ACIS background

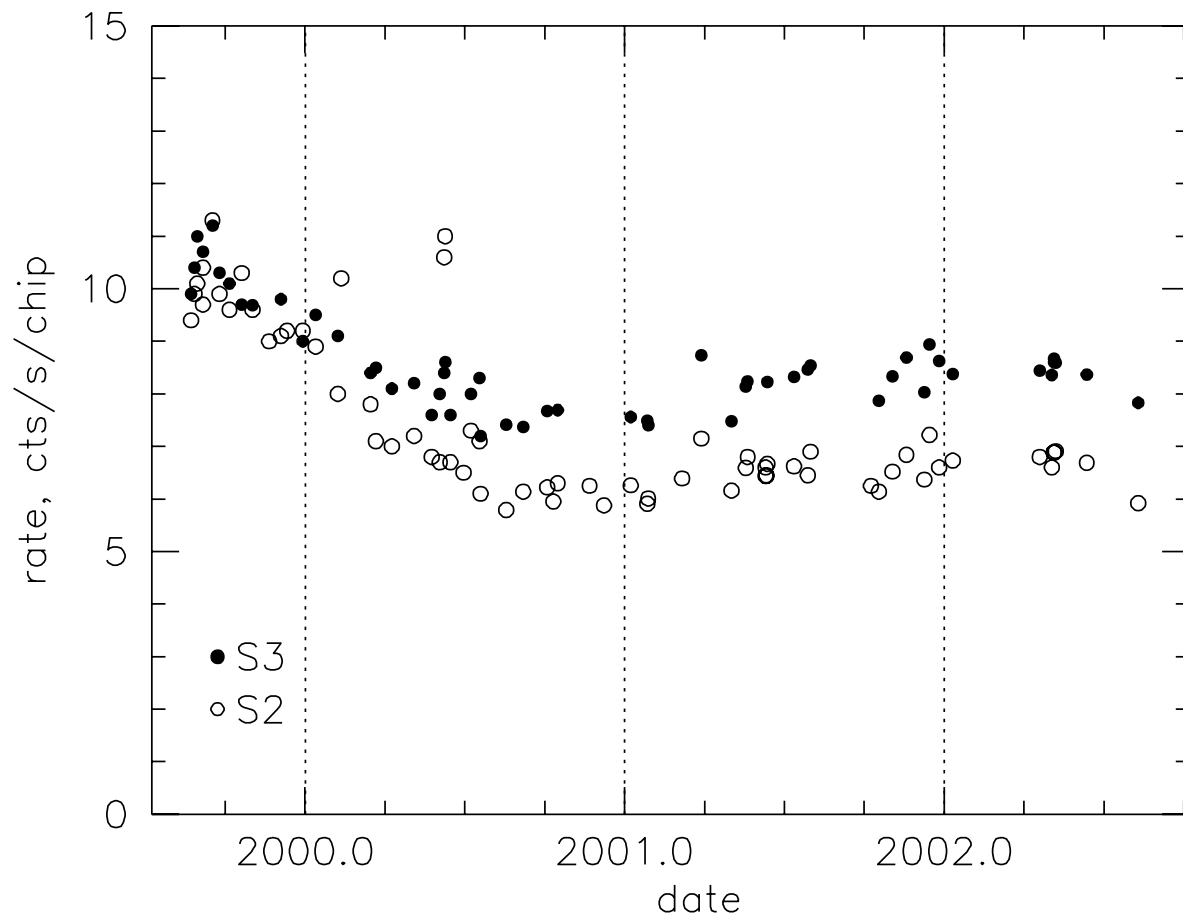*Maxim Markevitch, 2002 Nov 6*

New this year:

• **Particle-only background: ACIS stowed but working in normal imaging VF mode**

• **Modeling the "soft" flare species in BI chips**

• **Normalizing quiescent background to a 3% accuracy**

• **New blank sky datasets for 2001-2002, improved for 2000**

• **2000 and 2001-2002 datasets with CTI correction**

cxc.harvard.edu/cal , click on "ACIS", then "Background"

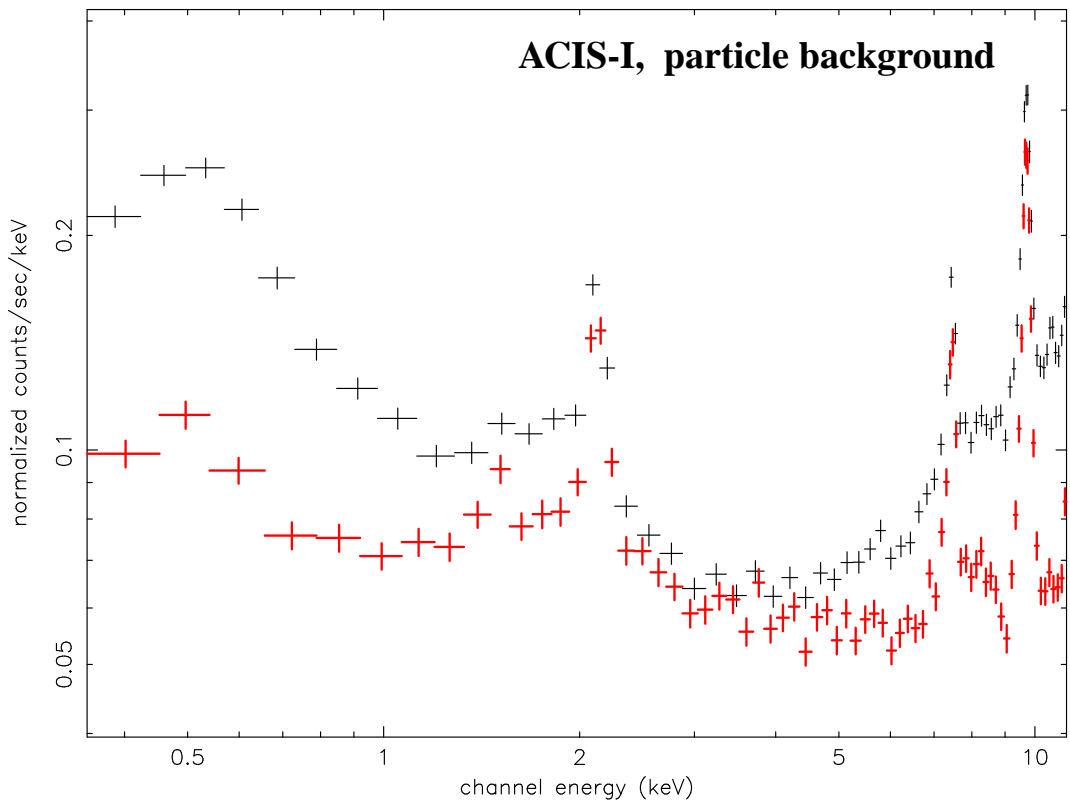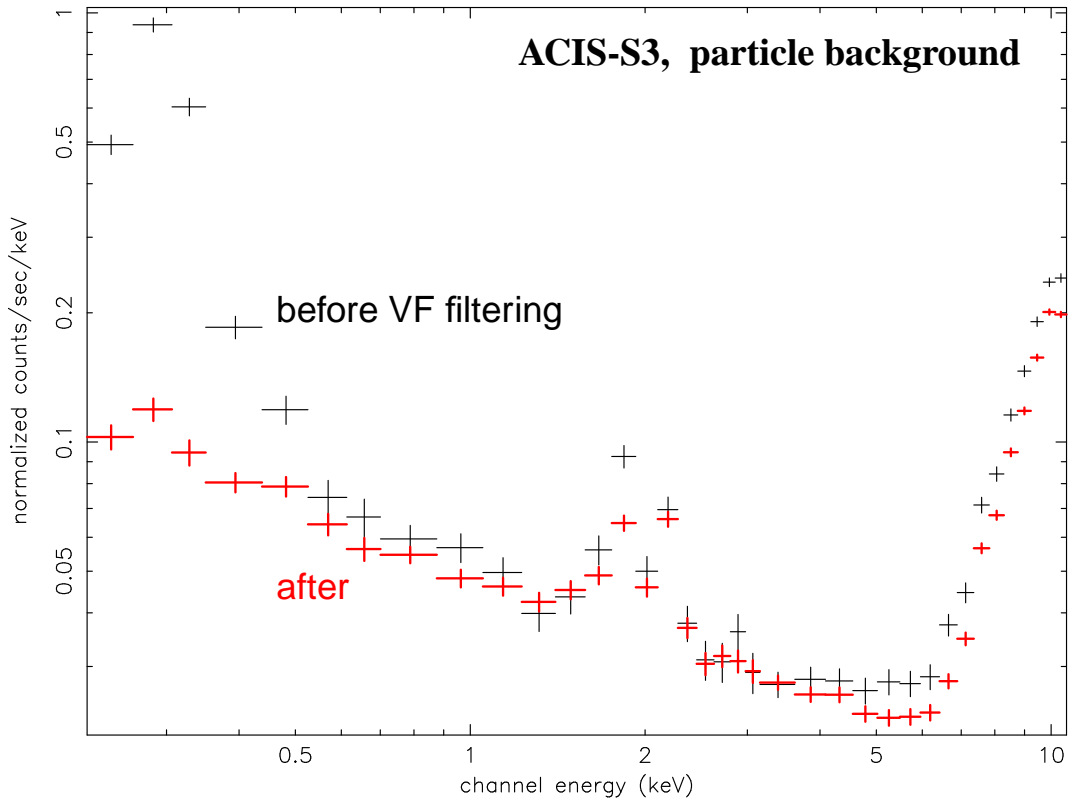**Total quiescent rate (all grades, energies)**
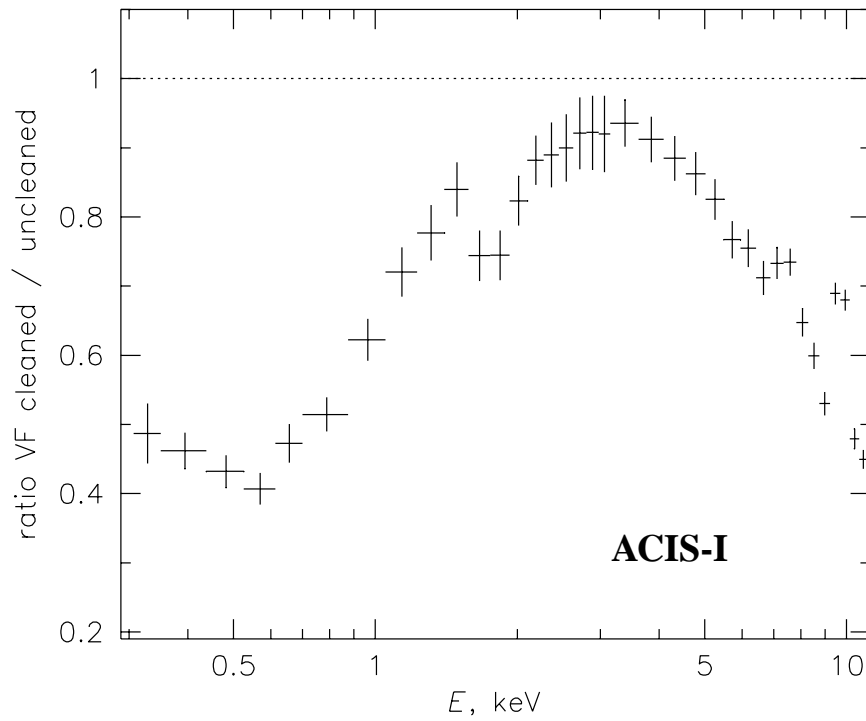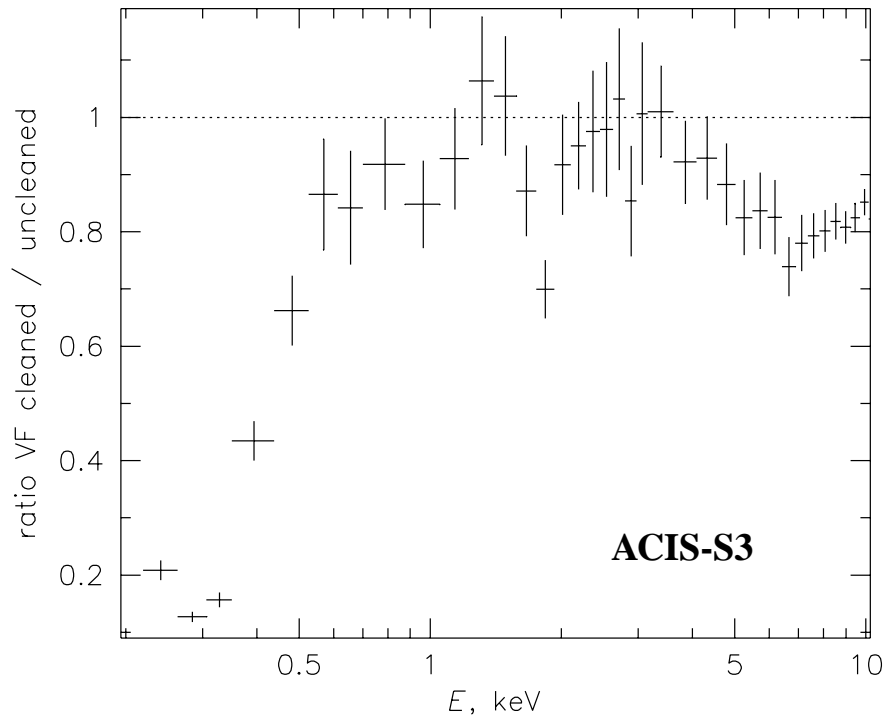
Blank sky datasets

- **Period C (2000) and D (2001-2002) datasets now include only the low Galactic brightness fields (pointings toward North Polar Spur are removed from the ACIS-S C file)**

- **To help modeling the possible soft Galactic excess or deficit, periods C and D now include the same set of observations for the main chips**

- **Better flare cleaning is applied to BI chips in C and D (using 2.5–7 keV band)**

- **Versions of CTI-corrected C and D files using both PSU and MIT-CXC correctors**

- **Period D now has VF mode files for ACIS-I and ACIS-S**

Improved background rejection in VF mode

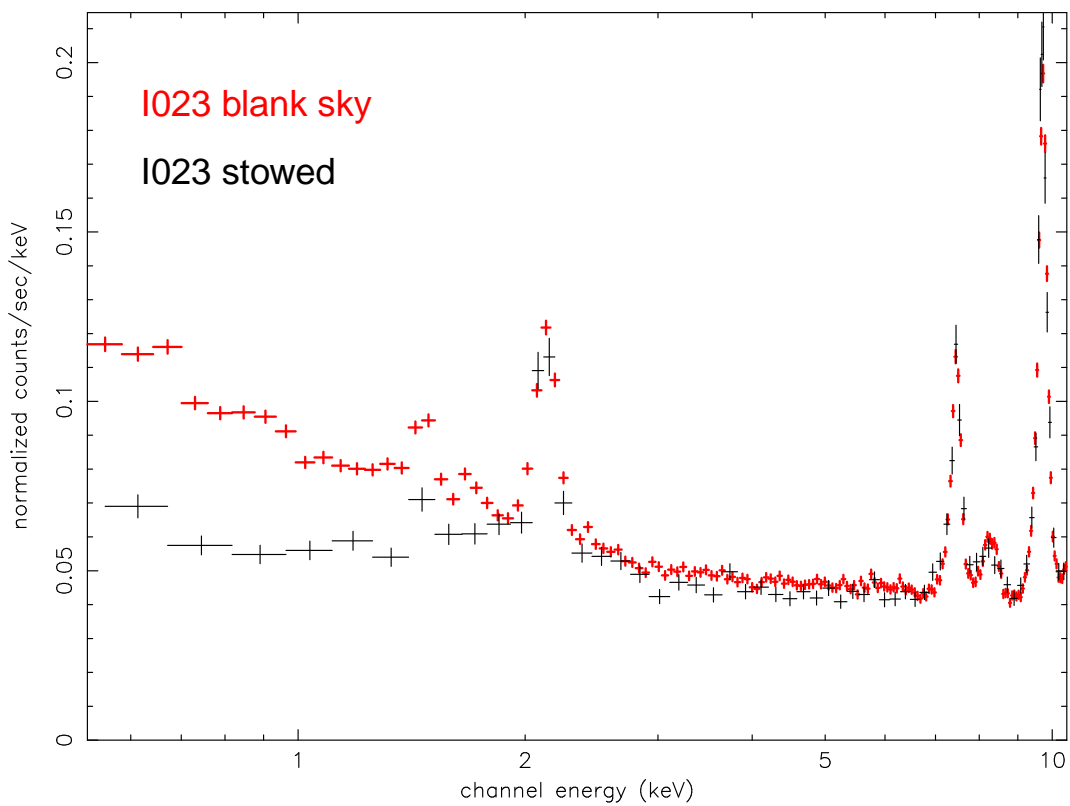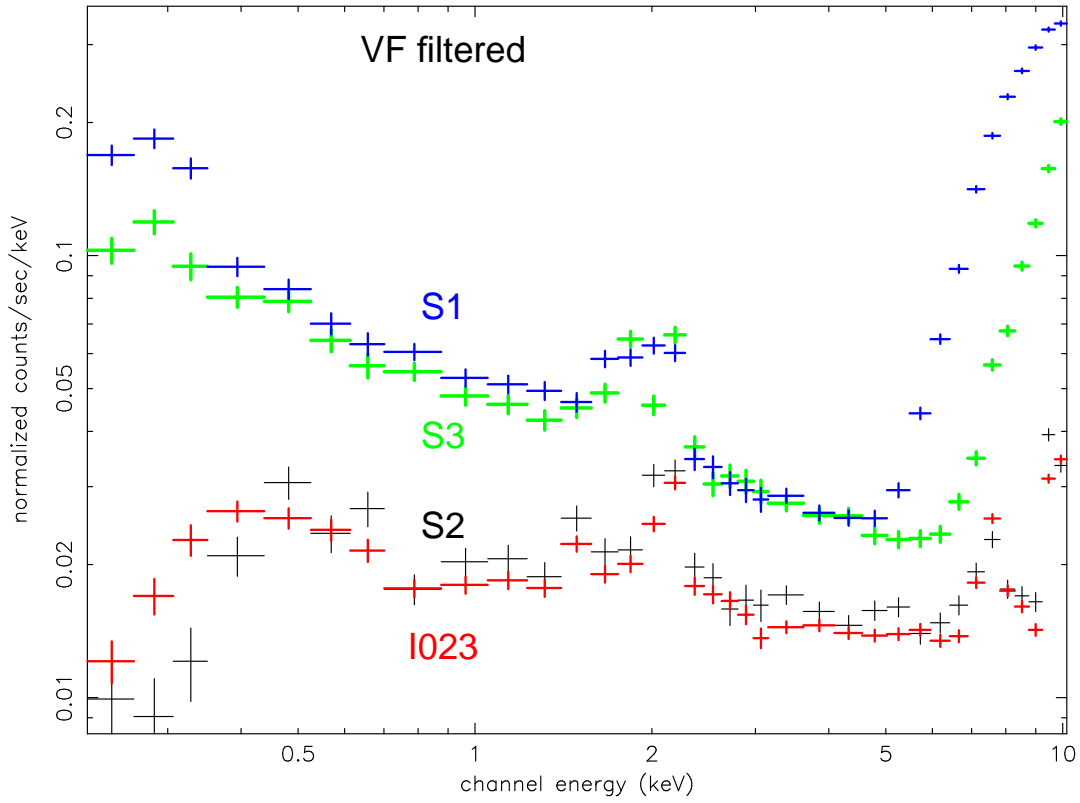*cxc.harvard.edu/cal , "ACIS", "Background", "VF mode"*

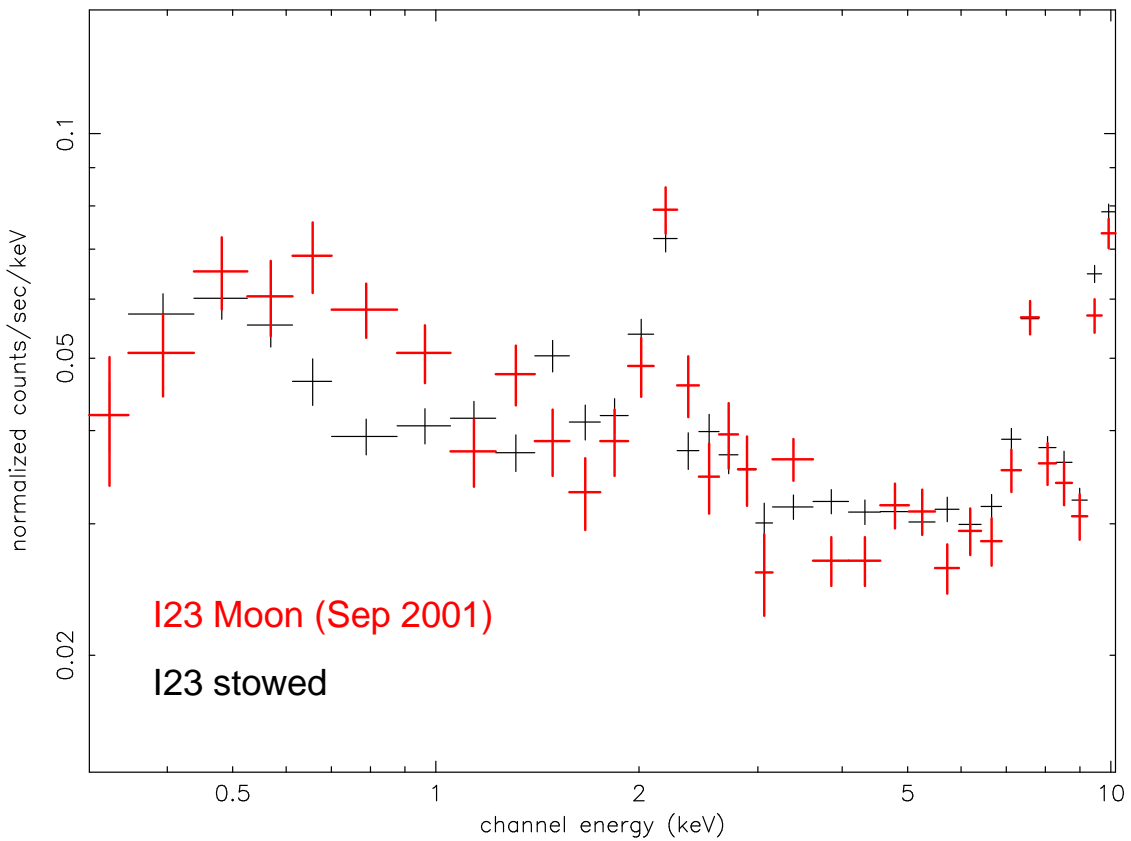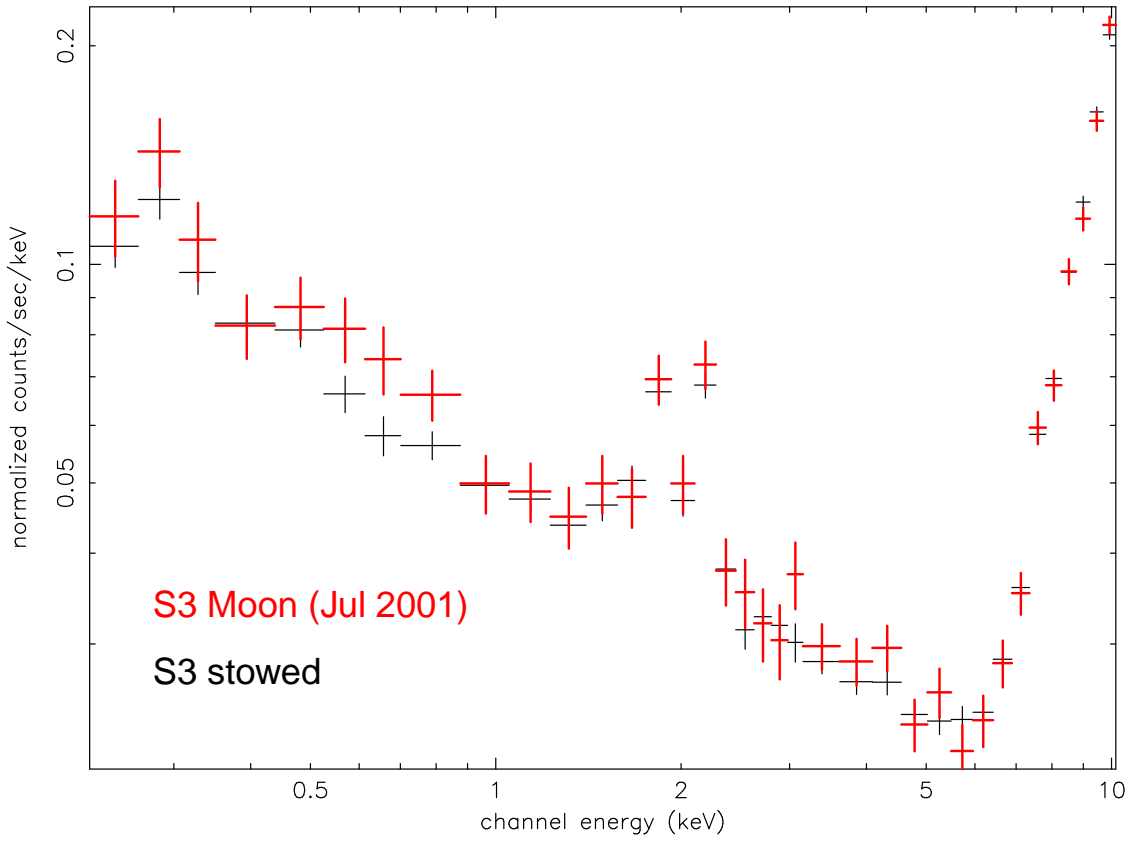# Improved background rejection in VF mode

Only 2% of real X-ray events are rejected — unless the source is close to pileup.

Particle background observations with ACIS stowed
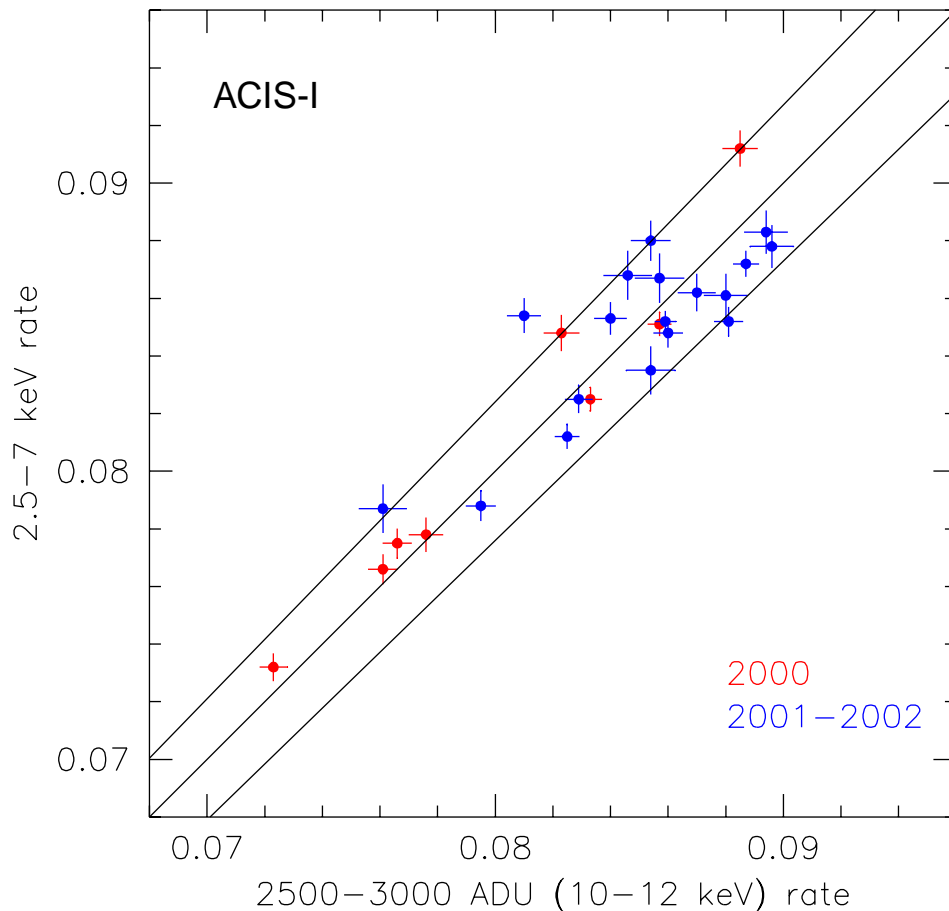
cxc.harvard.edu/cal , "ACIS", "Background", "ACIS stowed"

ACIS stowed compared to dark Moon
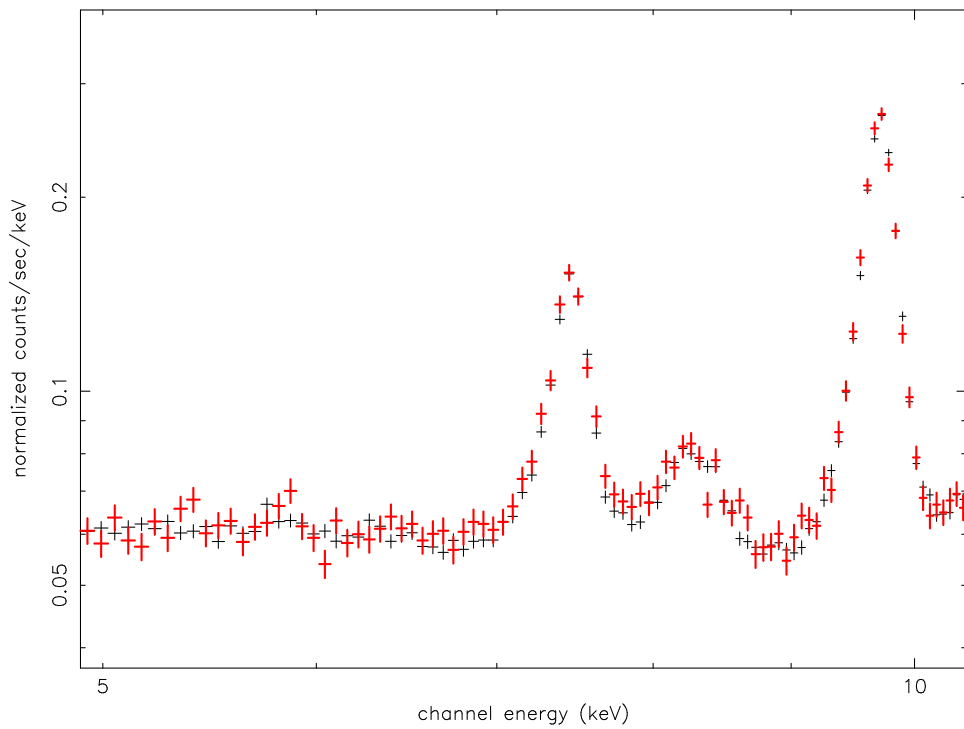

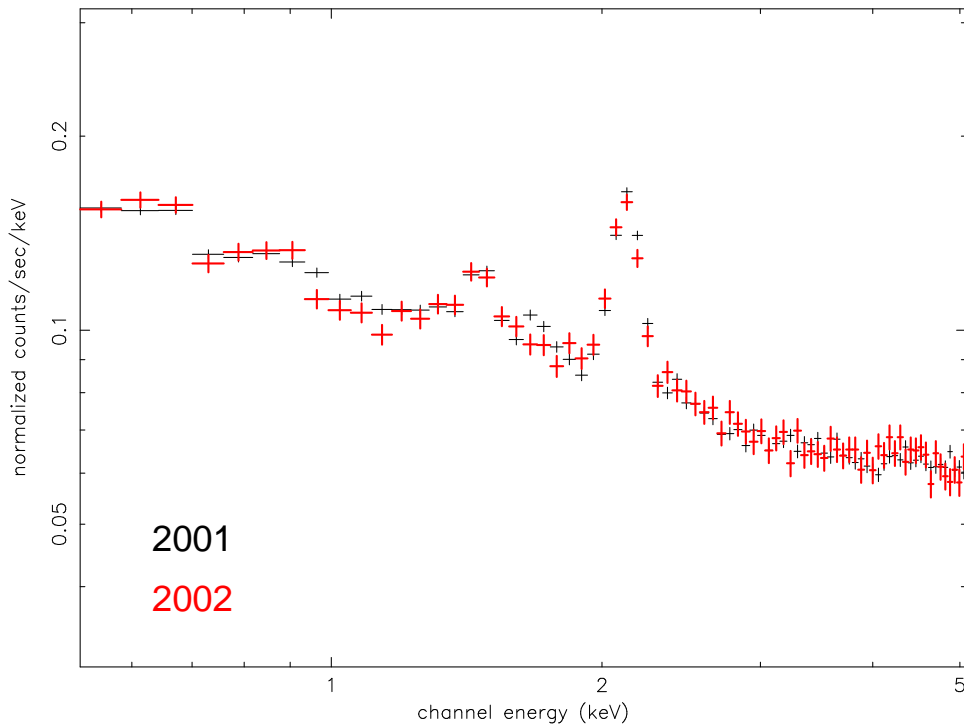● **Moon Sep 2001 data may have soft excess, July OK.**

Quiescent background normalization

Strong correlation between the high and low energy rates
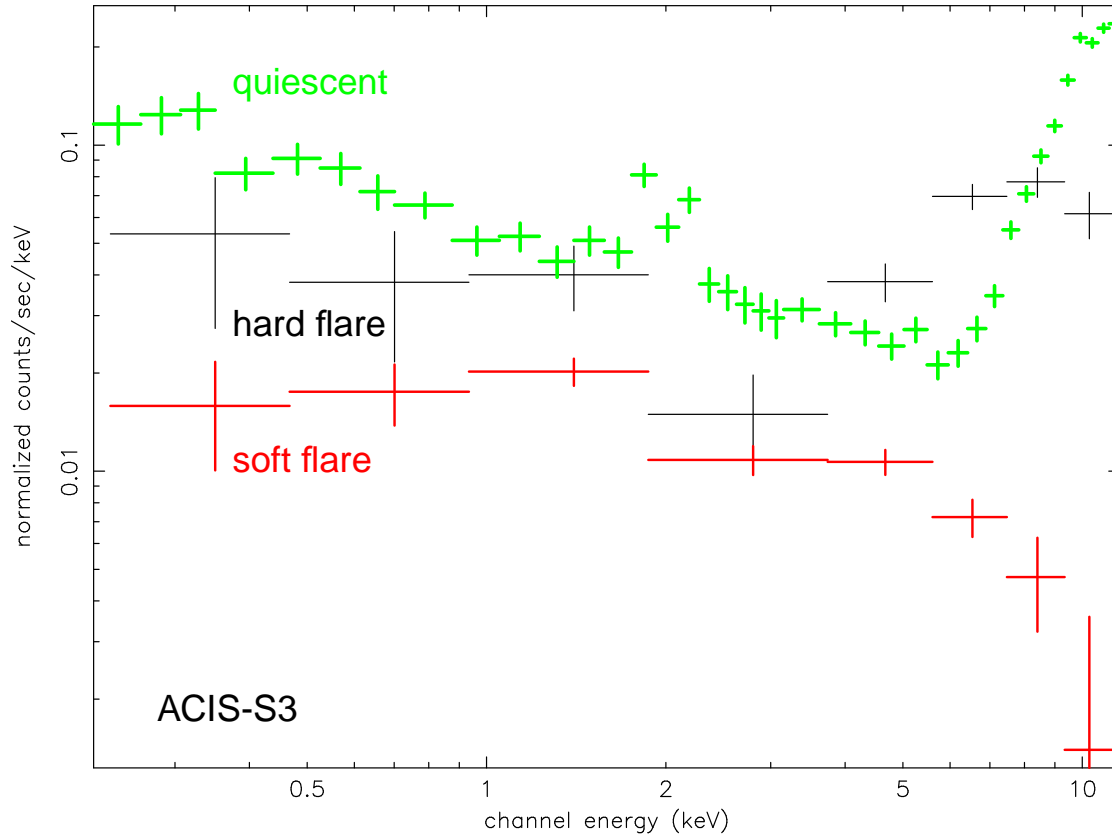
• **Normalization can be predicted to ±3% from the rate above 10 keV (e.g., in the 2500–3000 ADU band) — after the proper flare cleaning**

• **But, for BI chips, the 2.5–7 keV band is most affected by flares, so scatter is greater**

ACIS-I background spectra from 2001 and 2002

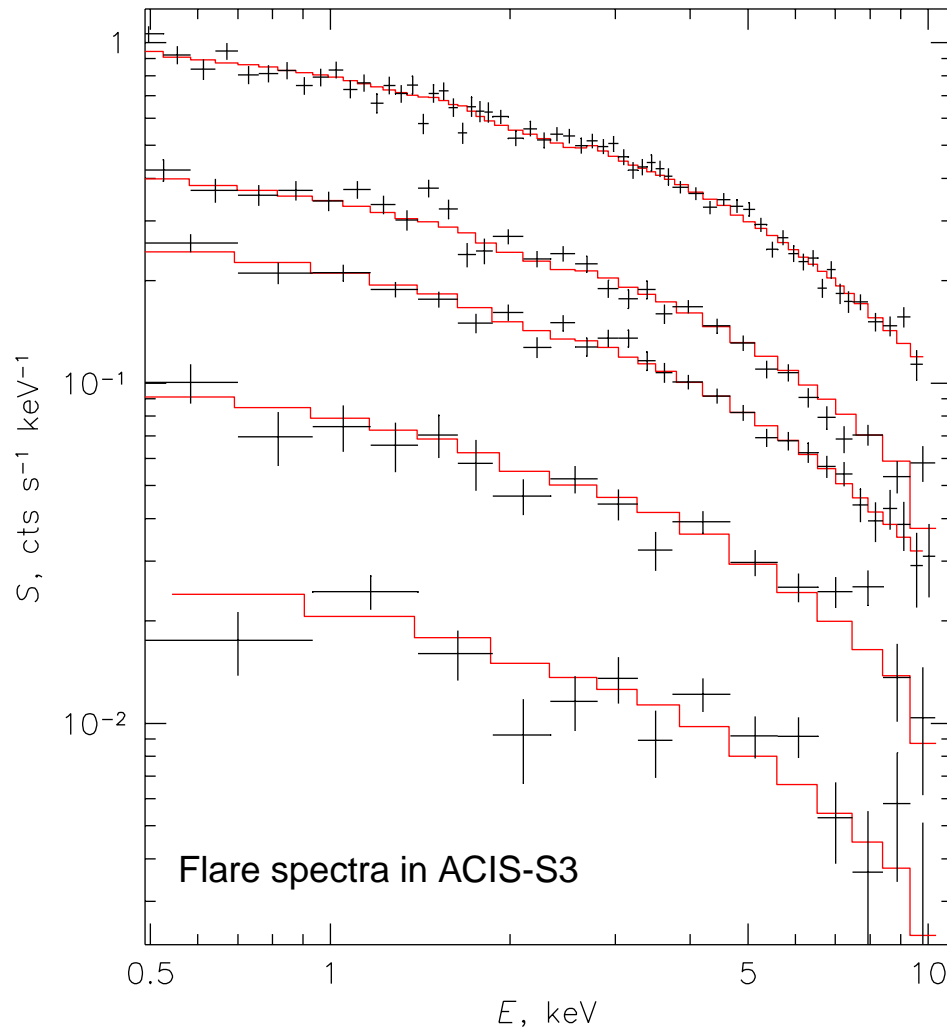- **Background spectrum is remarkably stable — after the proper flare cleaning.**

Different flare species in BI chips

Soft flares affect only BI chips; hard flares (less frequent) are seen in both BI and FI light curves

- **Soft flares do not affect spectrum at $E > 10$ keV**
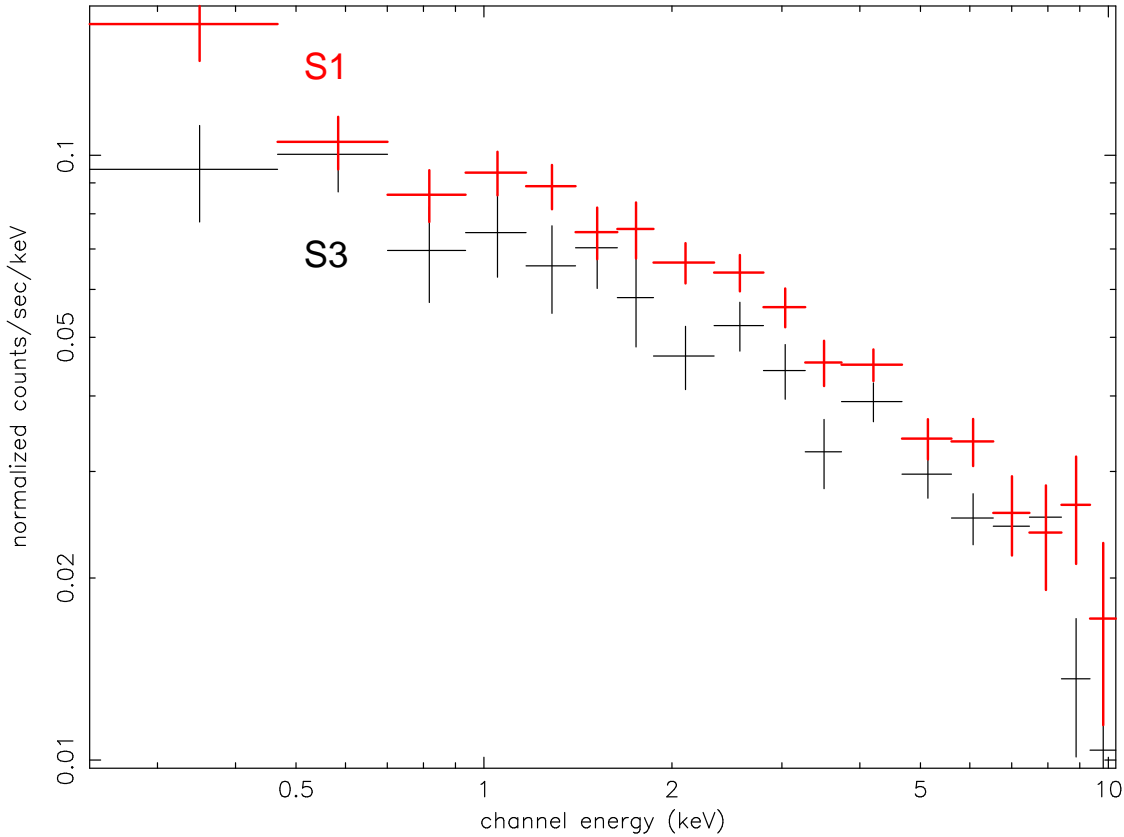
Soft background flares in BI chips

Flare spectra in ACIS-S3

The flare species affecting only the BI chips

• **Always have the same spectrum.**
Model shown: power law −0.15, cutoff at 5.6 keV

Observations shown span 2000–2001

Soft background flares in BI chips

Flares in chips S1 and S3 have the same spectrum, 5–10% difference in normalization

• **S1 can be used to model flares in S3**

Note that flares are not spatially uniform (S1 and S3 similarity is under study)

Background calibrator's wish list

When planning future observations:

• Use VF mode if possible, and as many chips as possible

• When observing with ACIS-S, turn chip S1 on

• Do not set upper energy cutoff below 12 kev (3000 ADU)

Even if background is not critical for your science, we do want your data for background calibration.