

# Testing the XIS HCO Contamination Model with E0102

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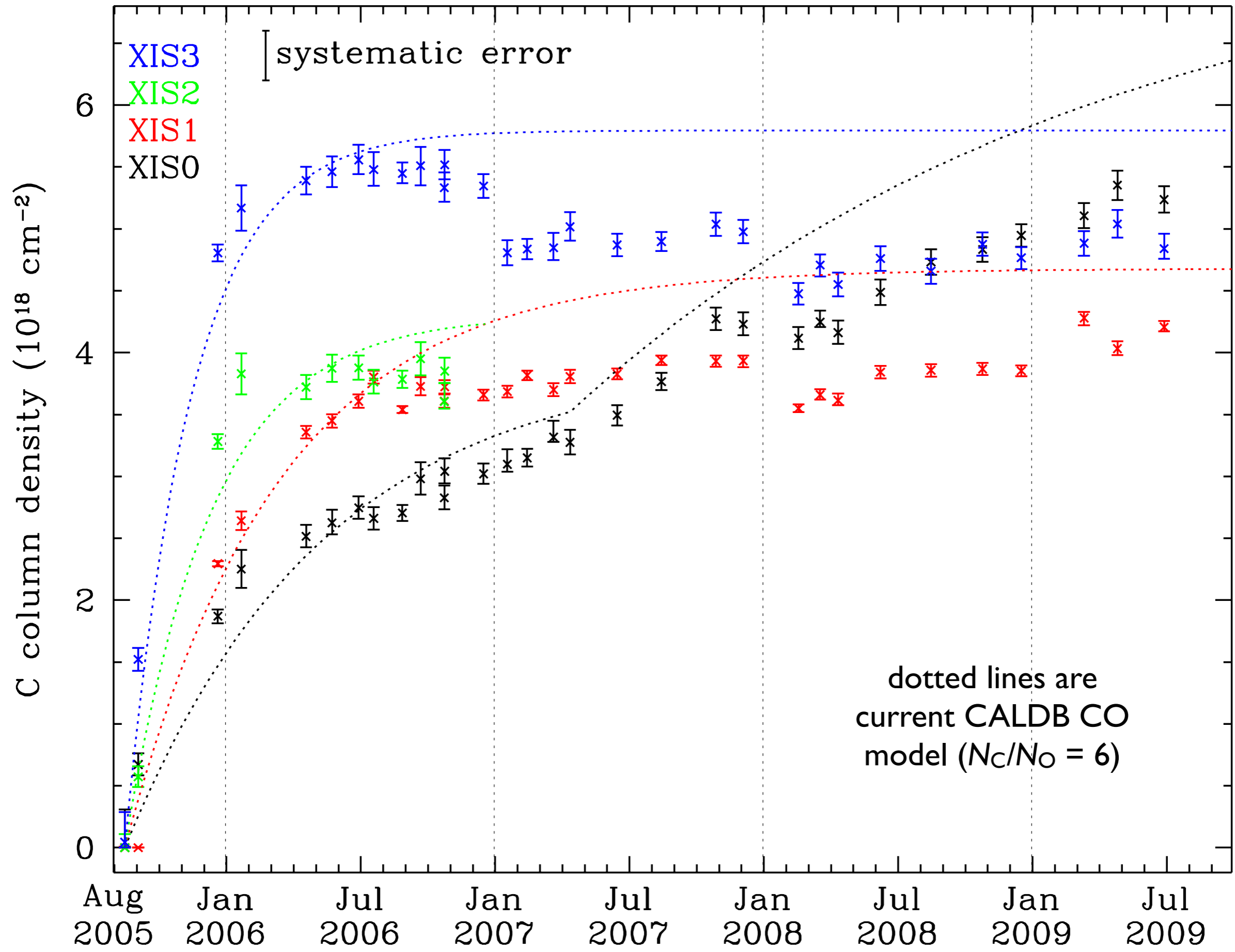
2009-10-11

- used all available E0102 data through 2009-06-26, all four XIS
- fit usual emission model to spectra, allowing absorption from HCO contamination model:
  - $N_C$  freely varying
  - $N_O/N_C = 0.27602 \times [1.0 - \exp(-\text{days\_from\_dooropen}/341.65)]$
  - $N_H/N_C = 157.61$
- XIS1 was fit down to 0.2 keV; XIS0,2,3 were fit down to 0.4 keV
- page 2 shows the trend of  $N_C$  only for the best fit contamination for each spectrum (points) with the current CALDB model of  $N_C$  assuming  $N_C/N_O = 6$  (dotted lines)
- page 3 shows the trend of  $N_C$  only for the best fit contamination for each spectrum (points) with the best-fit HCO model above. The fit is:

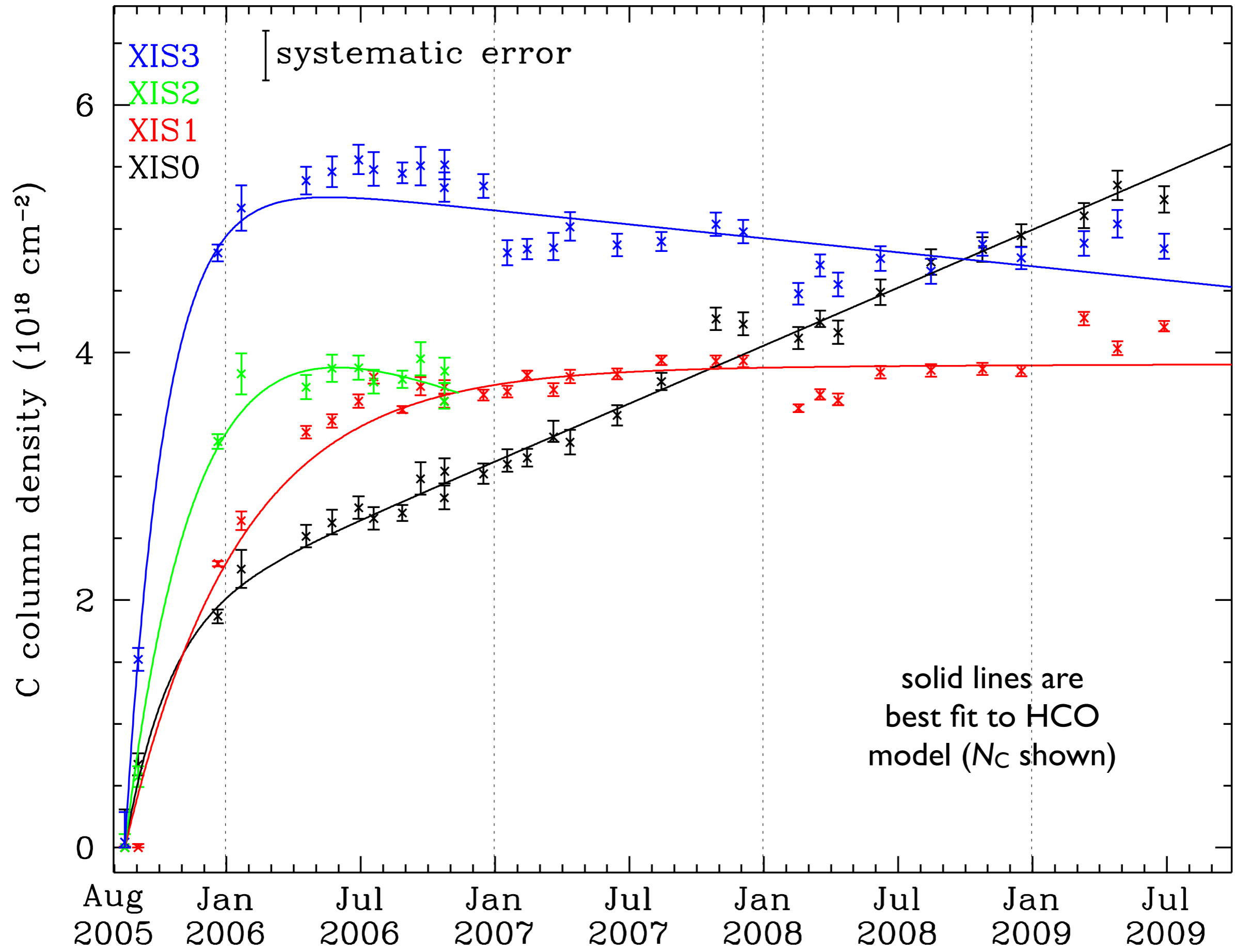
$N_C = A (1+Ct)[1-\exp(-t/B)]$  with  
 $t = \text{days since door opening (on MJD 53595.35)}$

XIS	A(cm <sup>-2</sup> )	B(days)	C(days <sup>-1</sup> )
0	1.829	53.83	1.402e-3
1	3.874	153.07	5.154e-6
2	4.782	98.88	-4.930e-4
3	5.460	54.76	-1.132e-4

# XIS contamination history from E0102 – HCO empirical model



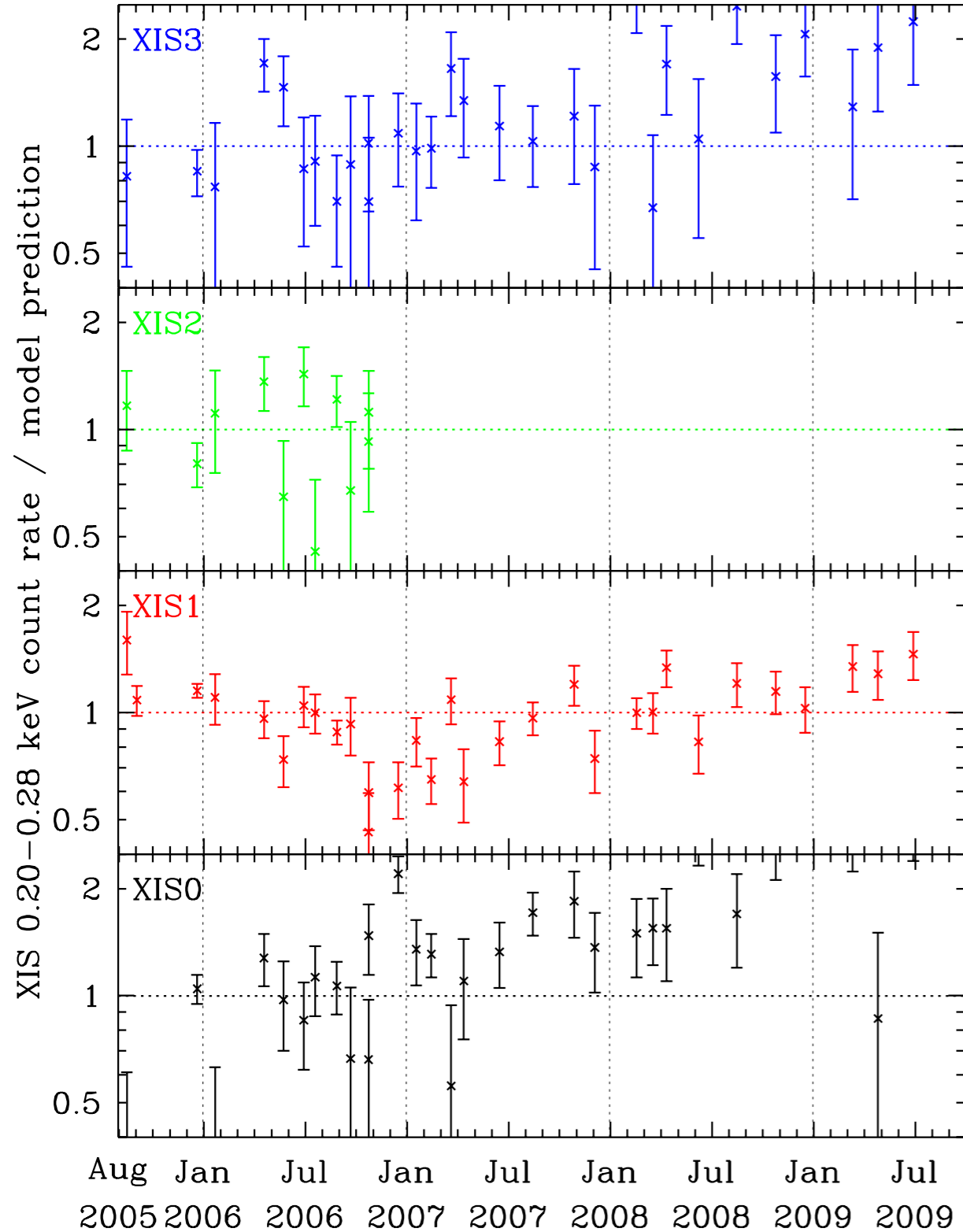
XIS contamination history from E0102 – HCO empirical model



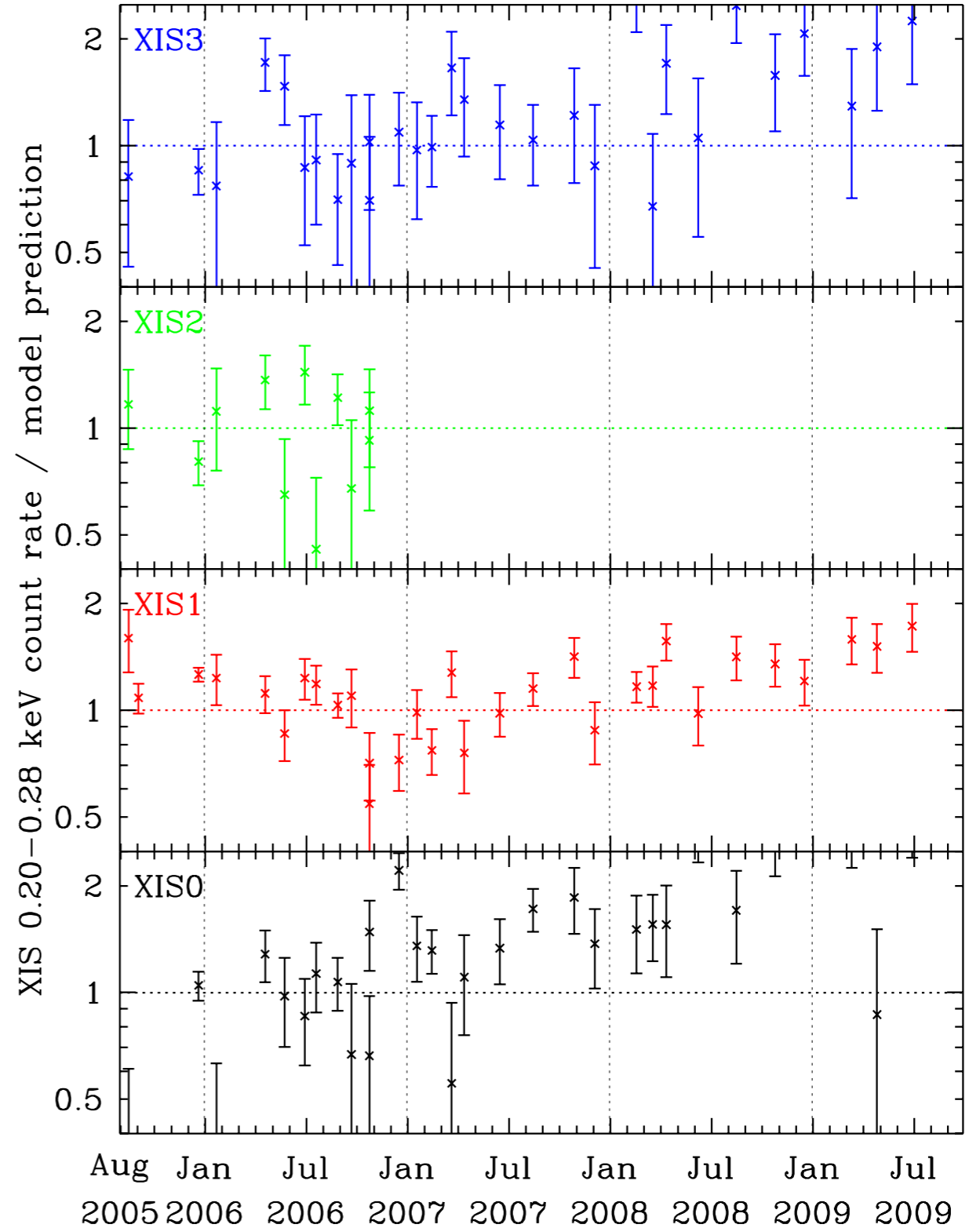
- pages 5-7 show the ratio of E0102 count rate to model prediction in three narrow, soft energy bands: below the C-edge, between the C-edge and O-edge, and above the O-edge. The left panel shows the CO (CALDB) model, the right panel shows the best-fit HCO model.
  - below the C-edge, only XIS1 has appreciable counts above background (~40% are from E0102). There is little difference here compared to the old model, and the E0102 emission model is poorly constrained here anyway.
  - between the C-edge and O-edge, there are clear improvements in the spectral fit for XIS1 and XIS3, indicating that decreasing the C in the contaminant is warranted. The XIS0 spectral fit gets worse in the new model, which might indicate a different change in the C/O ratio for that device.
  - above the O-edge, there is little change, indicating that the amount of O in the HCO model is OK. There is a ~10% baseline discrepancy between the FI and BI chips, which might indicate a problem with the BI QE parameters at this energy or something about the spectral extraction, as the E0102 emission model is required to have the same normalization for each chip in the current fits.
- The remainder of the pages compares spectral fits for a few representative observations. Four spectra with the CO model fits are shown on one page, and the same four with HCO model fits are shown on the next. One can blink back and forth to compare residuals. The changes in the FI spectra are slight, but the fit is improved in the BI. There are still large residuals in some recent spectra at the OVII 570 eV line.
- In conclusion, the E0102 data support the use of the empirical HCO model, although the changes in the overall fit quality are small. There is some improvement between 0.4-0.52 keV, but residuals remain near the 0.57 keV OVII line, perhaps due to response errors. There remains a ~10% count rate offset between XIS's.

# below C-edge, 0.20-0.28 keV

E0102 count rates vs. DEHP model (0.20–0.28 keV)

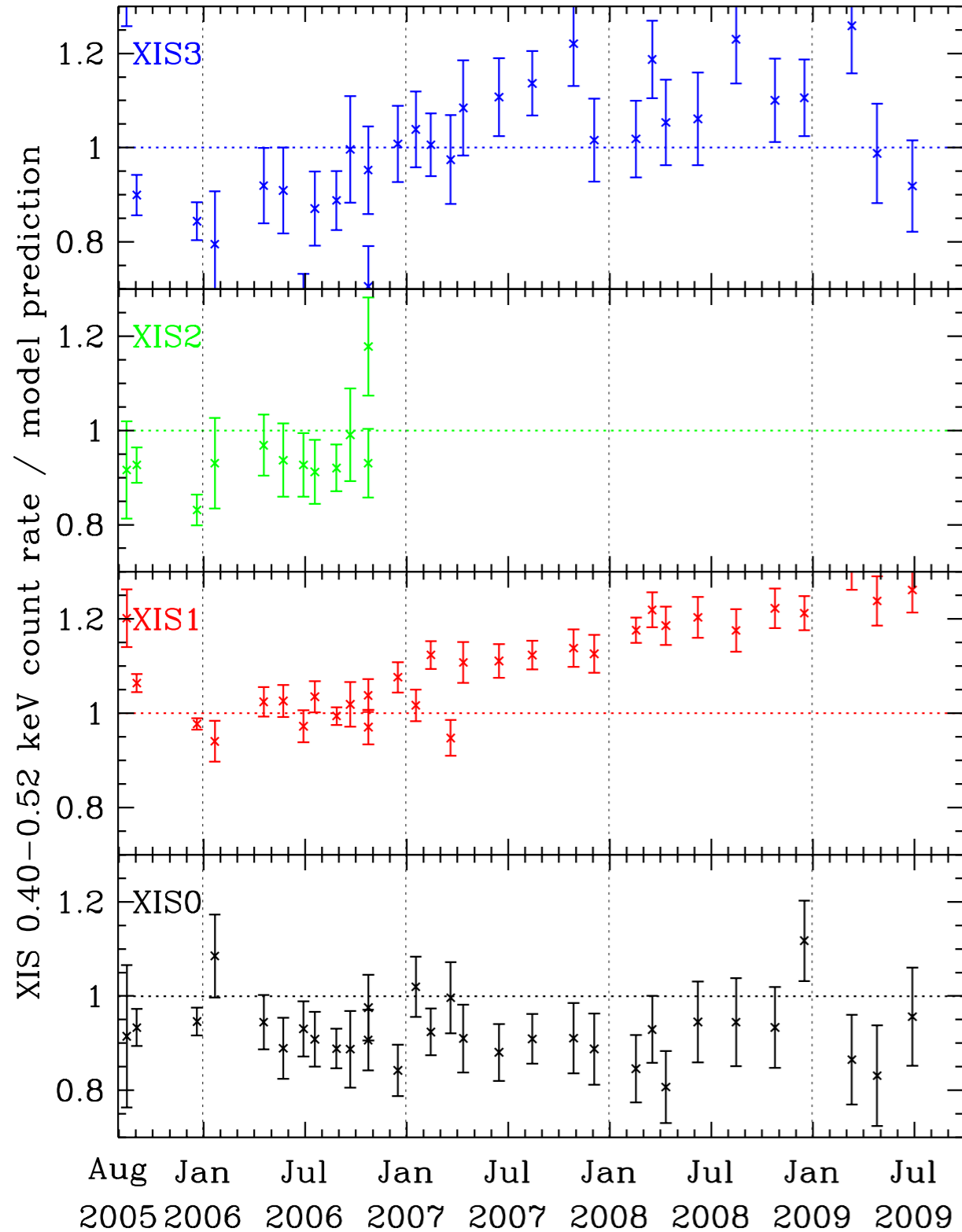


E0102 count rates vs. HCO model (0.20–0.28 keV)

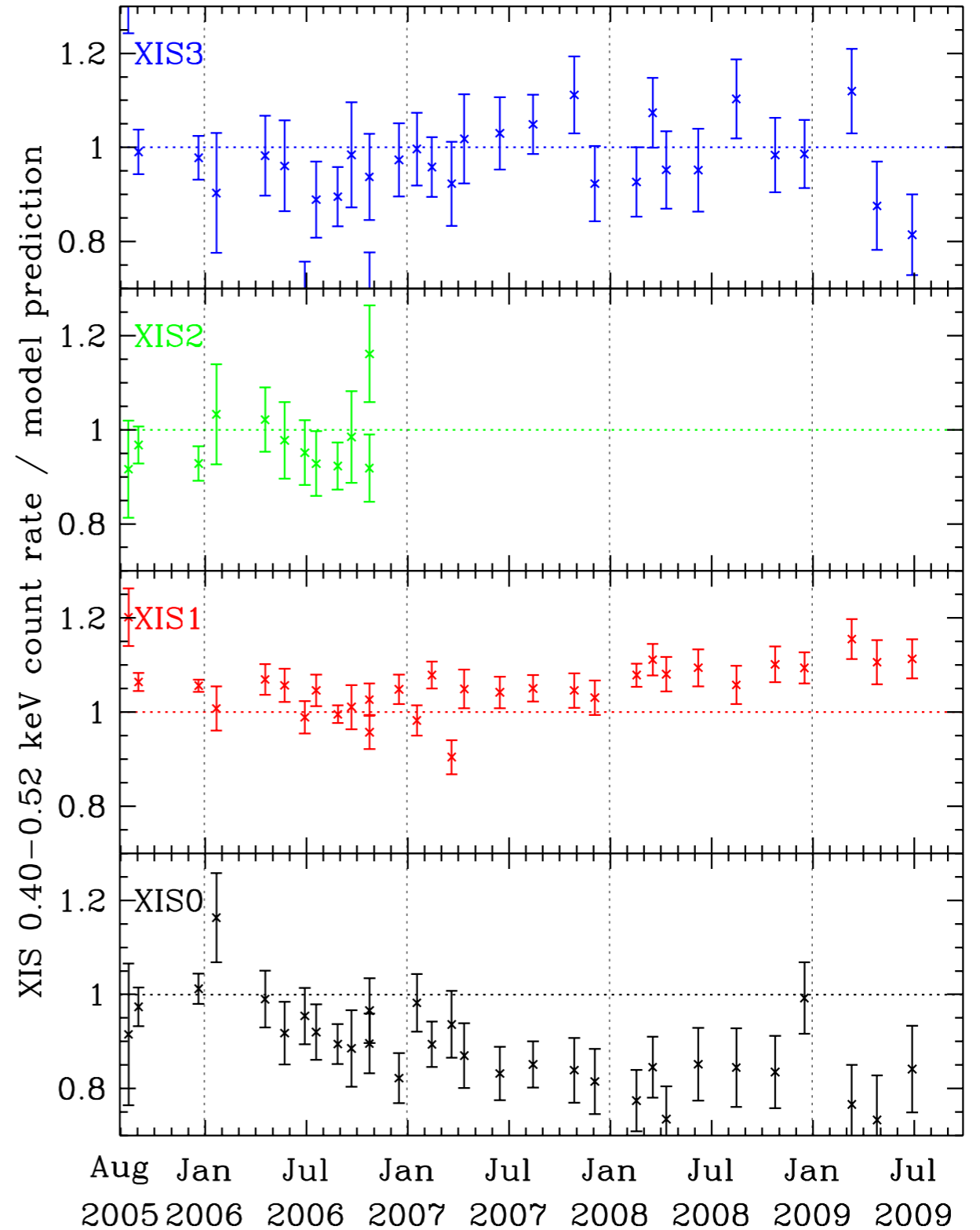


# C-edge to O-edge, 0.40-0.52 keV

E0102 count rates vs. DEHP model (0.40–0.52 keV)

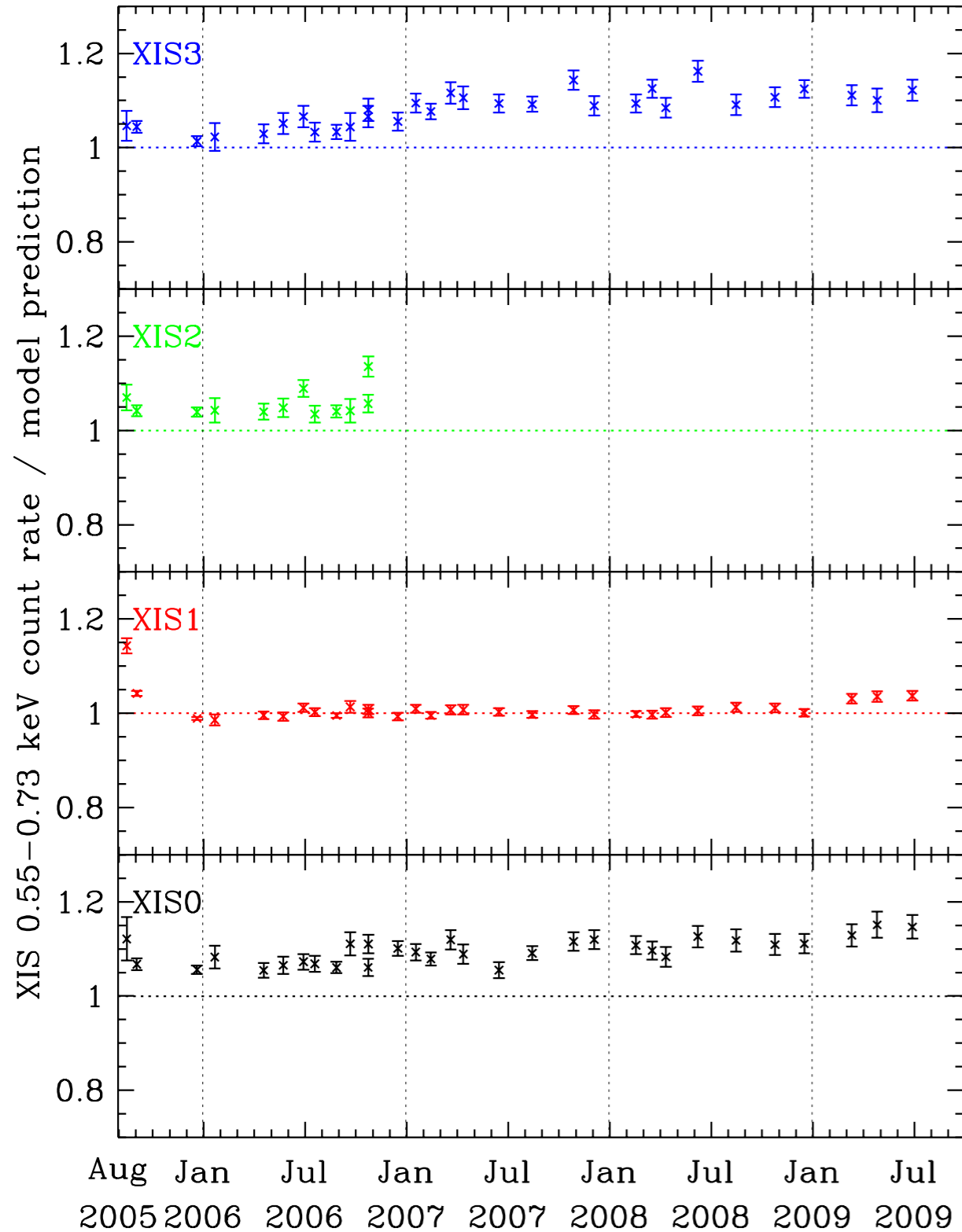


E0102 count rates vs. HCO model (0.40–0.52 keV)

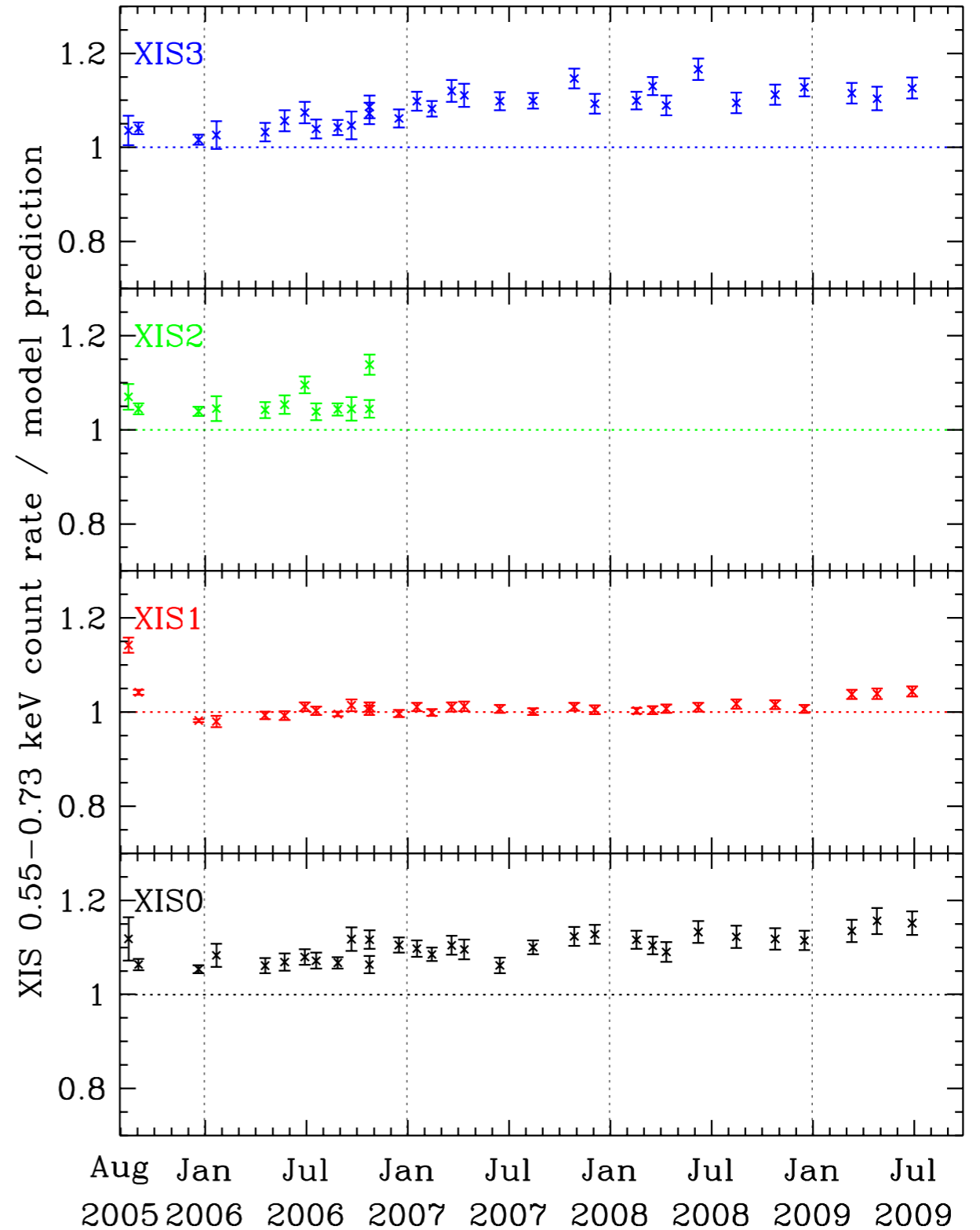


# above O-edge, 0.55-0.73 keV

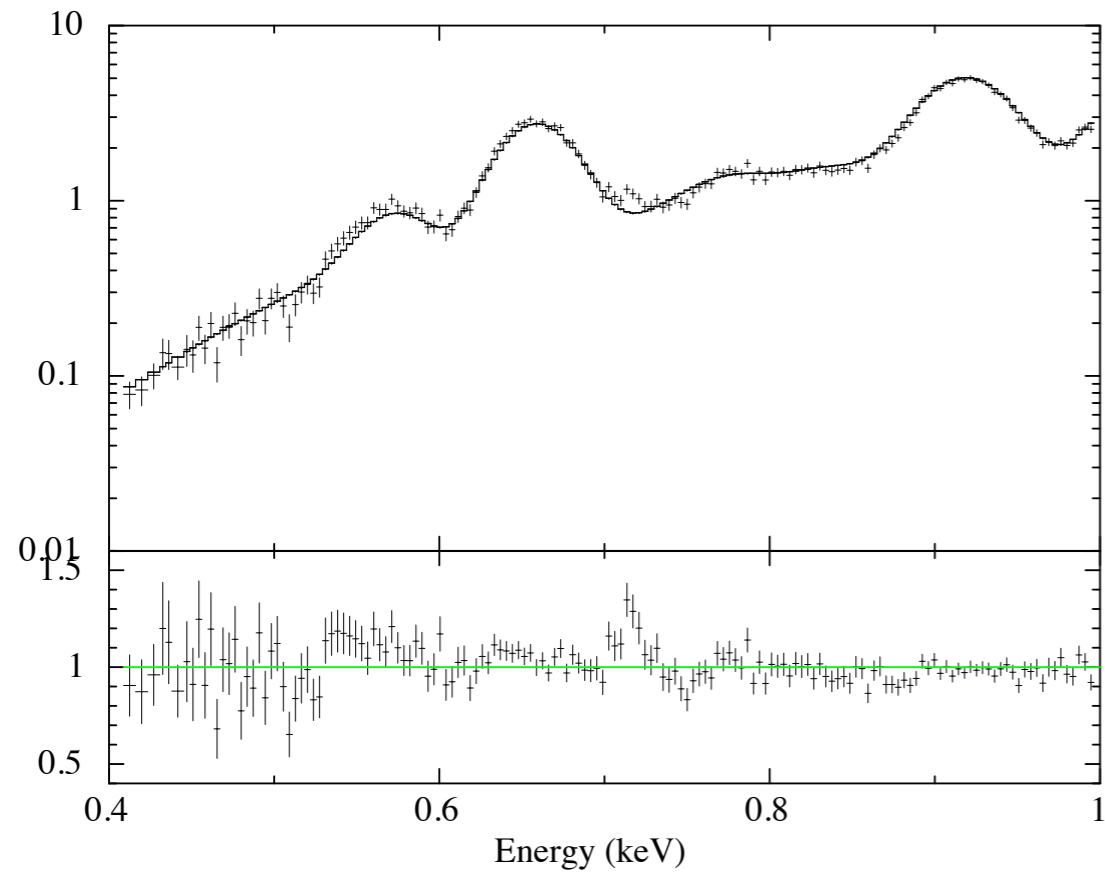
E0102 count rates vs. DEHP model (0.55–0.73 keV)



E0102 count rates vs. HCO model (0.55–0.73 keV)

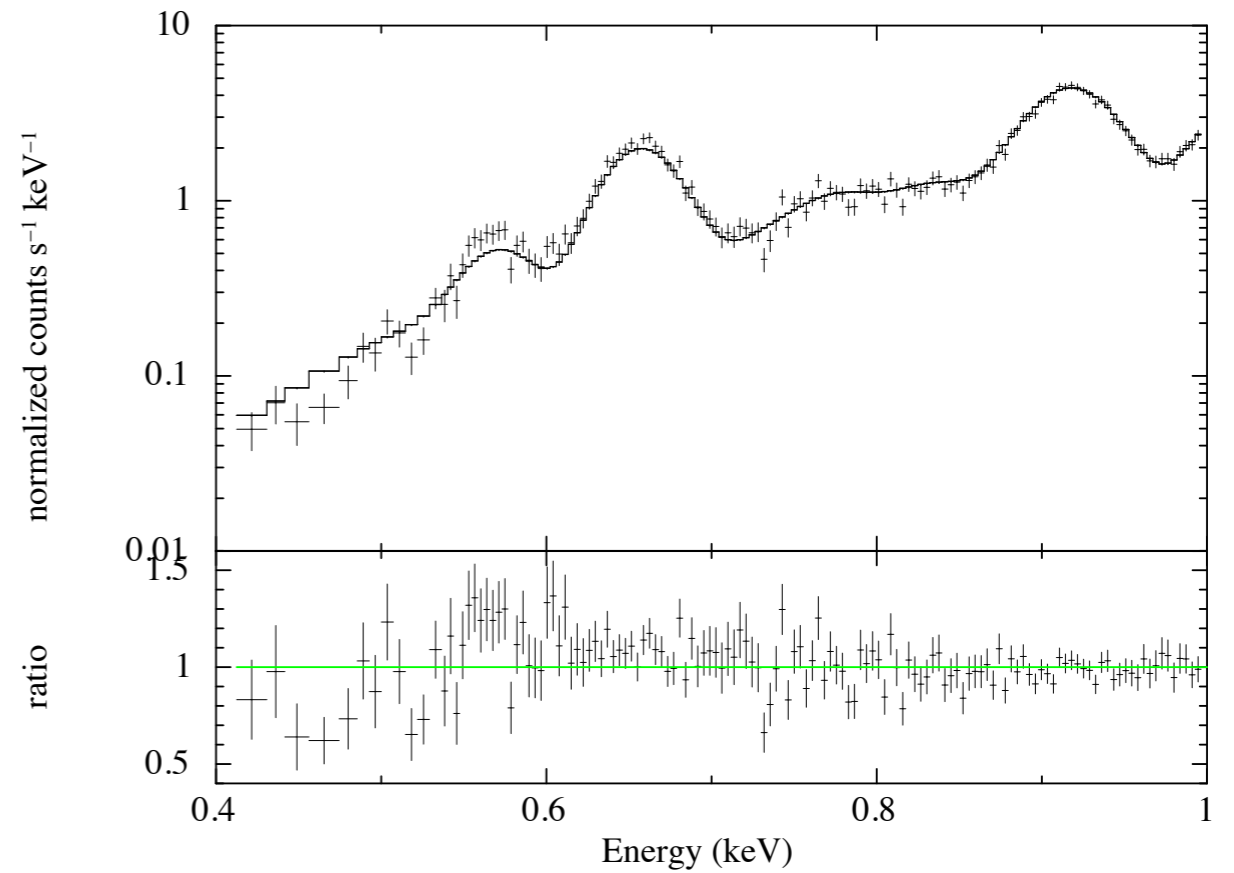


1 E0102-72.3 - XIS0, 20051217, w/ C/O = 6



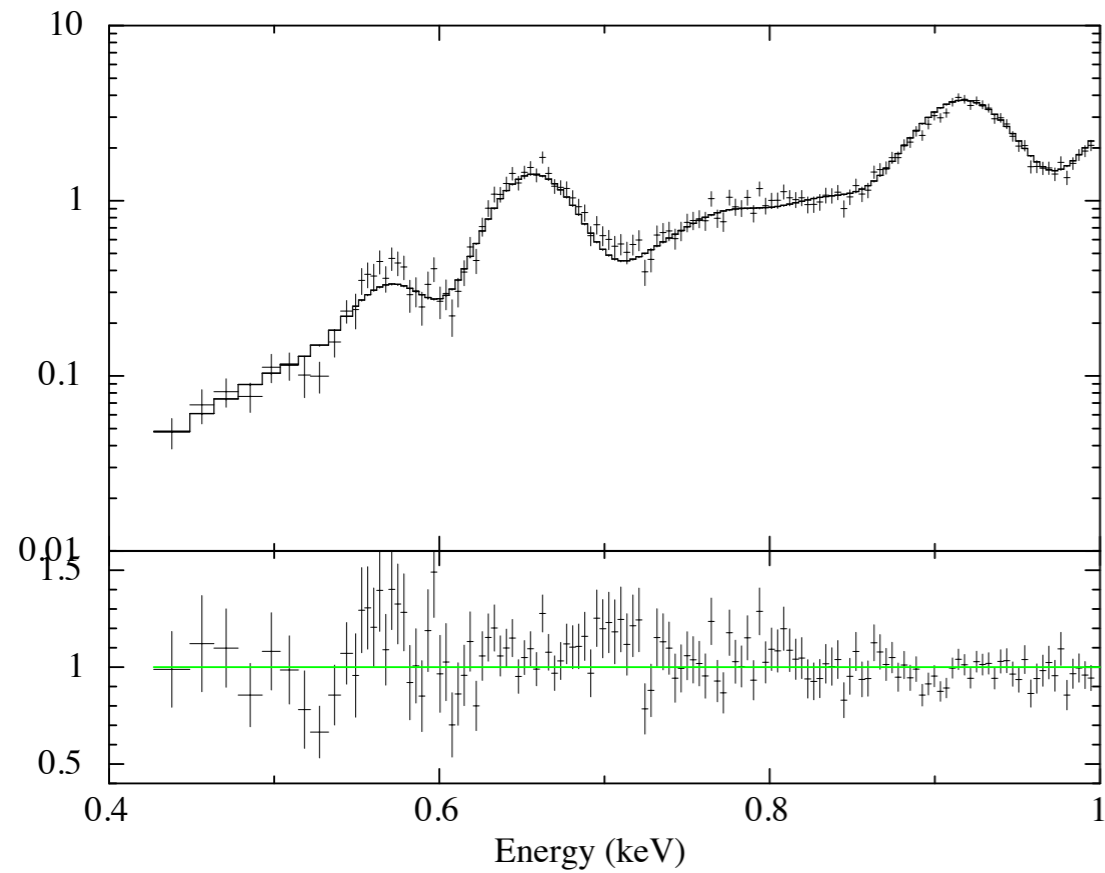
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1 E0102-72.3 - XIS0, 20061213, w/ C/O = 6



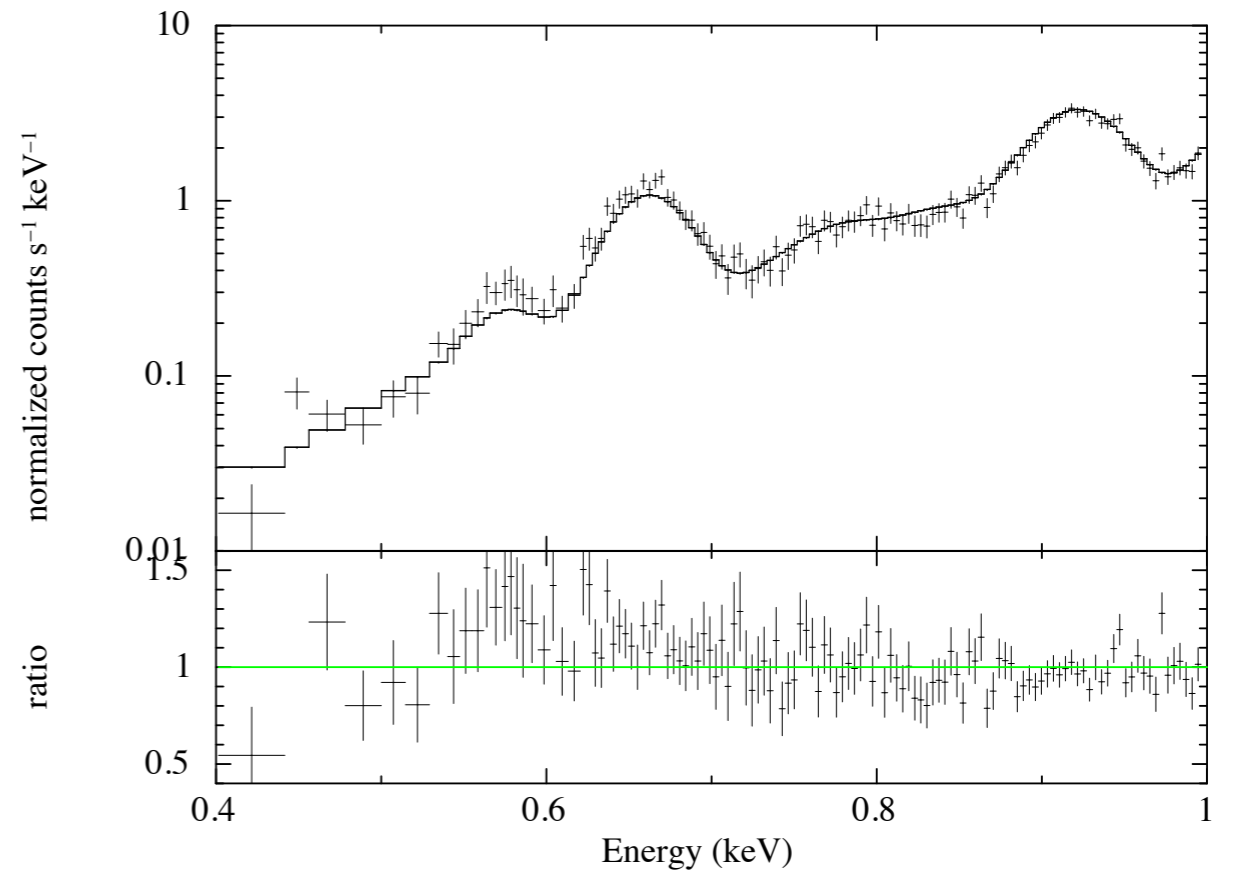
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1 E0102-72.3 - XIS0, 20080315, w/ C/O = 6



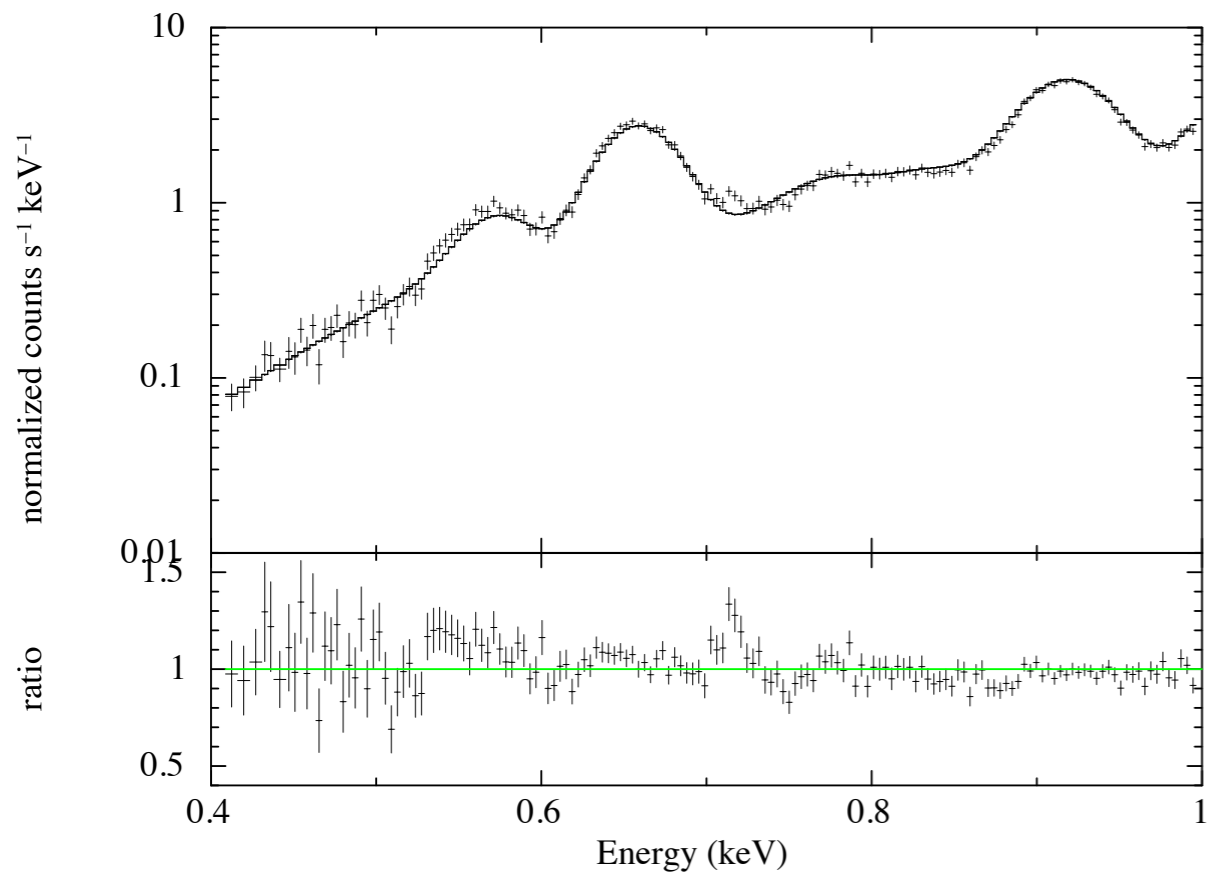
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1 E0102-72.3 - XIS0, 20090626, w/ C/O = 6



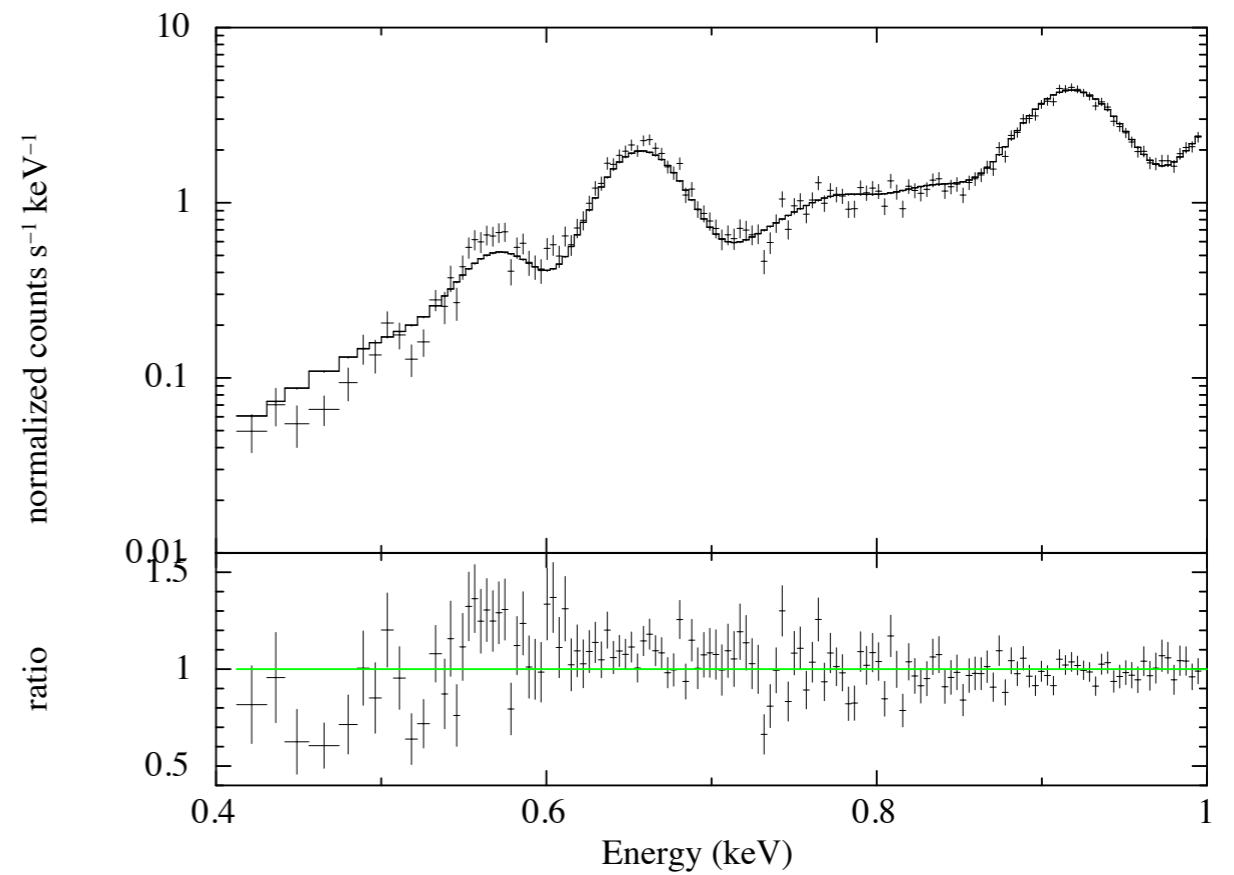
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1 E0102-72.3 - XIS0, 20051217, w/ HCO



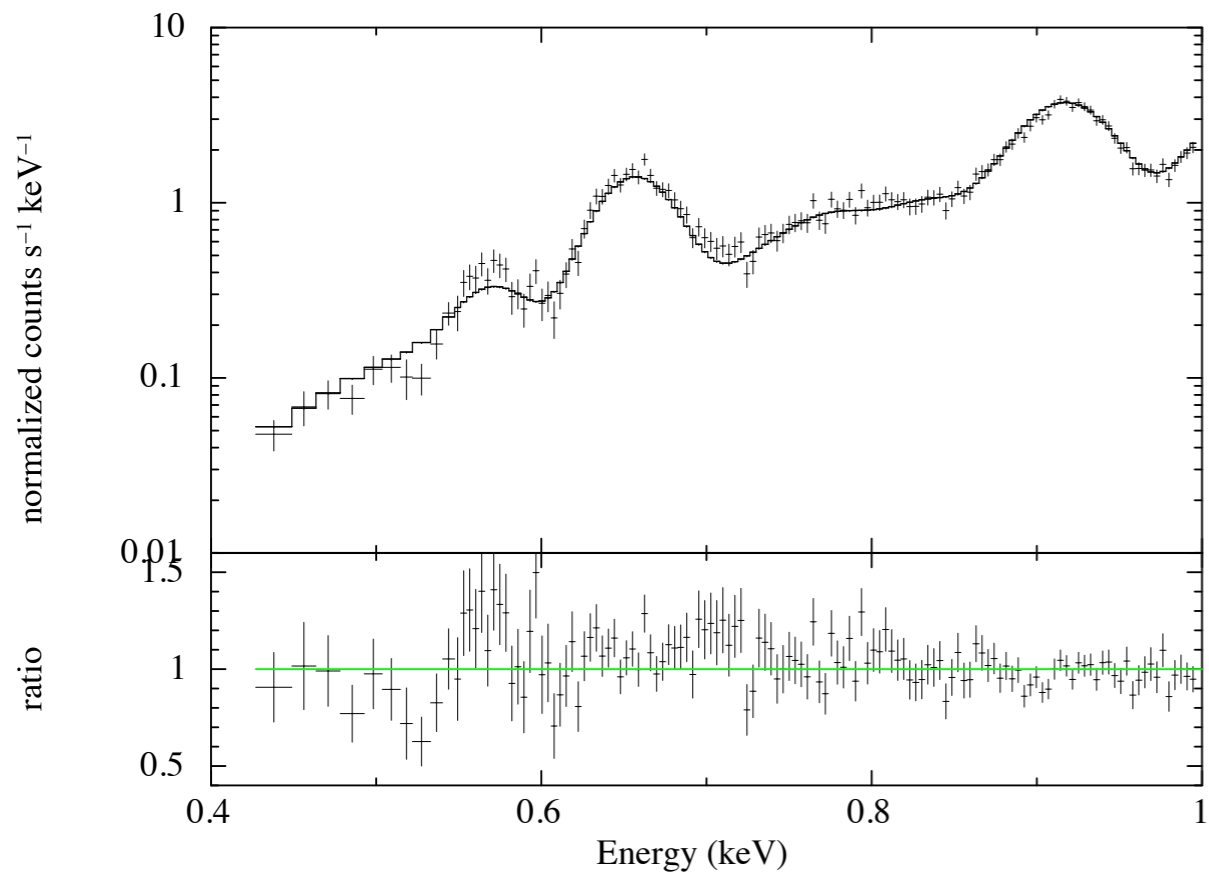
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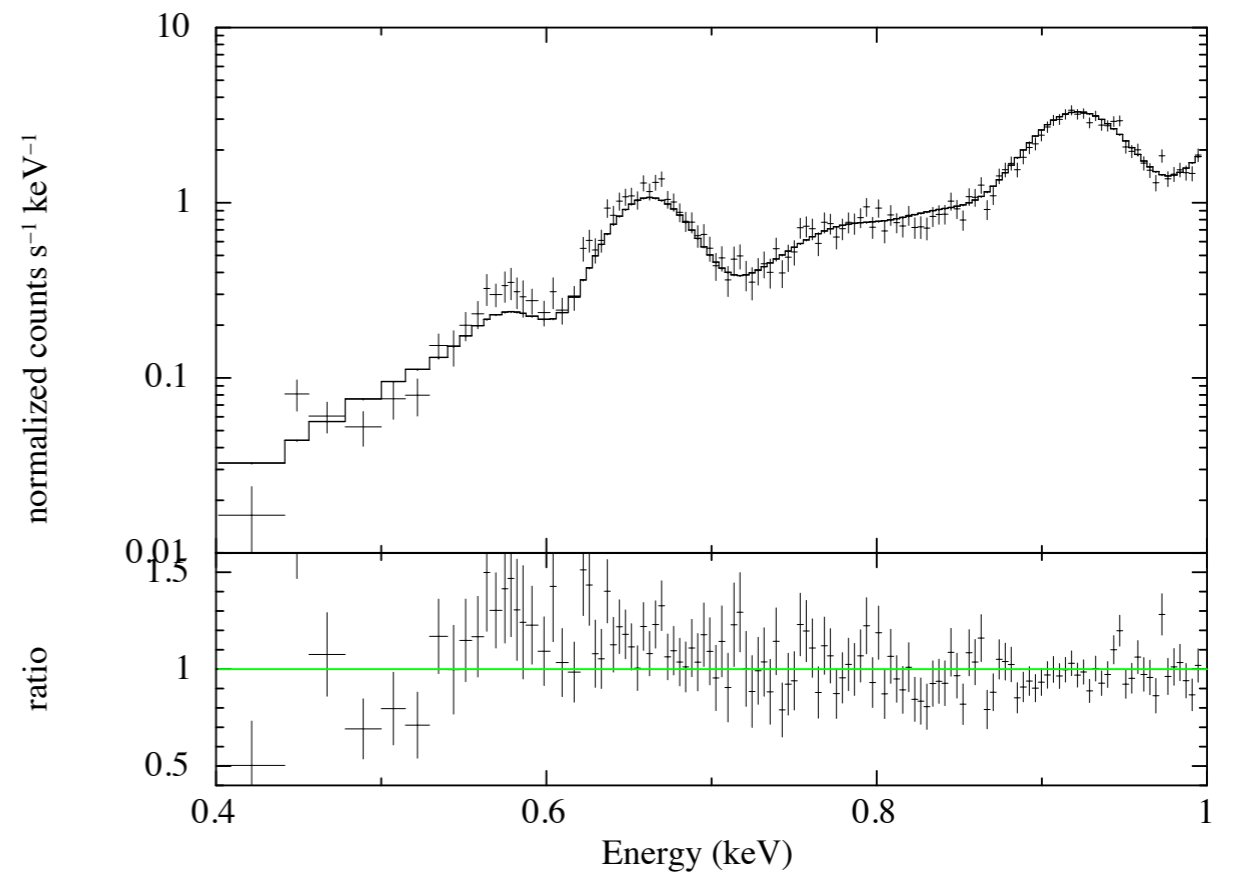
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1 E0102-72.3 - XIS0, 20080315, w/ HCO



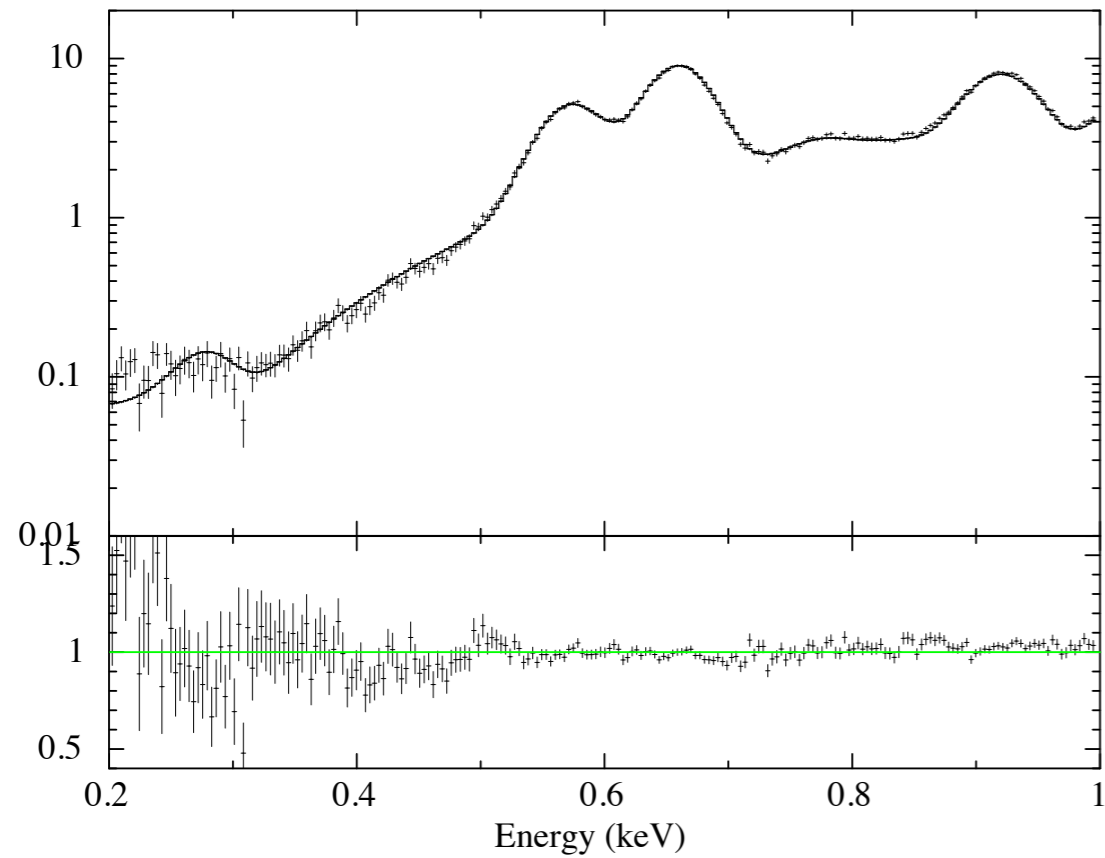
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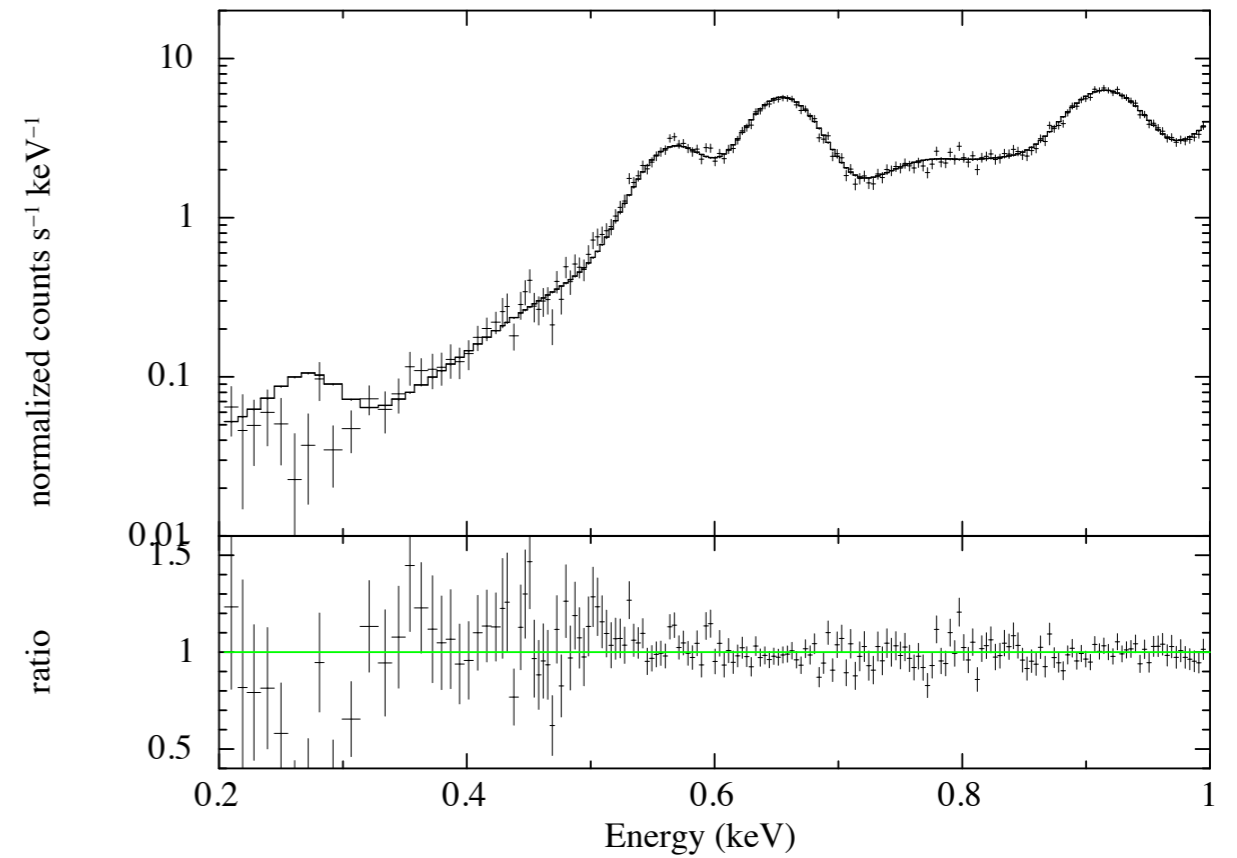
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1 E0102-72.3 - XIS1, 20051217, w/ C/O = 6



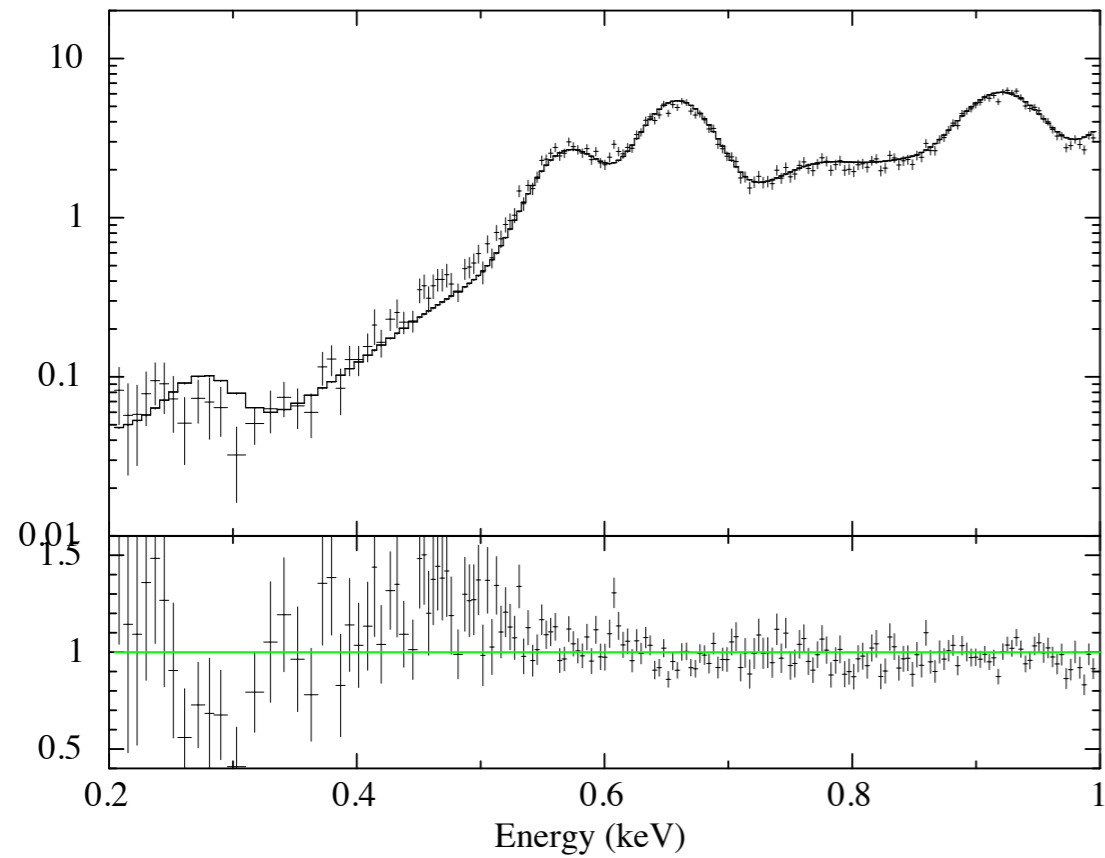
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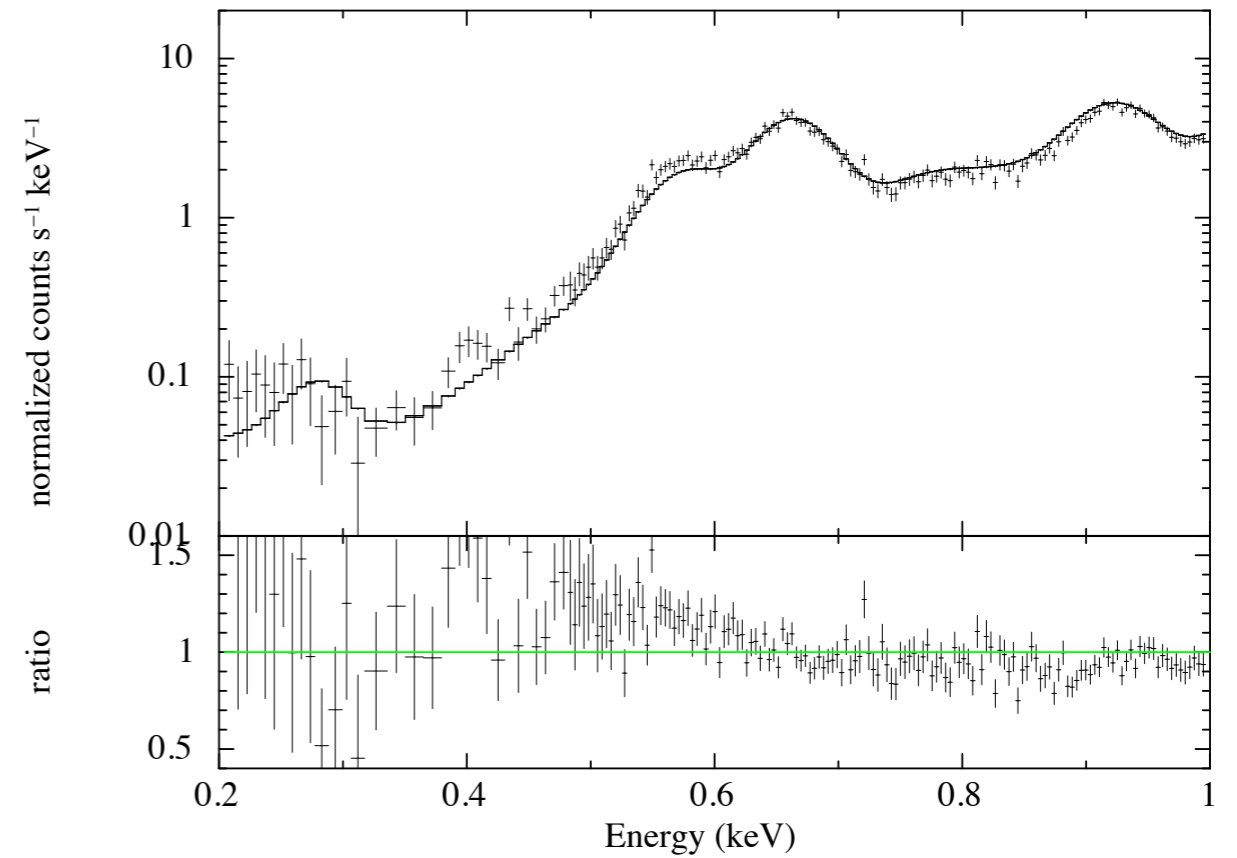
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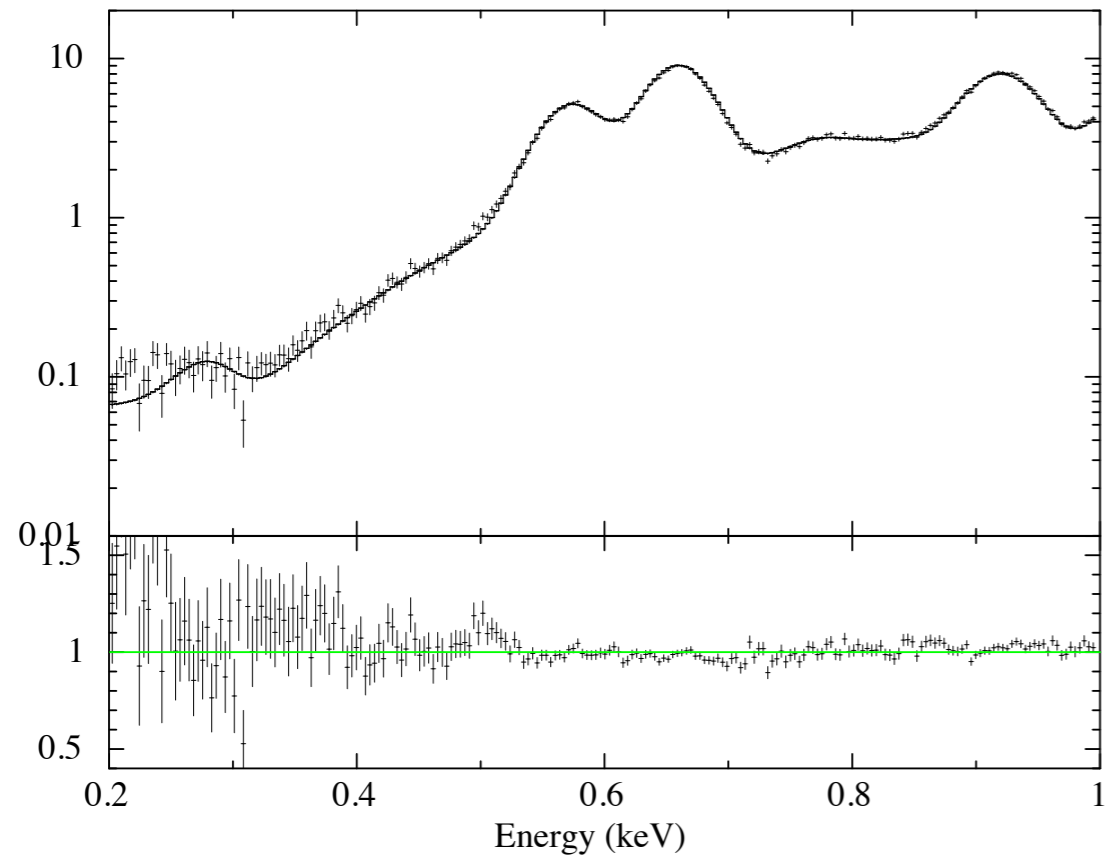
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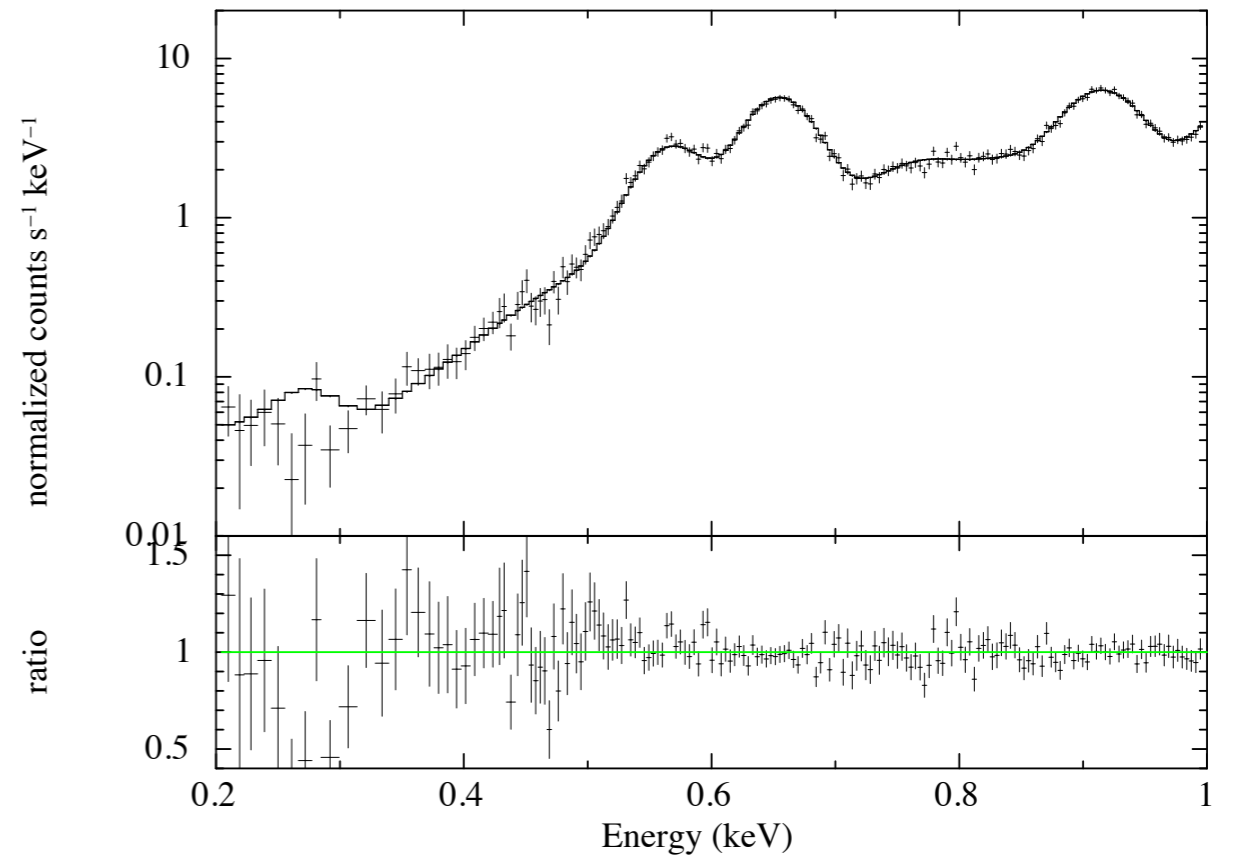
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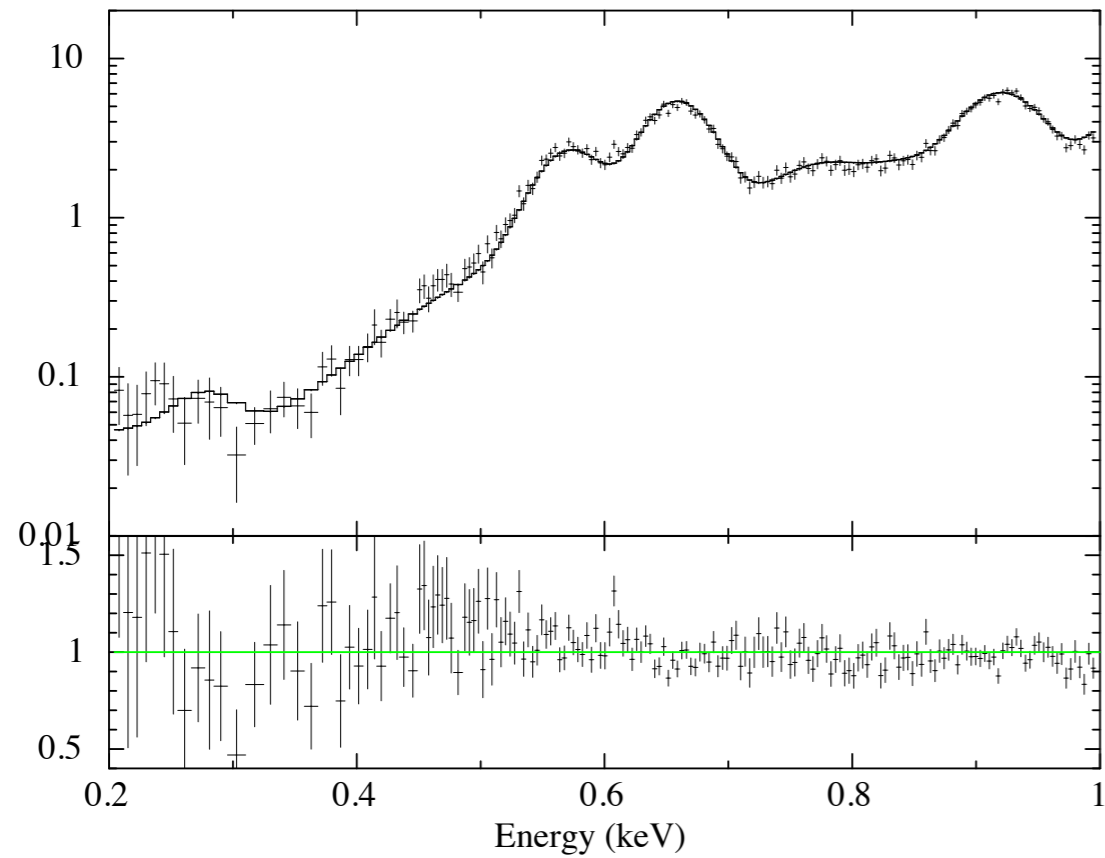
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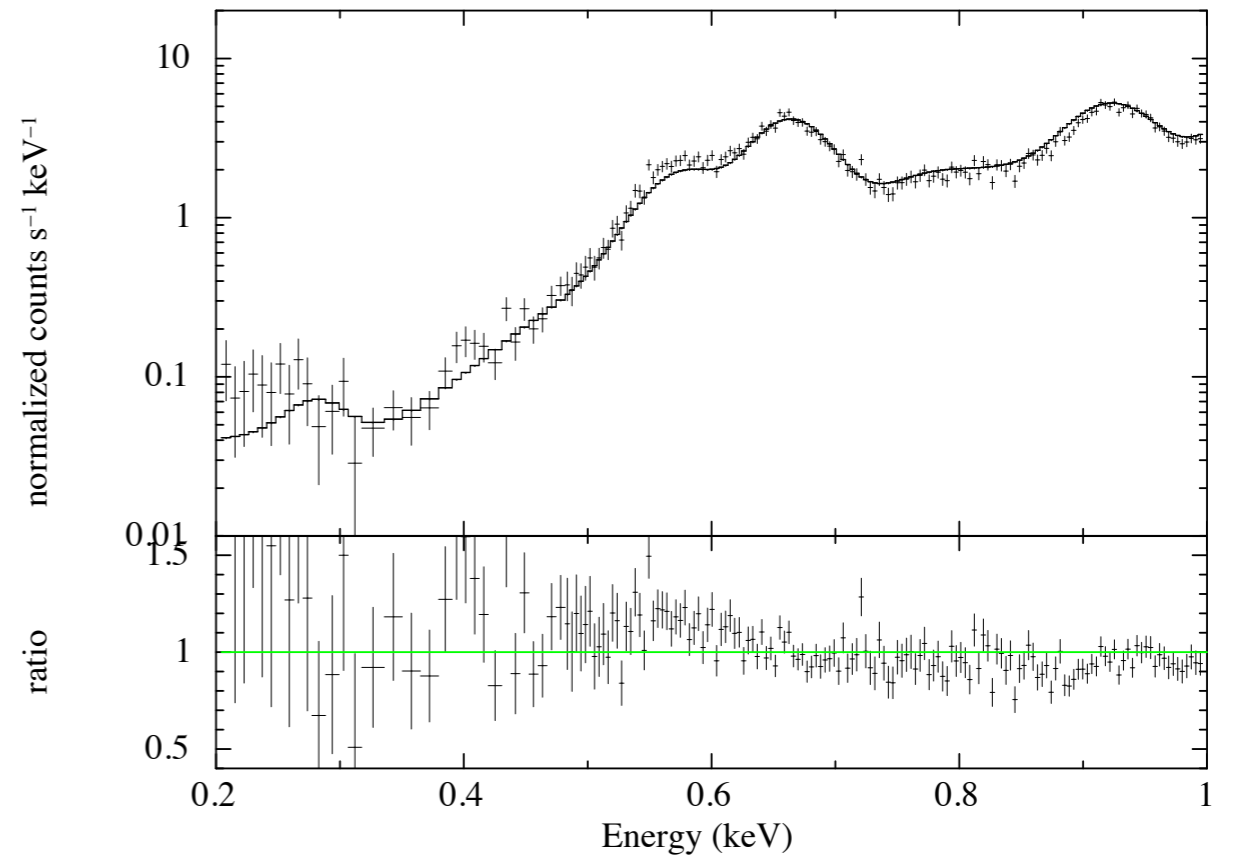
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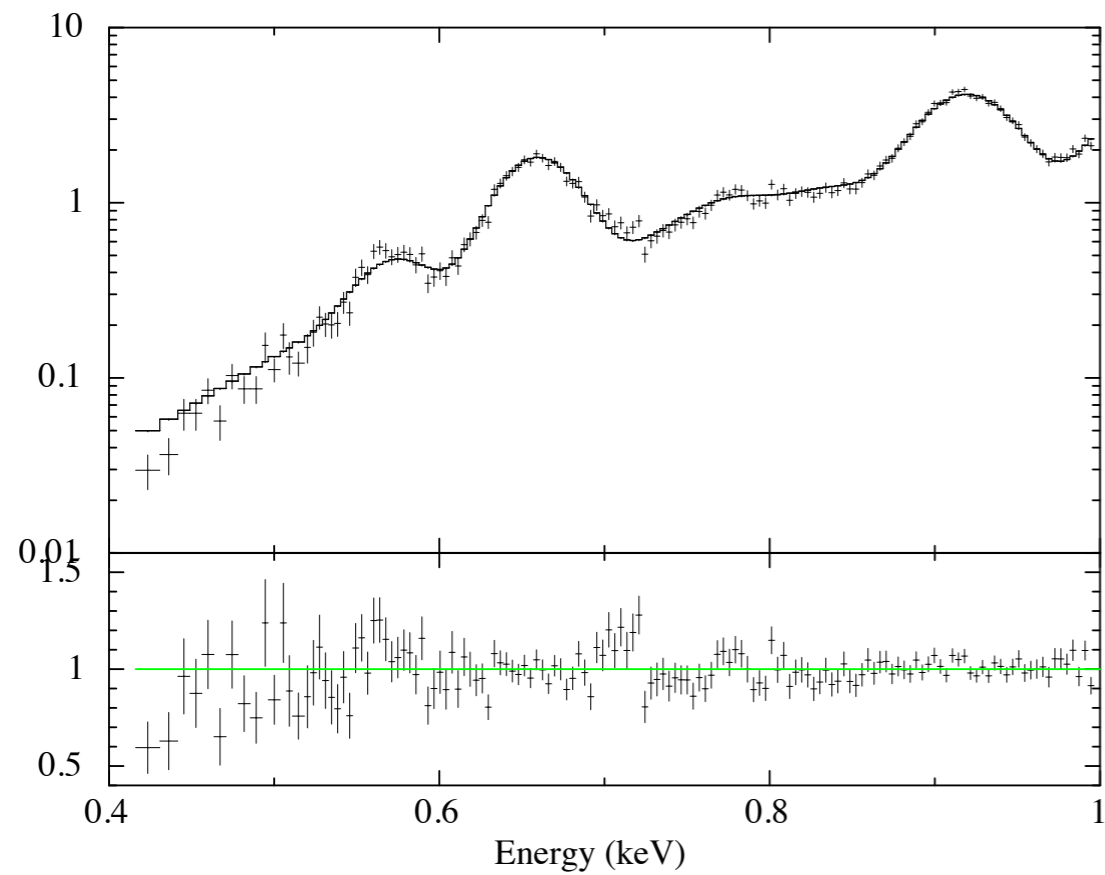
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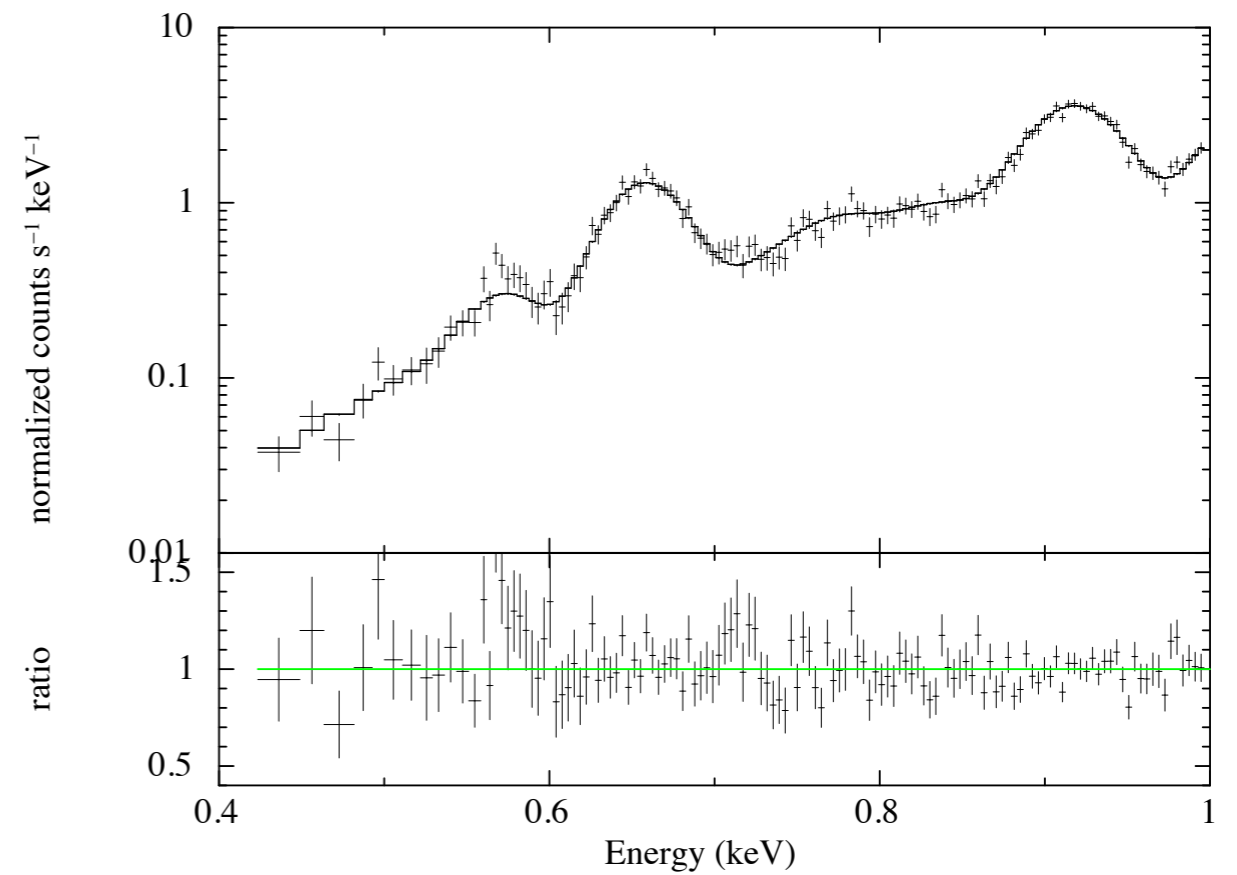
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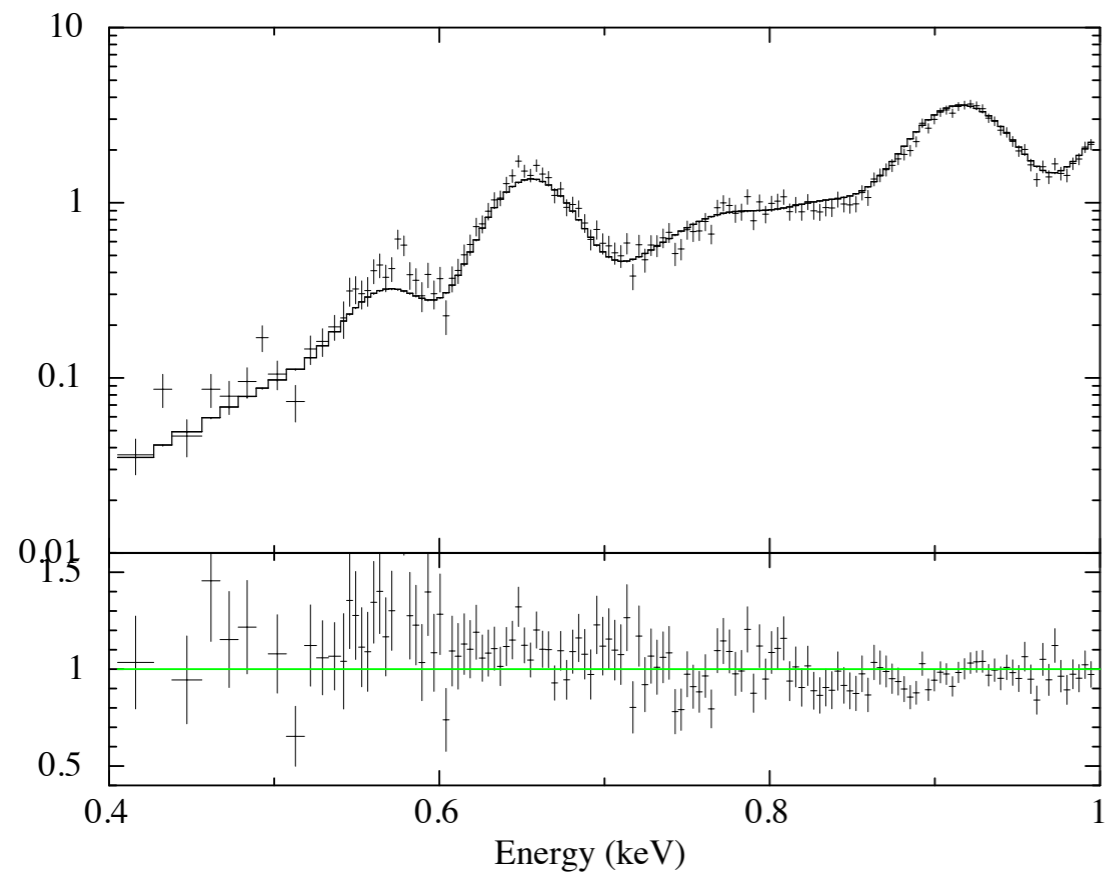
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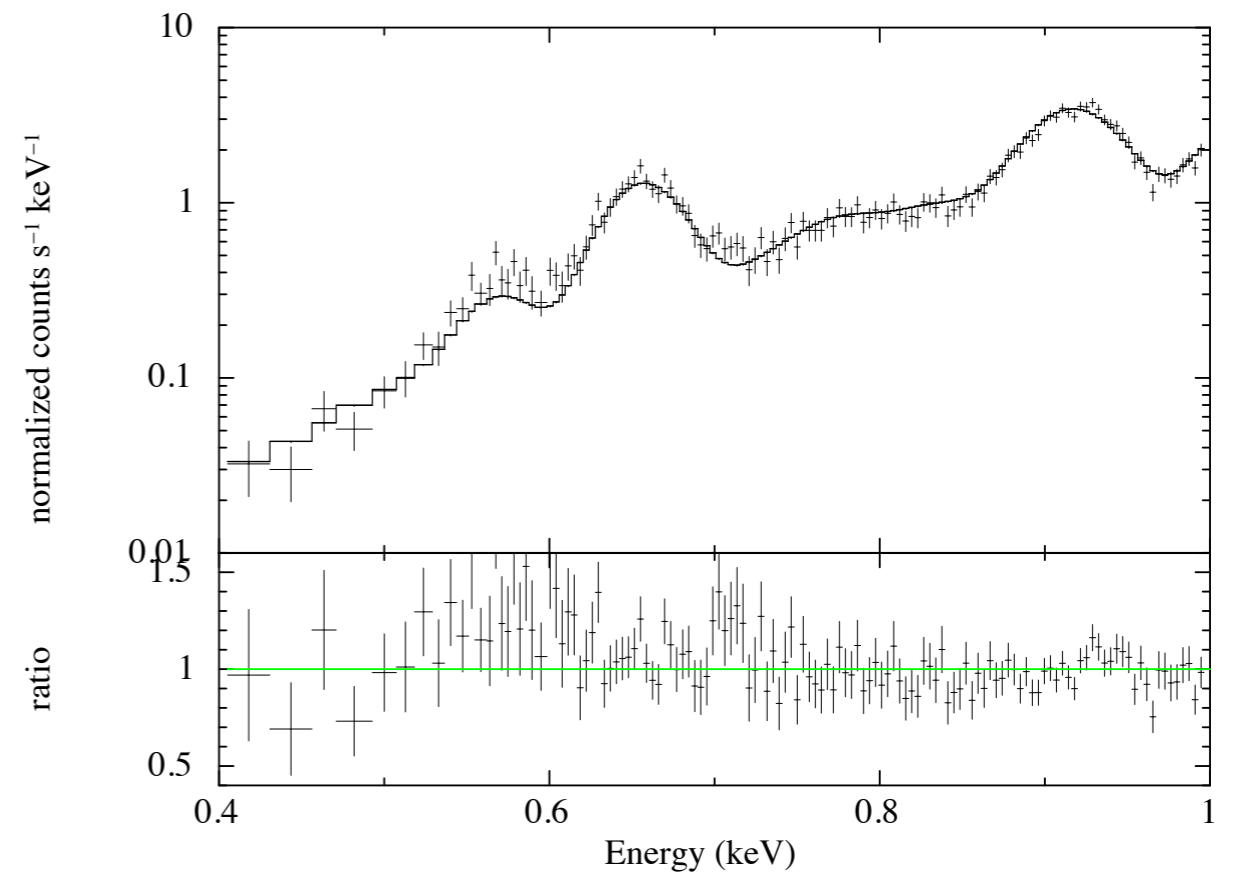
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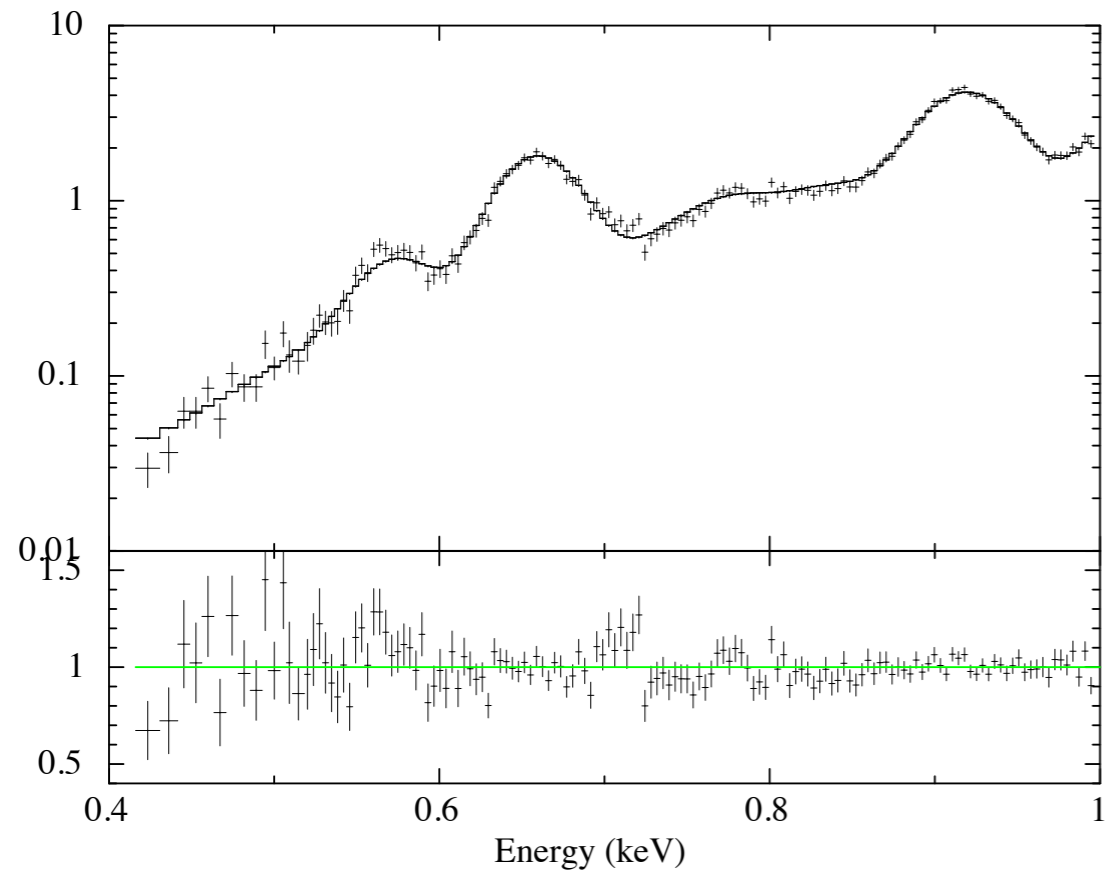
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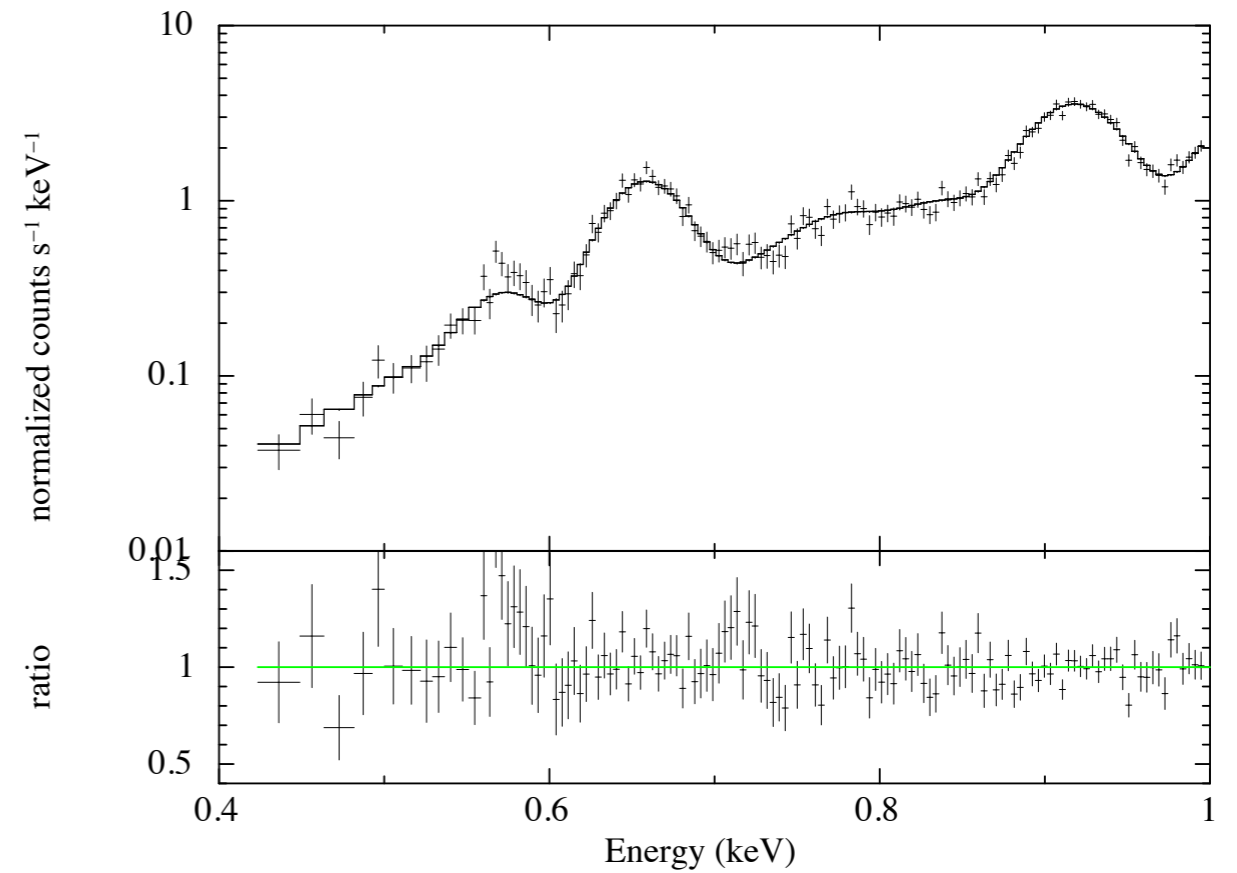
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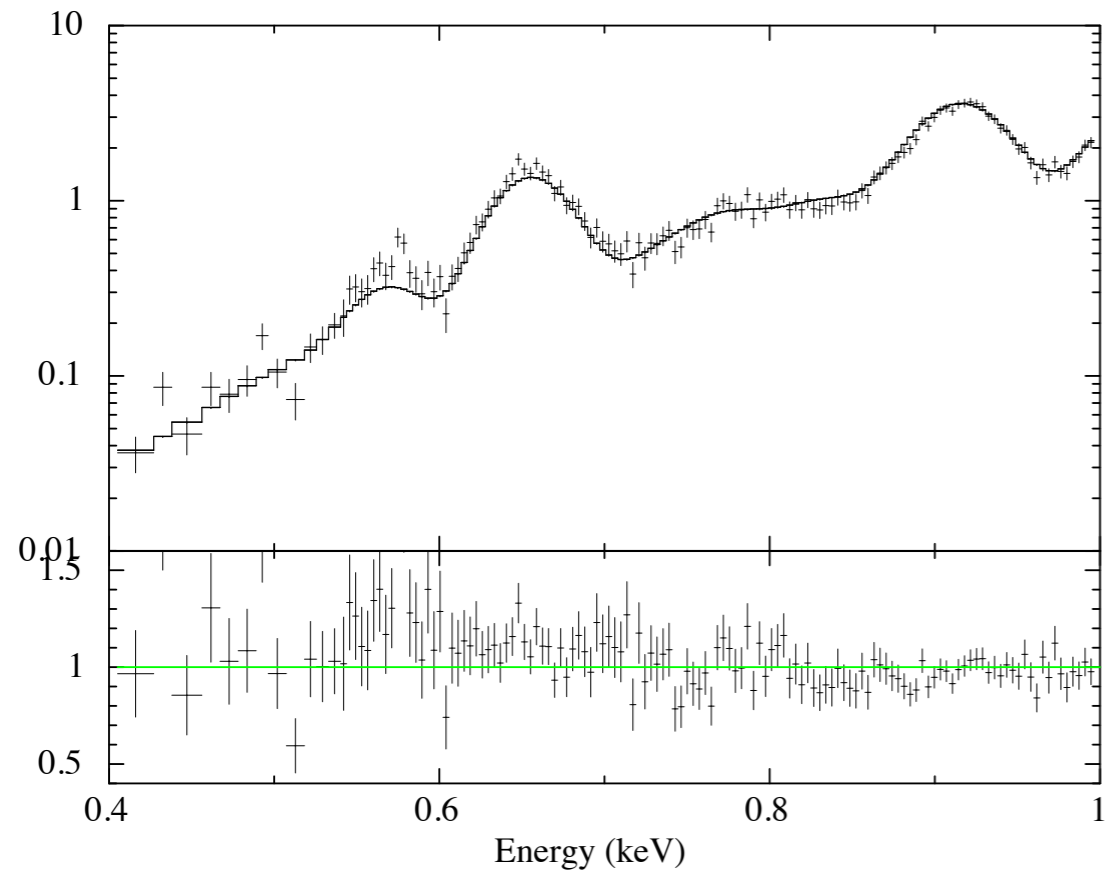
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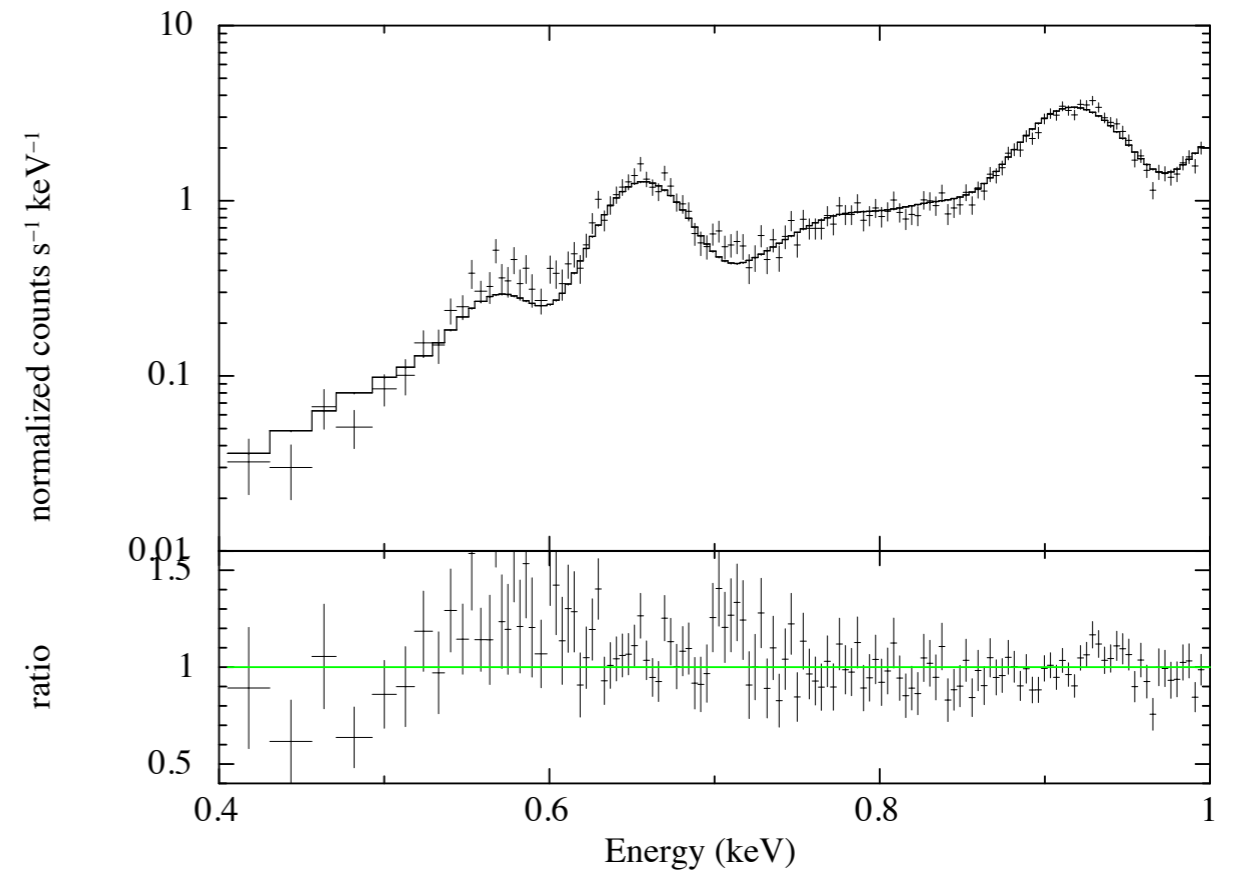
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