

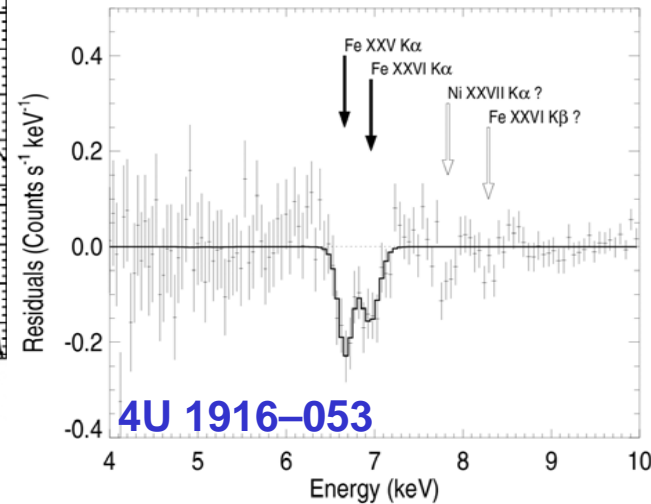
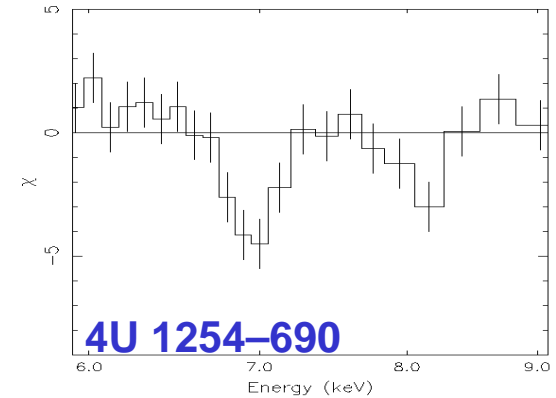
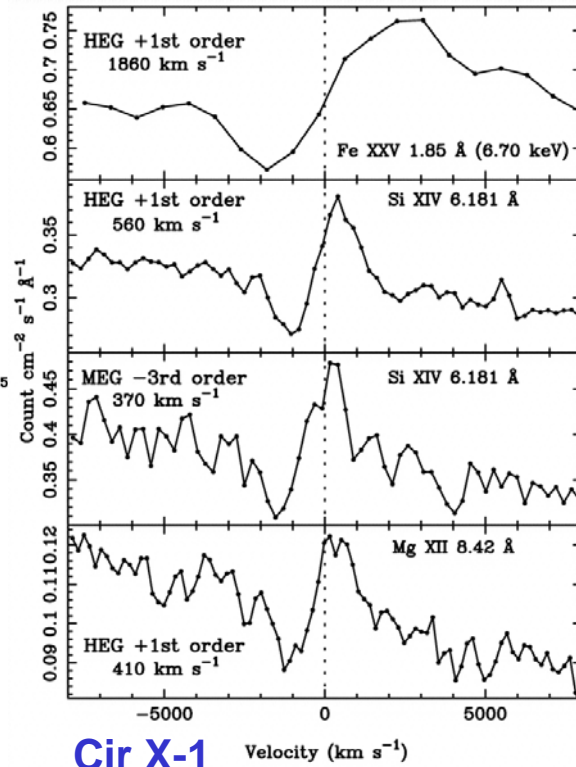
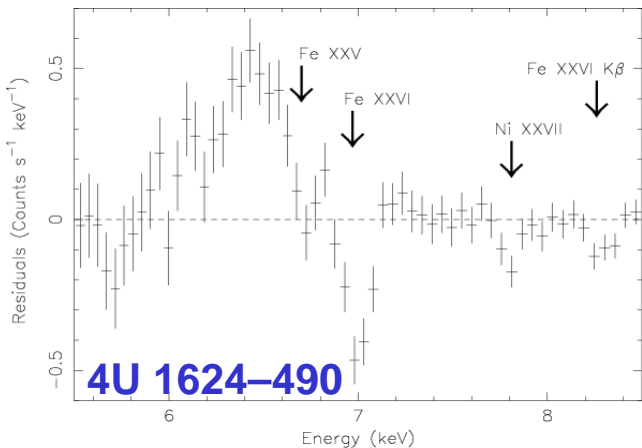
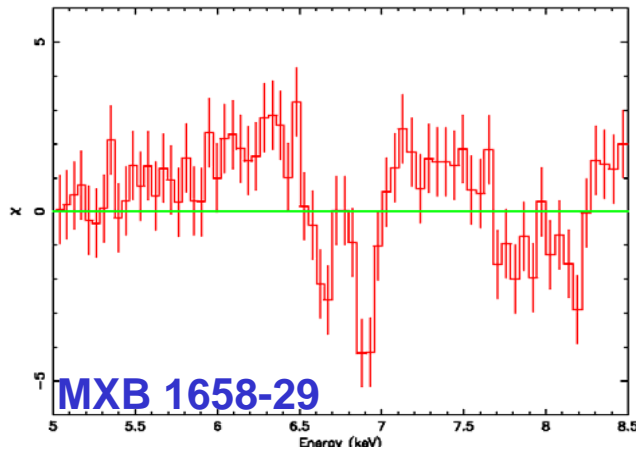
# *High-resolution spectroscopy of photo-ionized accretion-disc winds in galactic X-ray binaries*

Mariano Mendez

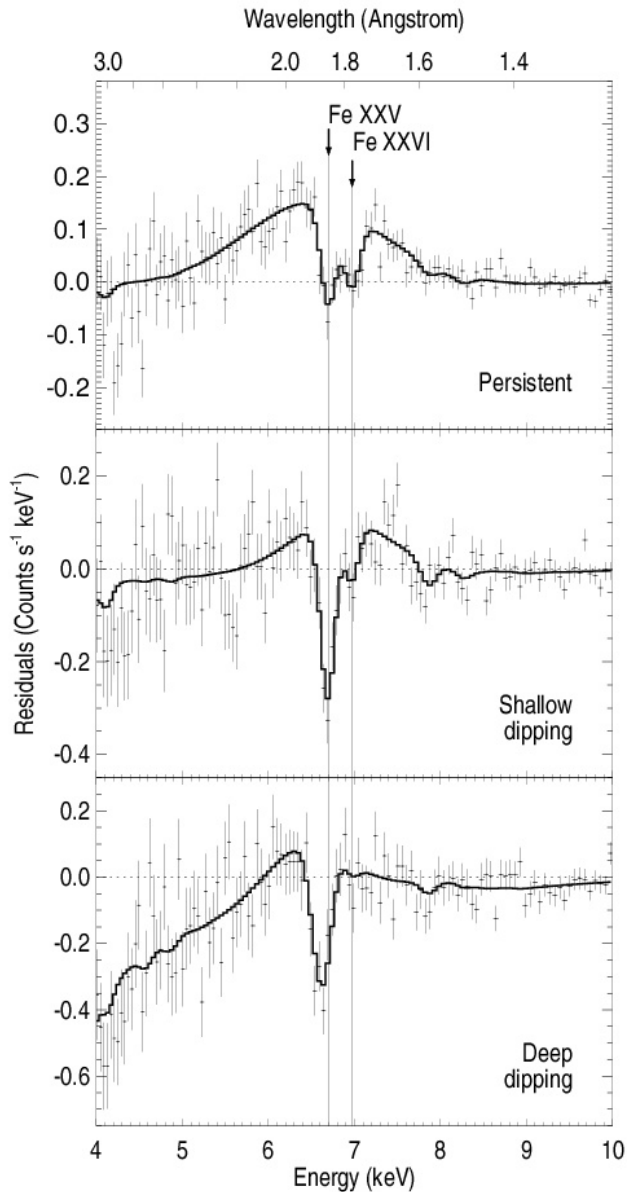
Elisa Costantini, Laurence Boirin, Maria Diaz-Trigo, Jelle Kaastra, Arvind Parmar, Felix Mirabel, Nora Loiseau, Bruno Altieri, Jacob van Peet, Peter Jonker, Jean in 't Zand

# Absorption from highly-ionized gas in XRBs

These objects show dips and eclipses in their light curves, and hence they probably are high-inclination systems in which we see the accretion disc (almost) edge on.



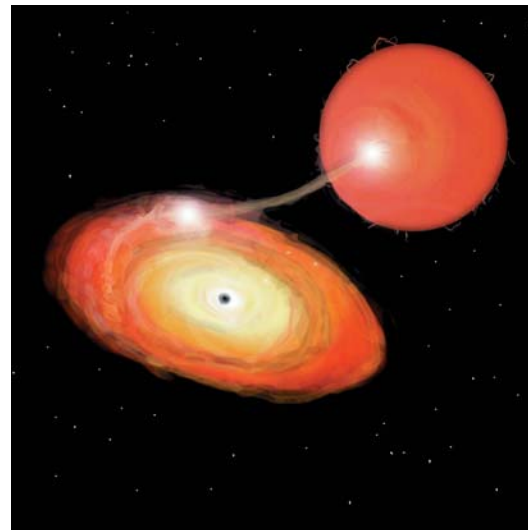
# The neutron star 4U 1323–62



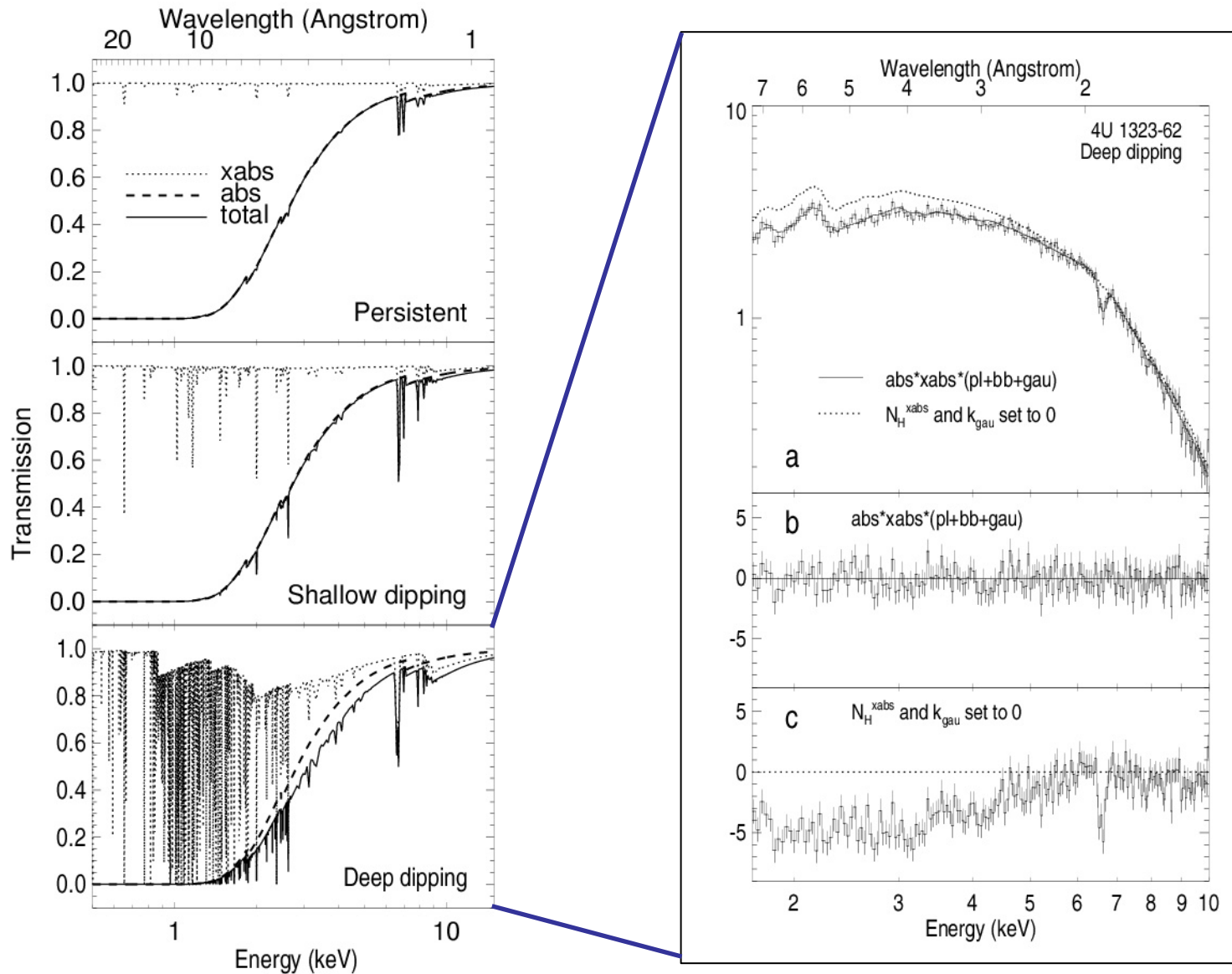
Changes of the relative optical depth of the FeXXV and FeXXVI absorption lines as a function of orbital phase with *XMM-Newton*/EPIC-PN.



Changes of the ionization conditions of a warm wind on top/below the accretion disc.



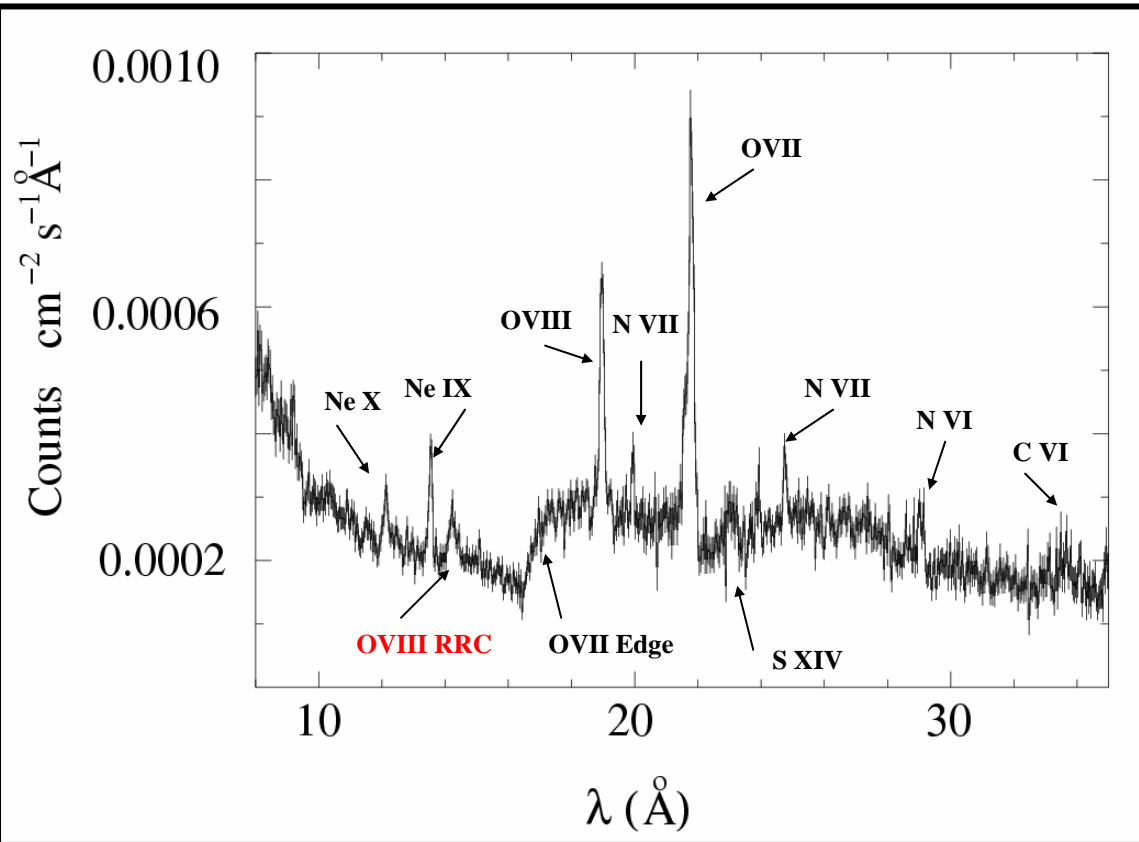
# The neutron star 4U 1323-62



# The neutron star EXO 0748–676

*XMM-Newton/RGS*

**Observations in 2000-2001**



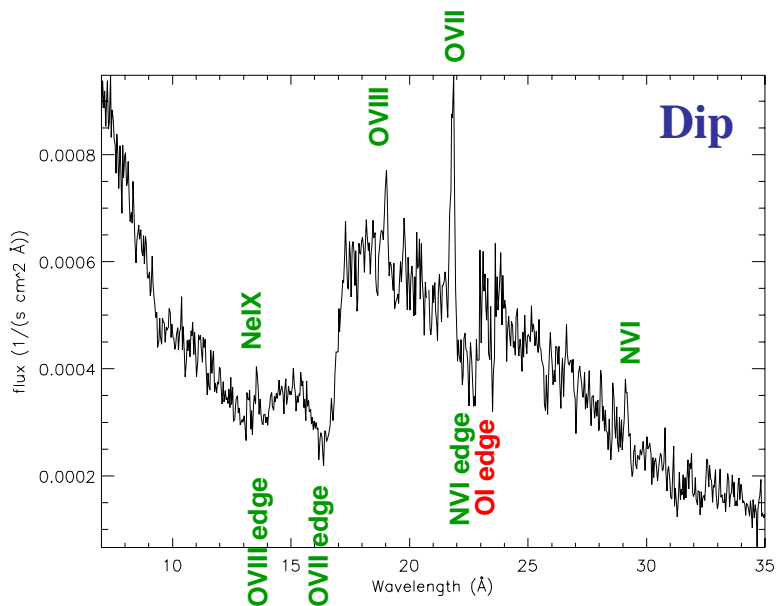
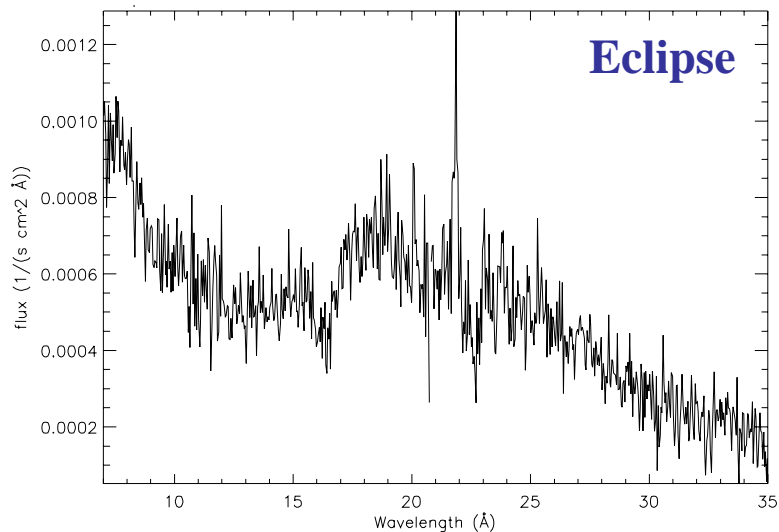
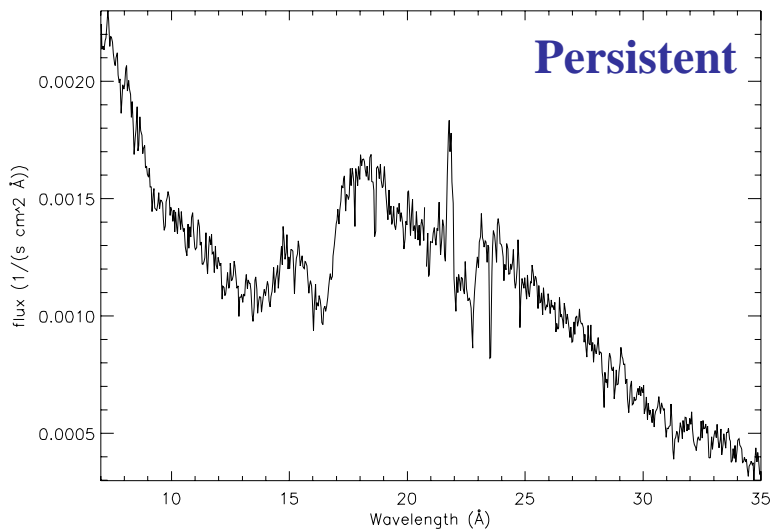
Cottam et al. (2001) find that the line widths increase for more ionized species, which suggests a relation between the ionization structure and the dynamics of the plasma.

*Cottam et al. 2001;*

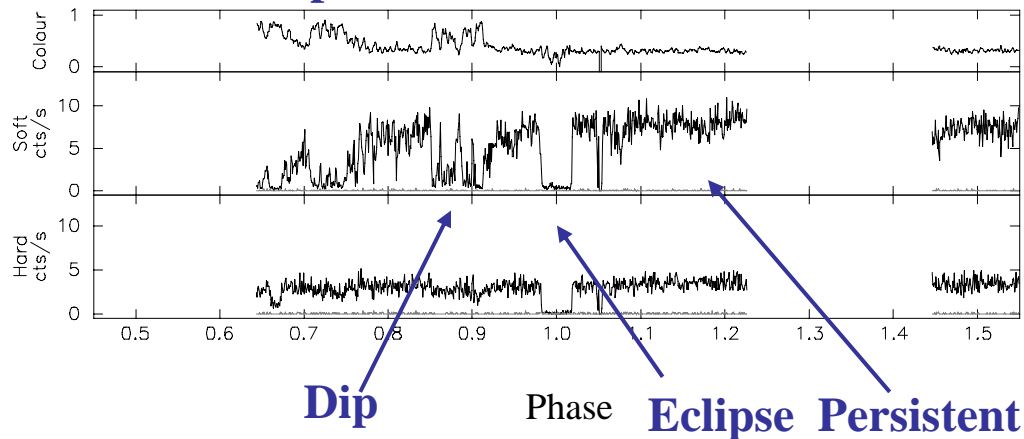
*Van Peet, Mendez, Costantini, et al. 2006*

# The neutron star EXO 0748–676

*XMM-Newton/RGS*  
Observations in 2003

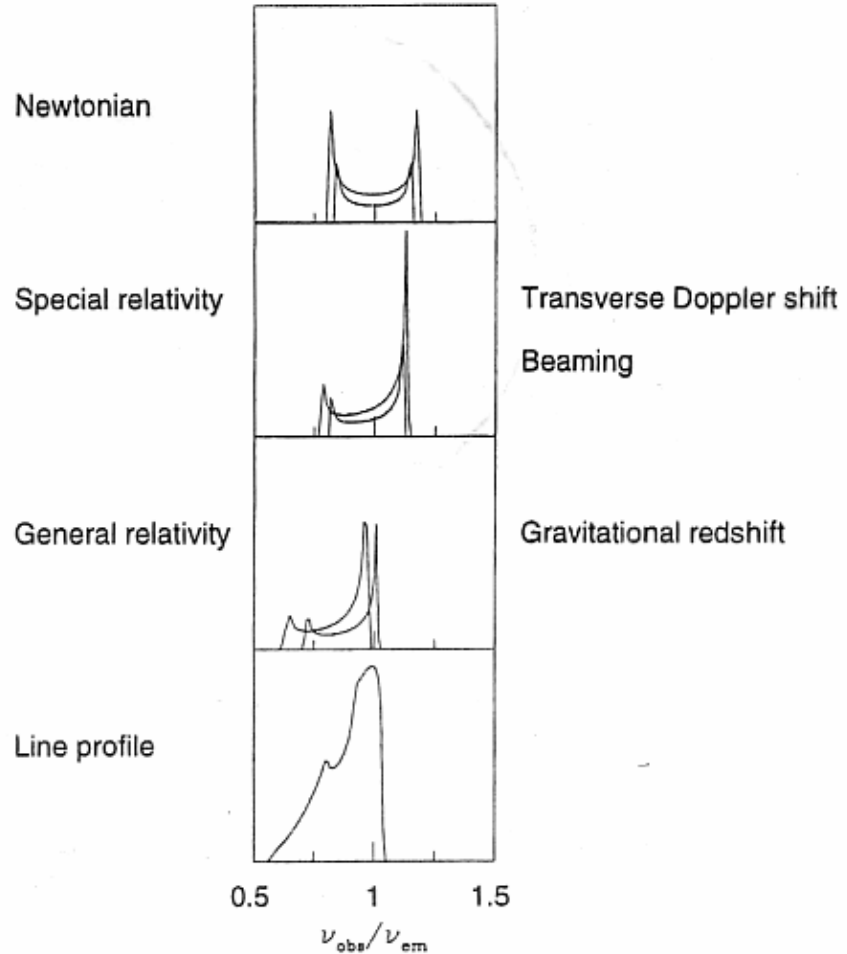
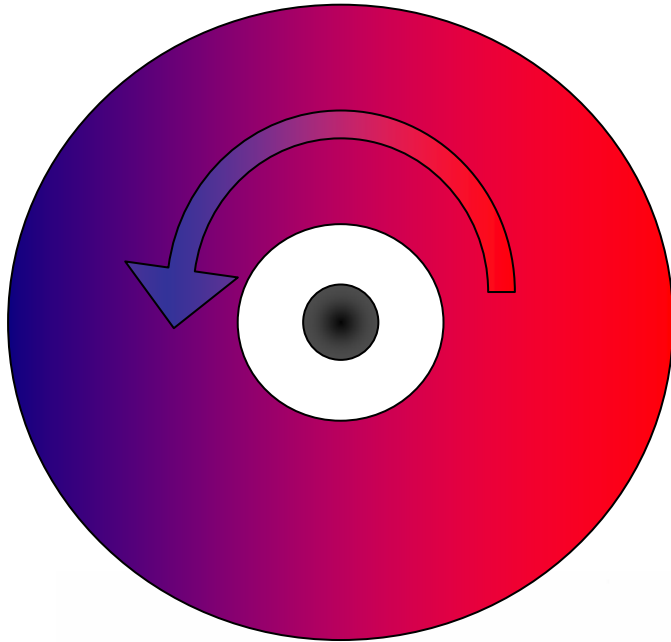


*XMM-Newton/RGS* spectra as a function of orbital phase



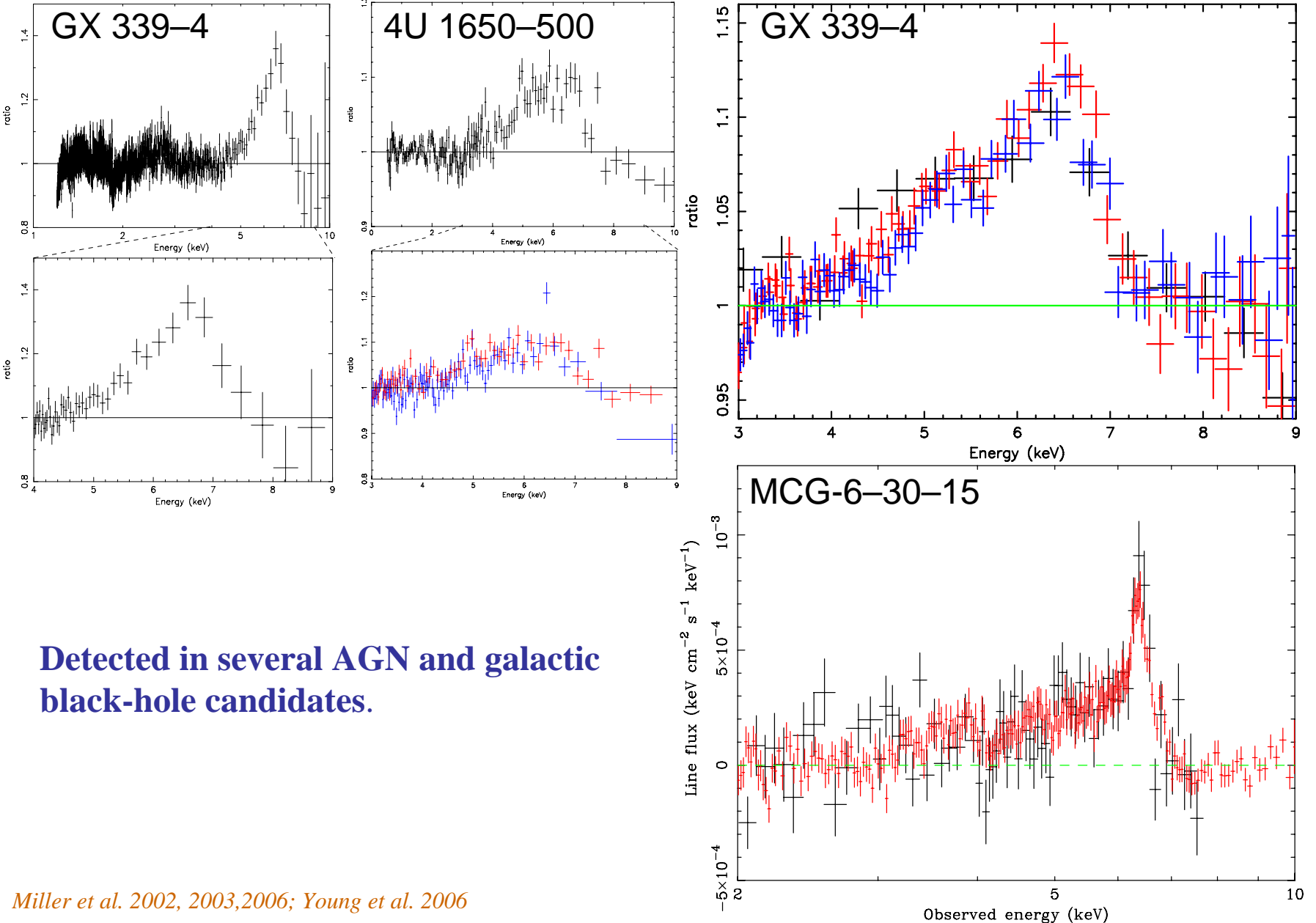
# Relativistic Disc Lines

Accretion disc around a black hole



Line profile

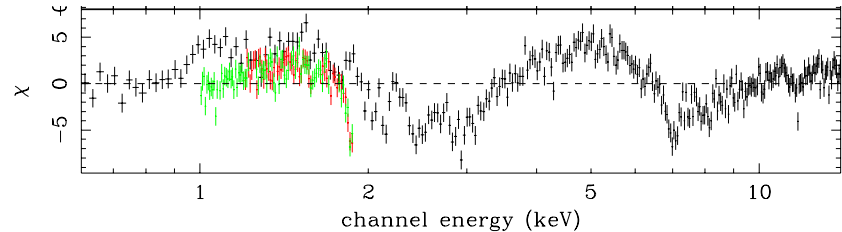
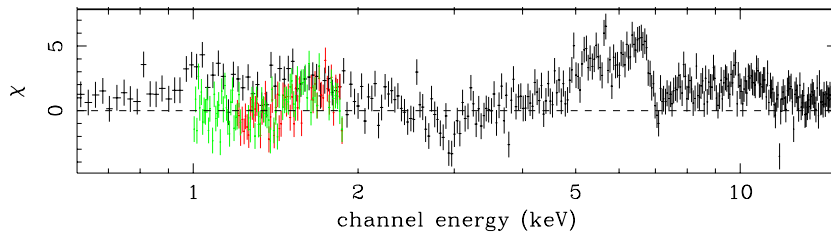
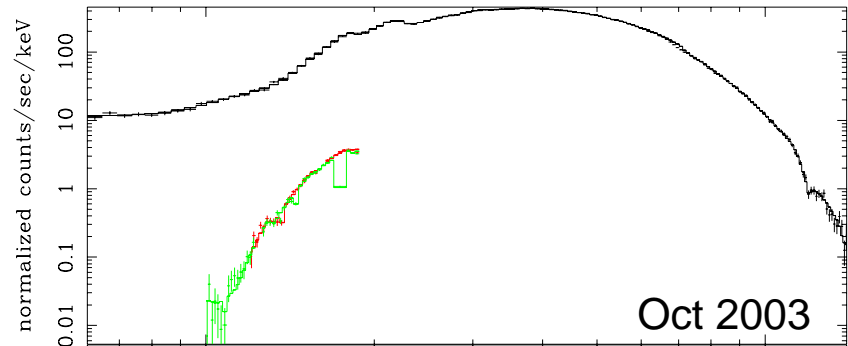
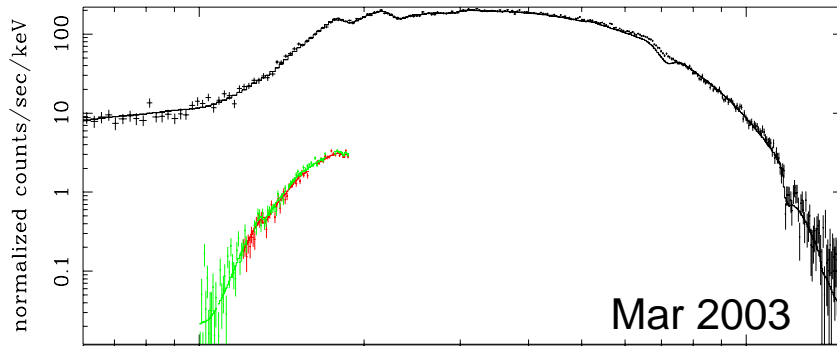
# Relativistic Disc Lines



Detected in several AGN and galactic black-hole candidates.



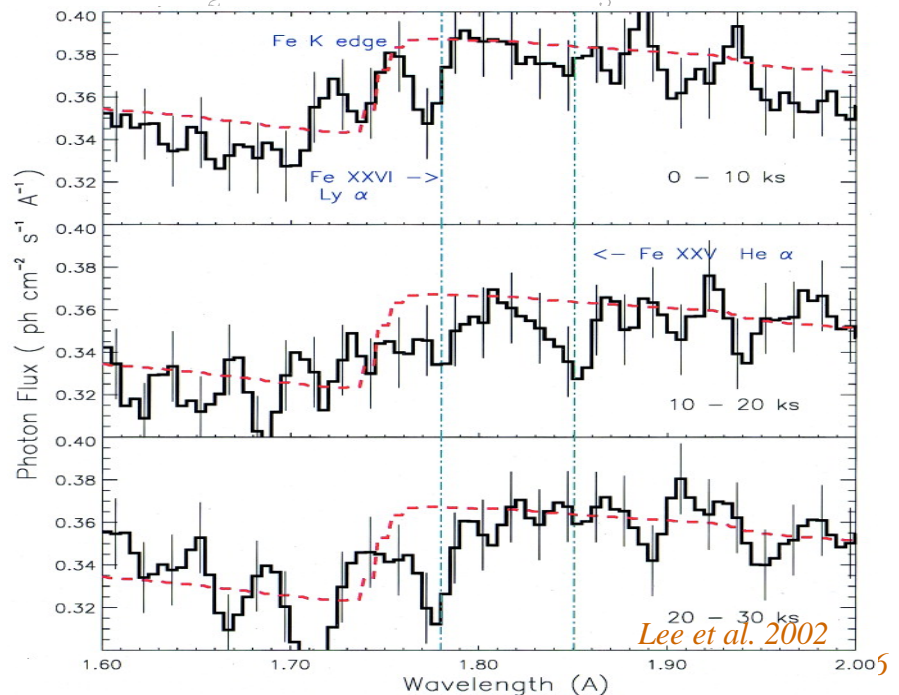
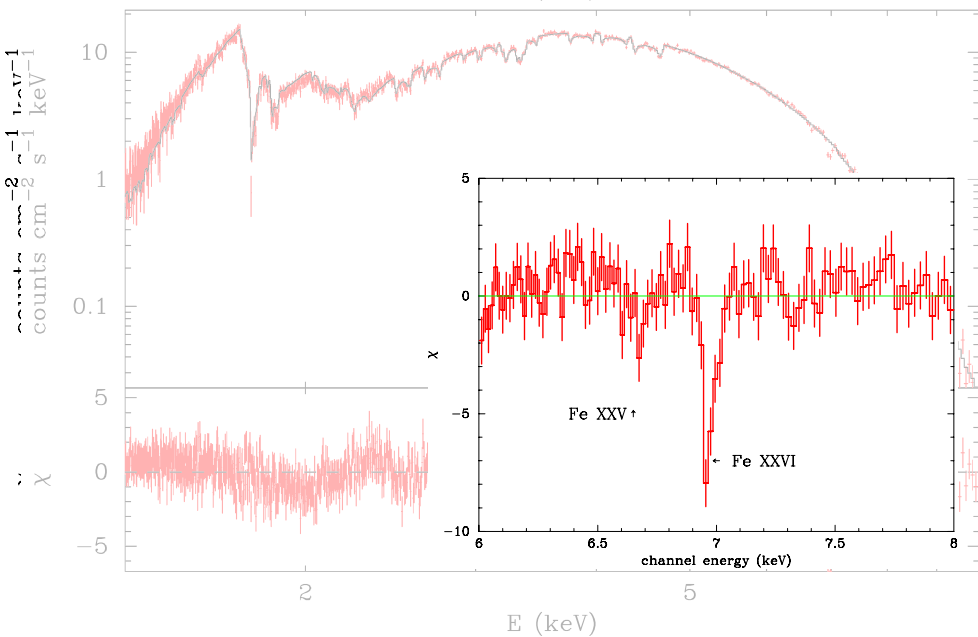
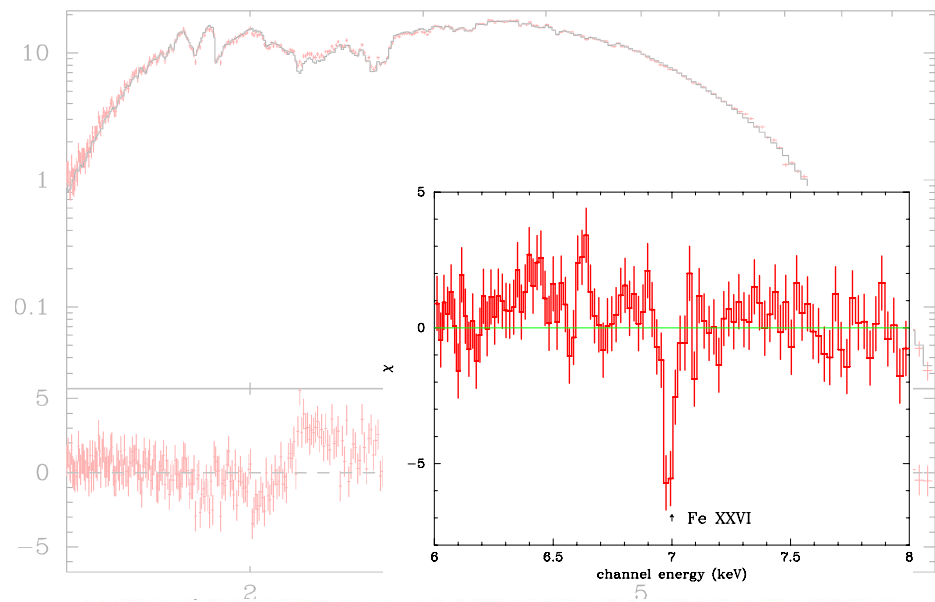
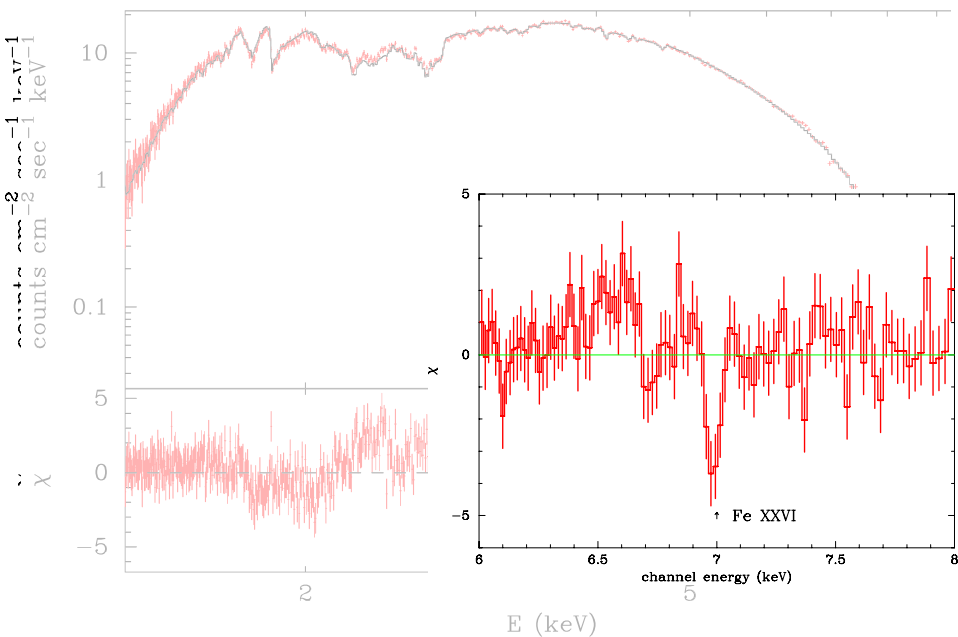
# Relativistic Disc Lines or Warm/Hot Absorber?



## Black-hole candidate GRS 1915+105 - *XMM-Newton* EPIC-PN/RGS

In both observations GRS 1915+105 is in the same state, with the disc extending down close to the innermost stable orbit around the black hole (Belloni et al. 1997). Nevertheless, **while in the observation of March 2003 there appears to be a broad emission line, in the observation of October 2003 it does not** (see residuals to a simple continuum model; lower panels). Both observations can also be fitted using a highly ionized absorber (middle panels; on the figure in the right the normalization of the absorber was set to 0).

# Warm/Hot Absorber



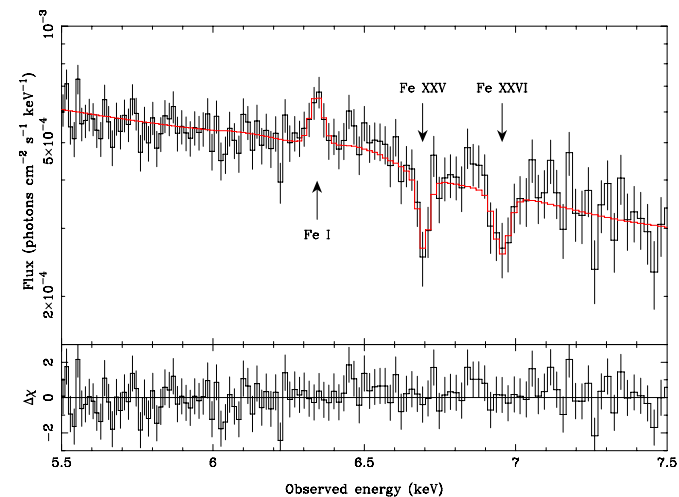
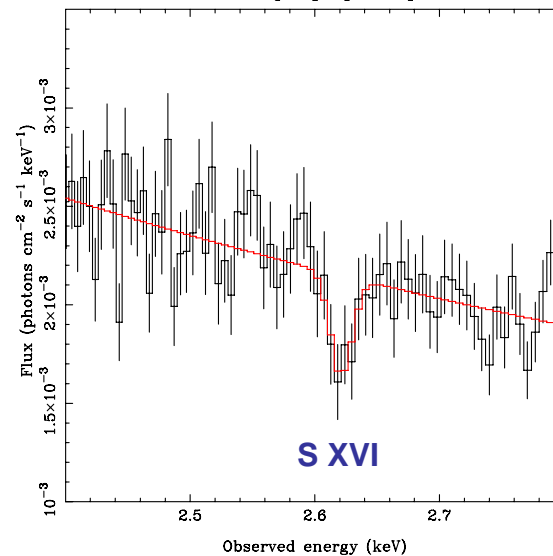
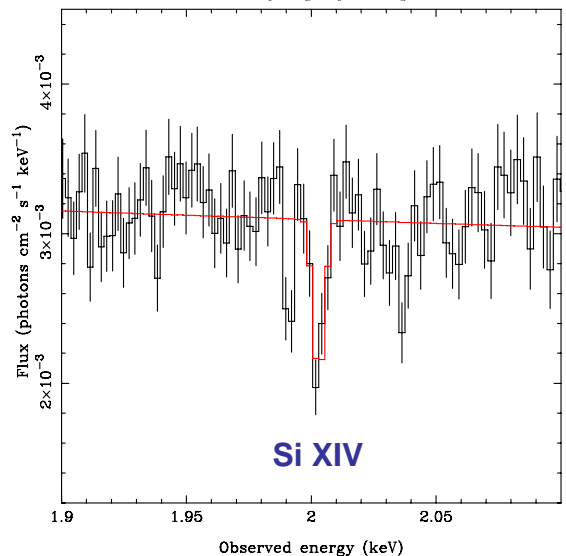
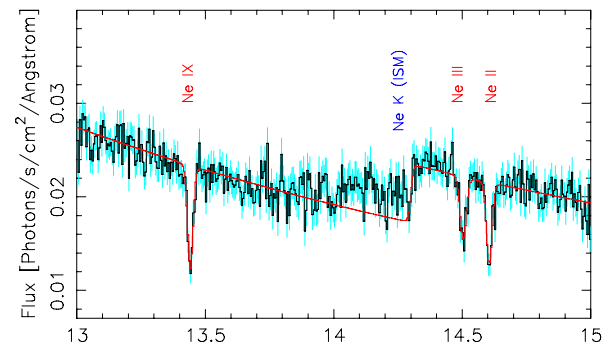
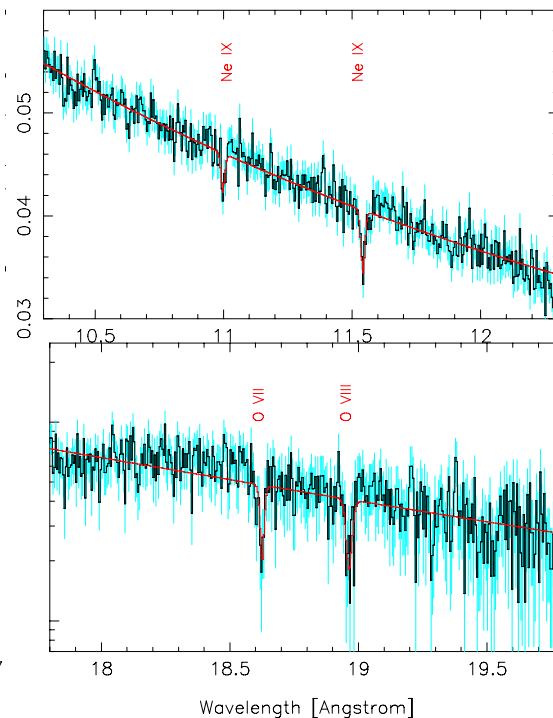
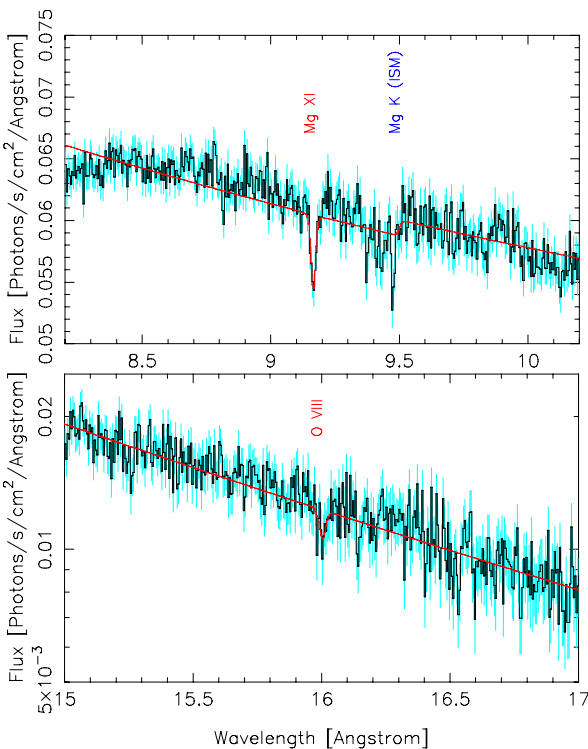
# Warm/Hot absorber

Miller et al. 2003

Young et al. 2006

GX 339-4  
Chandra/HETGS

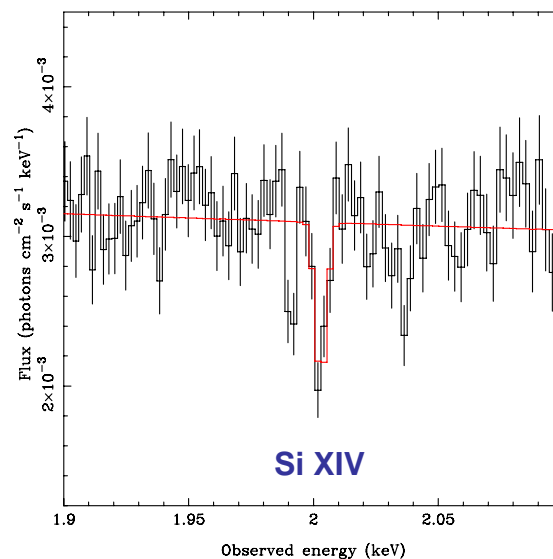
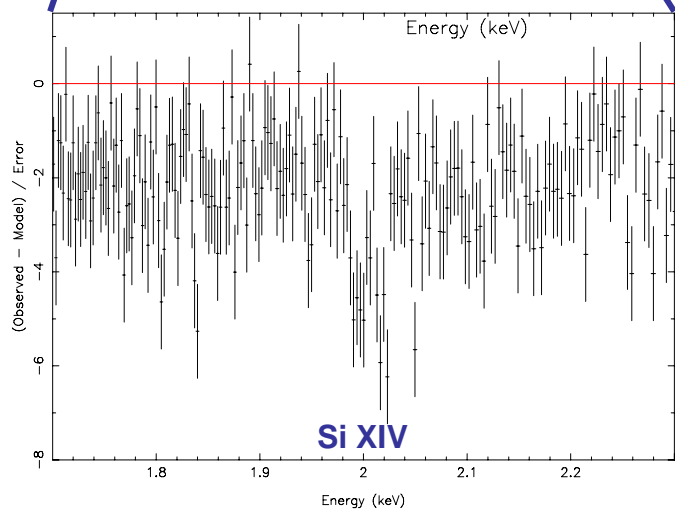
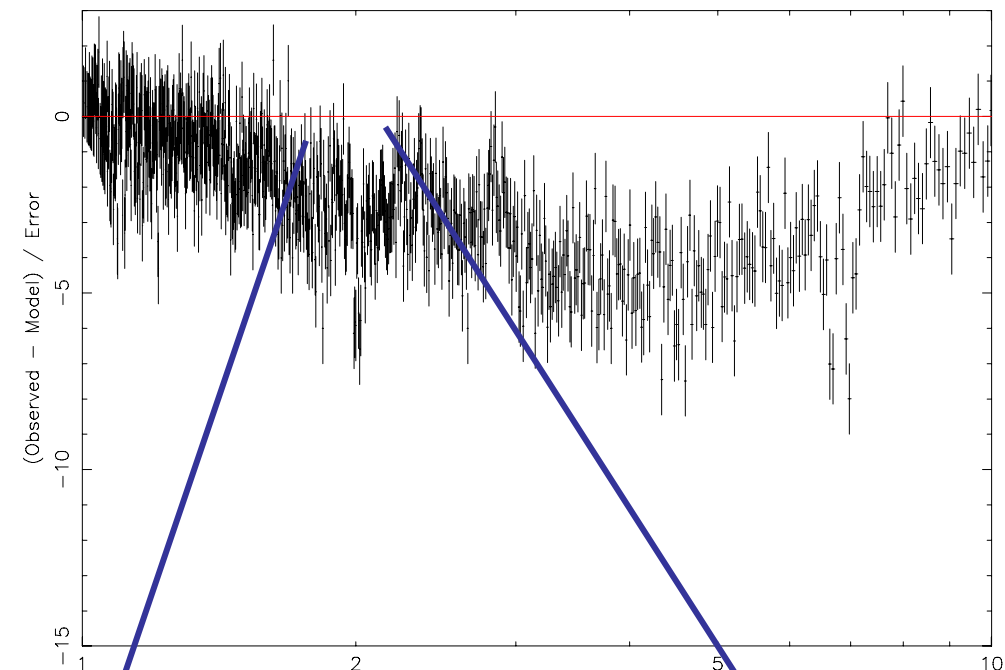
MCG-6-30-15  
Chandra/HETGS



# Warm/Hot absorber

Simulation of a *Chandra*/HETGS observation of a source 100 times brighter than 4U 1323–62, assuming a warm absorber with a power-law AMD from  $\xi=2.5$  to  $\xi=5$ .

To plot the residuals, the absorber was set to 0.

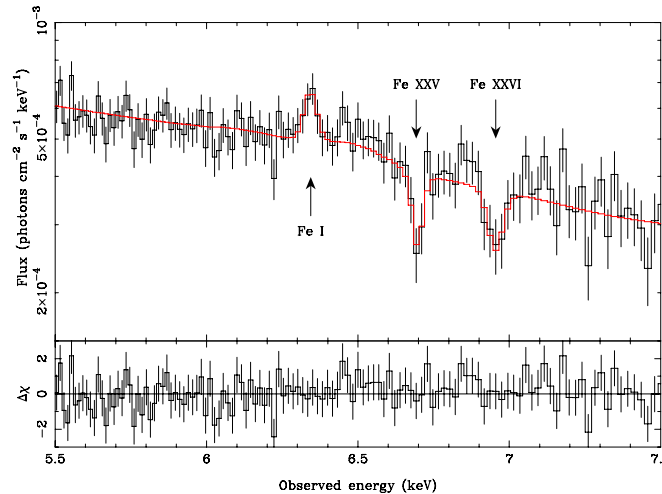
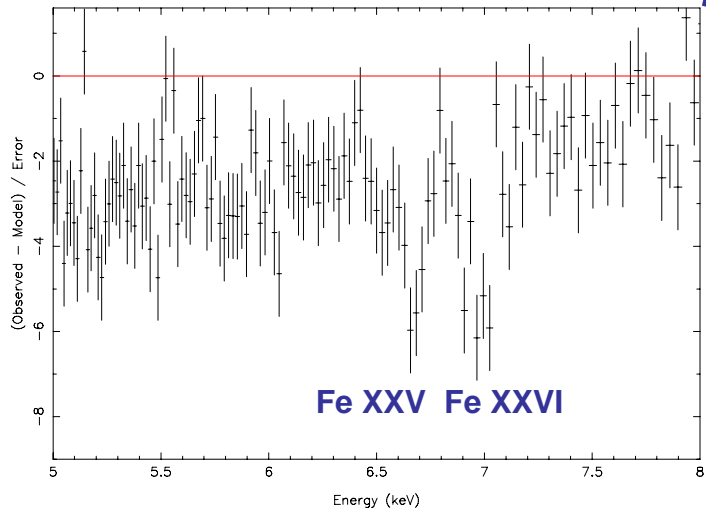
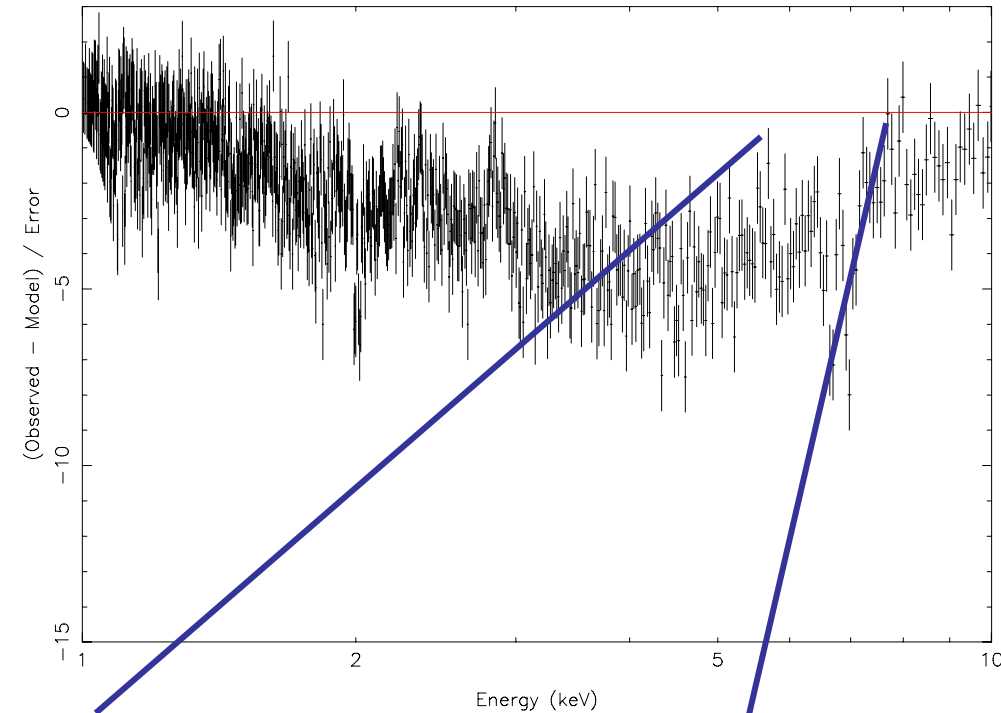


MCG-6–30–15  
*Chandra*/HETGS

# Warm/Hot absorber

Simulation of a *Chandra*/HETGS observation of a source 100 times brighter than 4U 1323–62, assuming a warm absorber with a power-law AMD from  $\xi=2.5$  to  $\xi=5$ .

To plot the residuals, the absorber was set to 0.



MCG-6-3 0-15  
*Chandra*/HETGS

# Conclusions

- **As in the case of AGN, the X-ray spectra of accreting galactic compact objects show evidence of absorption and emission by a photo-ionized plasma spanning a wide range of ionization parameters.**
- **This plasma seems to have cylindrical symmetry, and hence is probably connected to the accretion disc (see talk by Maria Diaz-Trigo).**
- **Both in AGN and galactic black-hole candidates, it may still be premature to discard alternative interpretations involving complex absorption as the cause of (part of) the red wing of the broad iron emission line at 6–7 keV.**

