The Impact of an X-Ray Superburst from the Neutron Star in 4U 1636-536 on the Accretion Disk

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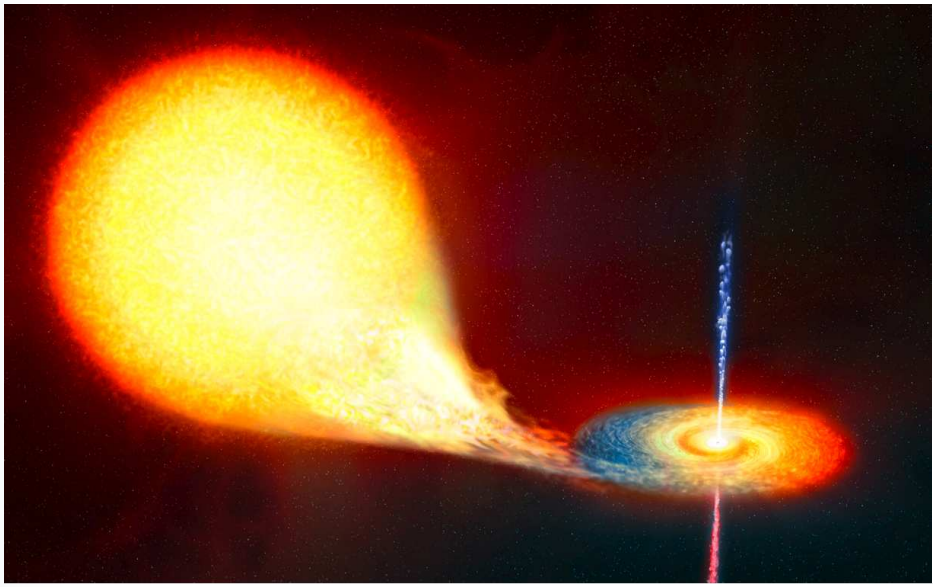
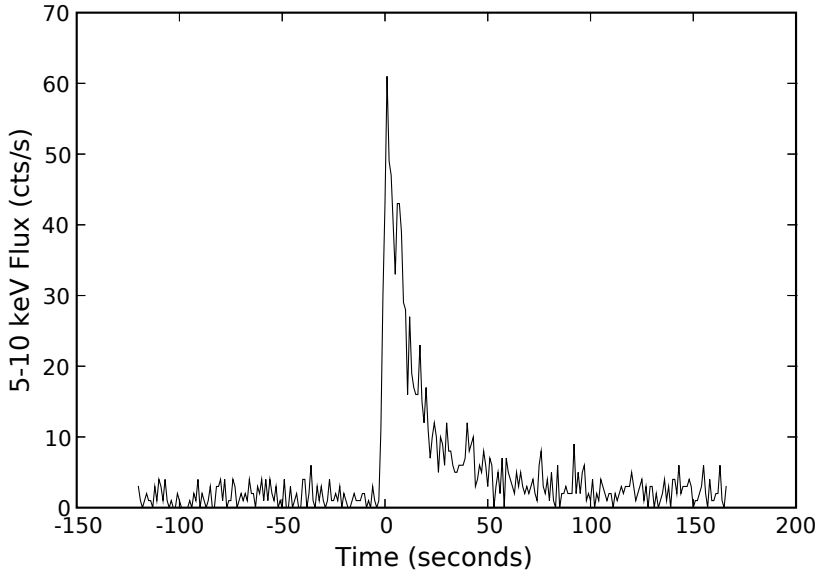
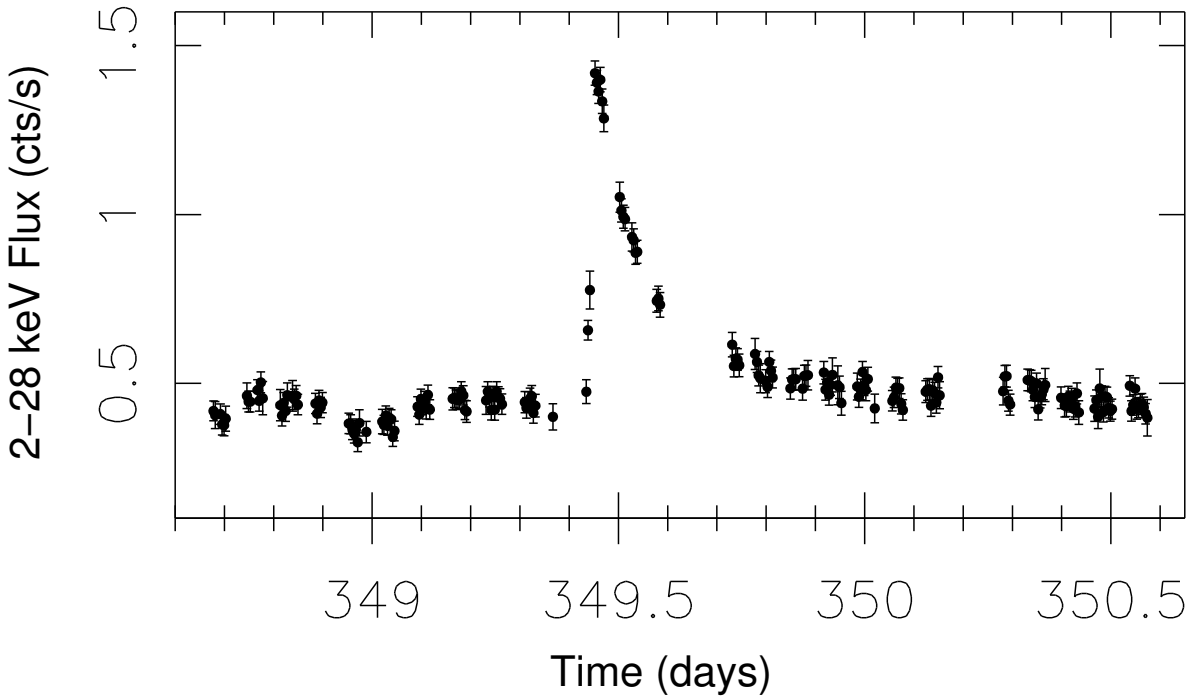
X-Ray Bursting Neutron Stars





- Burn accreted H, He; observe cooling neutron star
- 103 known bursters
- Over 6000 Type I bursts observed: see next talk by Duncan Galloway

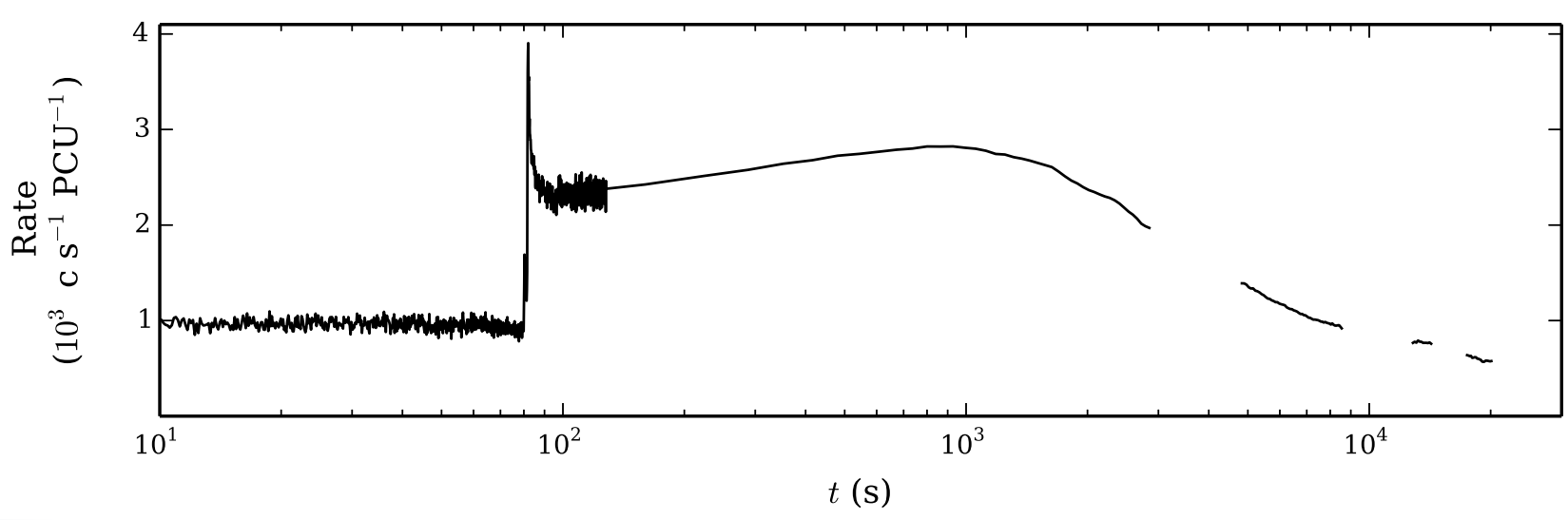
Superbursts: thermonuclear carbon flashes



Kuulkers et al. 2002

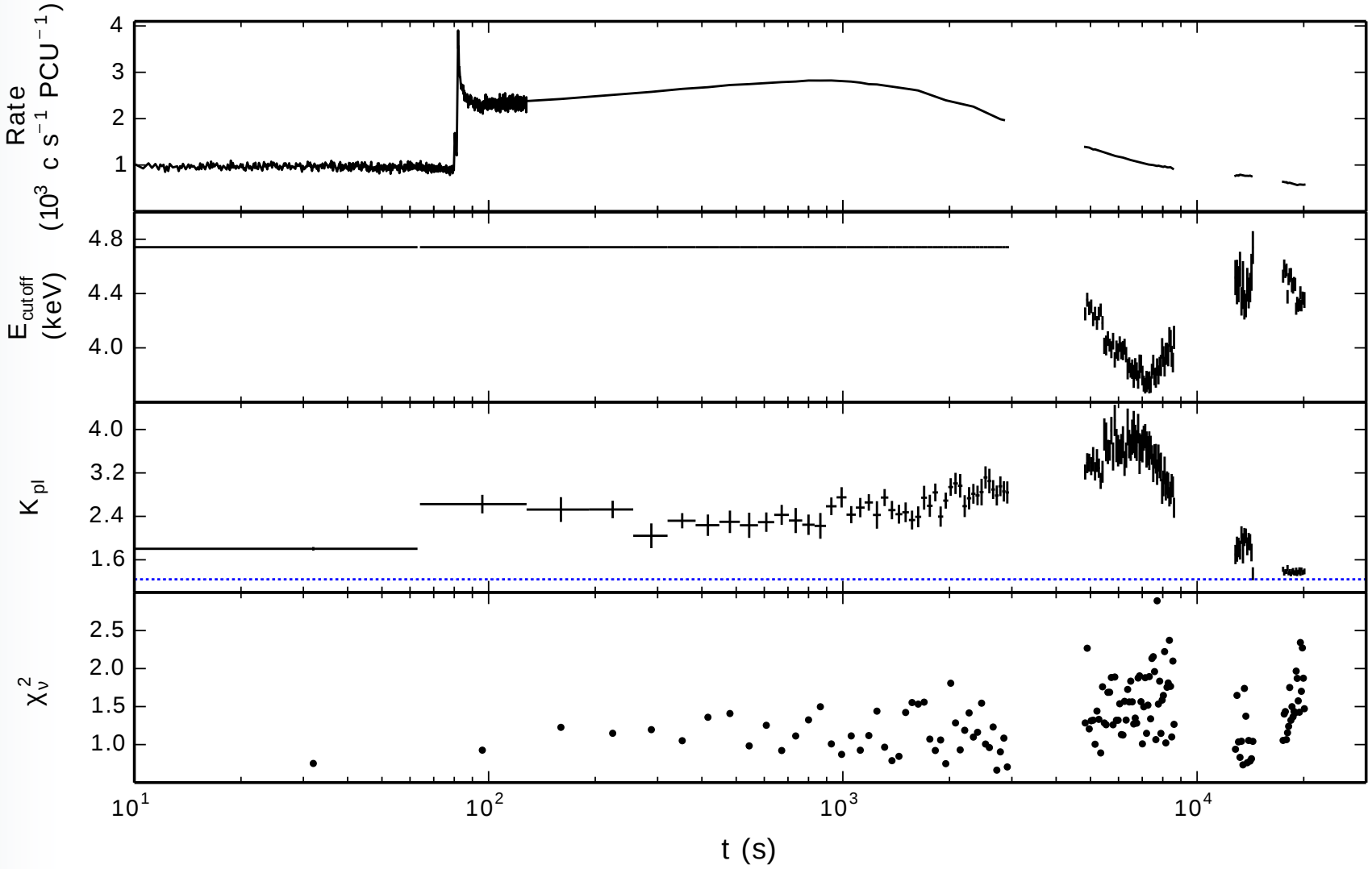
- 1000x longer decay time (hours), 1000x more energetic
- Rare: only 23 observed from 14 sources
- Ignite carbon on top of crust

RXTE/PCA Superburst of 4U 1636–536



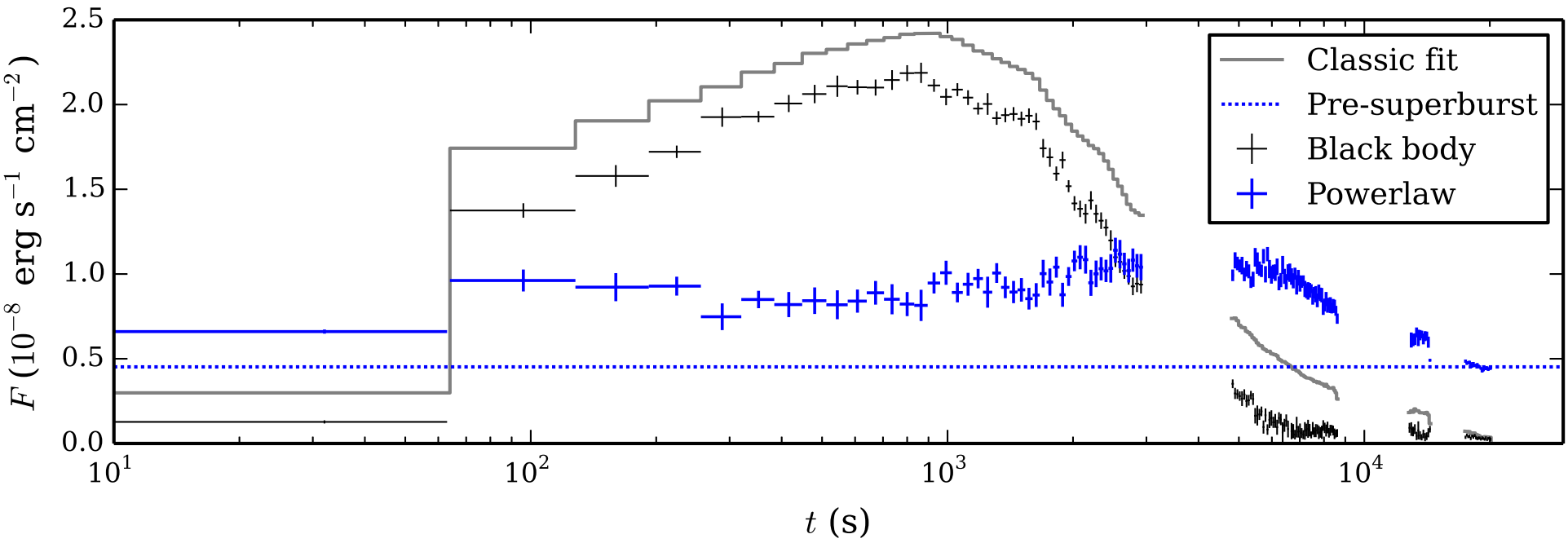
Keek et al. 2014

Non-Thermal Emission Evolves



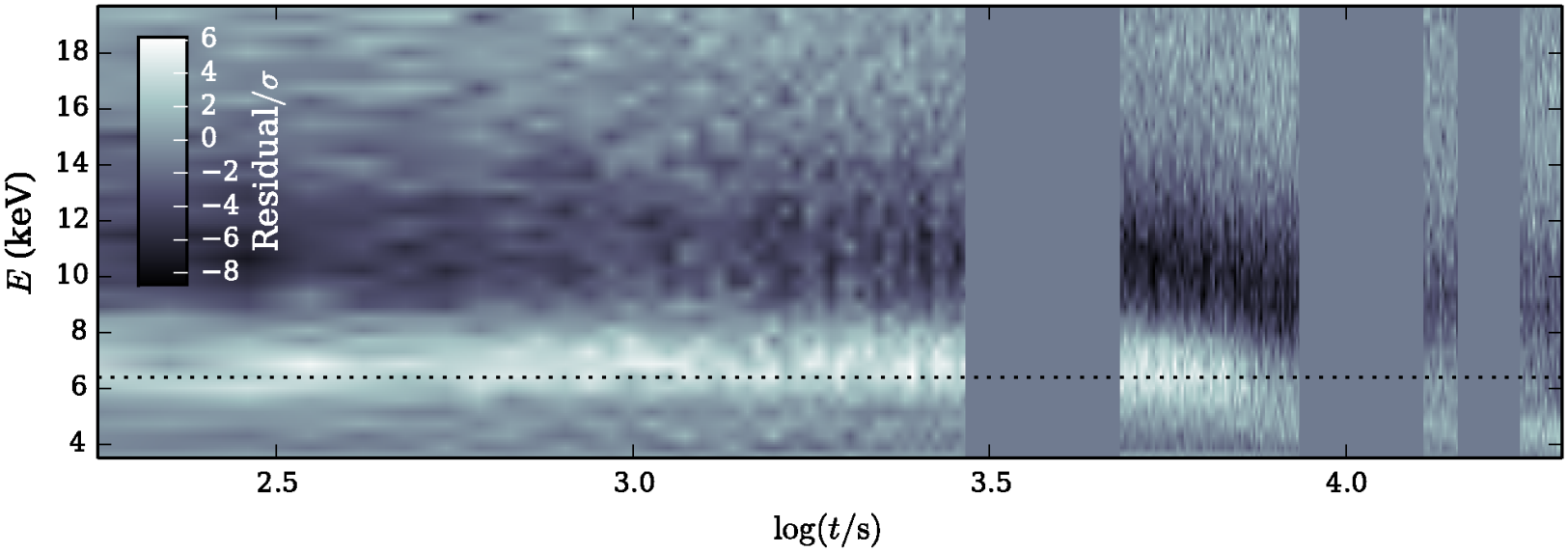
Keek et al. 2014

Black-Body Flux Is Smaller Than Thought



Keek et al. 2014

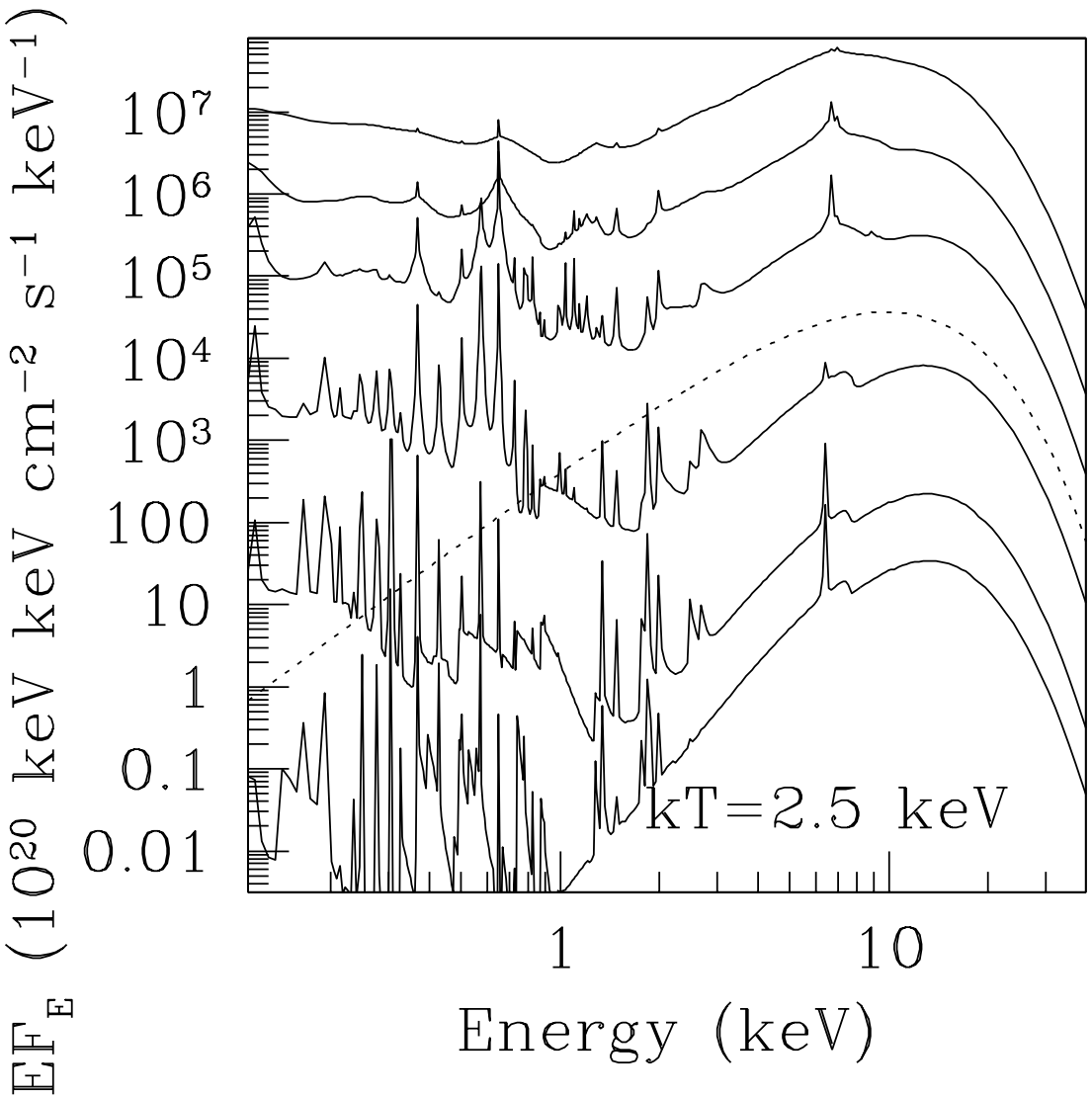
Feature in Spectral Residuals



Keek et al. 2014

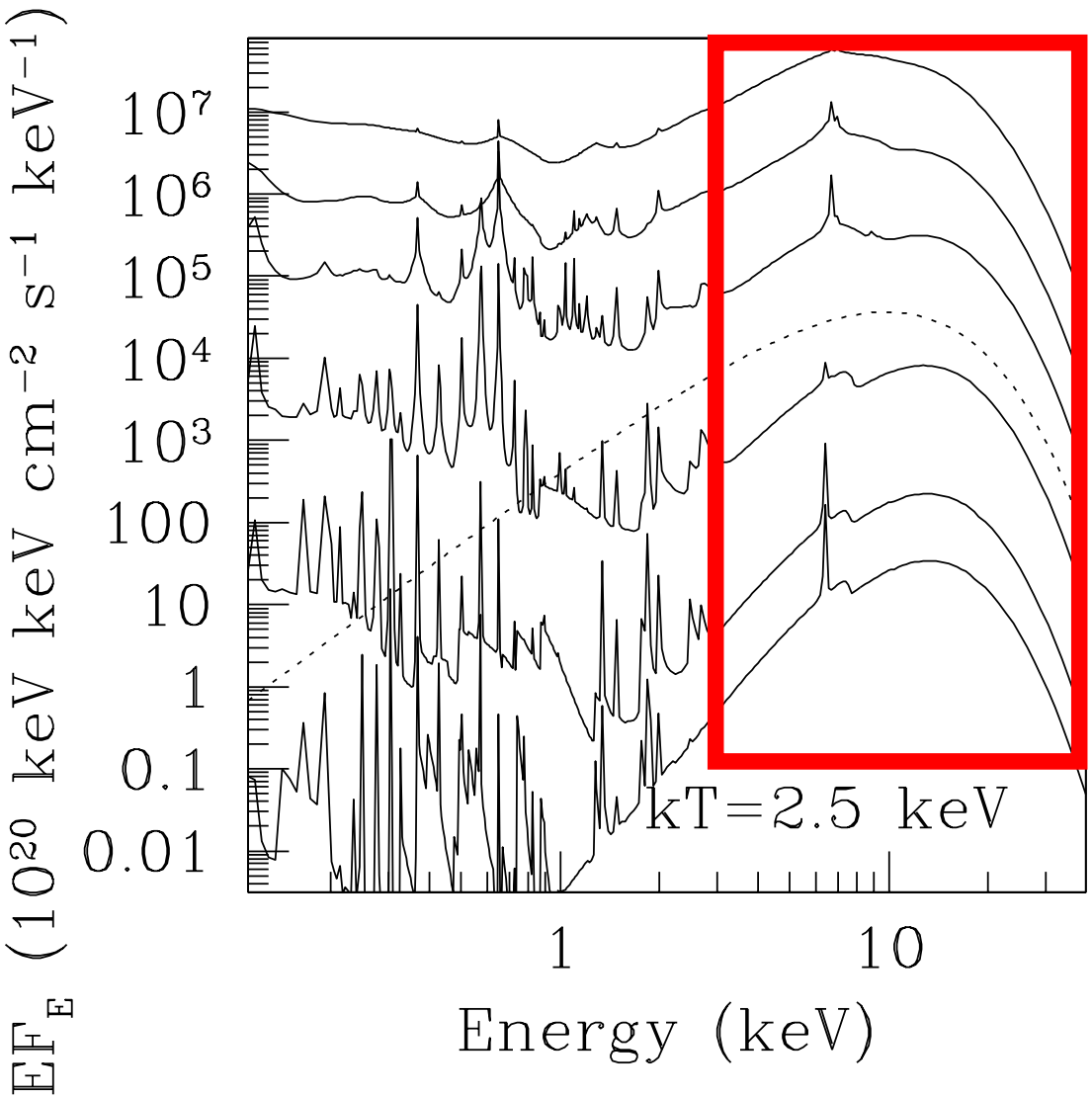
- Close to 6.4keV: Fe Kα emission line and absorption edges
- Drift to lower energy

Models of Reflection Spectra



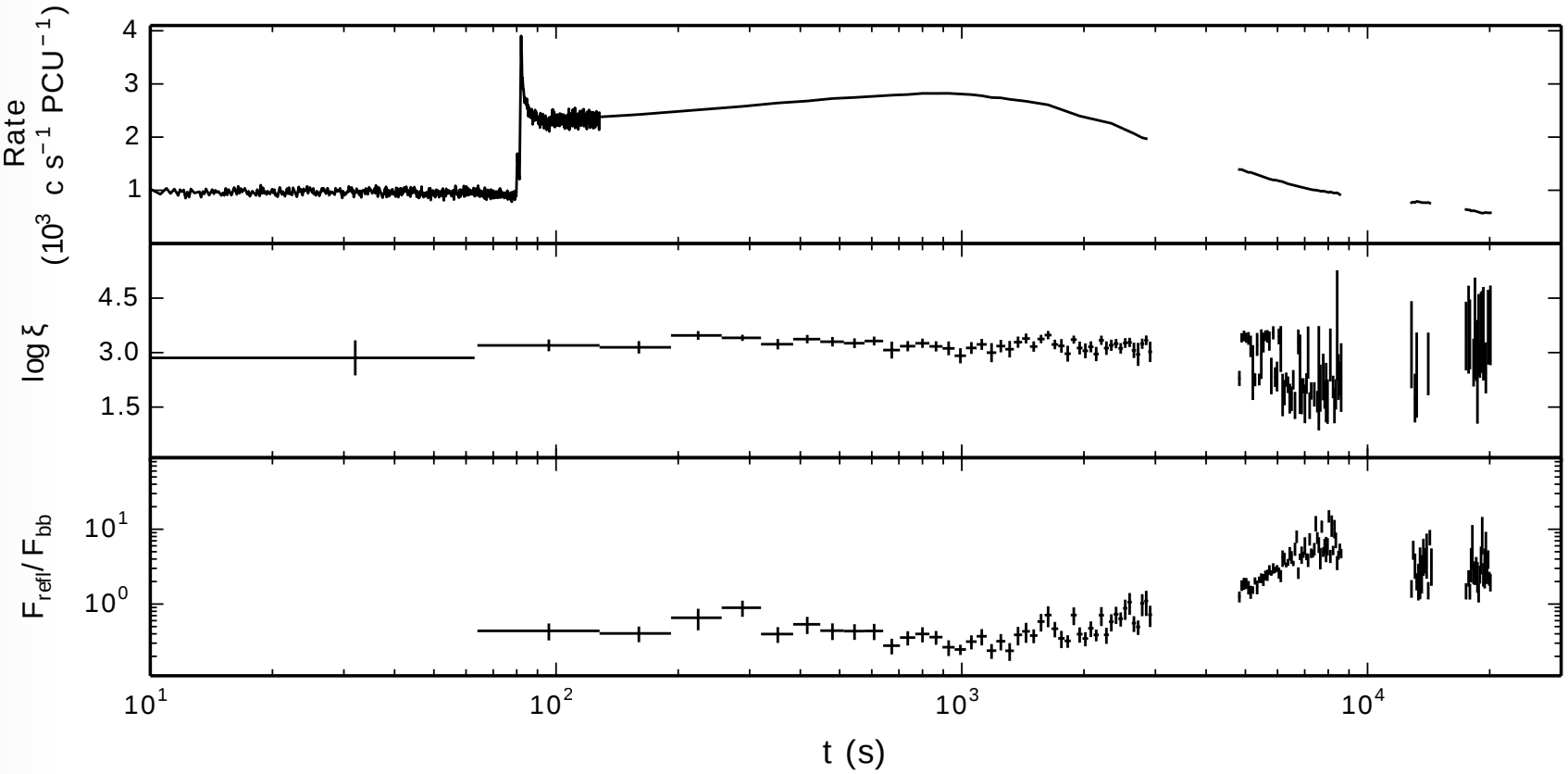
Ballantyne 2004

Models of Reflection Spectra



Ballantyne 2004

Switching Ionization and Reflection Fraction



Keek et al. 2014

Conclusions

Persistent flux

- Substantial increase during burst
- Spectral shape evolves
- Black body flux lower than previously thought!
- Challenging to constrain all continuum components simultaneously

Spectral features

- Line and edge around $6.4\,\mathrm{keV}$
- Consistent with detailed models of reflection spectra
- Interpretation: multiple reflectors?