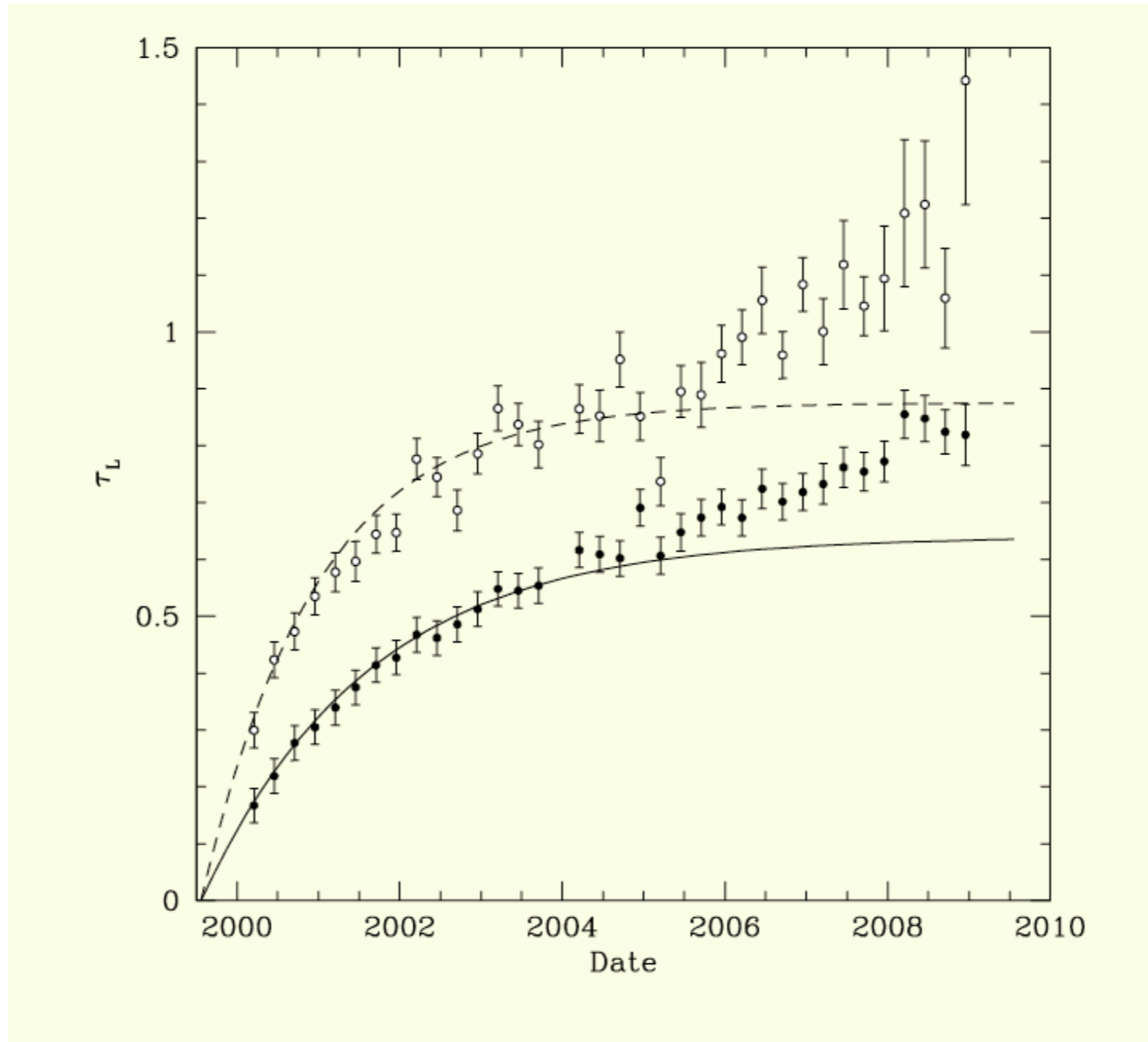


c.2009 updates to the ACIS contamination model

Alexey Vikhlinin

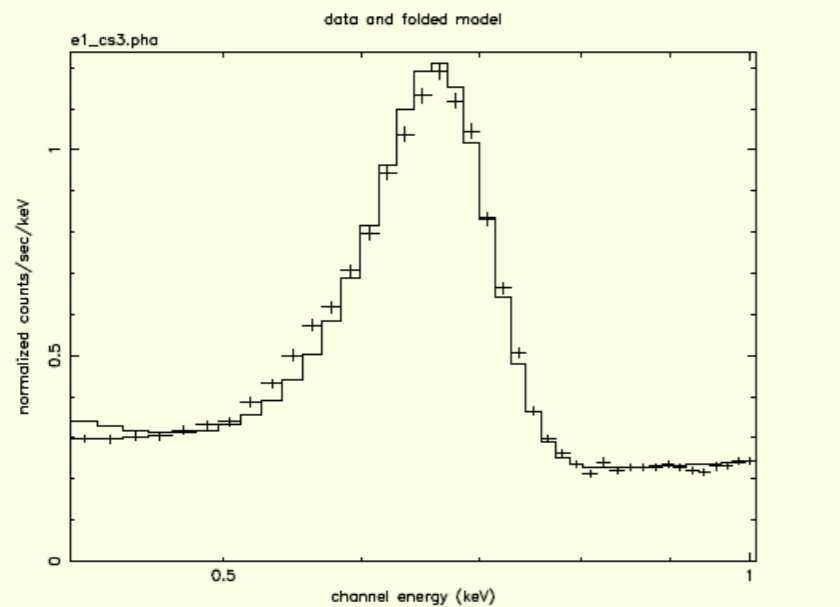
Main reason for an update: accelerated growth in contamination since ~2006



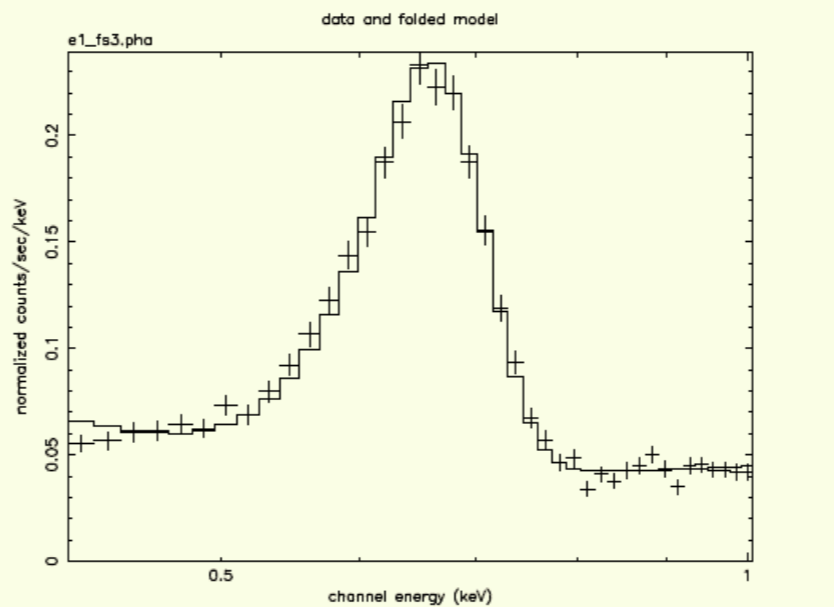
ACIS-S3,
center & edge

Why difficult now?

Epoch 1

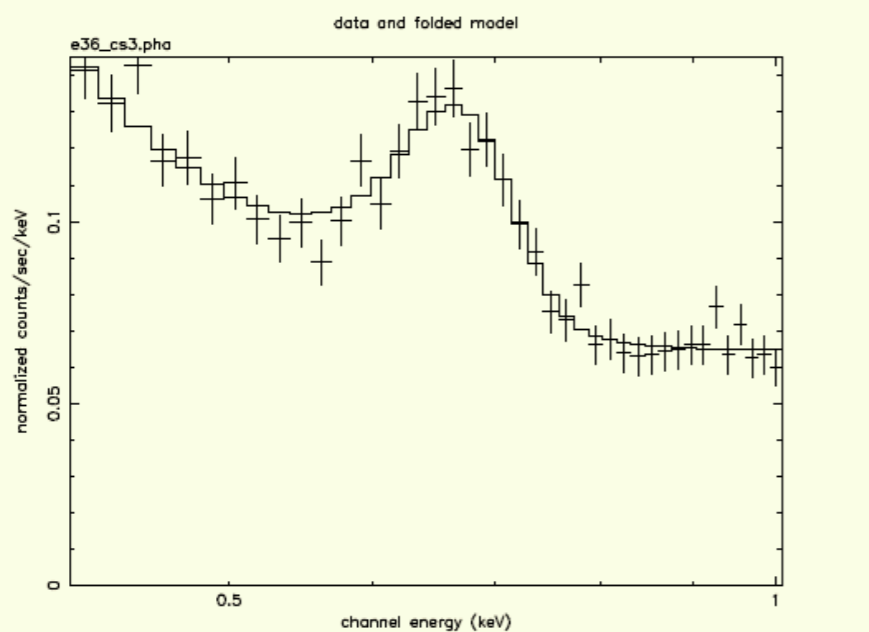


Center

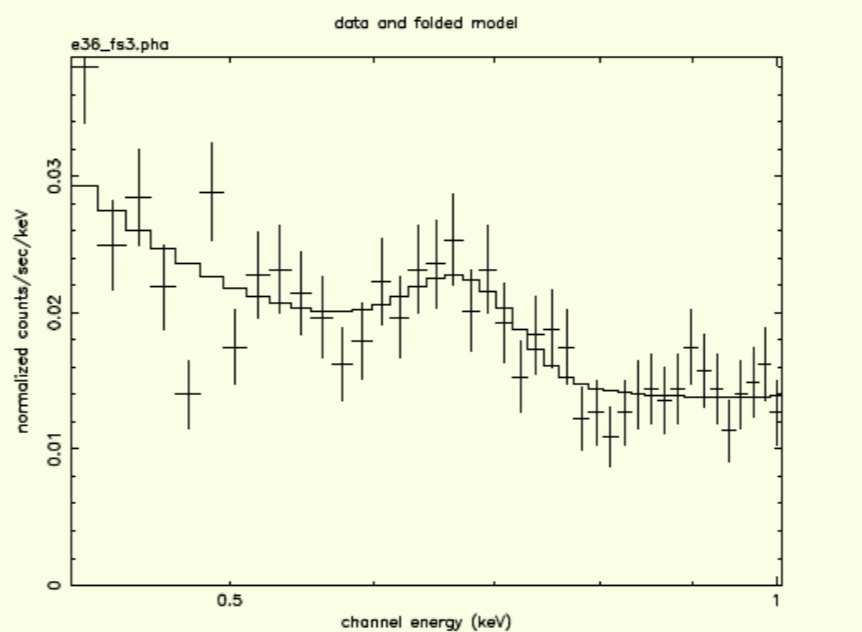


Bottom

Epoch 36



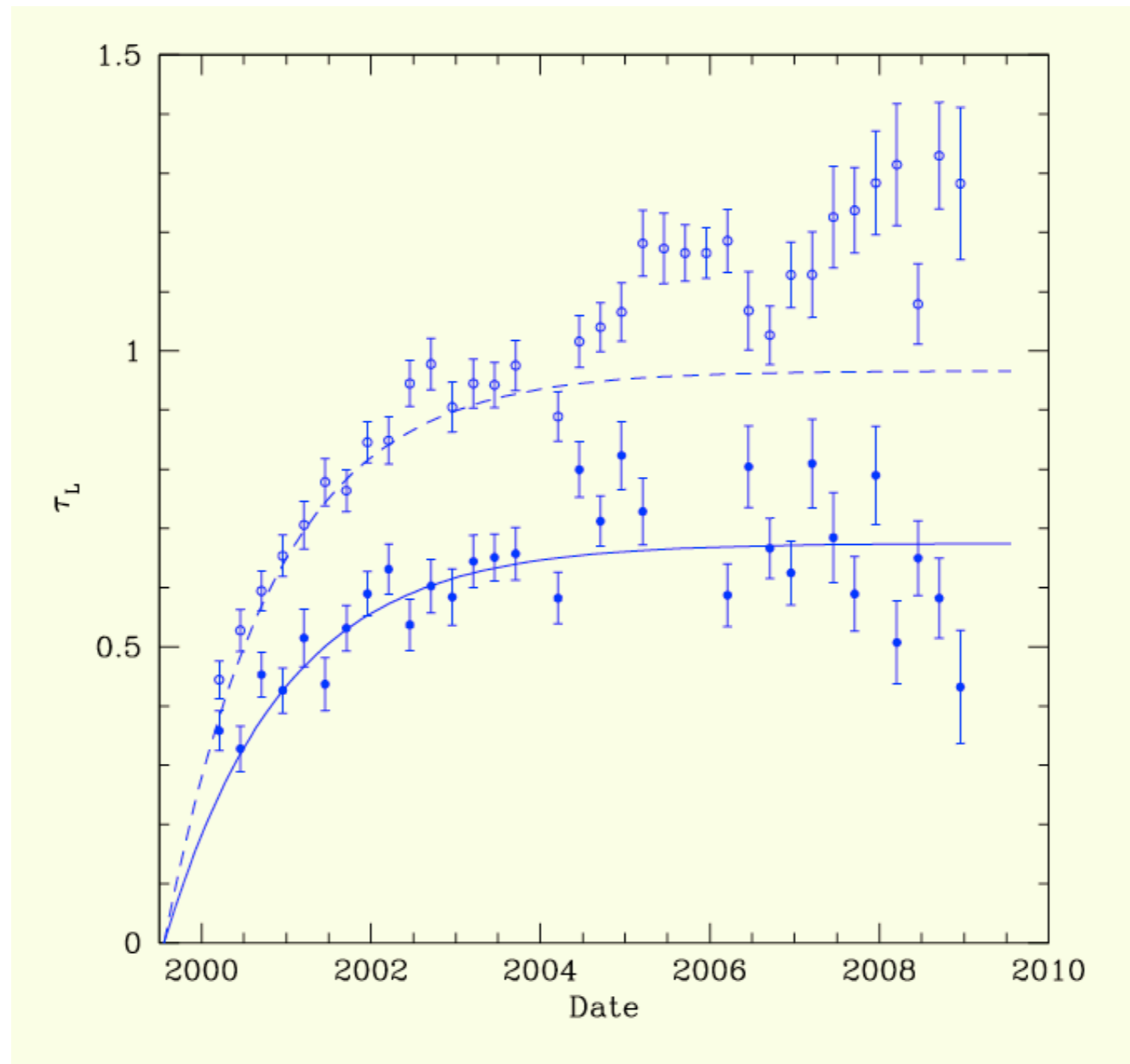
Center



Bottom

ACIS-S3,
center & edge

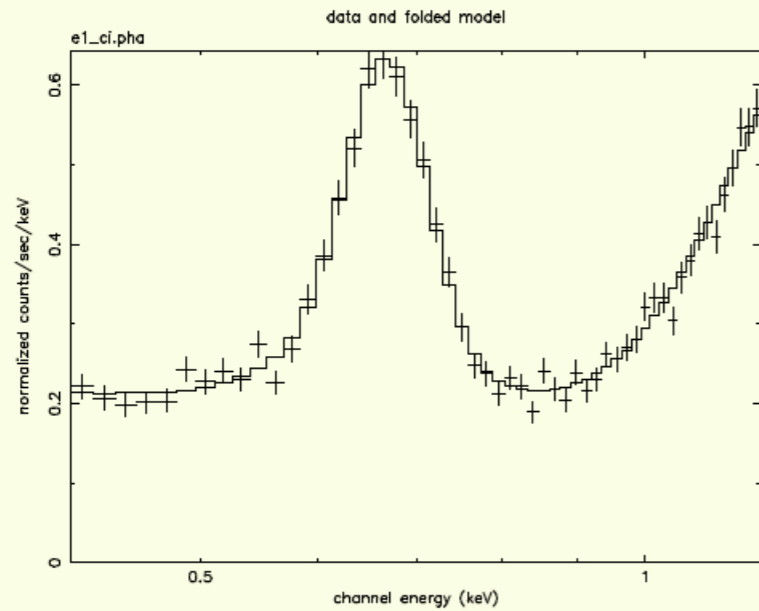
Even more difficult in ACIS-I



ACIS-I,
center & edge

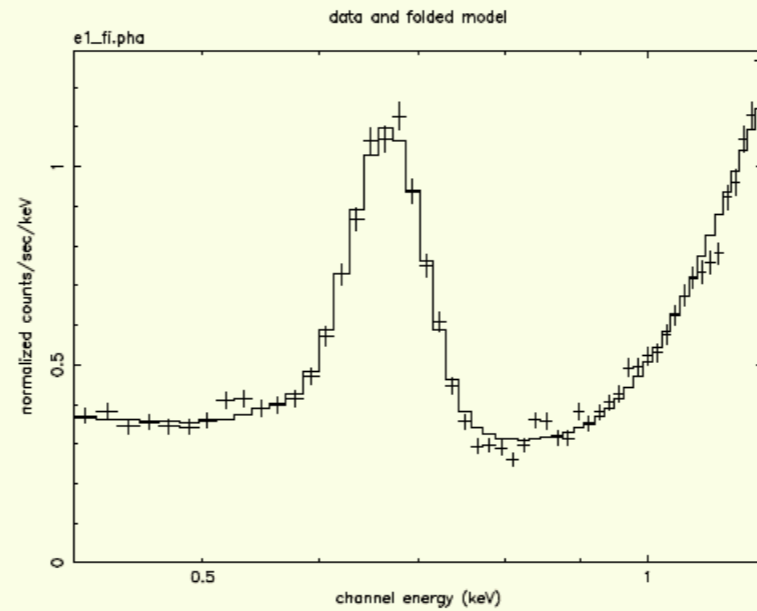
Why difficult now?

Epoch 1



Center

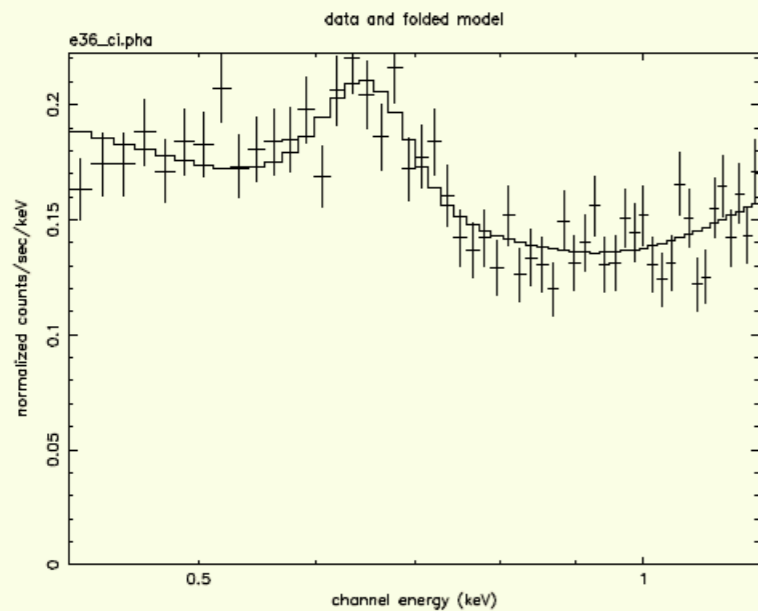
slwsky 3-Mar-2009 16:49



Bottom

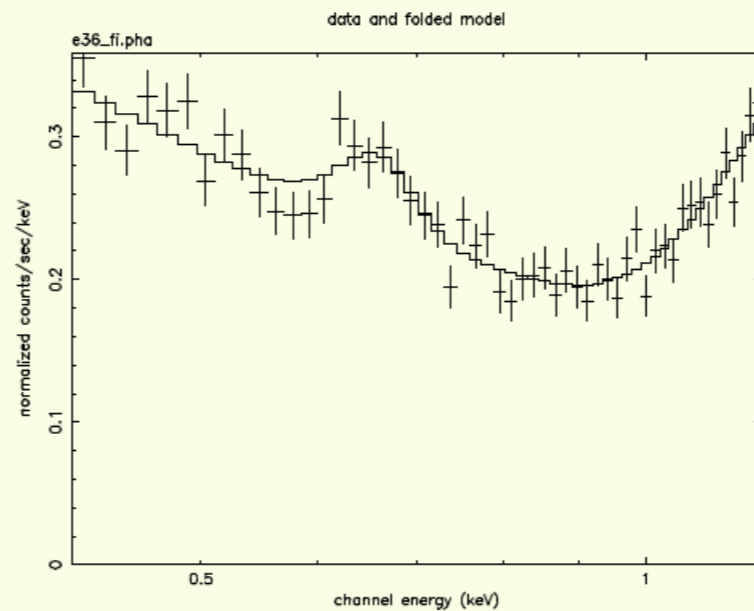
slwsky 3-Mar-2009 16:49

Epoch 36



Center

slwsky 3-Mar-2009 16:57



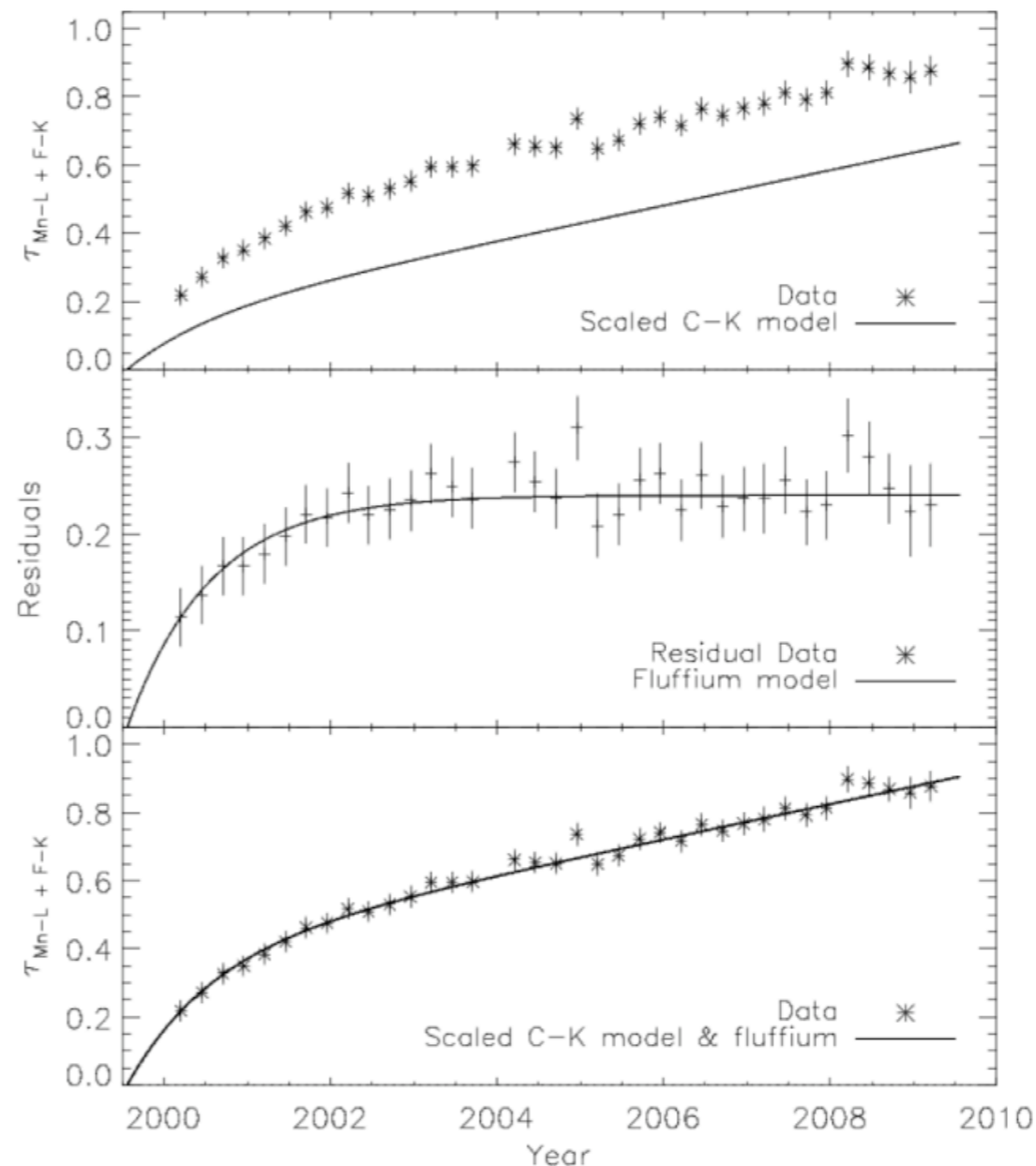
Bottom

slwsky 3-Mar-2009 16:57

ACIS-I,
center & edge

Expectations for fluffium from C-K / ECS

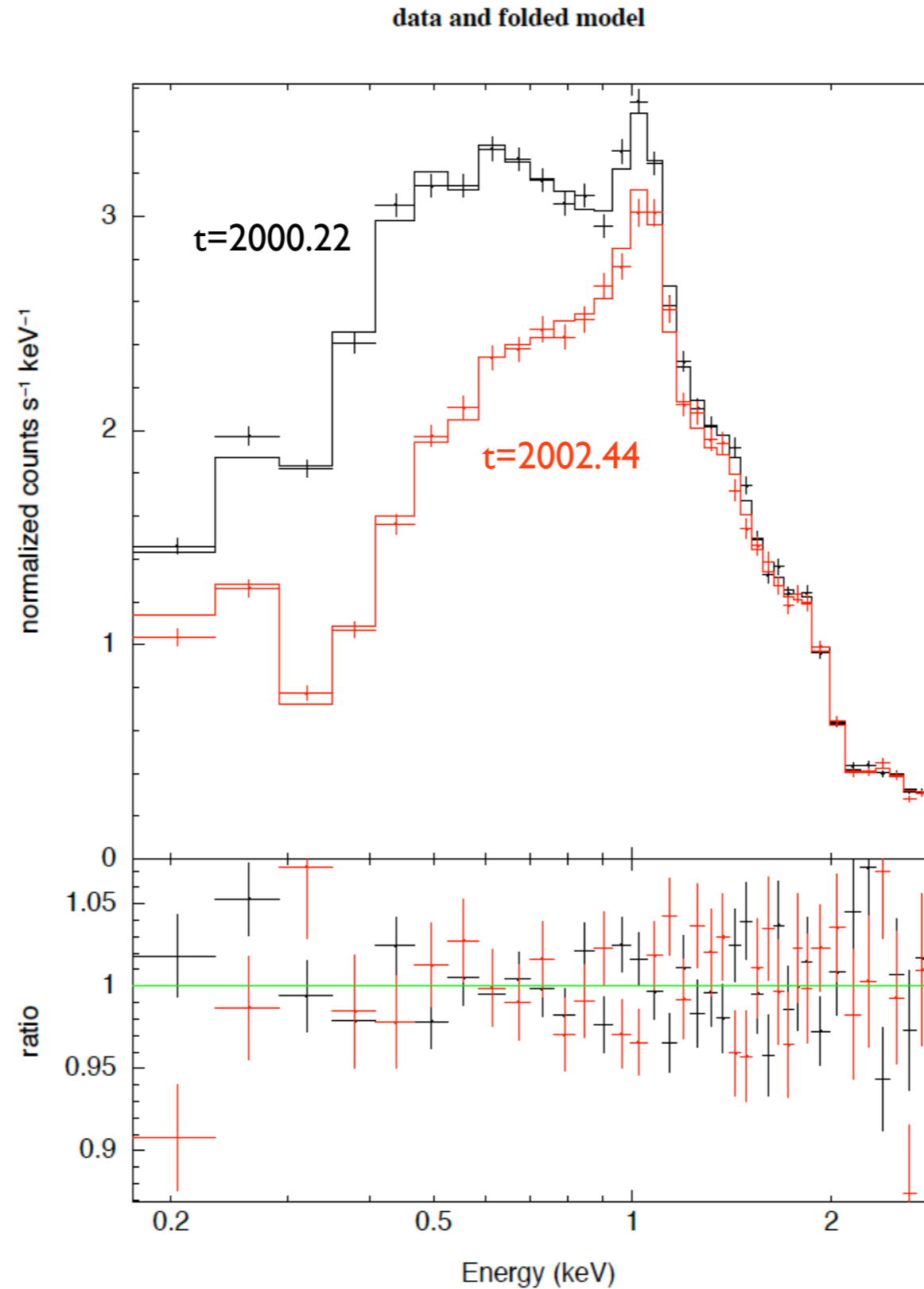
- Scale C-K model to 660 eV
- Subtract from CS data
- Fit to rising exponential
- Assign difference to fluffium



Key expectation: ratio of spectra between 2000 and 2002 should have a fluffium component, while 2002/2009 should not

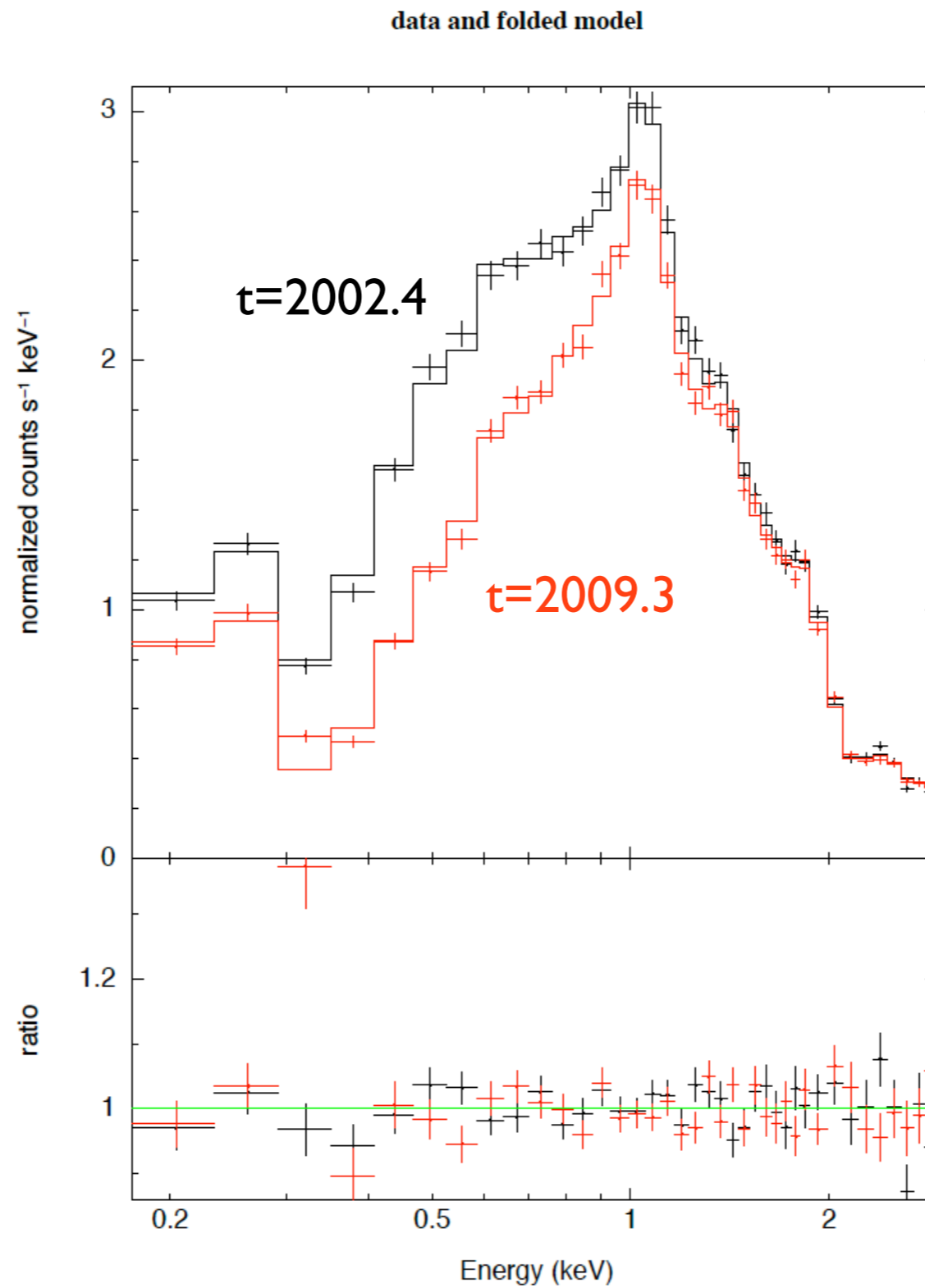
“Fluffium” not seen in the 2000/2002 ratio

A1795:



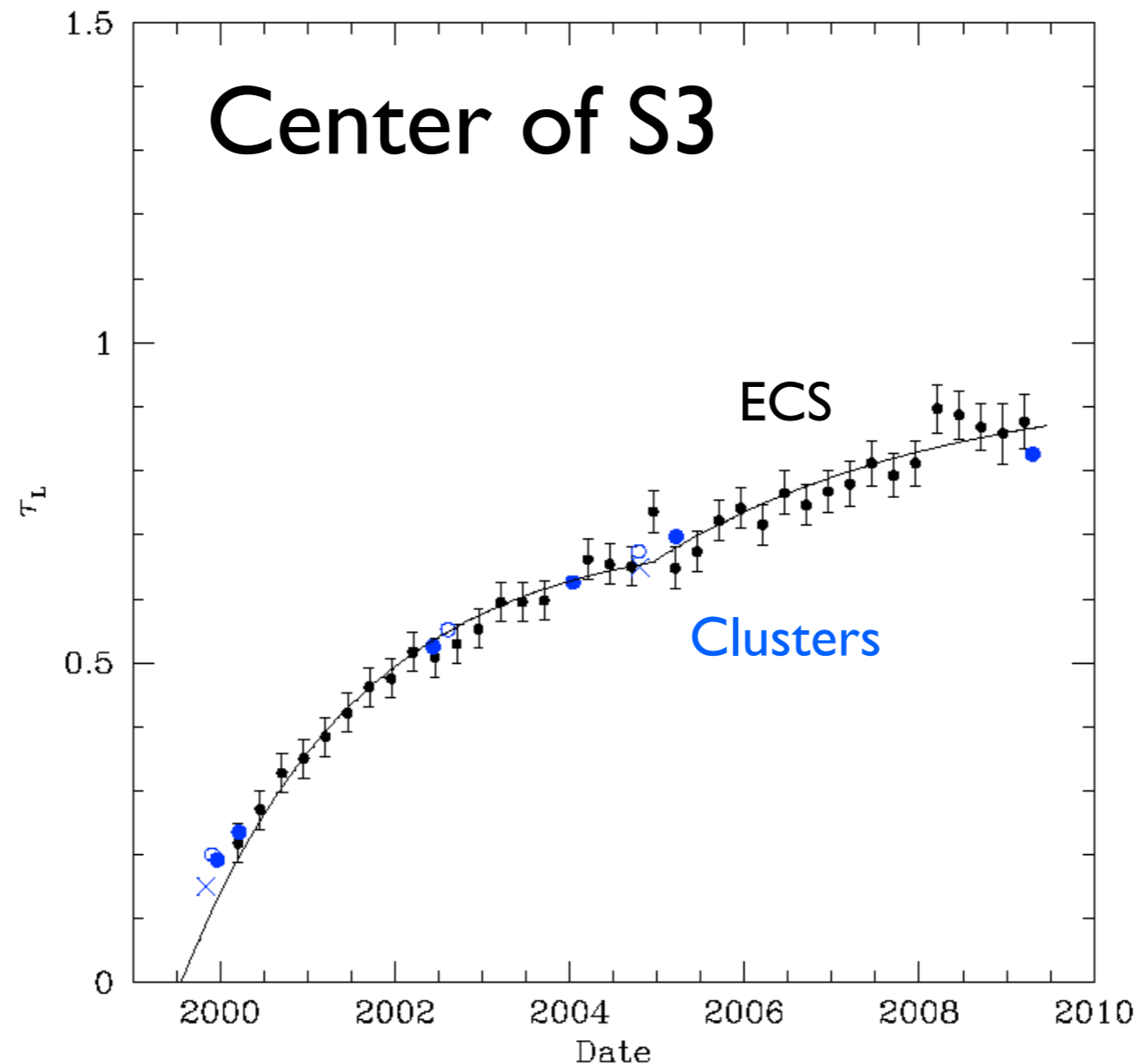
... nor in 2002/2009:

A1795



Starting points

- Relative changes in cluster spectra do not follow fluffium
- Evolution of cluster spectra @ 0.67 keV follow ECS L/K

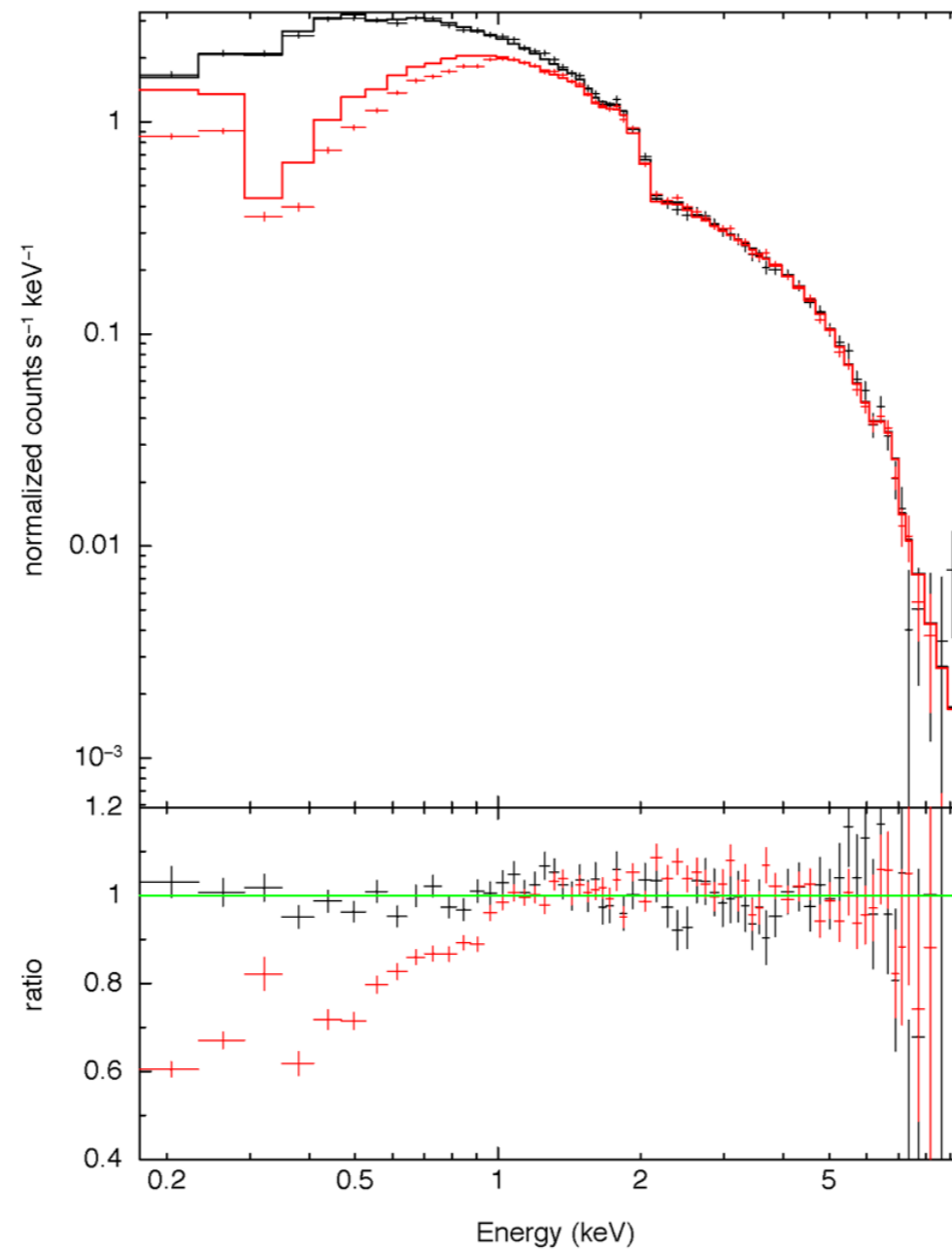


The Plan

- Derive the extra spectral component empirically
- Fit normalization of the spectral component and elemental components to gratings spectra, with τ for the L-lines tied to ECS measurements
- Test with astro-sources

Empirical model for extra absorption

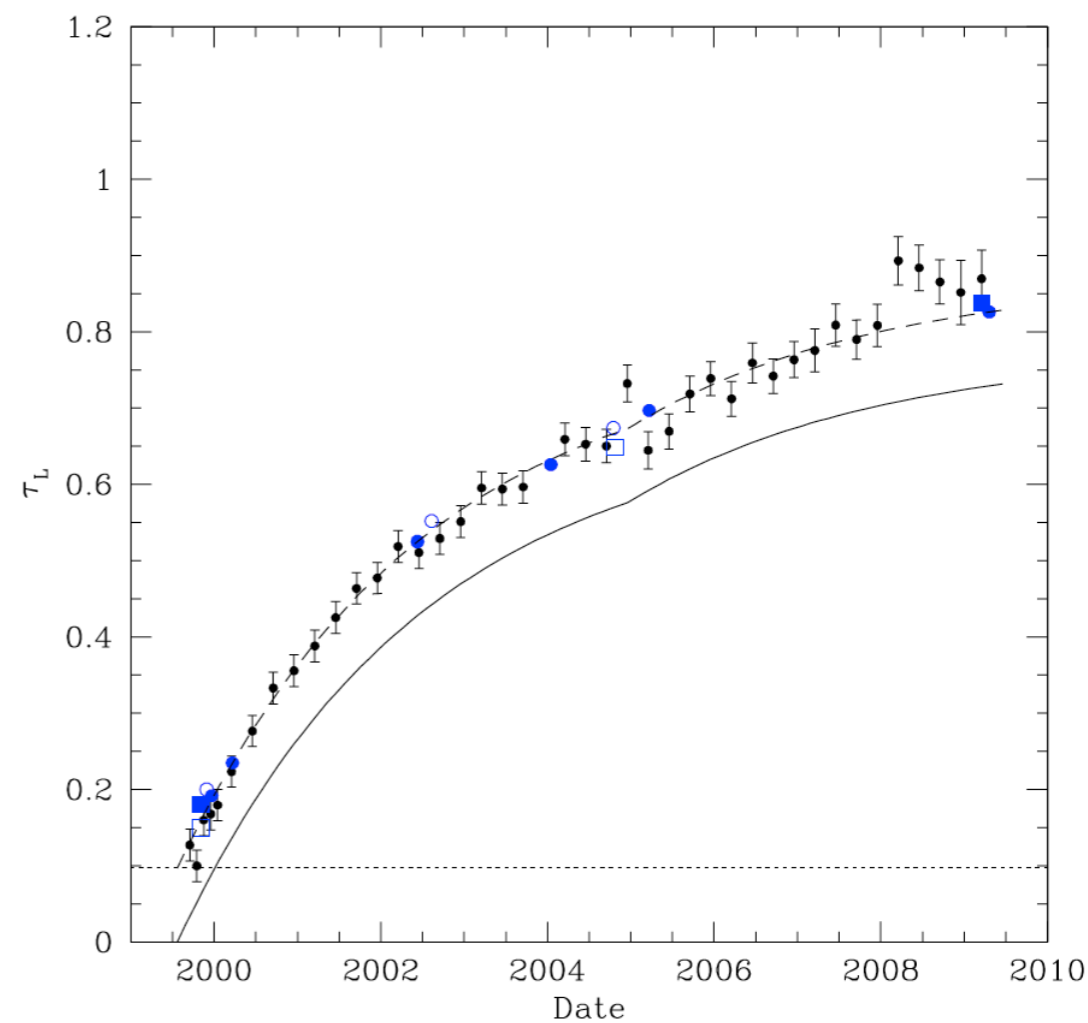
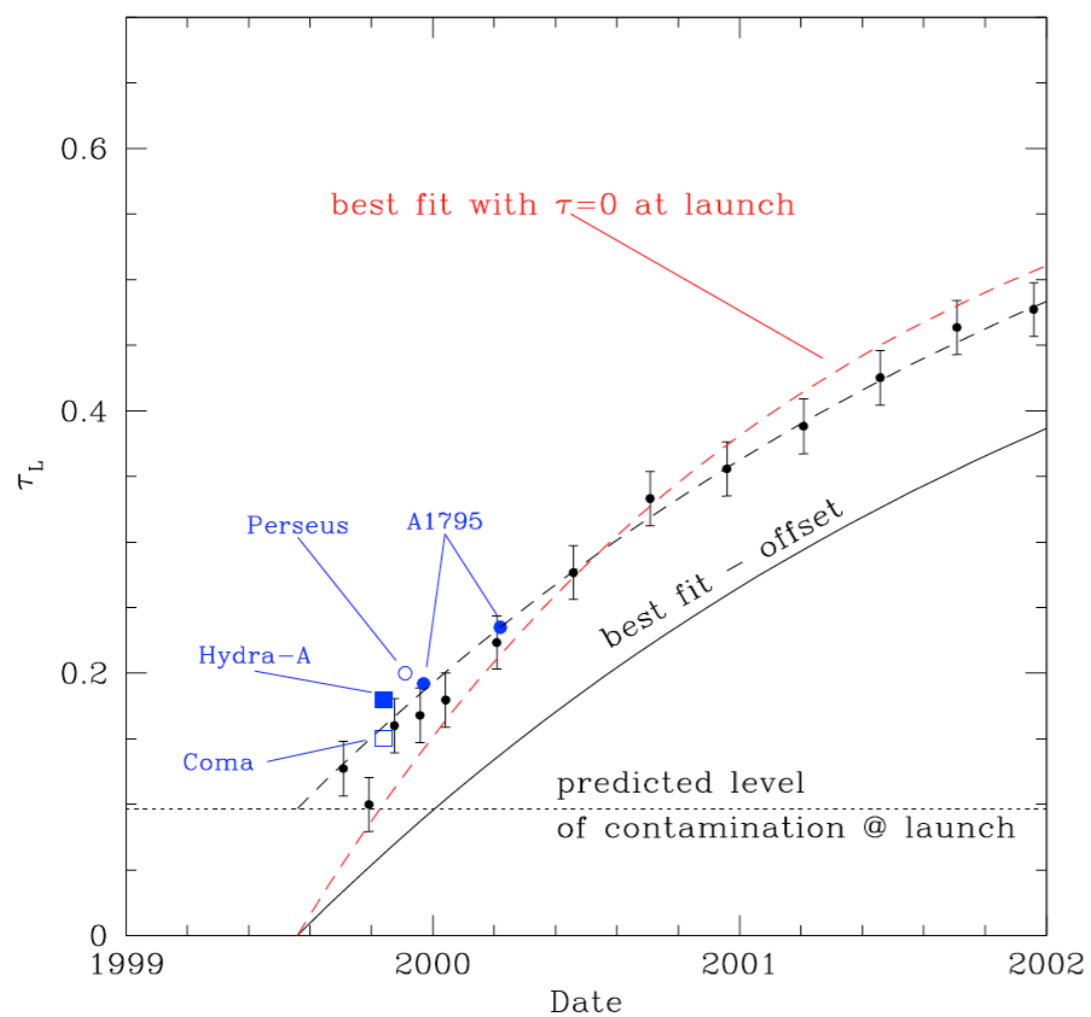
data and folded model



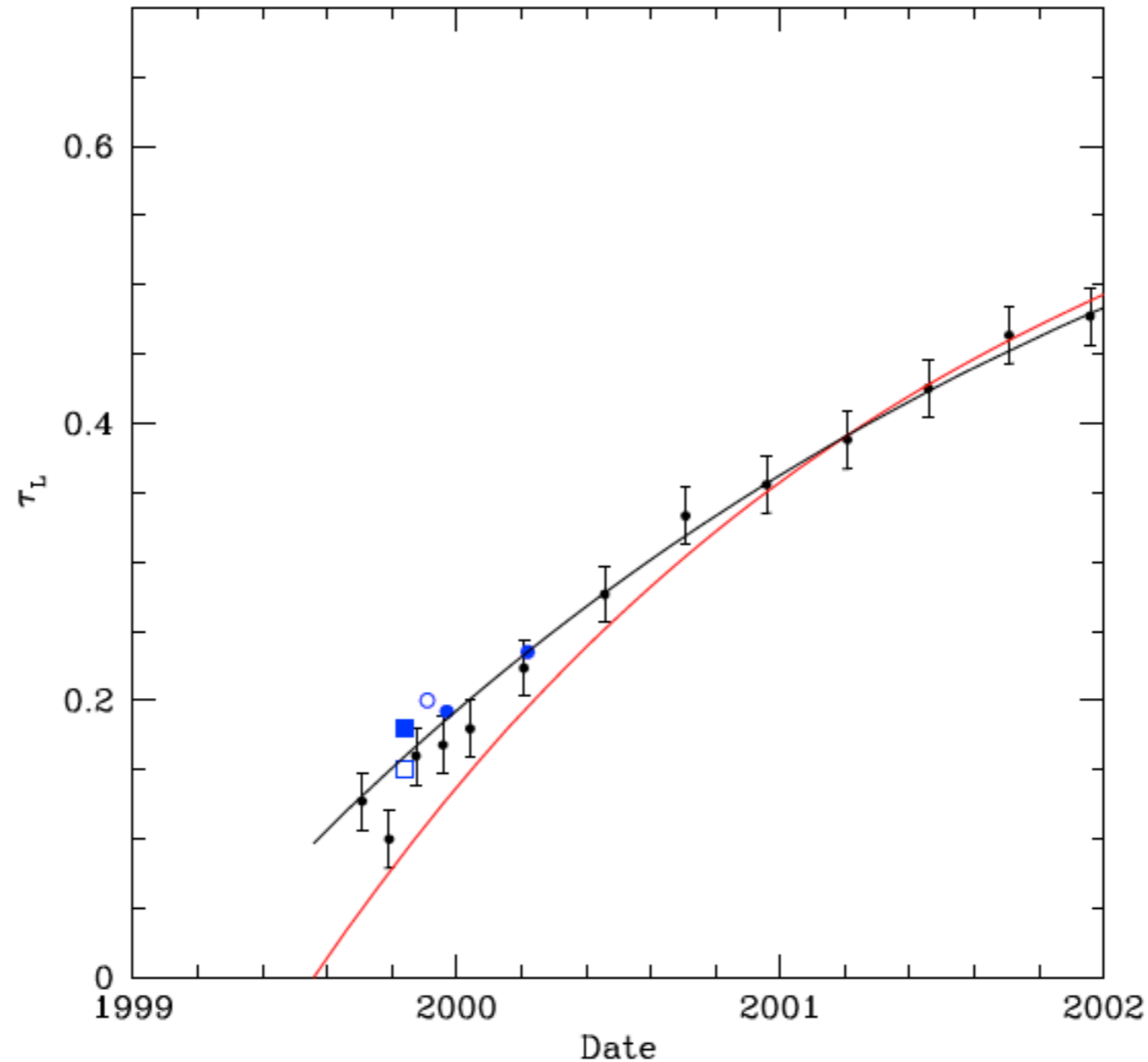
alexey 5-Oct-2009 17:38

- Fit a model to an early observation
- Modify by contamination with just the elemental model applied
- Look at residuals: empirical fit —
 $\tau(E) = A \exp(-(E/\sigma)^2)$, $\sigma=0.63$ keV

tau(t) model

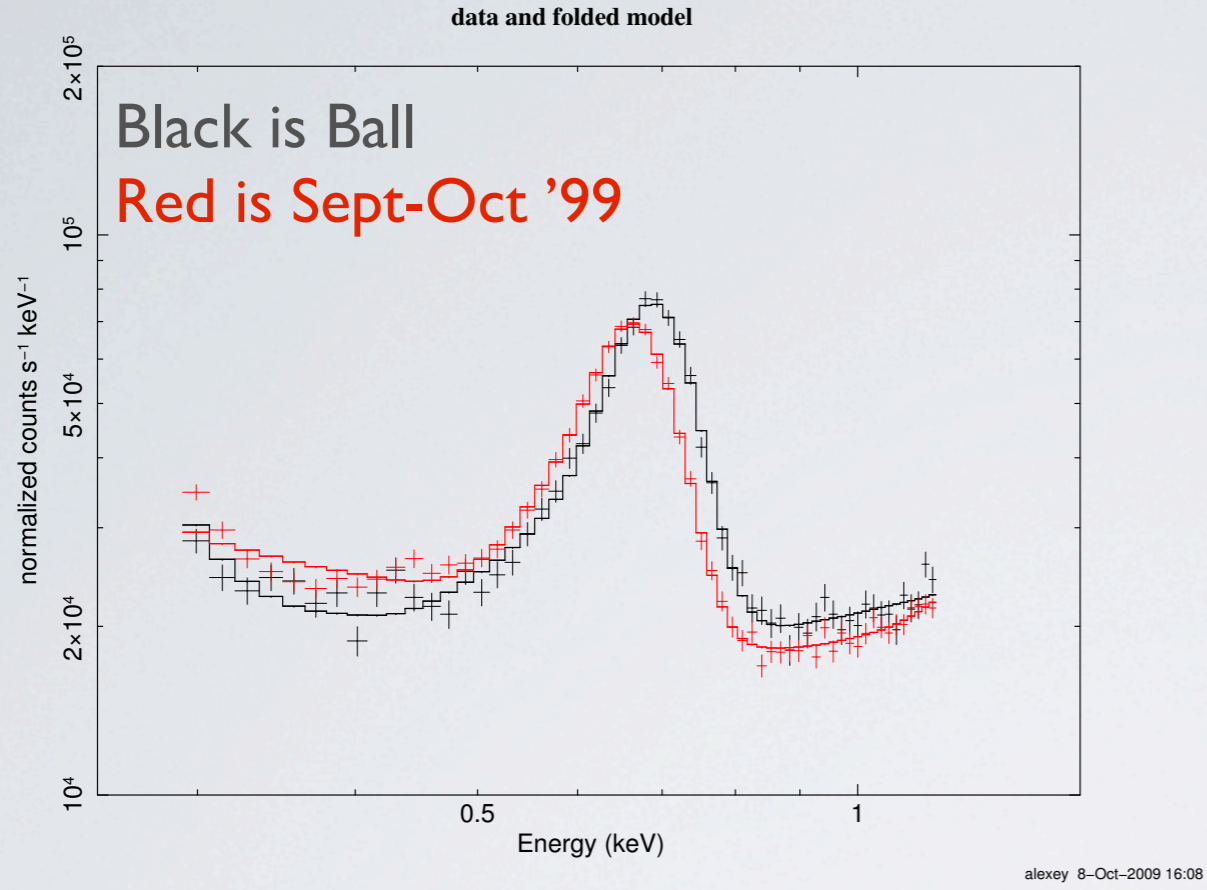


Early Contamination?

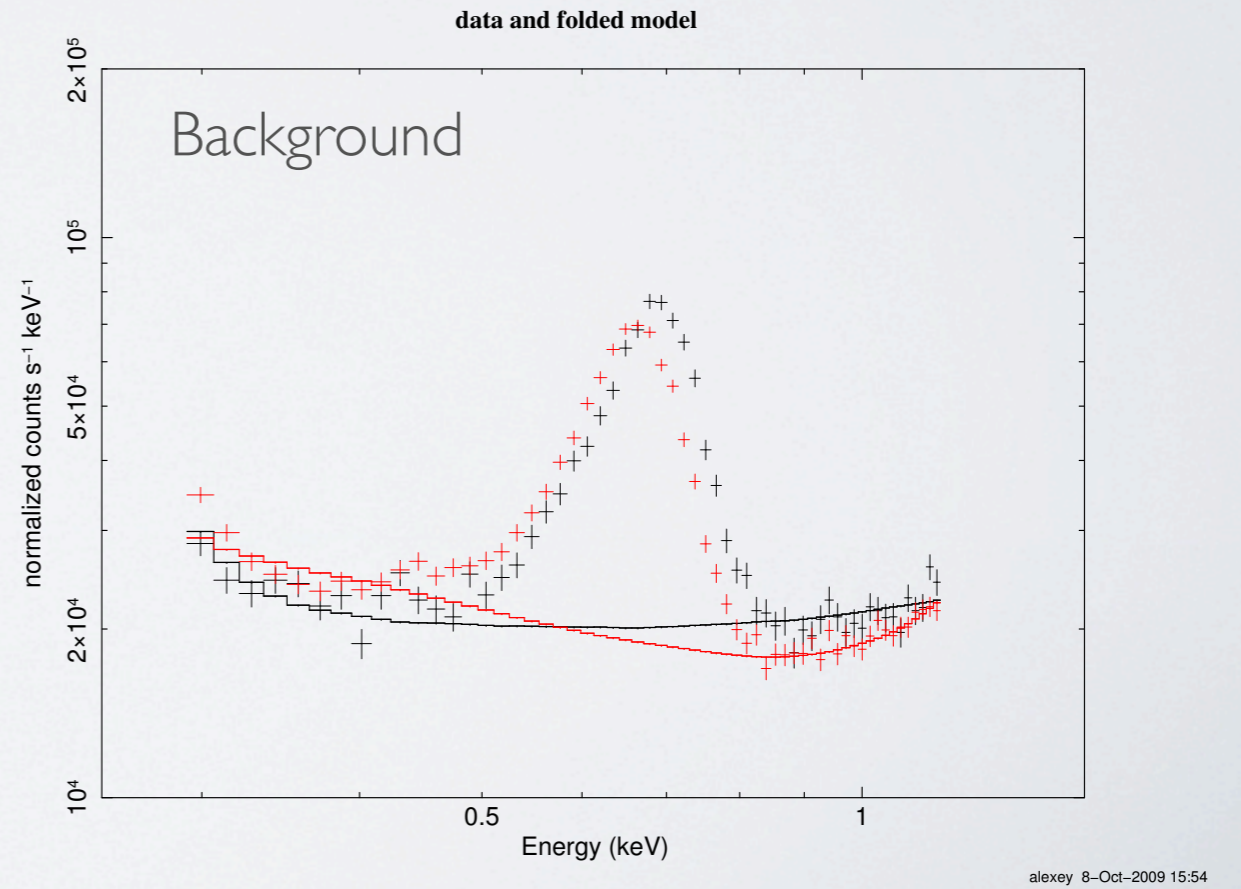
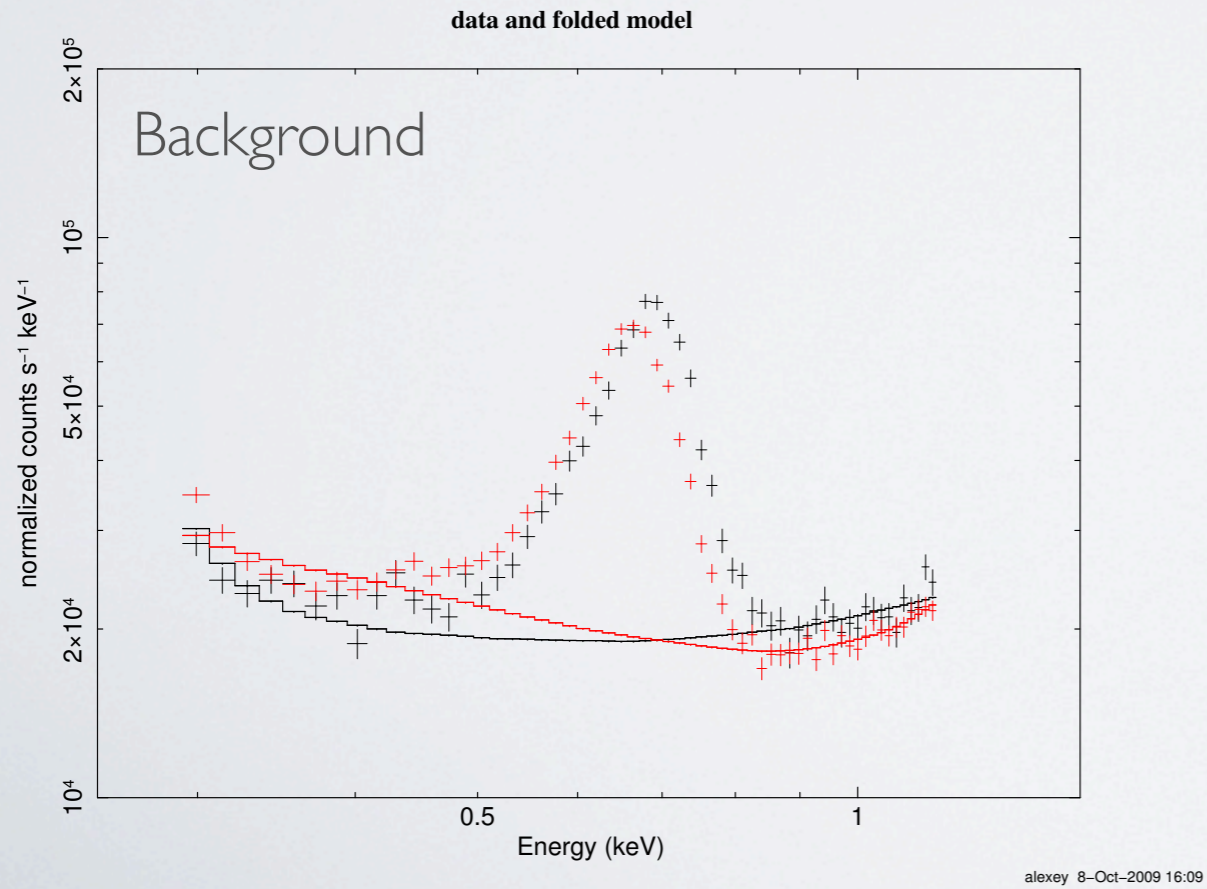
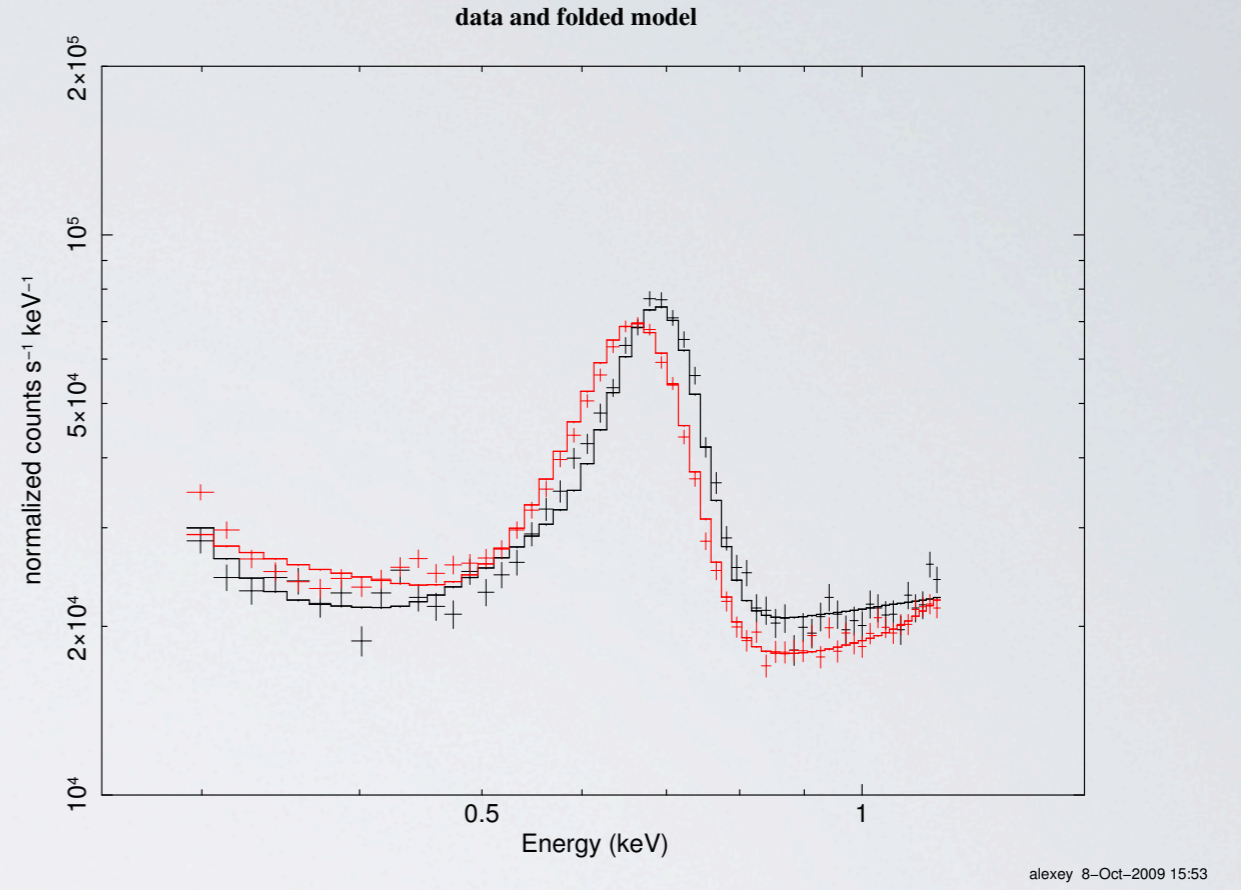


- Either quick buildup to $\tau=0.1$ within days of launch
- Or incorrect zero-point

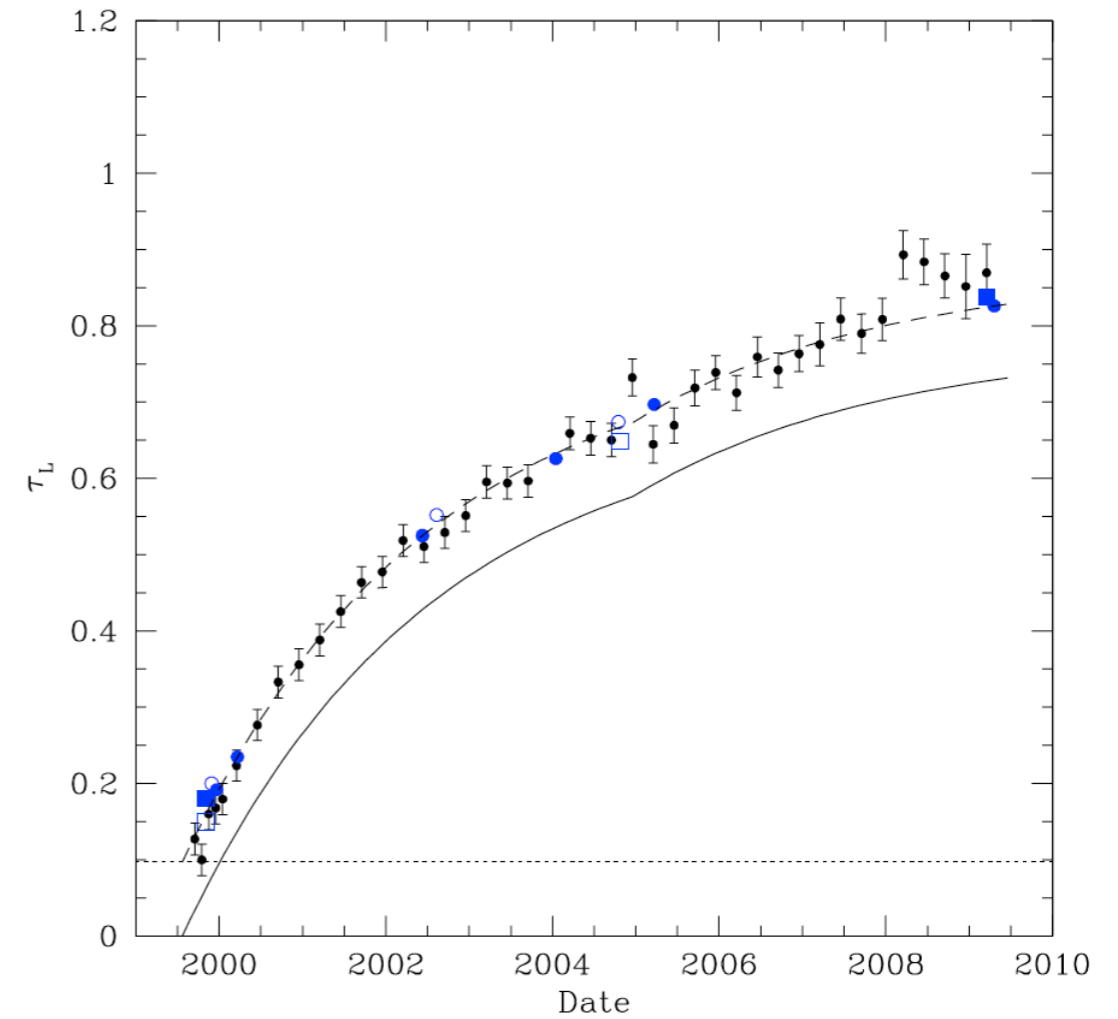
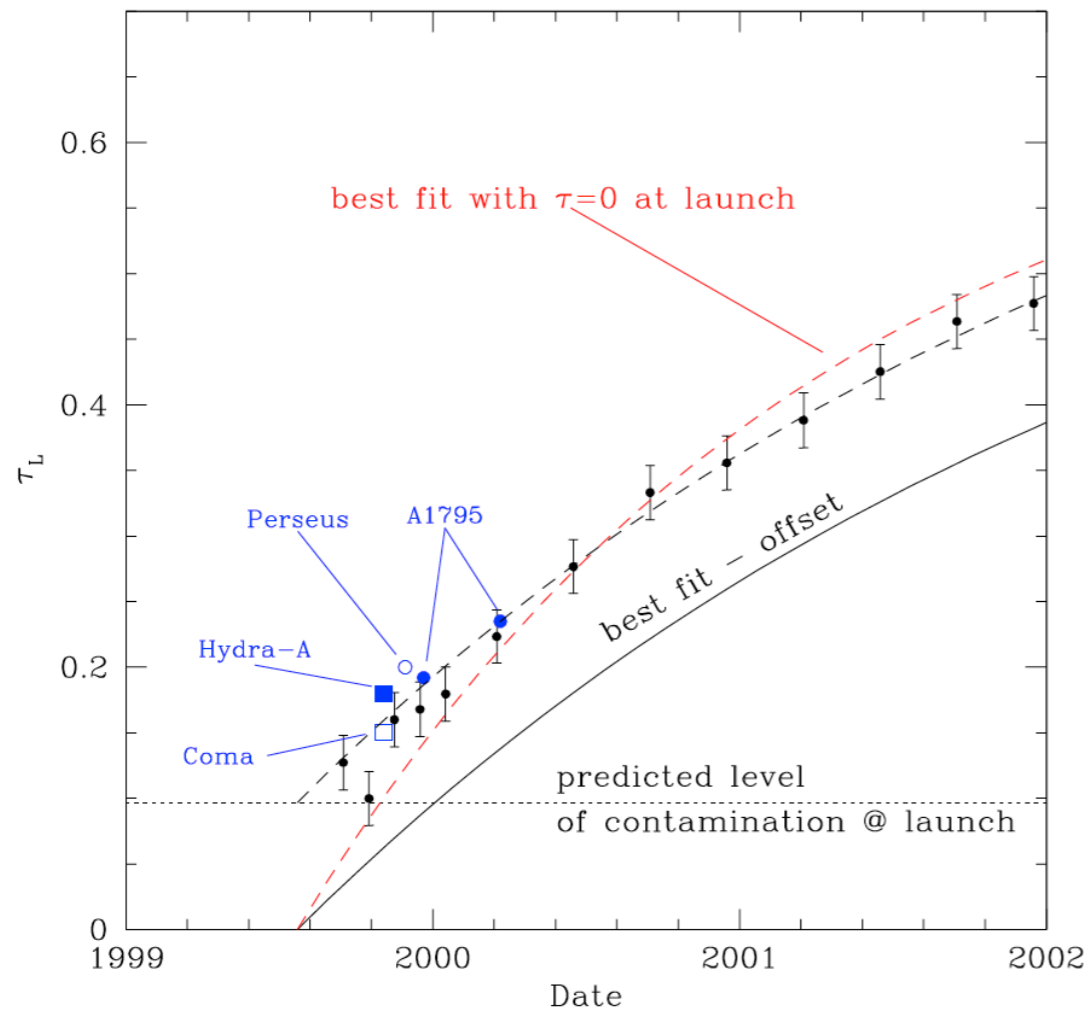
Best fit



Red tied to be 10% higher

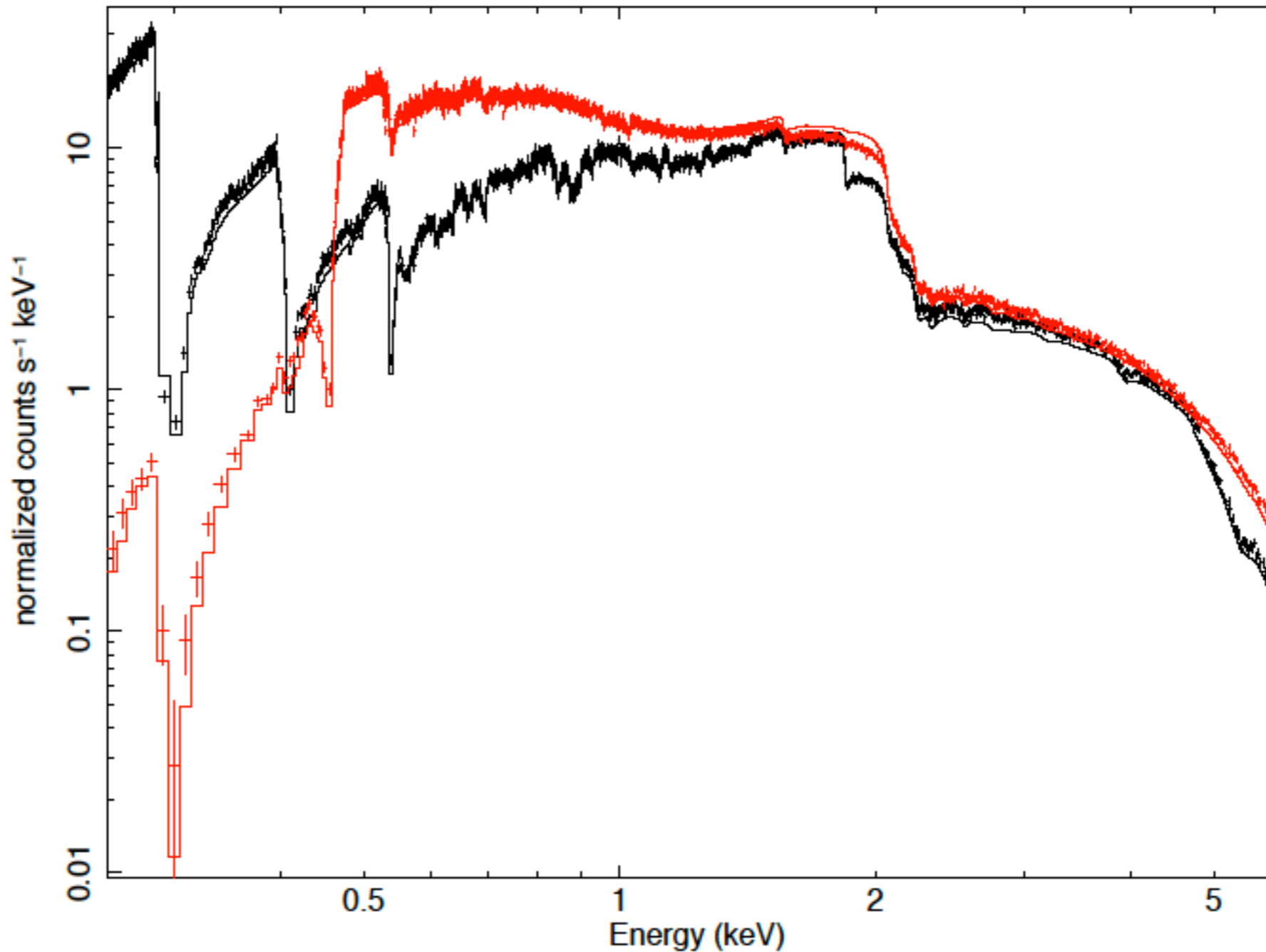


tau(t) model



Grating fits

data and folded model

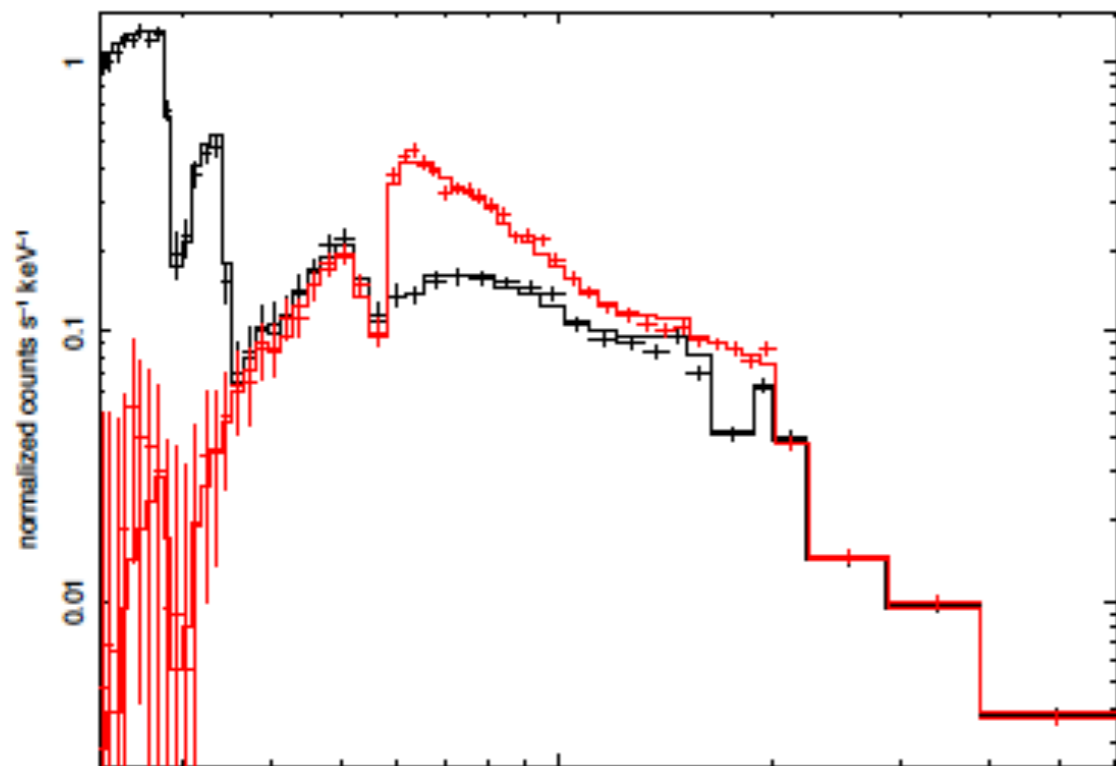


alexey 6-Oct-2009 16:15

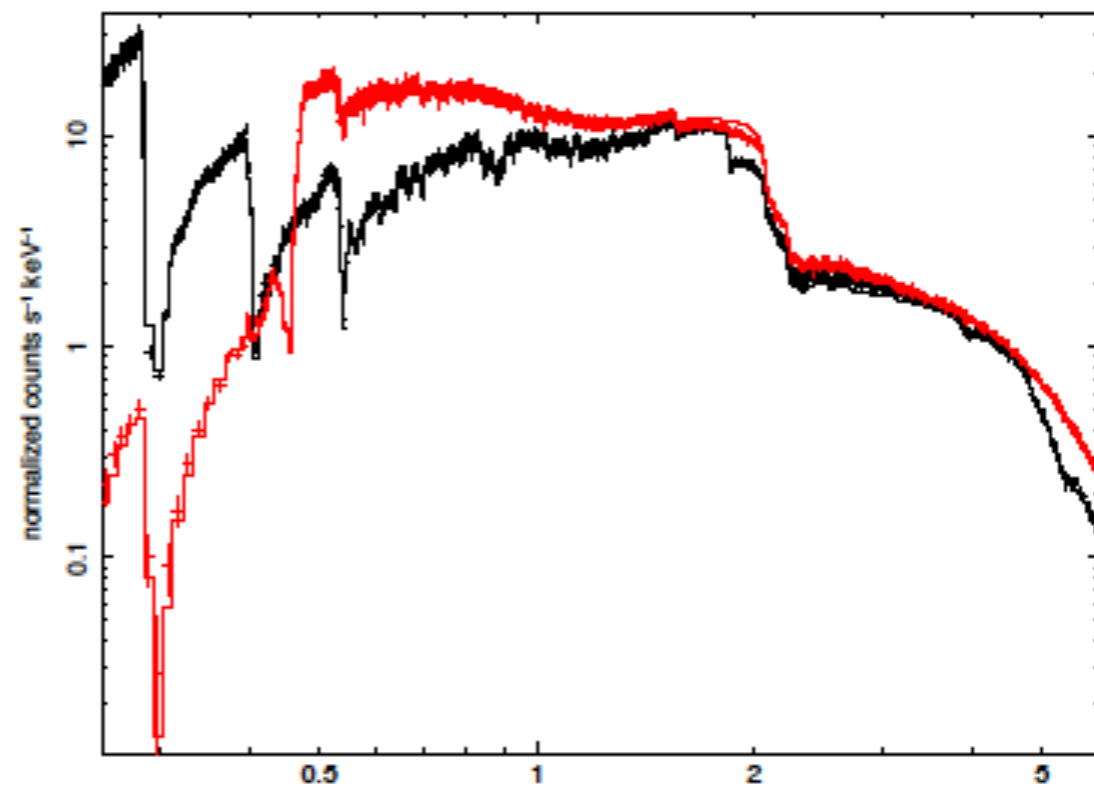
With $\tau_{\text{ECS}}=0.1$, grating spectra at all times and locations are consistent with
 $\tau_{\text{C}} : \tau_{\text{O}} : \tau_{\text{Gauss}} = 1 : 0.18 : 0.75$

Grating fits

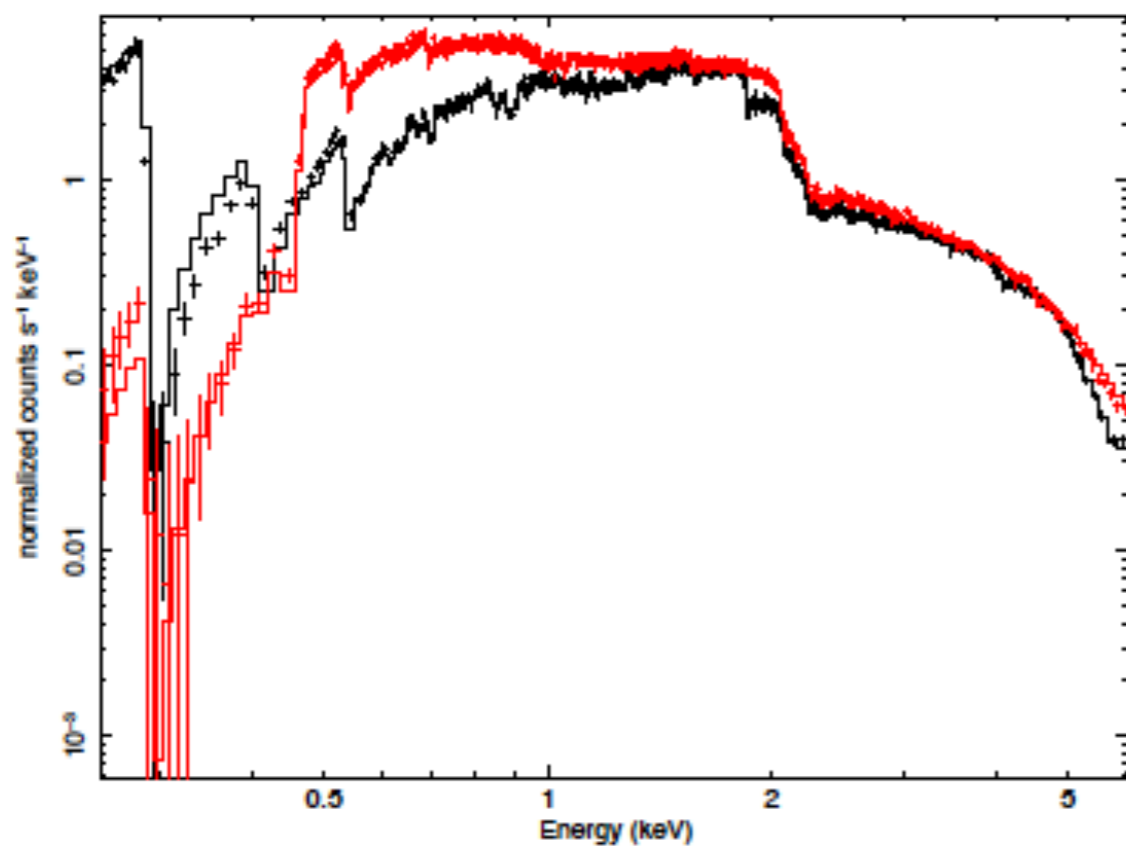
data and folded model



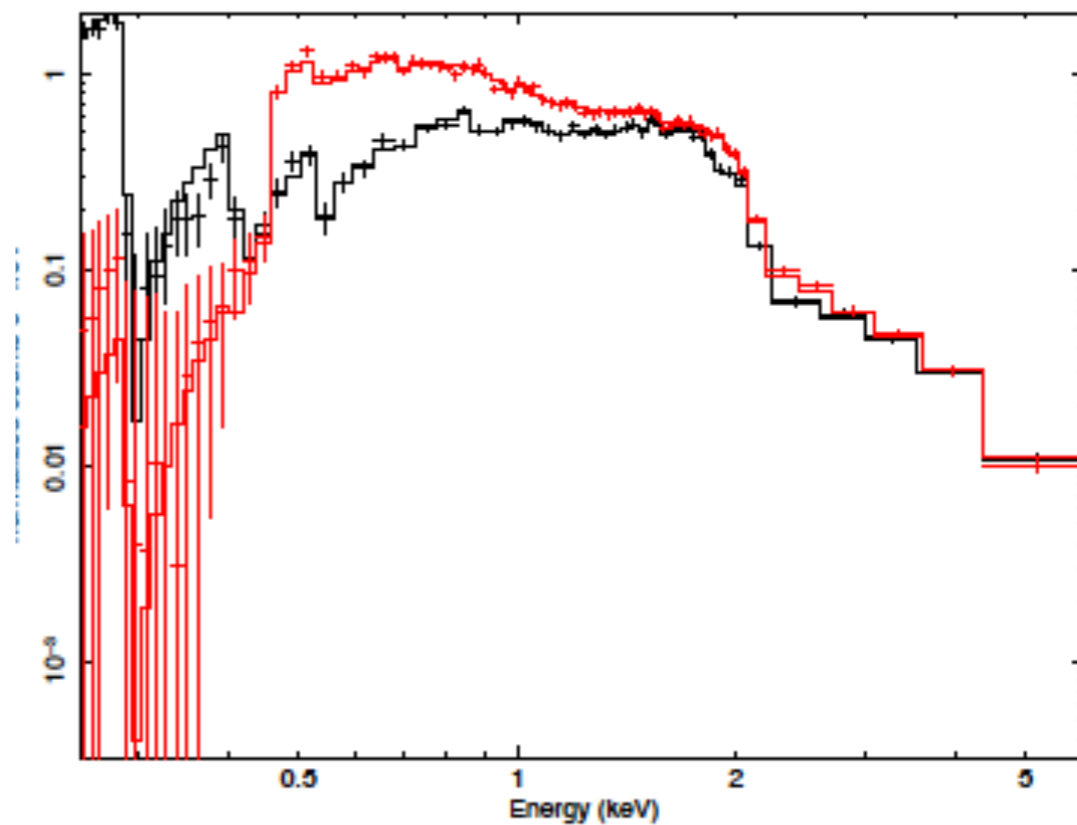
data and folded model



data and folded model



data and folded model

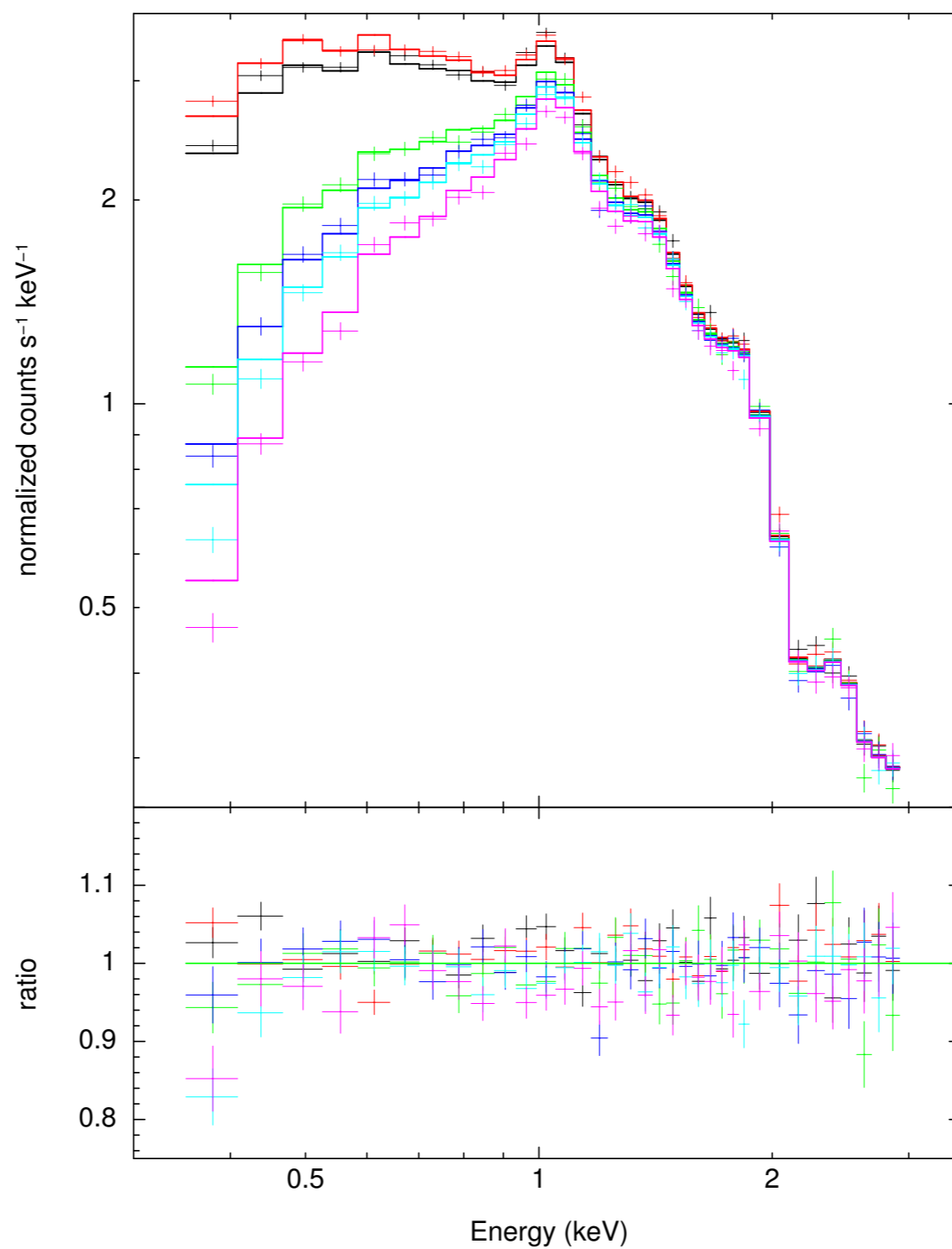


AI795 in ACIS-S from 1999 to 2009

Energy (keV)

alexey 1-Oct-2009 20:16

data and folded model



alexey 1-Oct-2009 20:17

Energy

data and folded model

