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

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- 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

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

$E \Phi_E \left(10^{20} \text{ keV cm}^{-2} \text{ s}^{-1} \text{ keV}^{-1}\right)$

Energy (keV)

$kT=2.5$ keV

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 keV
- Consistent with detailed models of reflection spectra
- Interpretation: multiple reflectors?