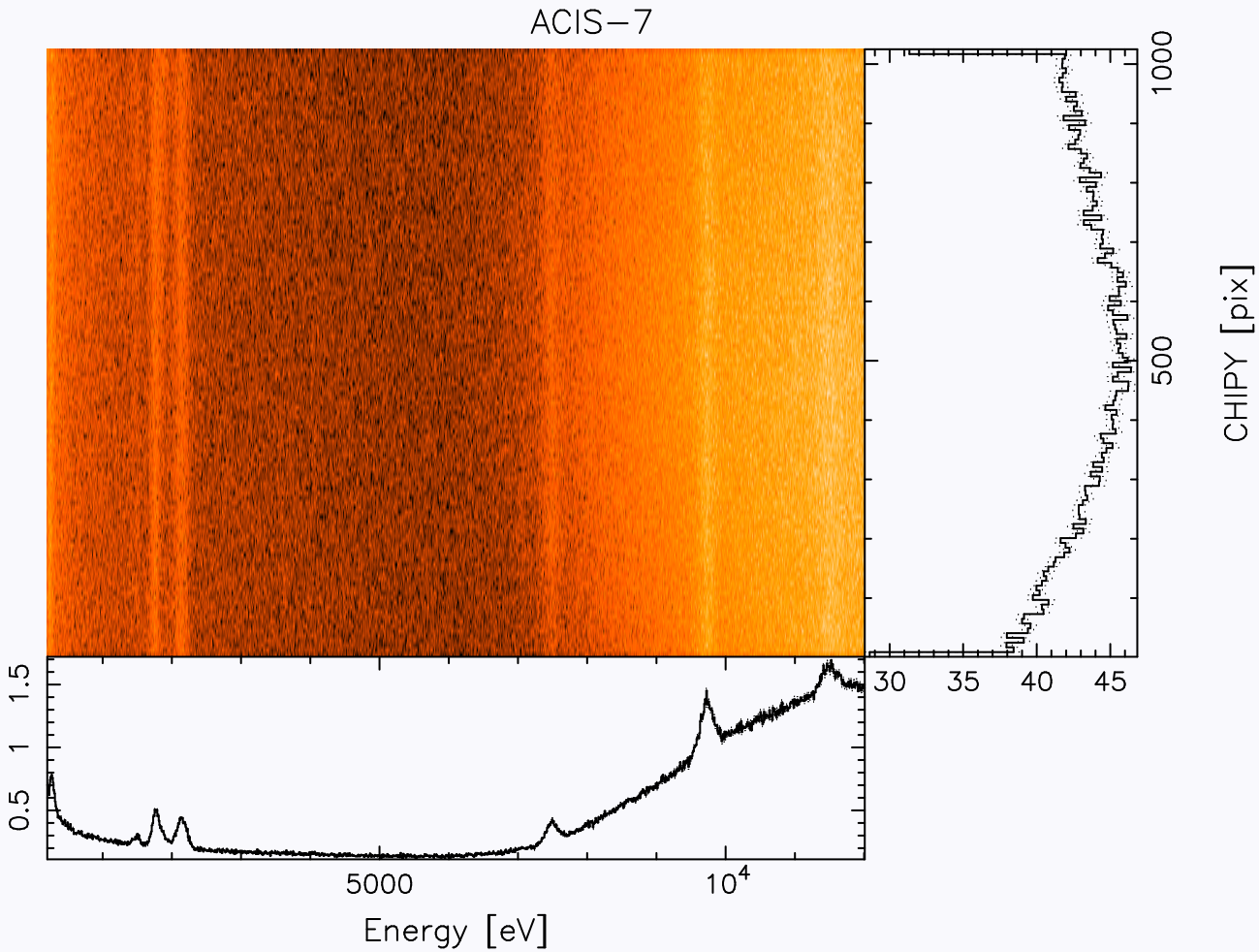
ACIS-S3: `chipy` Variation (no VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chip – S3

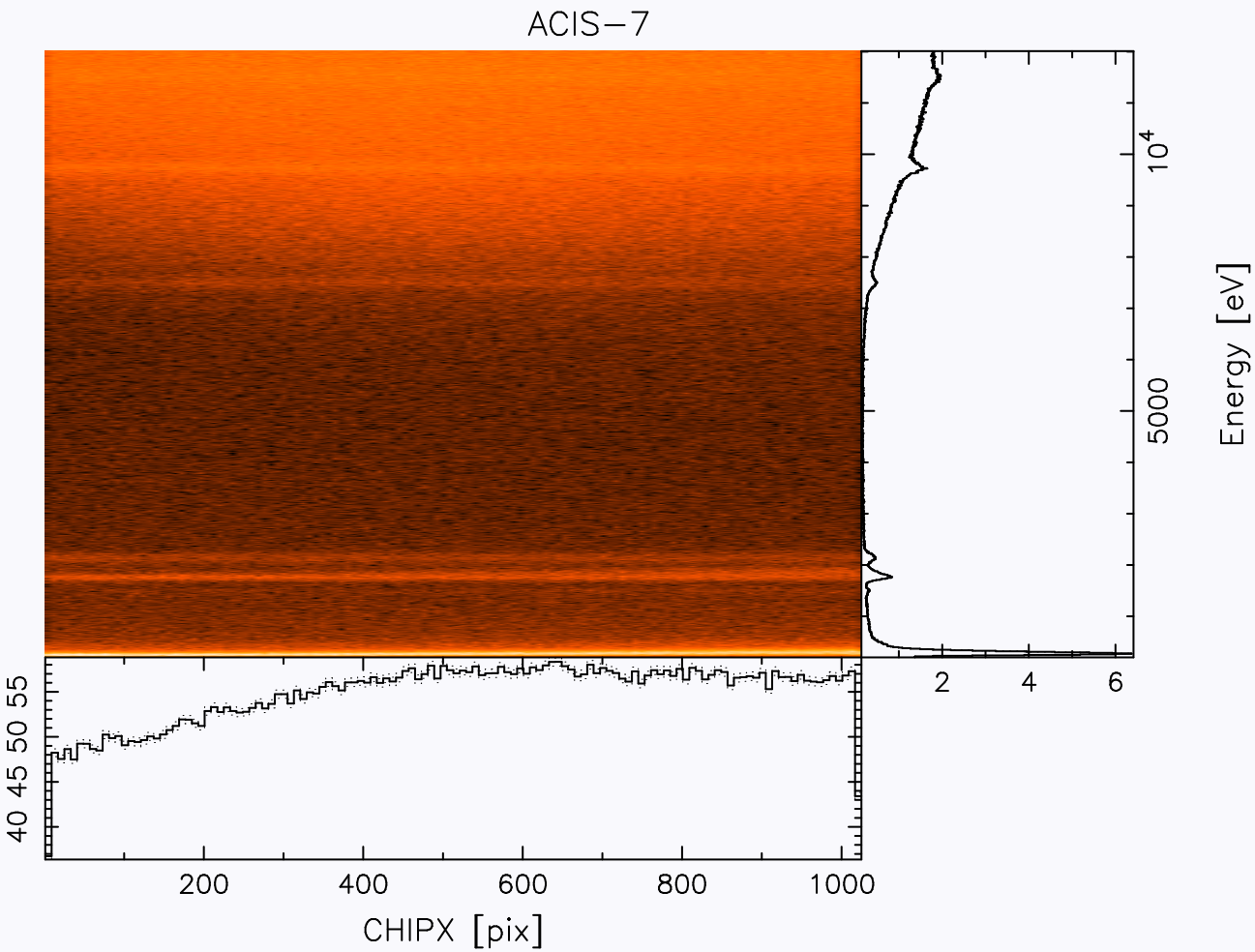
ACIS-S3: `chipy` Variation (with VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chips – S3

ACIS-S3: `chipx` Variation (no VF cleaning)



Background Spatial/Spectral Variation (ACIS “stowed”)

BI Chips – S3

ACIS-S3: `chipx` Variation (with VF cleaning)