

ACIS Contamination Update

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ARLO & JANIS by Jimmy Johnson



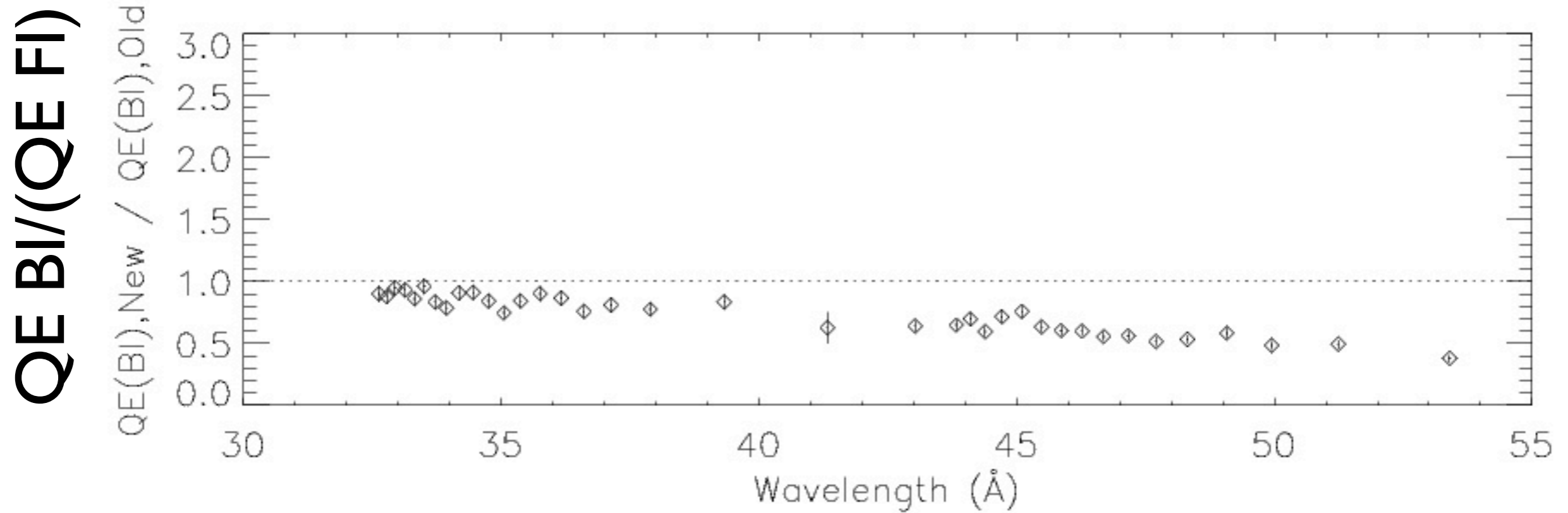
Updates from 2011 IACHEC

- Possible O-K, C-K edge differences across chips
 - Due to use of IDL “rebin” command
 - averages integer data using integer math
 - not flux conserving
 - badd when count are low
 - Reanalysis uses flux conserving method
 - No such problems in new analysis: spatial model is OK

New Contamination Model Issues

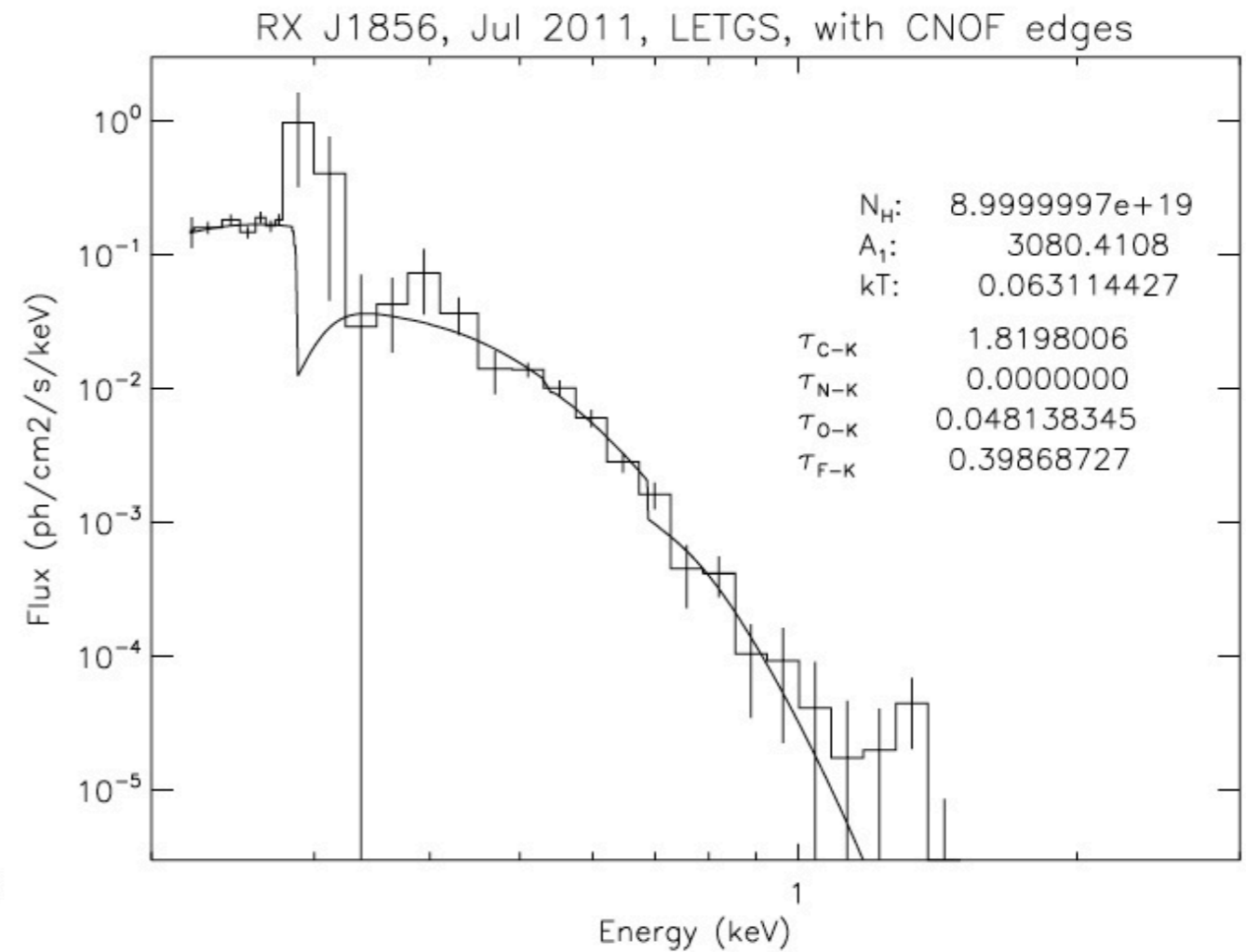
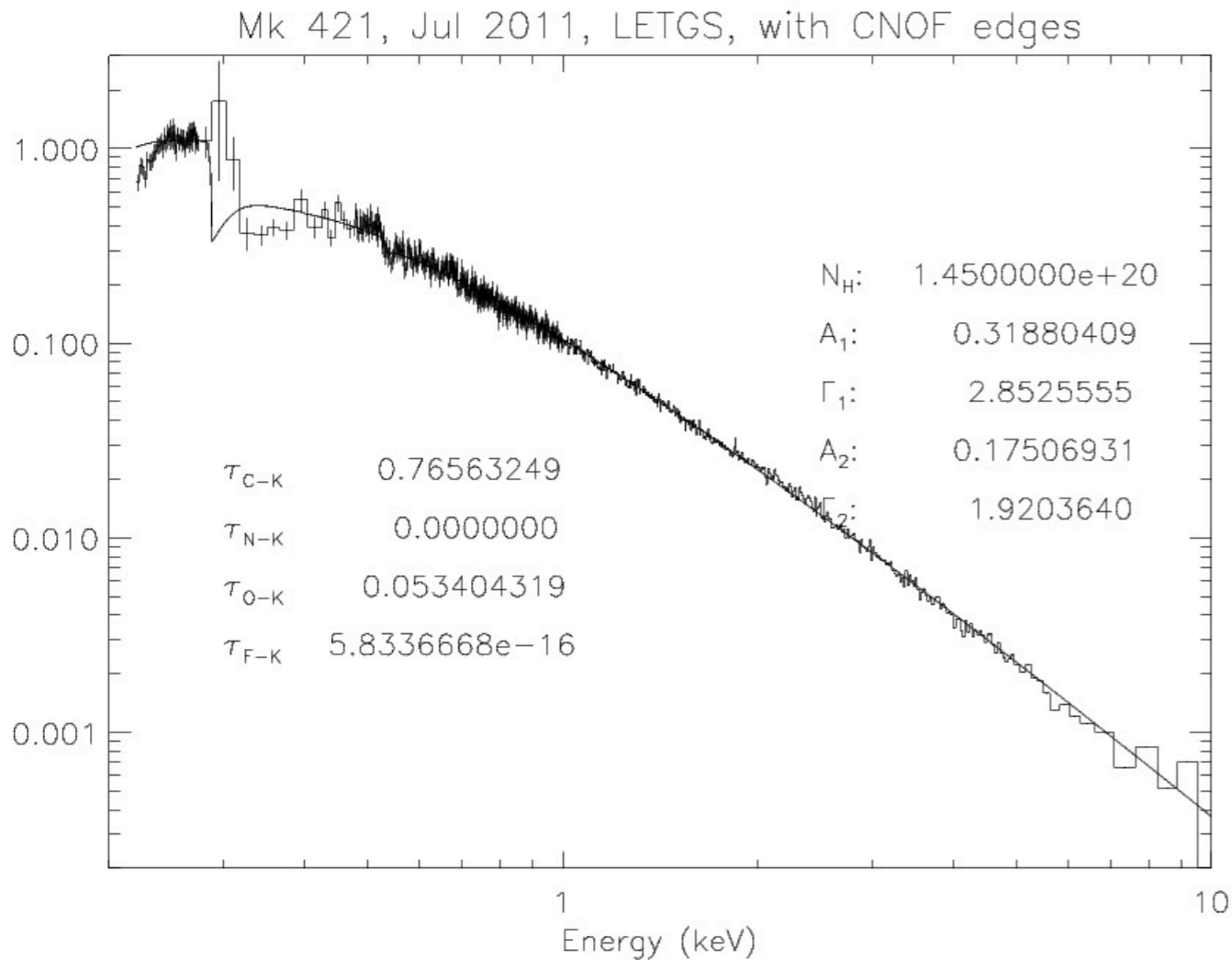
- LETG extraction problem below 0.5 keV
 - gain offset, PHA distribution clipped
- LETG/ACIS residuals
 - C-K (RX J1856, Mk 421)
 - F-K (ToO of SAX J1808)
- S3 and I3 dQE/dt shows contam'n pattern
- New spatial model generated from A1795
- E0102 ACIS fits: F-K may be needed

Checking BI/FI — LETGS



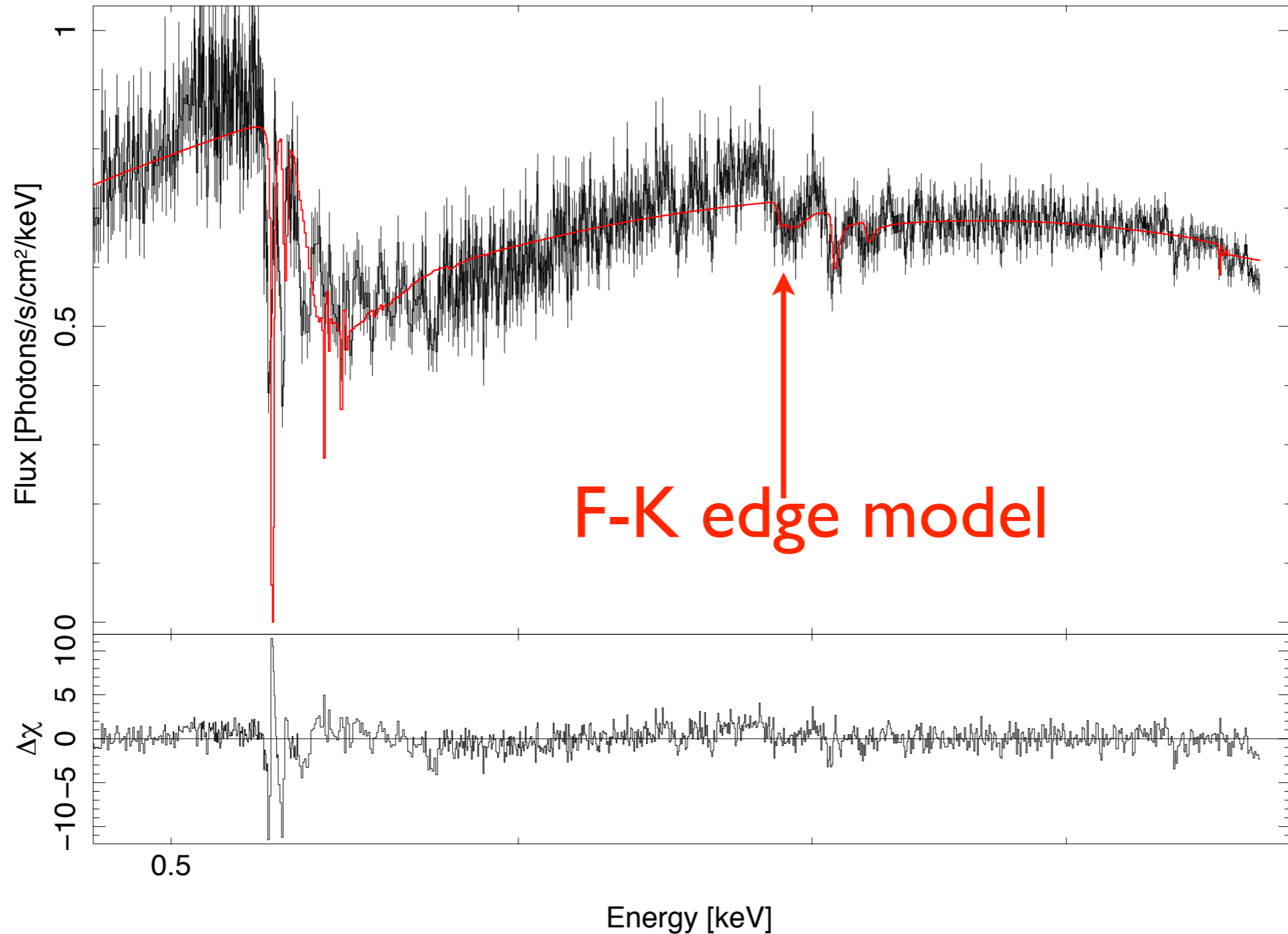
Current Contamination

Model Leaves C-K Residual



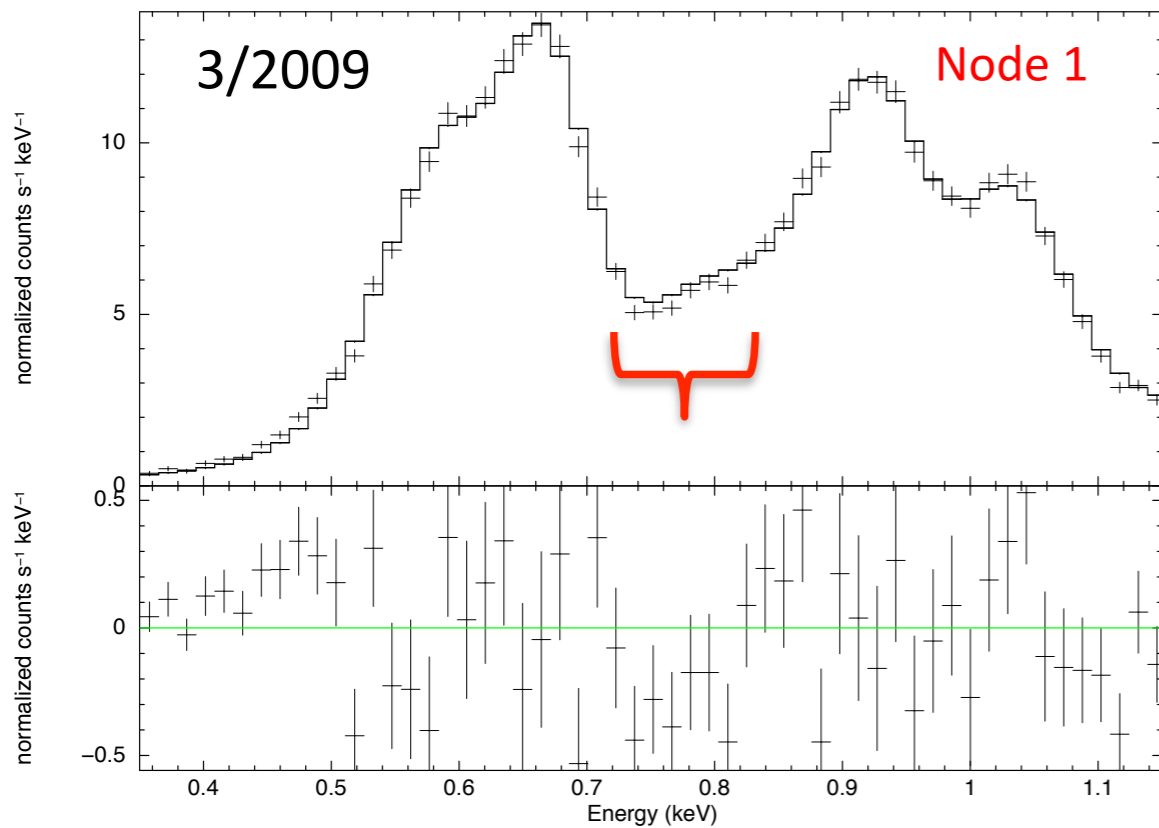
Current Contamination

Model Leaves F-K Residual

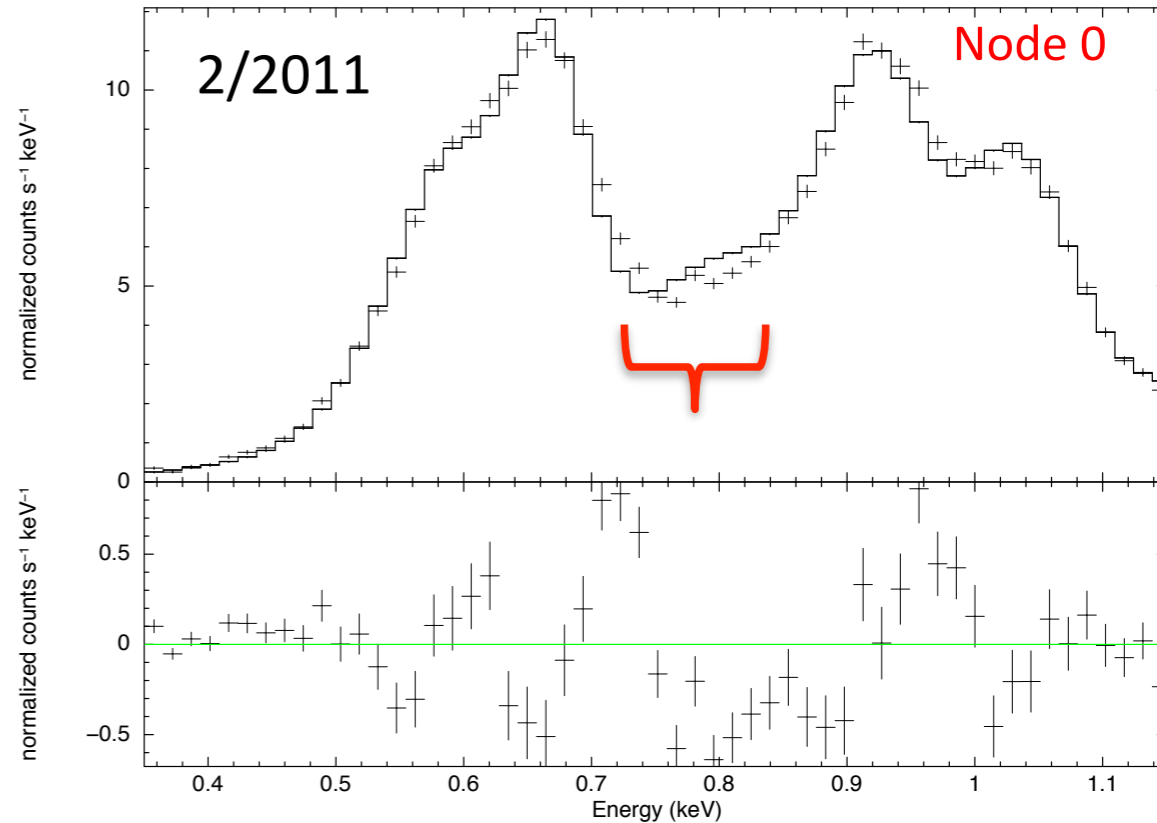


Some Evidence from E0102 fits for more F at late times:

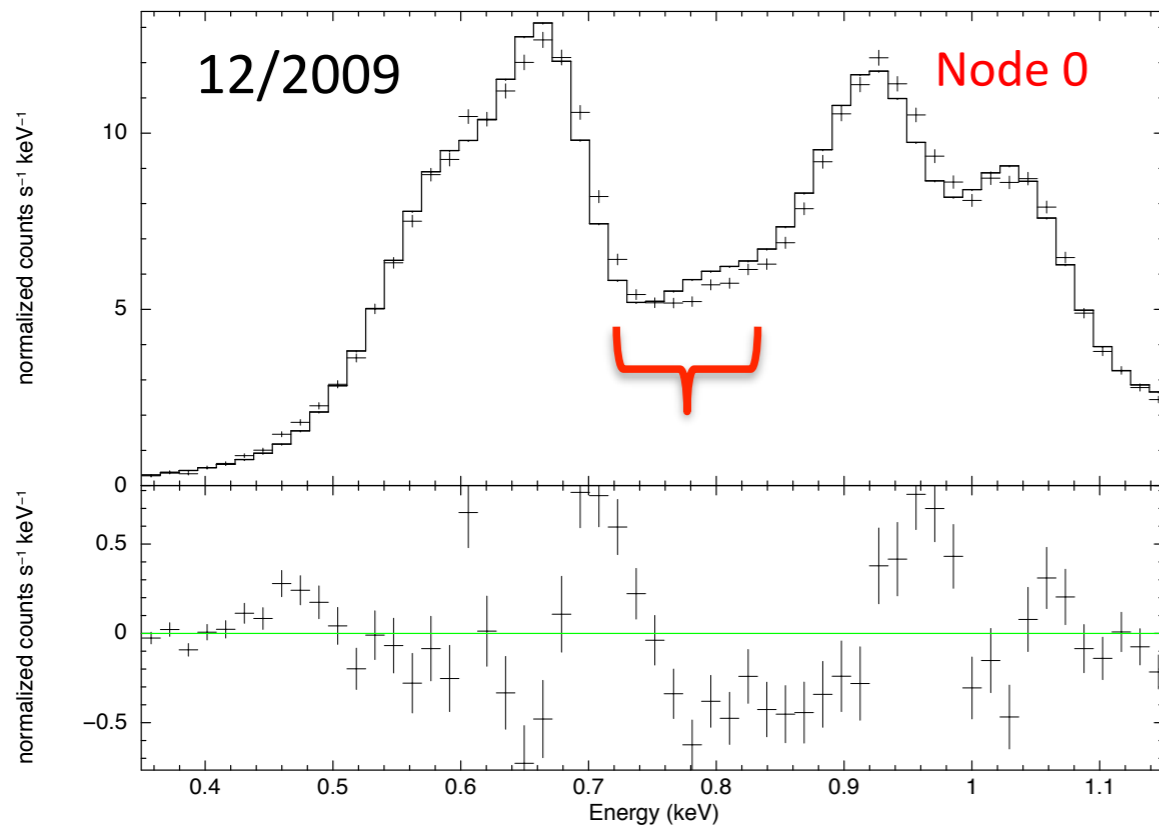
ObsID 10656, contam=9941, chi-sq=189, dof=115, red-chi=1.64



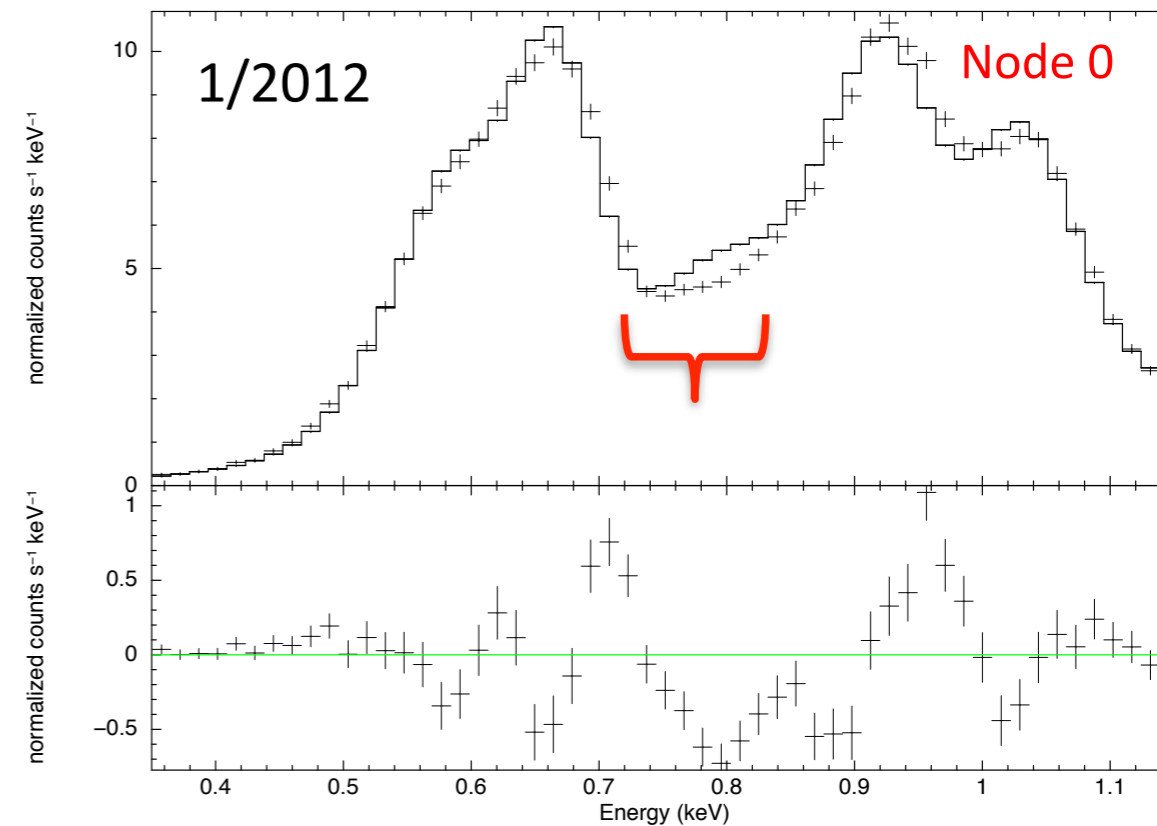
ObsID 13093, contam=9941, chi-sq=458, dof=140, red-chi=3.27



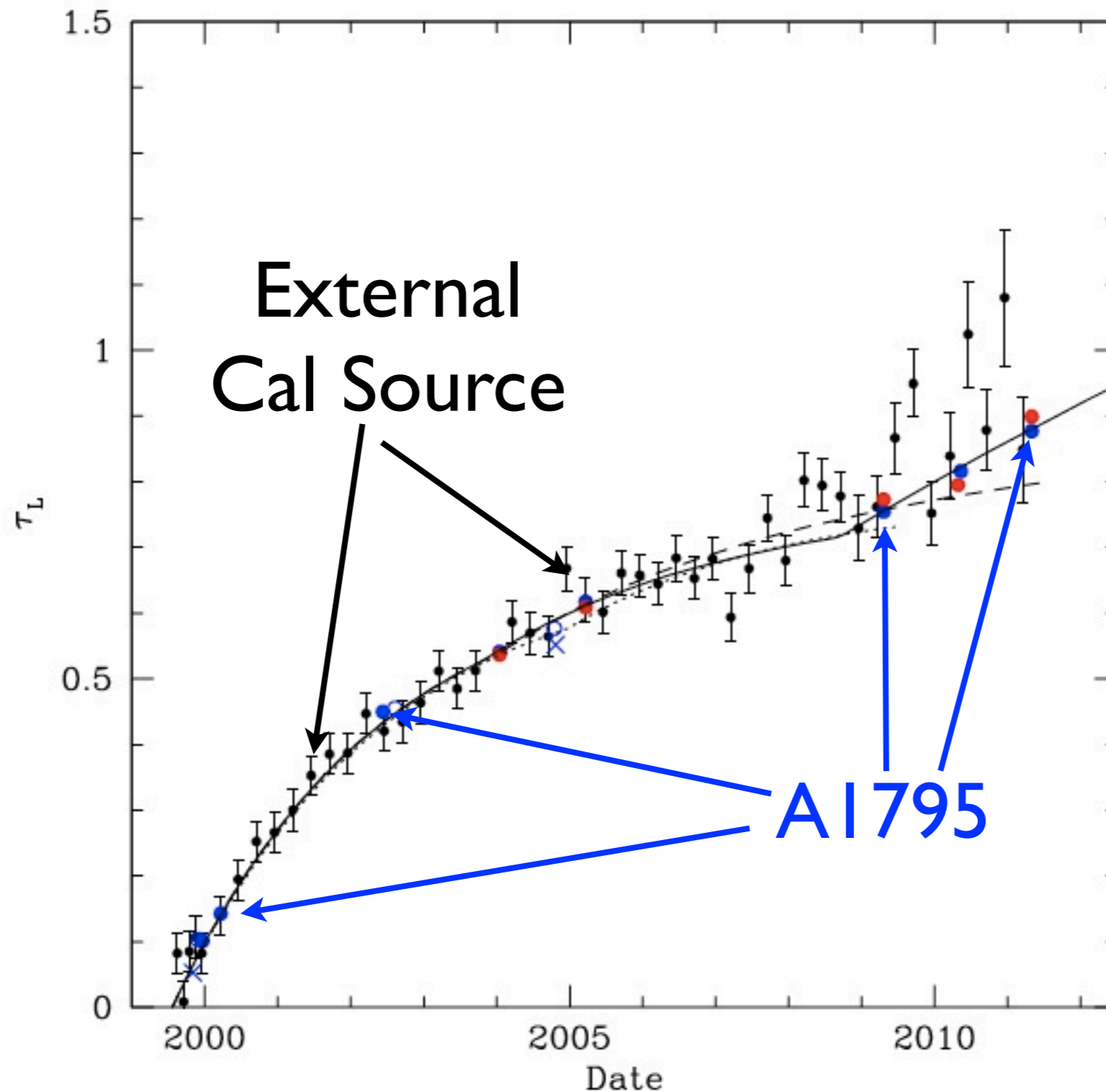
ObsID 11957, contam=9941, chi-sq=448, dof=138, red-chi=3.25



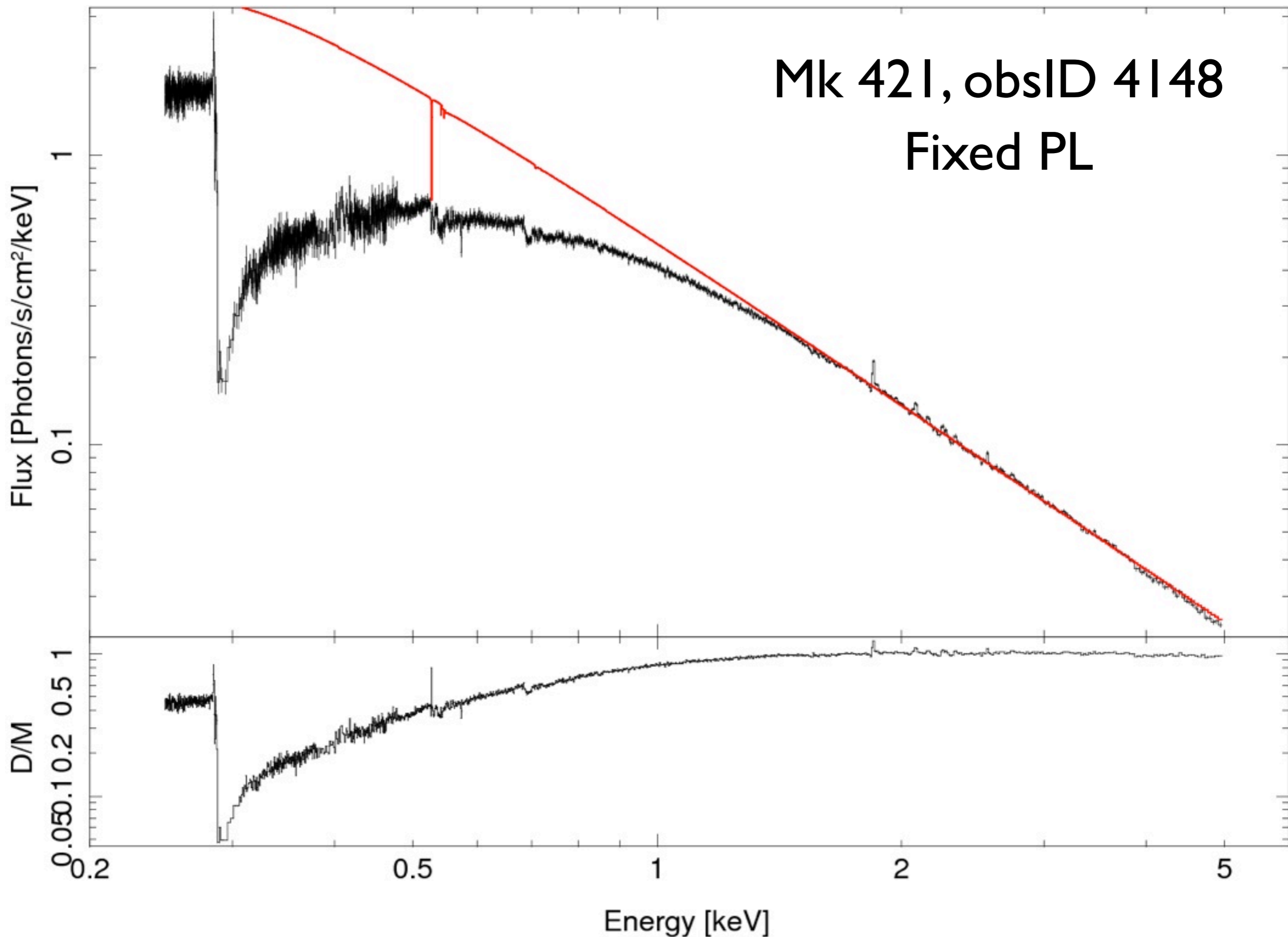
ObsID 14258, contam=9941, chi-sq=526, dof=139, red-chi=3.78



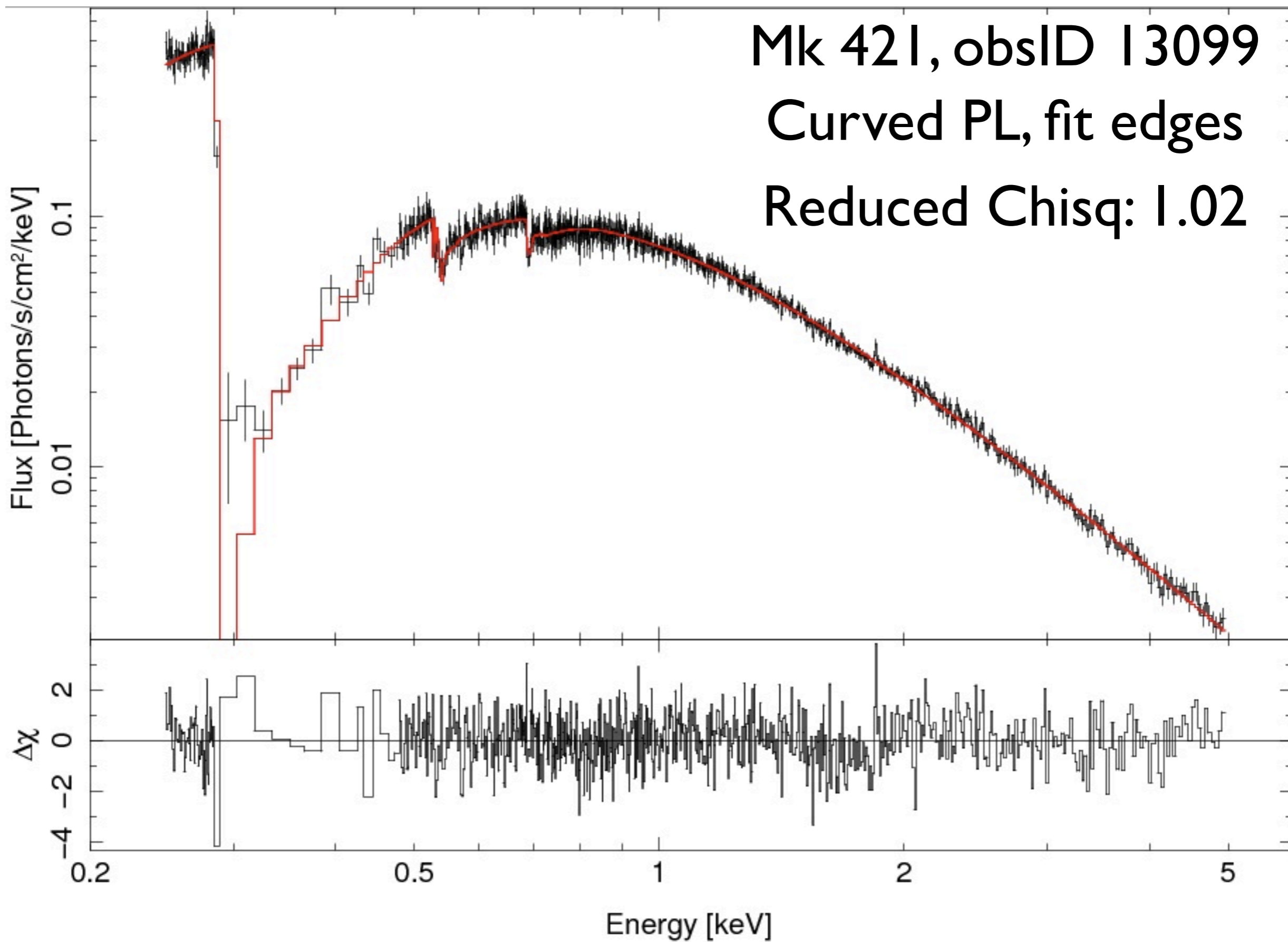
Optical Depth at Mn-L on ACIS-S (current model)

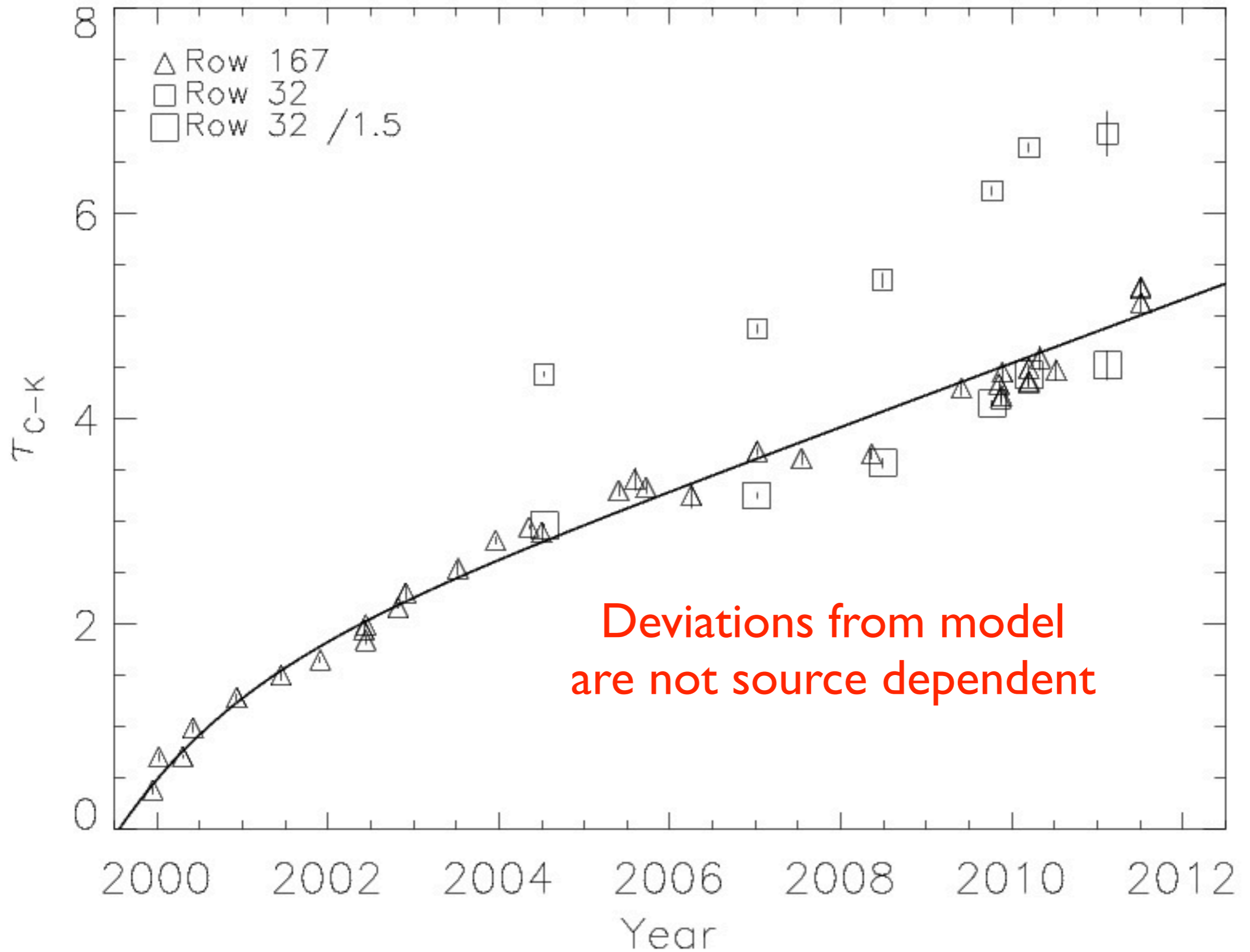


Mk 421, obsID 4148
Fixed PL

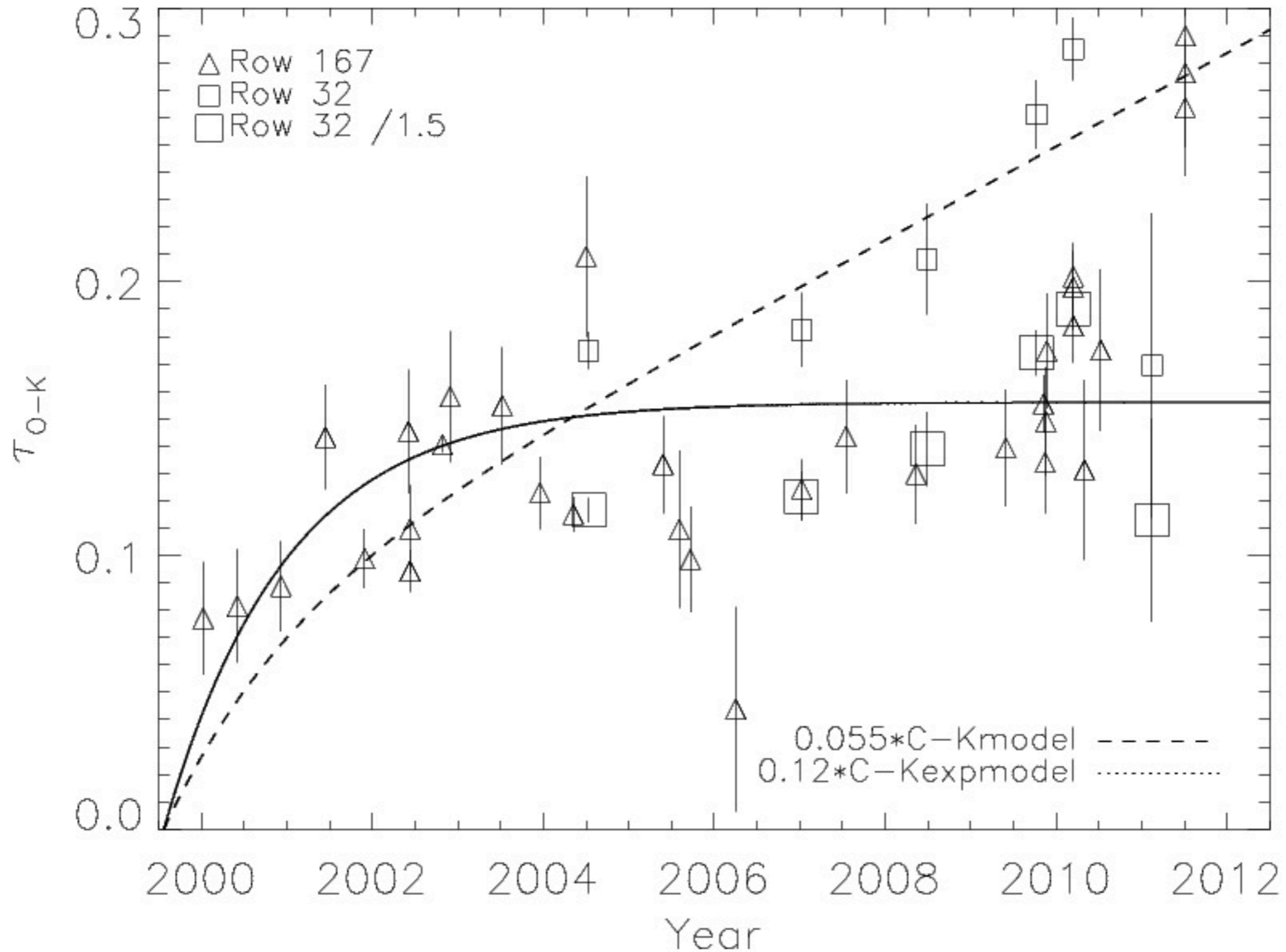


Mk 421, obsID 13099
Curved PL, fit edges
Reduced Chisq: 1.02

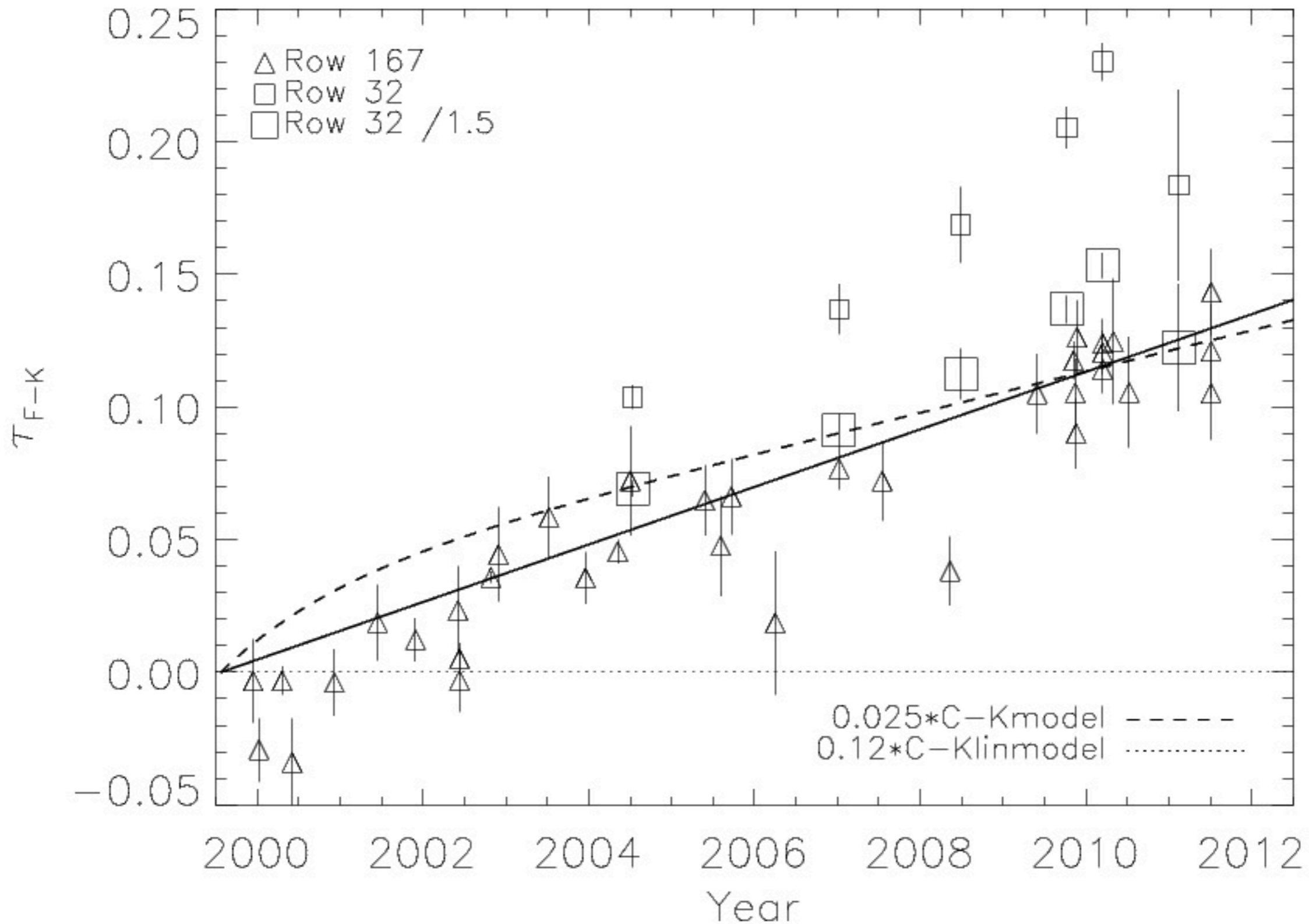




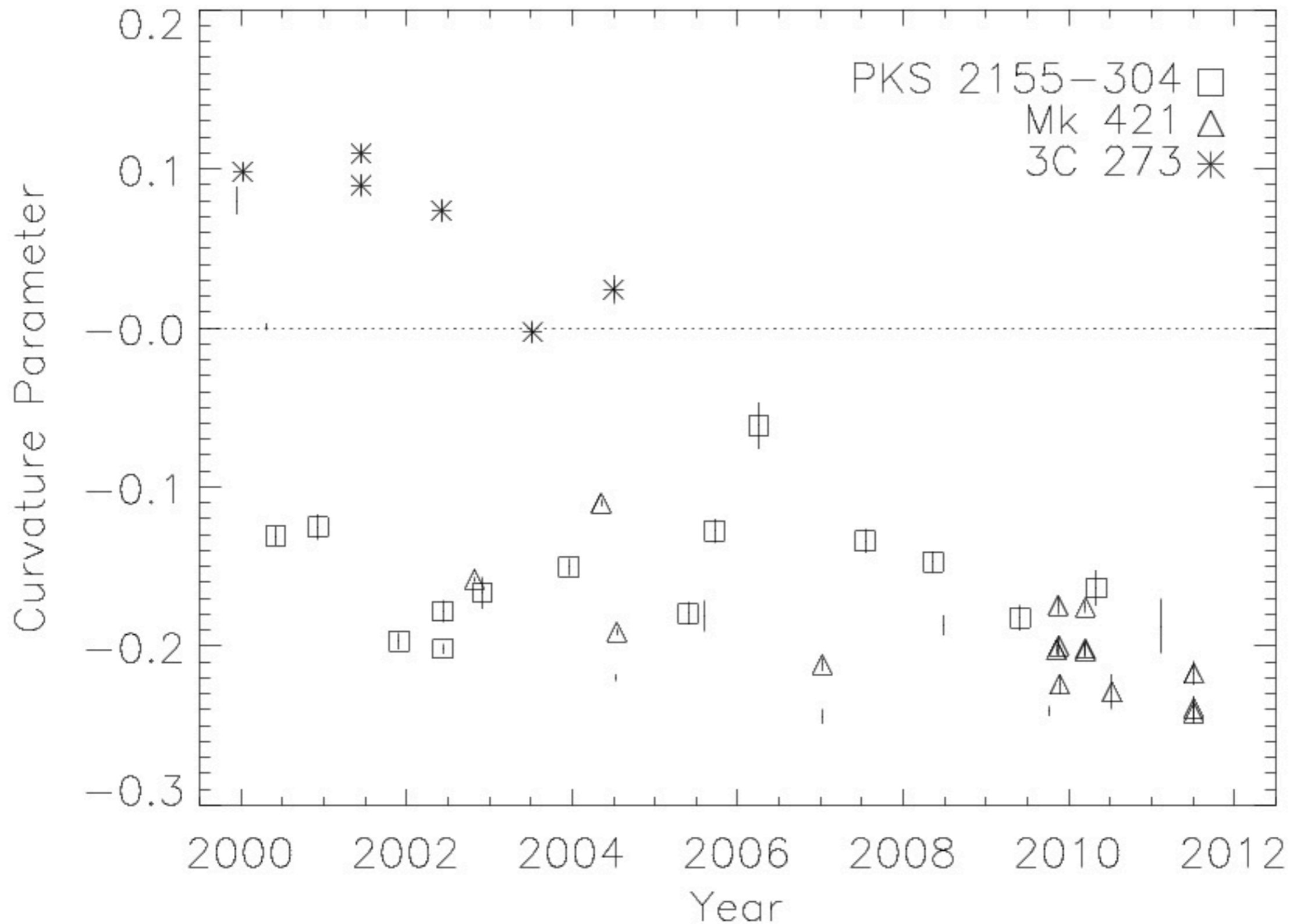
O-K Levelled?



F-K Increases Linearly



Varying Curvatures?



Toward a New Contaminant Spectral Model

- Hypothesis: C-K opacity model extrapolation error
- New task: Measure empirically
 - Use blazars — mildly curved spectra
 - Extrapolate spectra over contaminant edges
 - Scale by one optical depth parameter
 - Compare to cluster data

Extrapolating past C-K

- Contaminant opacity below C-K
 - $\tau \sim 0.03(\tau_{C-K})(E/0.285)^{(-8/3)}$
 - Uncertainty is <10%
 - $\tau_{C-K} < 6$ currently
- Plan ($t = \text{yr since launch}$)
 - Model: $\tau_{C-K} = 1.5(1 - e^{-t}) + 0.25t$
 - Fit continuum: 0.25-0.28, 1-8 keV regions

Summary: Contamination Issues

- LETG extraction problem below 0.5 keV
 - gain offset, PHA distribution clipped
- S3 and I3 dQE/dt shows contam'n pattern
- New spatial model generated from A1795
- E0102 ACIS fits: F-K may be needed
- LETG/ACIS residuals
 - new model of F-K v. time — linear
 - new model of O-K v. time — asymptotic