SWCX: A Background Component You Should Care About

Take Brad's talk to heart.

For observations of objects which cover the FOV with surface brightnesses are within an order of magnitude of the cosmic background for E<1.5 keV, SXRB emission can be very significant.

CVI, OVII, OVIII, NeIX, and MgXI SWCX emission lines have the capability of really screwing up temperature/density diagnostic for, e.g., SNRs, nearby galaxies, and relatively local cooler clusters

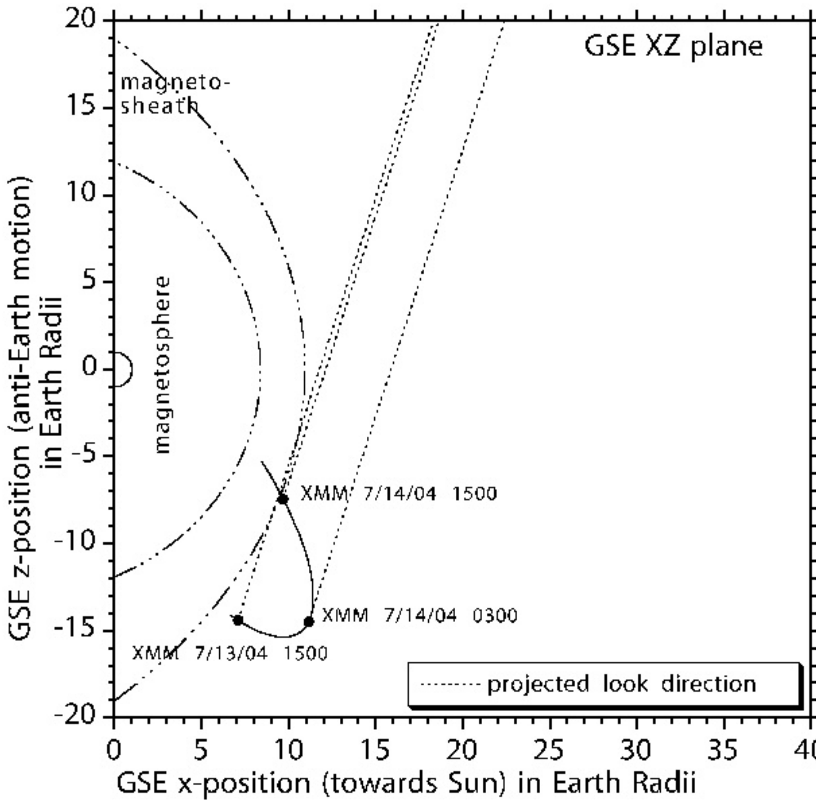
SWCX emission contamination need not be detectable from an observation light curve.

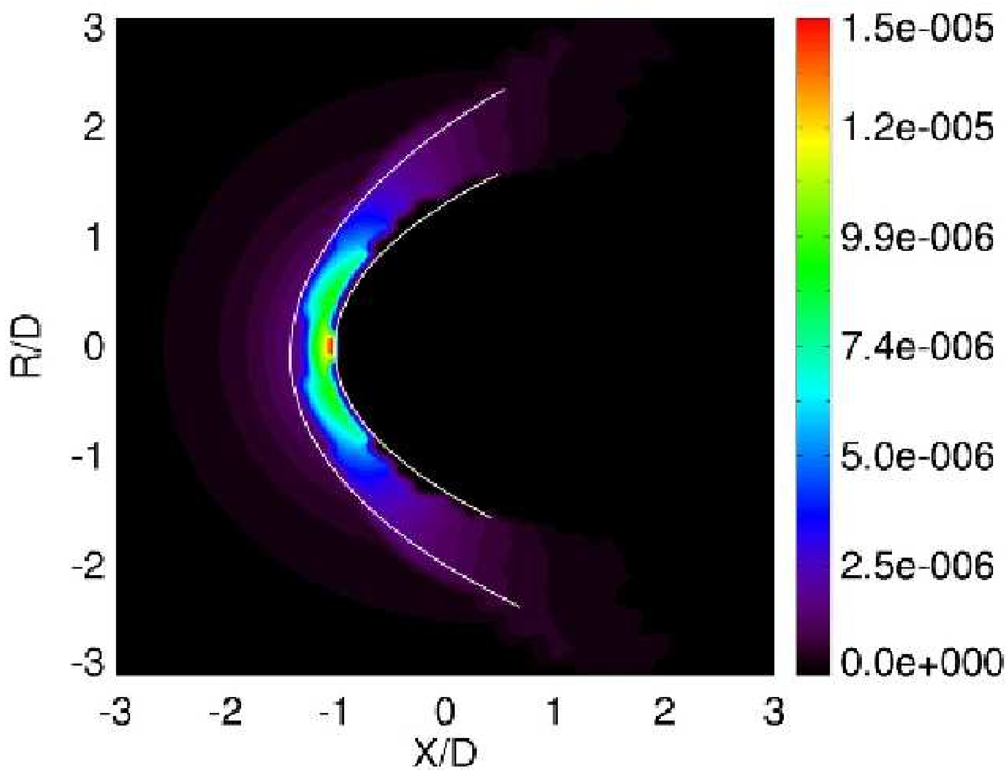
Solar Wind Charge Exchange Emission

- Highly ionized atoms in the solar wind collide with interstellar material in the solar system or exospheric material in the near-Earth environment

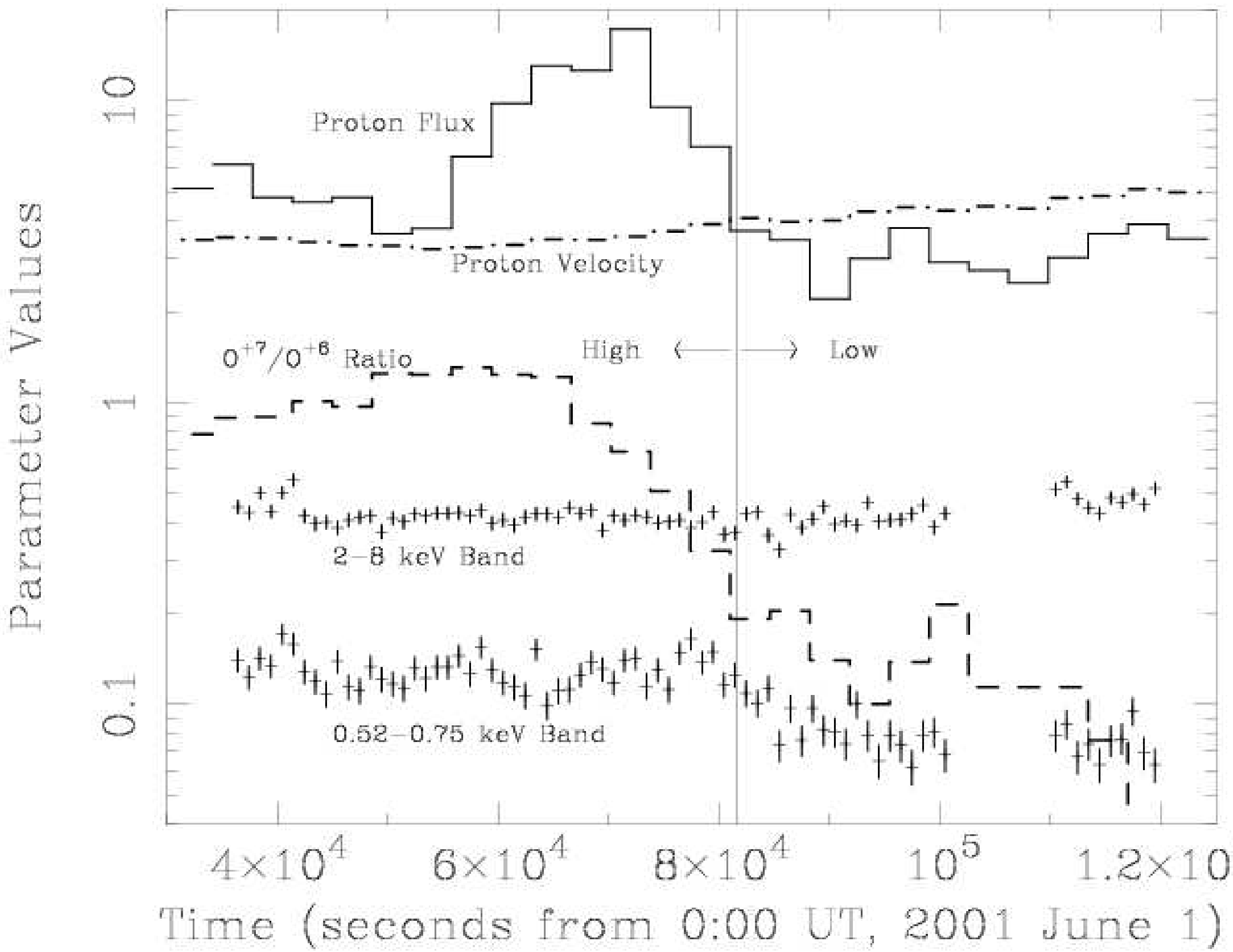
Serendipitously observed in the Hubble Deep Field-North GT Observations

- This time, most likely emission from near the magnetosheath





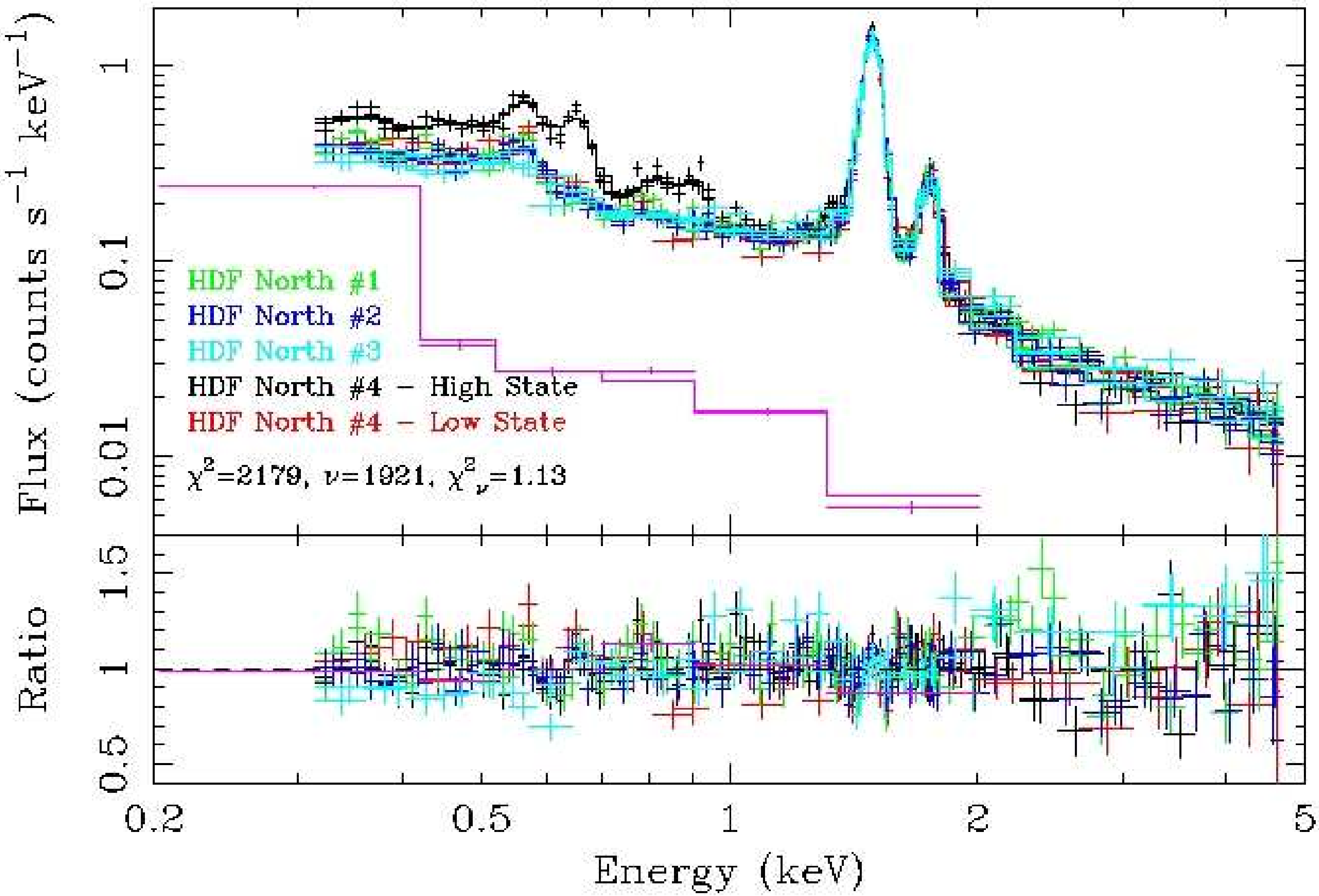
Light Curves and Parameter Values for the HDF-N Observations

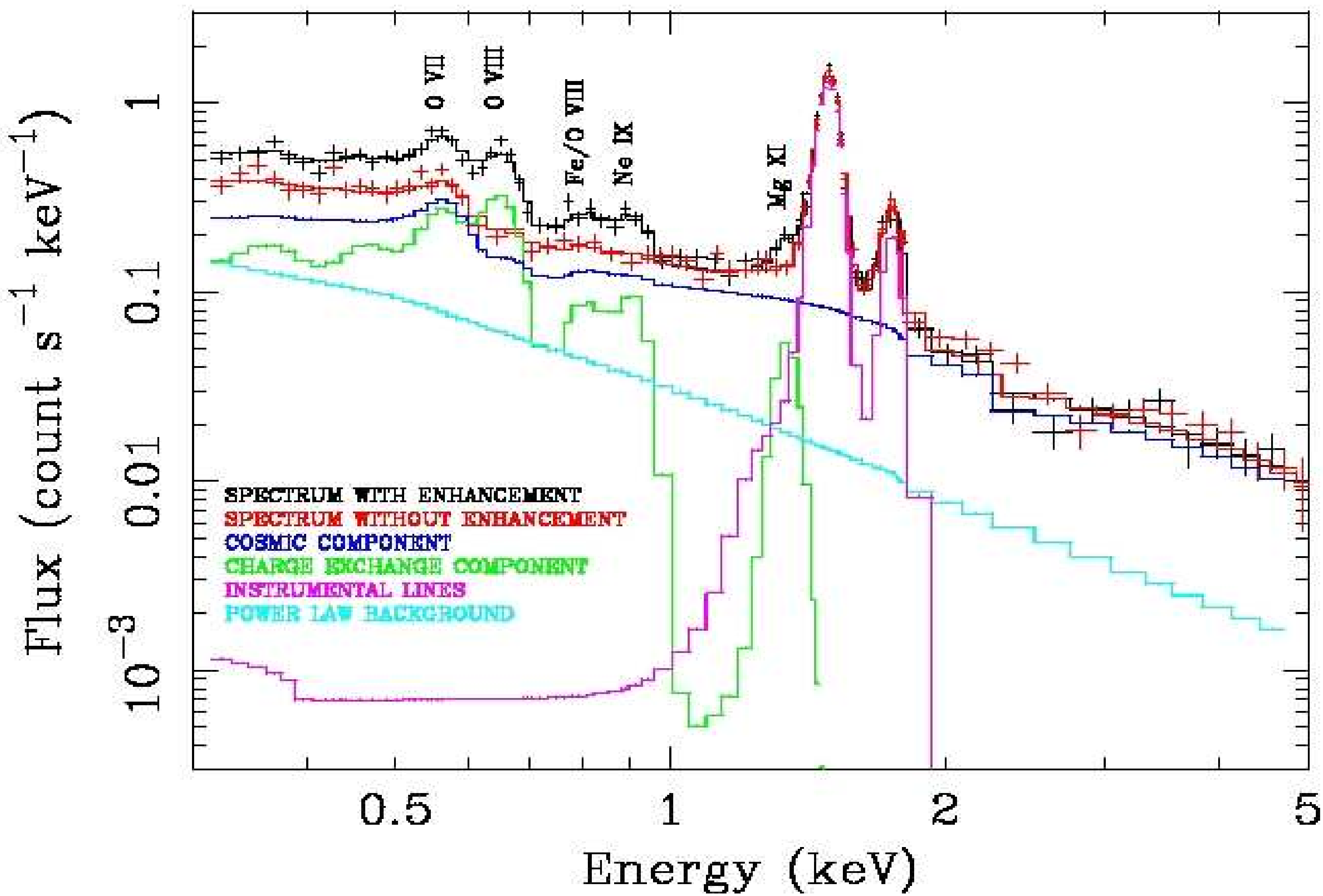


- **A confusing light curve – Most everything is varying but the emission count rate is relatively stable until cutoff**
- **Hubble Deep Field North GT Observations – 4 Observations Over 16 Days**
- **Fitted Background-Subtracted Spectra**

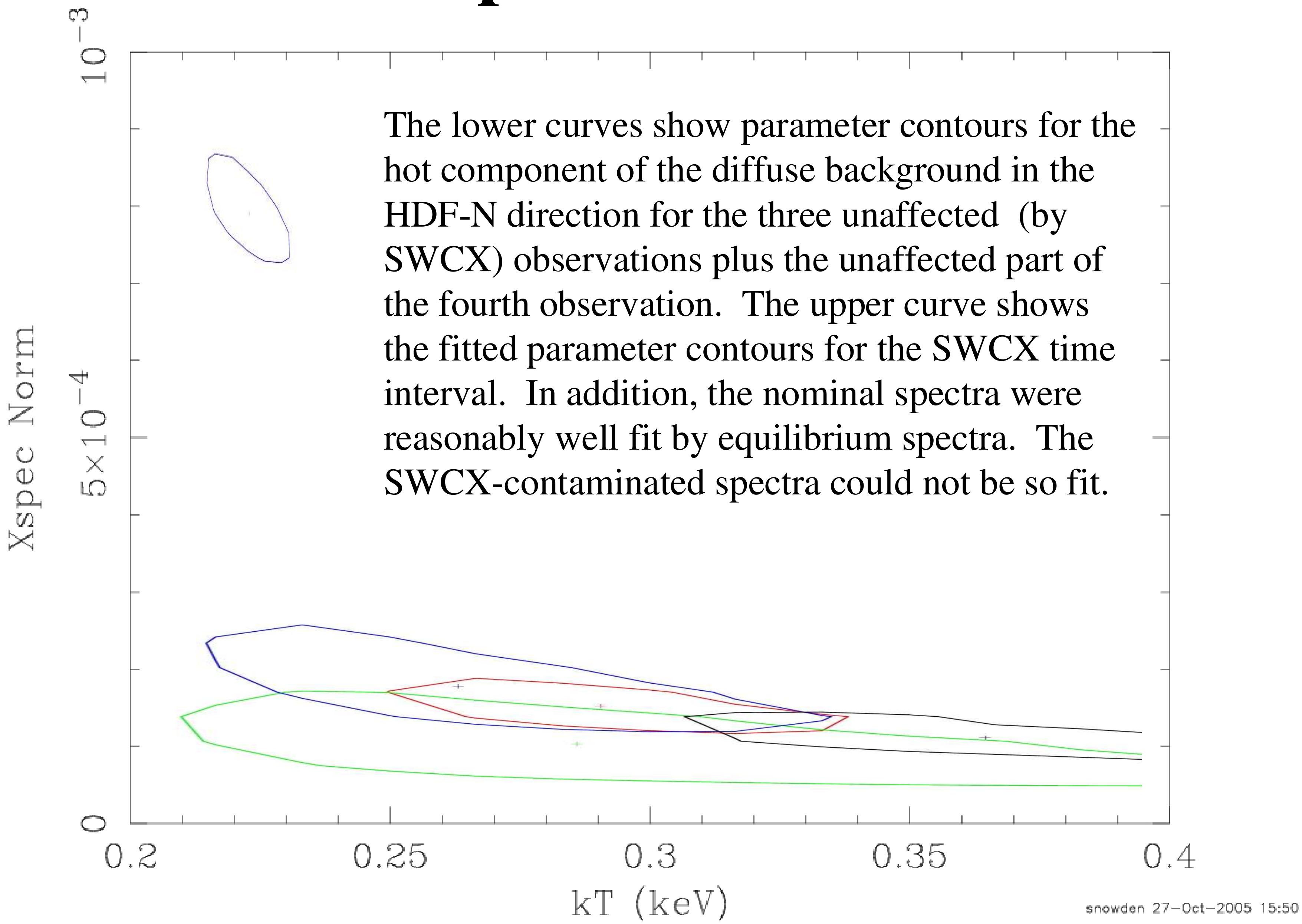
HDF-N: With and Without SWCX

The effect is clearly identifiable with strong emission from CVI, OVII and OVIII, NeIX, and MgXI.




O VII
O VIII
Fe/O VIII
Ne IX
Mg XI
SPECTRUM WITH ENHANCEMENT
SPECTRUM WITHOUT ENHANCEMENT
COSMIC COMPONENT
CHARGE EXCHANGE COMPONENT
INSTRUMENTAL LINES
POWER LAW BACKGROUND
Flux (count s^{-1} keV^{-1})
1
0.1
0.01
10^{-3}
0.5
1
2
5
Energy (keV)

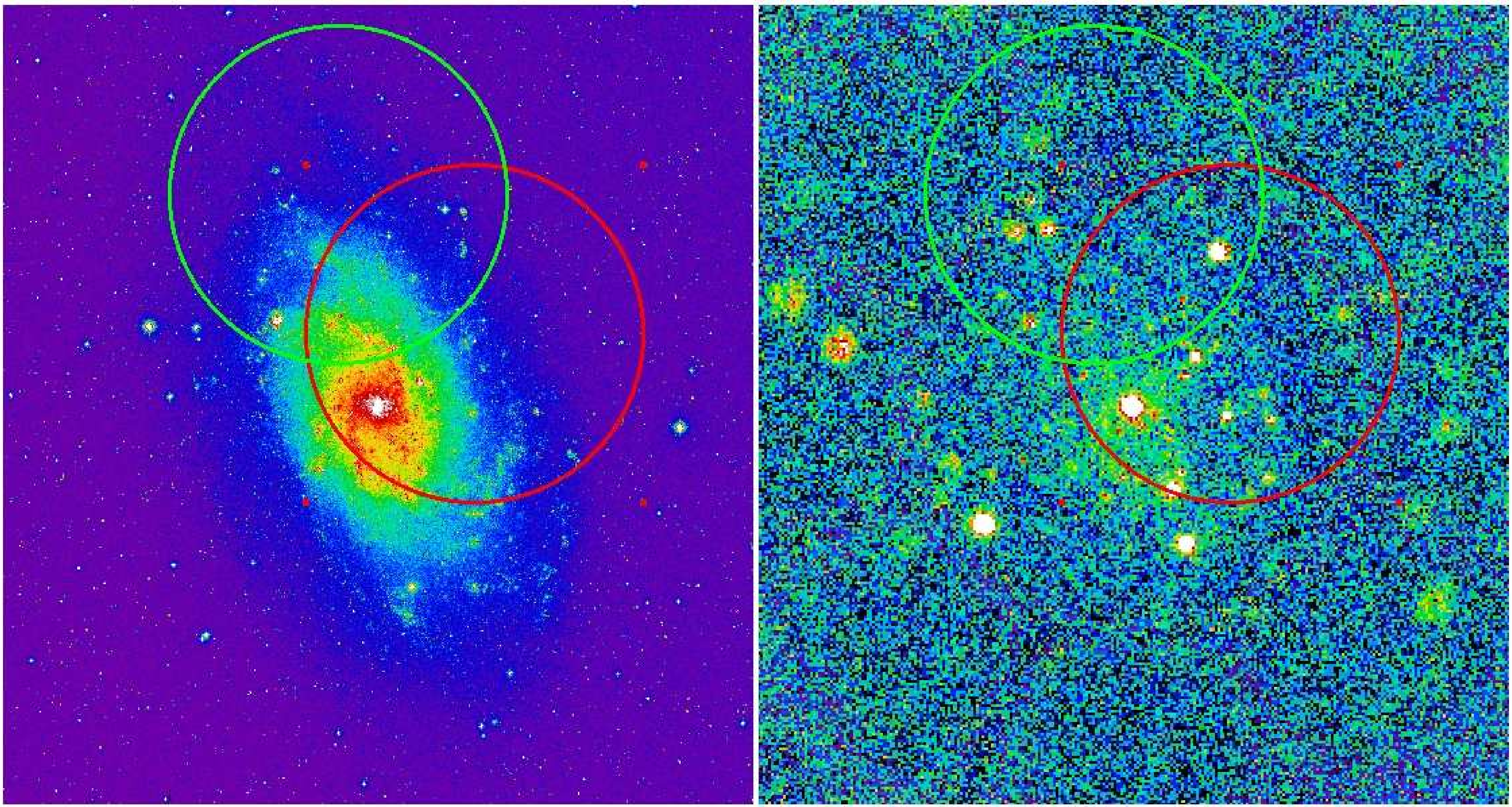
Normalization/temperature value contour plots for naive fits



The lower curves show parameter contours for the hot component of the diffuse background in the HDF-N direction for the three unaffected (by SWCX) observations plus the unaffected part of the fourth observation. The upper curve shows the fitted parameter contours for the SWCX time interval. In addition, the nominal spectra were reasonably well fit by equilibrium spectra. The SWCX-contaminated spectra could not be so fit.

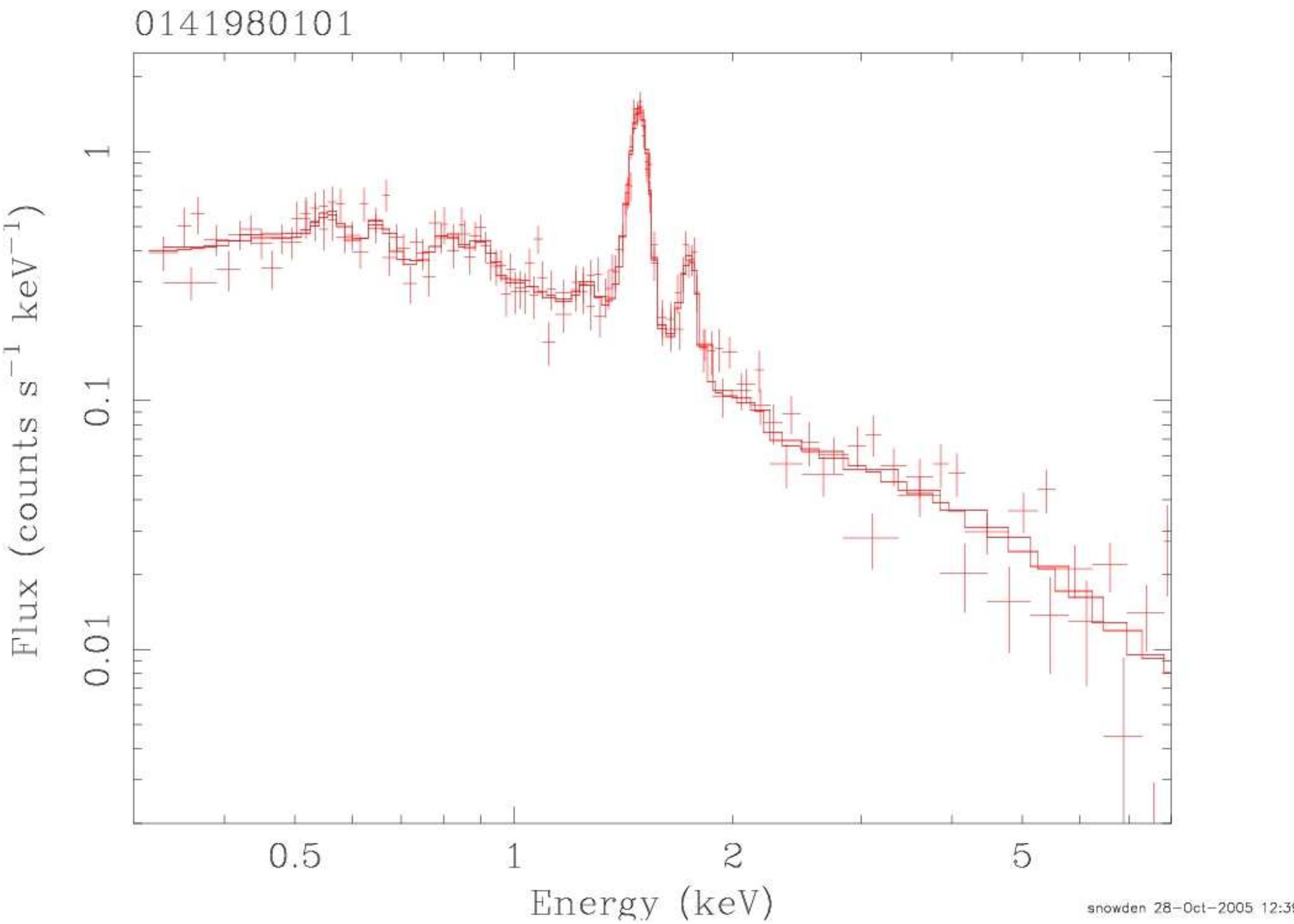
One More Example – M33

DSS and ROSAT PSPC images of M33 with two XMM-Newton EPIC pointings indicated.



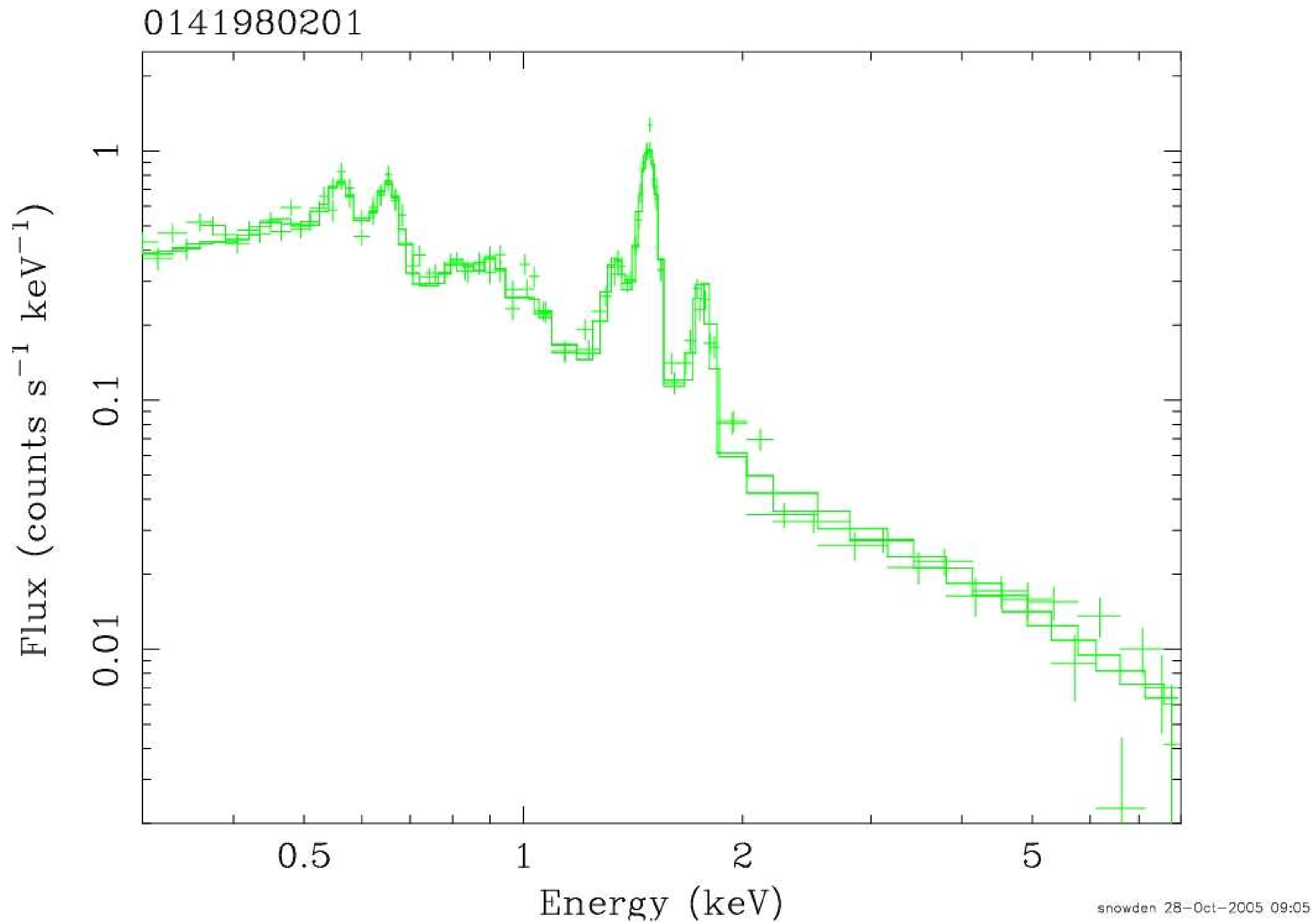
XMM-Newton MOS Spectra of M33

Spectrum from the inner region of M33, minus the two brighter point sources.



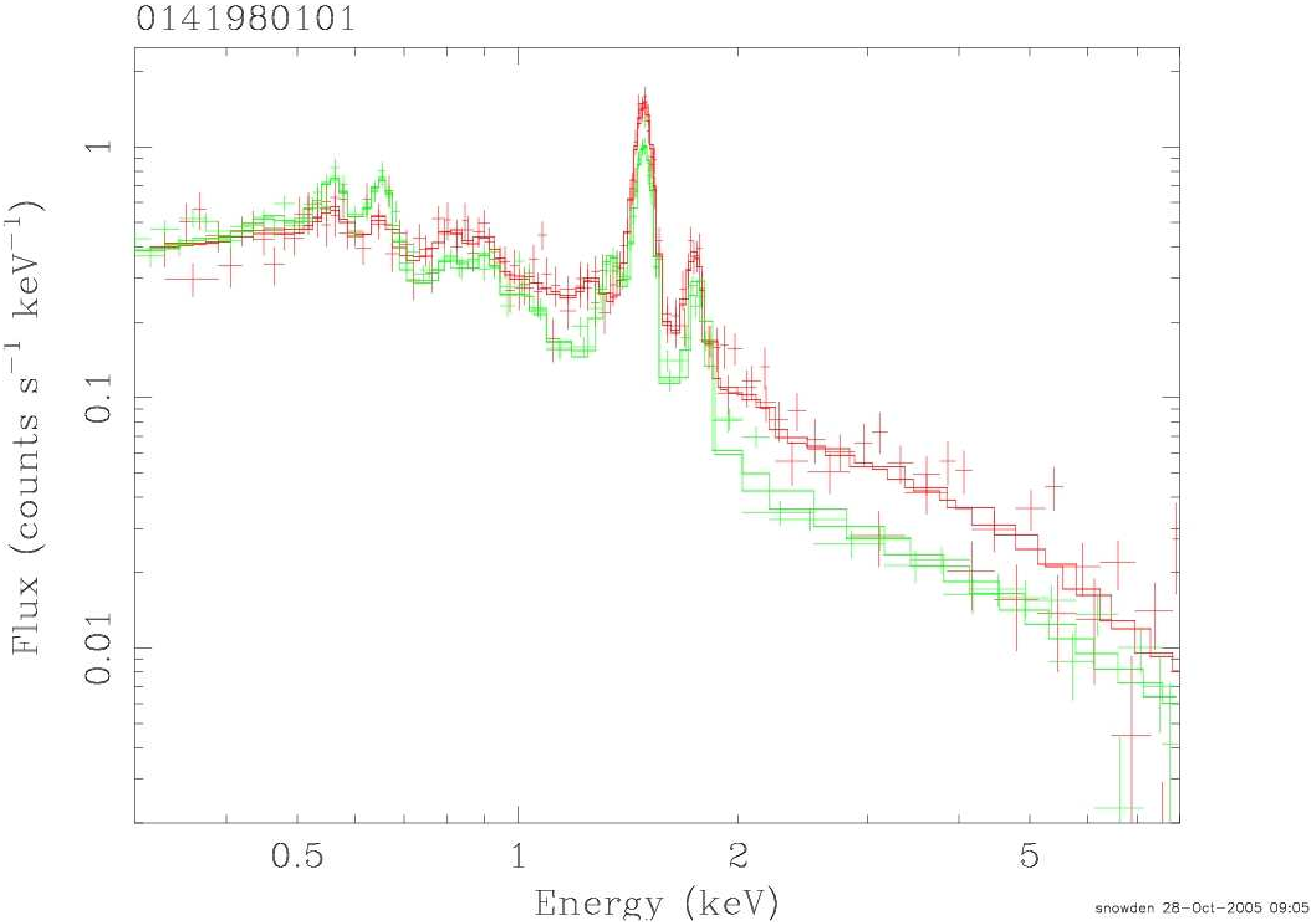
XMM-Newton MOS Spectra of M33

Spectrum from the outer region of M33.



XMM-Newton MOS Spectra of M33

The two spectra together. Note the effect of the SWCX emission.



XMM-Newton MOS M33 Light Curve

From the observation with SWCX contamination.