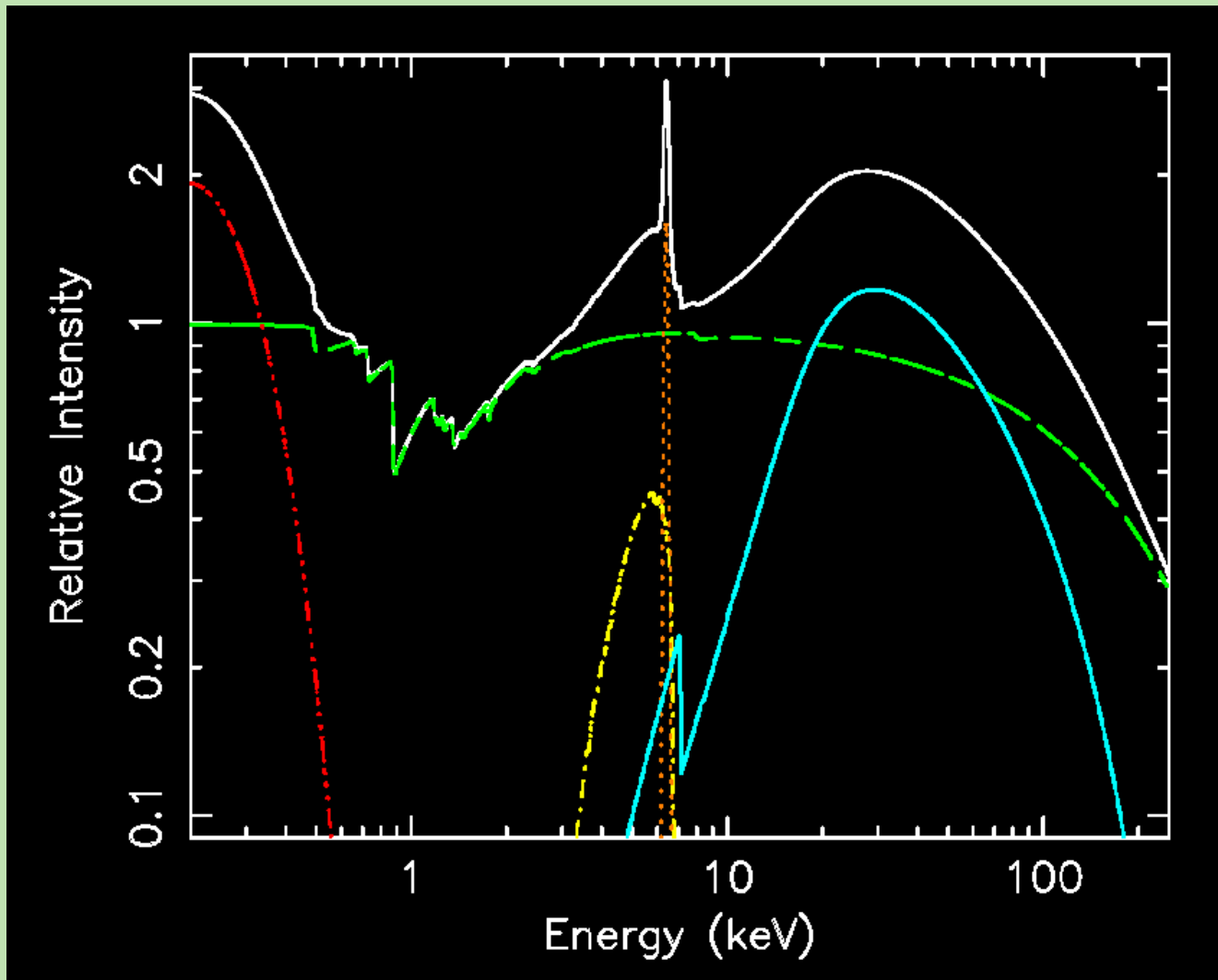


Conundrum:

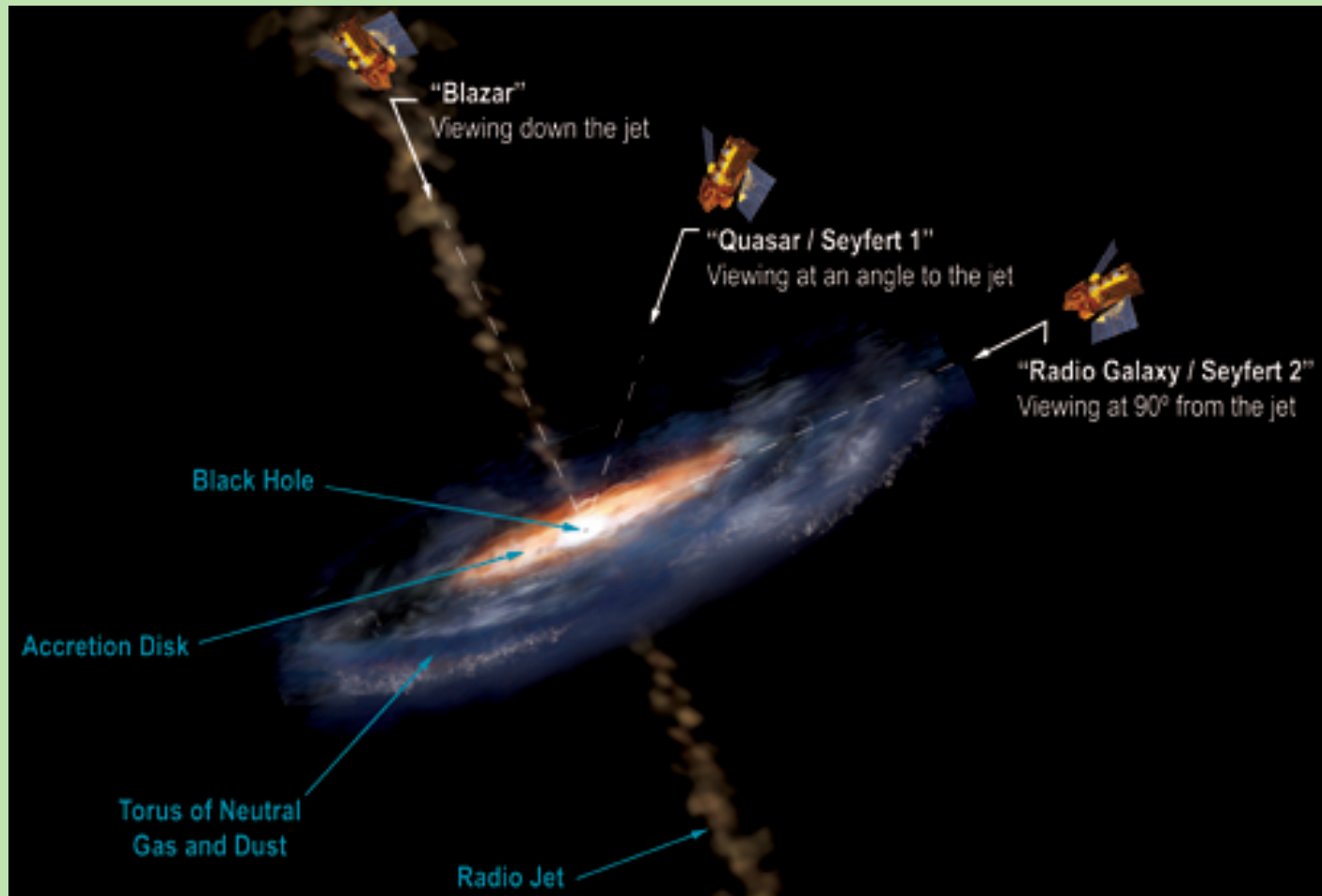
- **Why do RL have powerful jets while RQ do not?**
 - *Structure of inner accretion flow?*
 - *SMBH spin?*
 - *Gas environment?*
 - *Launching mechanism (e.g., Ghisellini et al. 1994)?*

X-rays provide a window on the accretion flow and environ

Power of X-ray spectroscopy



Broad-Line Radio Galaxies

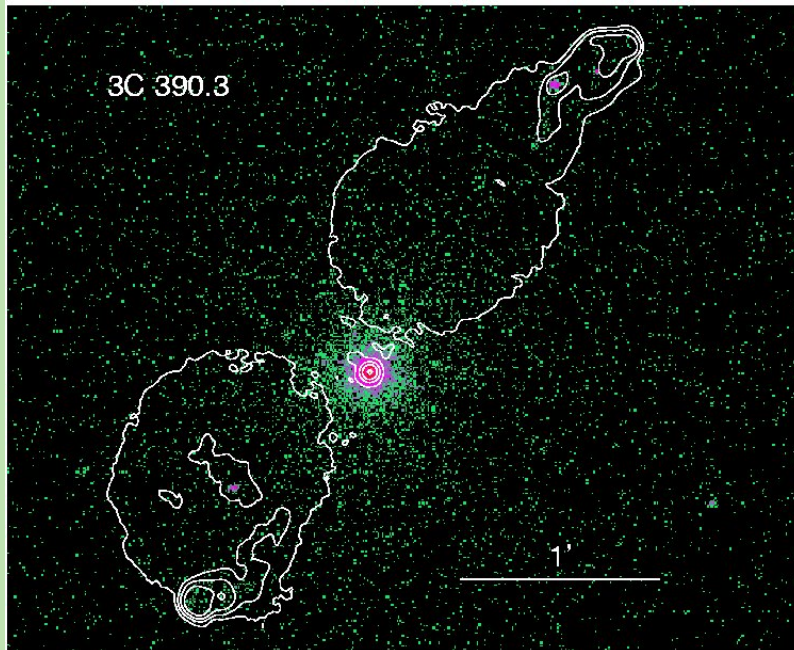


*Suzaku Observations of
the BLRG 3C 390.3
(also XMM and BAT)*

Rita Sambruna
NASA's GSFC

***Collaborators: J. Reeves, V. Braitto, K. Lewis,
M. Eracleous, D. Donato, M. Gliozzi, D. Ballantyne,
J. Tueller (for the BAT team)***

3C 390.3

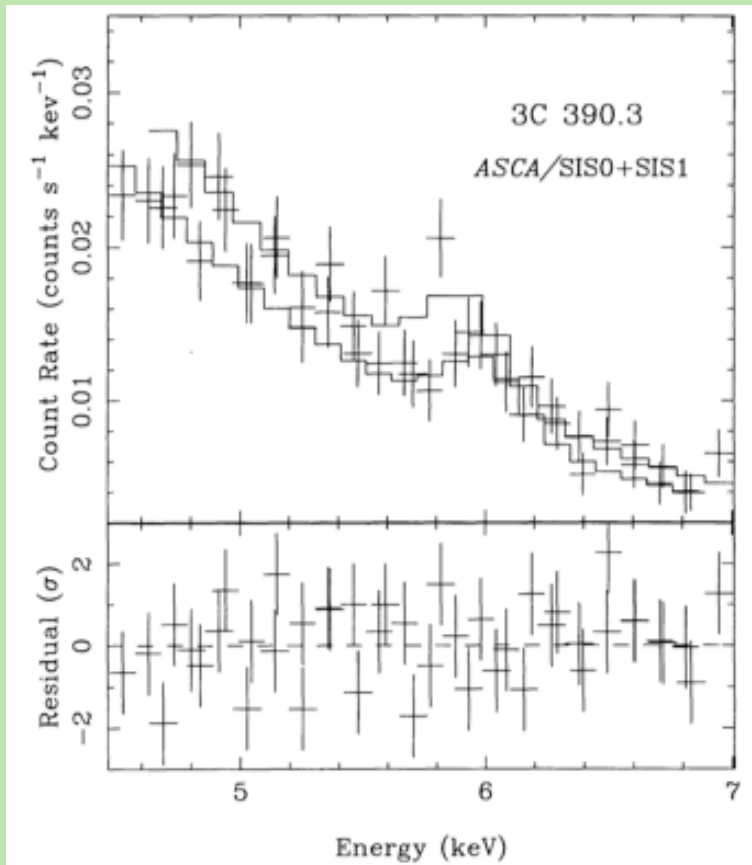


- Double-peak optical emitter
- FR II
- Superluminal
- $30 < \text{incl} < 35 \text{deg}$

For $\text{incl}=33 \text{deg} \rightarrow \delta=0.6$

Jet not expected to contribute to nuclear X-rays

Past X-ray Observations



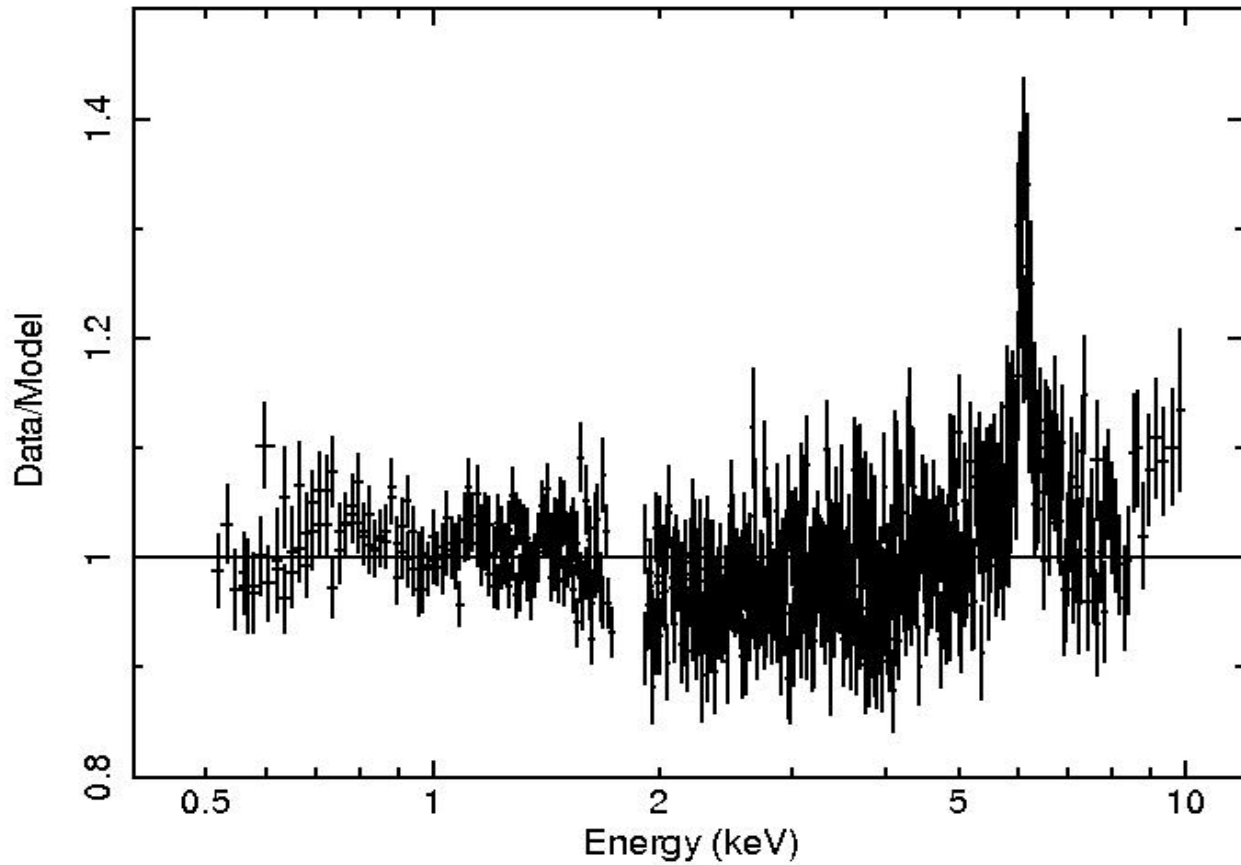
$$\forall \Gamma=1.7$$

- Fe K α EW=170 eV
- FWHM \sim 17,000 km/s
- $R \sim 1$
- Variable cold N h
- Variable flux

New Observations

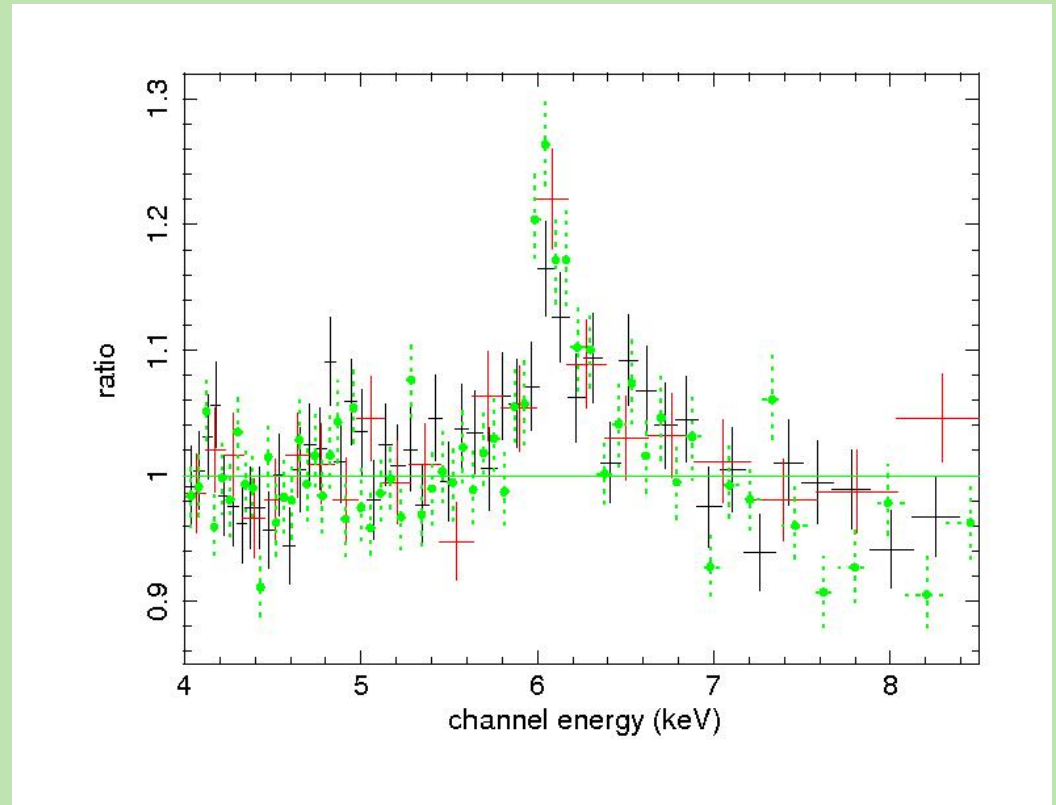
- Suzaku:
December 2007 for 90 ks
XIS and PIN
- XMM:
October 10 & 17, 2004
50+20 ks
- Archival BAT exposure 9 months

The XIS data

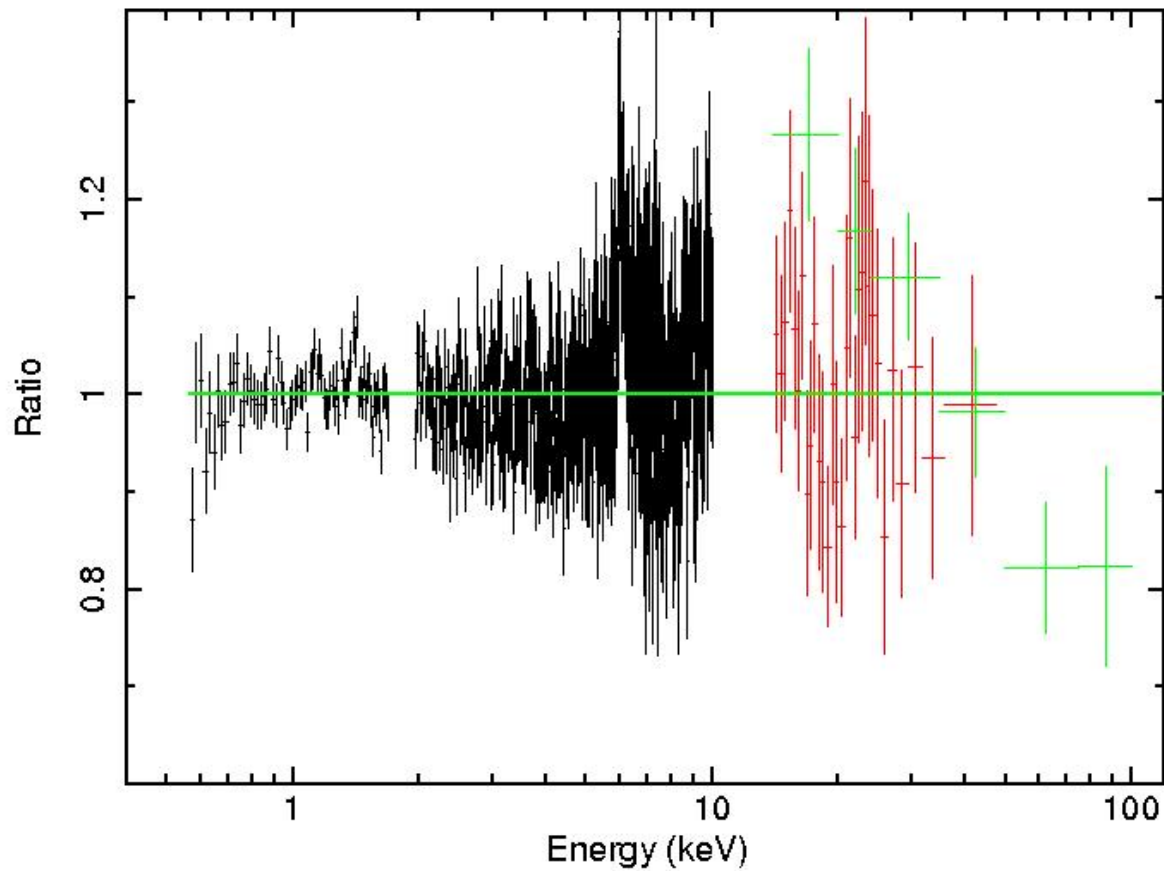


The Fe K region

- Narrow core at 6.4 keV; 13,000 km/s
- Weaker, broader line at 6.6 keV; 42,000 km/s
- He-like Fe



Broad-band spectrum



Cold AND ionized reflection

$$\forall \Gamma=1.60$$

- $E_{\text{cutoff}} \sim 180 \text{ keV}$

Cold reflection:

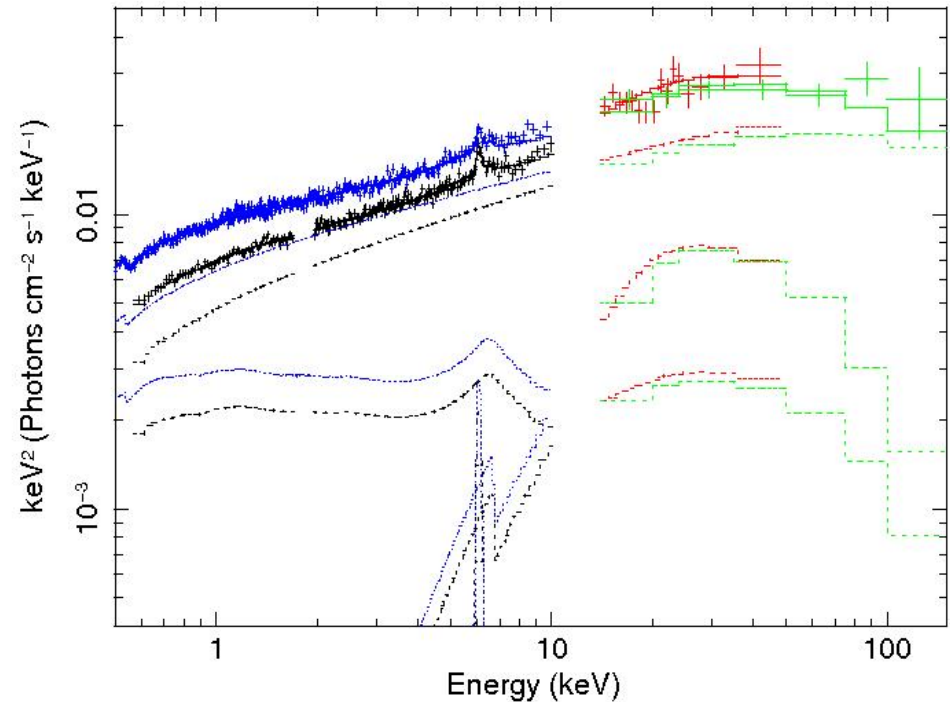
- $R=0.50$
- $EW=38 \text{ eV}$

Ionized reflection:

$$\forall \xi \sim 2700$$

- $R_{\text{in}} = 200 R_g$

Larger than $20 R_g$ at 90%
confidence



Implications

- An ionized disk in 3C390.3

Confirms the suggestion by Ballantyne et al. (2000) that (some) BLRGs contain more highly ionized disks than Seyferts

A broad ionized line is also observed in 3C120 with Suzaku (Kataoka et al. 2007)

Model prefers a solution where the bulk of the line originates from outer parts of disk

Cold line from BLRs?

(cont.)

- A truncated disk in 3C 390.3?

The data strongly suggest the inner ($< 20 R_g$) disk regions are obscured

→ an ion torus ? $L/L_{\text{edd}} \sim 0.01 - 0.2$

→ Base of a jet ?

→ Outflow ?

Suzaku is starting to extract *quantitative* information about the RL flow structure

Lack of absorption

- No evidence for cold or warm absorption in 3C390.3
- Lack of soft X absorption is to-date the clearest distinction between BLRGs and Seyferts
- Puzzling...

More BLRGs to come

Bright sources:

- 3C 382: 100 ks, Reeves et al.
- 3C 445: 120 ks, Braitto et al.
- 3C 111: 100 ks

**Need more BLRGs,
lower lum regimes!!!**

HAIKU

Peeking in X-ray cores
Suzaku red bird of south
Fly free forever