

High Resolution Spectroscopy of Active Galactic Nuclei

Andy Young



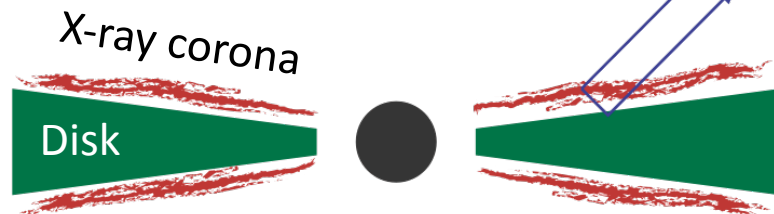
Outline

- Warm absorbers and broad iron lines
- ~~Radiatively inefficient accretion flows~~
- “Towards IXO”

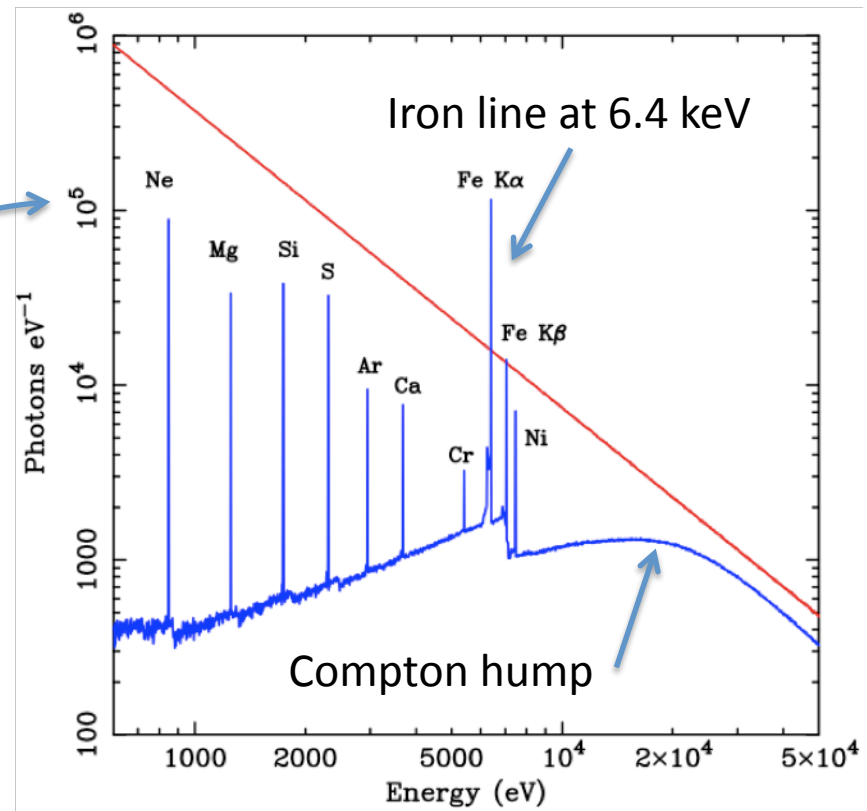
Warm absorbers and broad iron lines

Iron K α fluorescence line

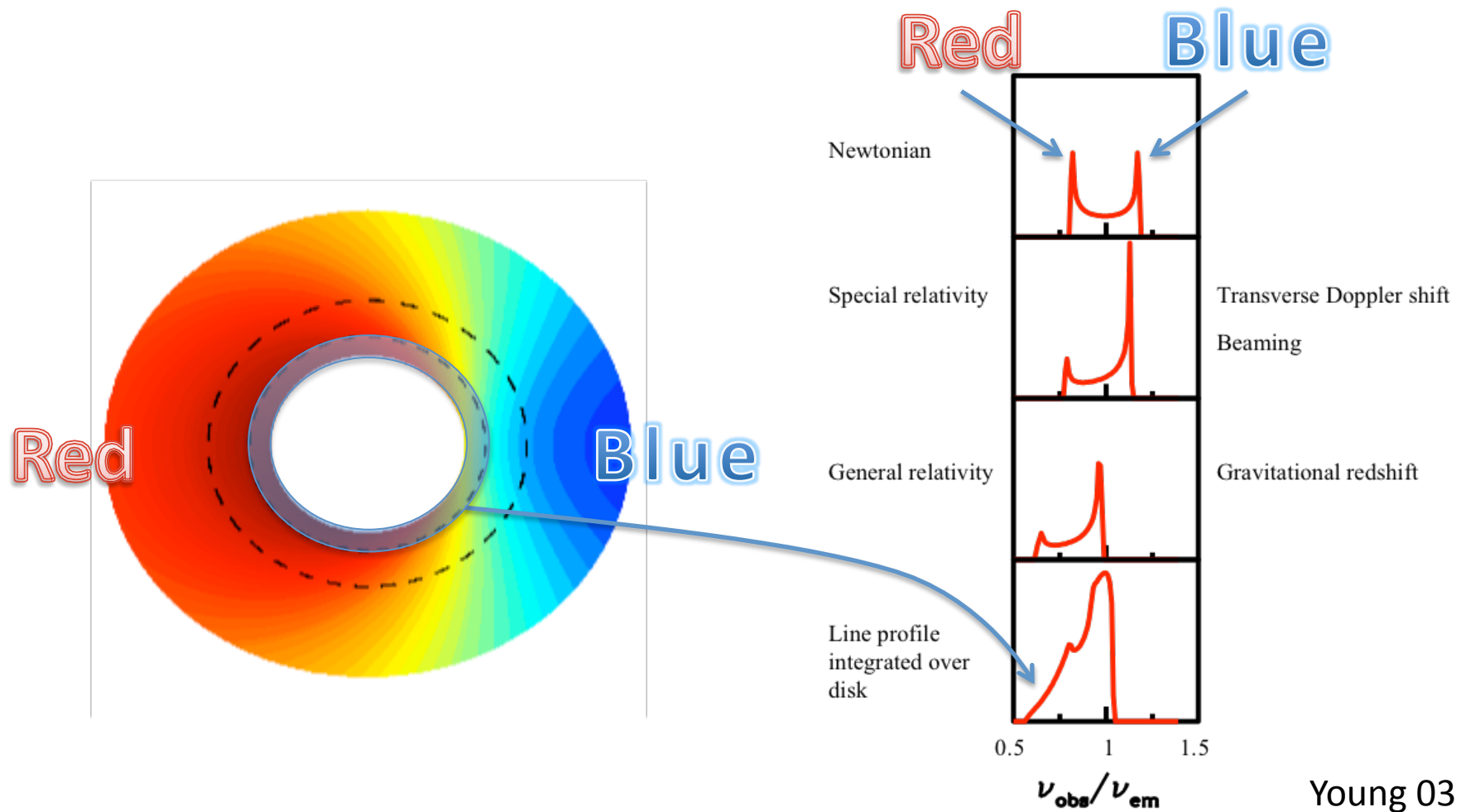
Accretion disk



"Reflection" spectrum



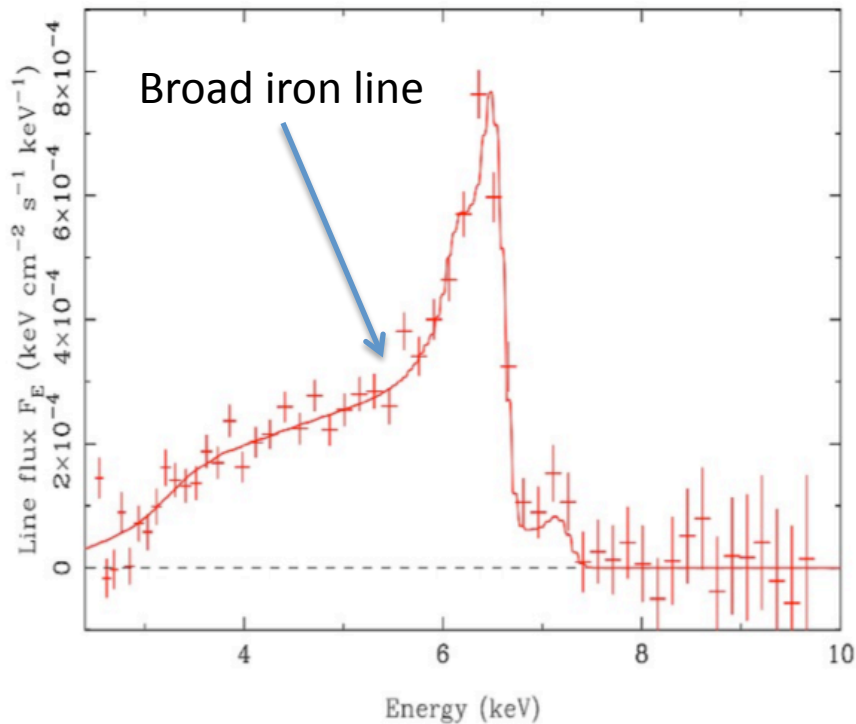
Broad iron line



Young 03

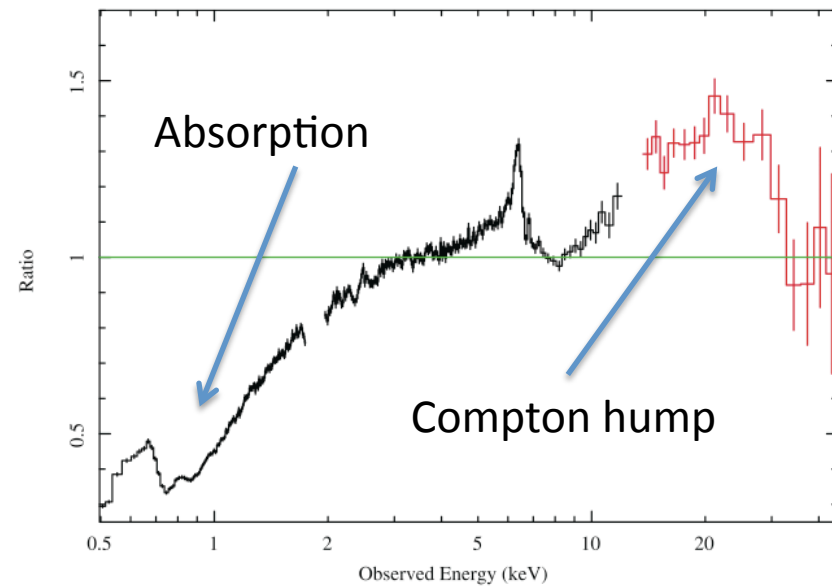
Observations

MCG—6-30-15 (XMM)



Fabian+02

MCG—6-30-15 (Suzaku)

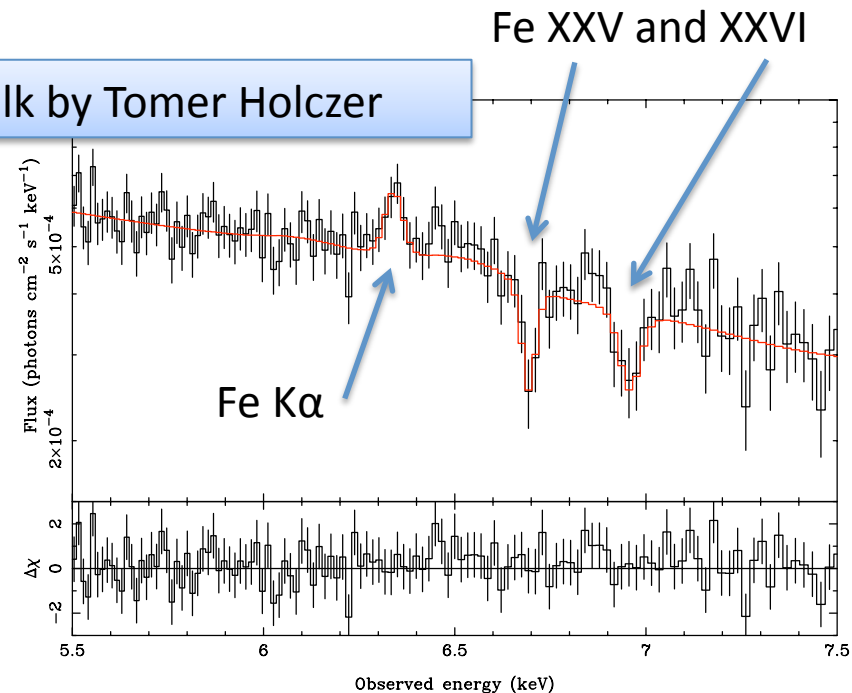


Miniutti+07

High resolution spectroscopy: MCG—6-30-15 (Chandra HETGS)

- Ionized absorber is clearly present and important
- Broad range of ionization states, column densities, outflow velocities
- Absorption by Fe XXV and Fe XXVI
- What does this do to the hard X-ray continuum?

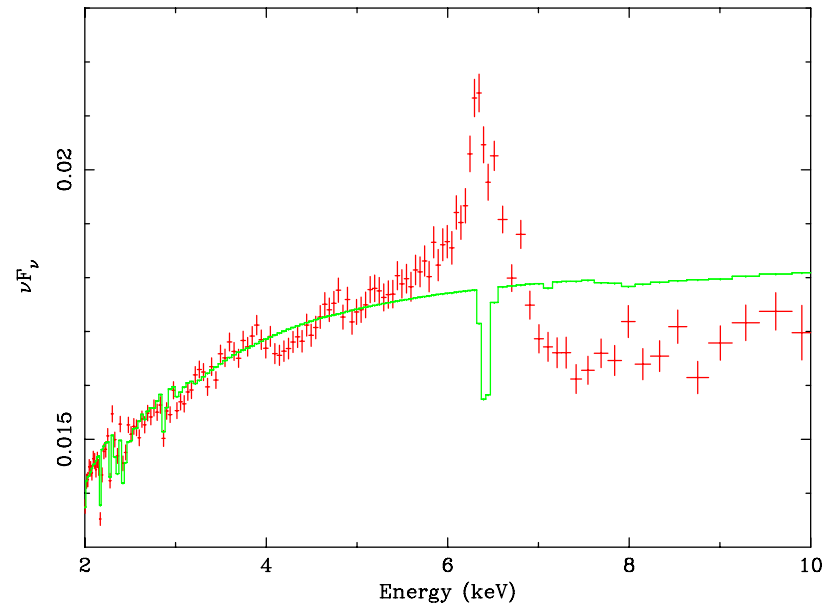
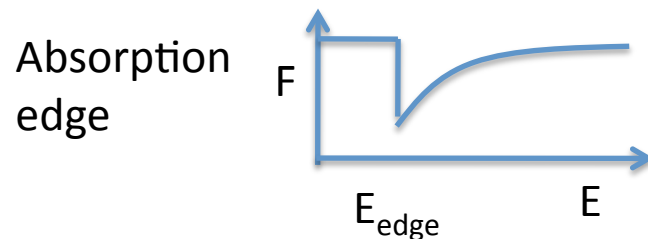
See talk by Tomer Holczer



Young+05

Ionized absorption

- Could ionized absorption extend up to the Fe K band?
- Does this affect our interpretation of the broad iron line?

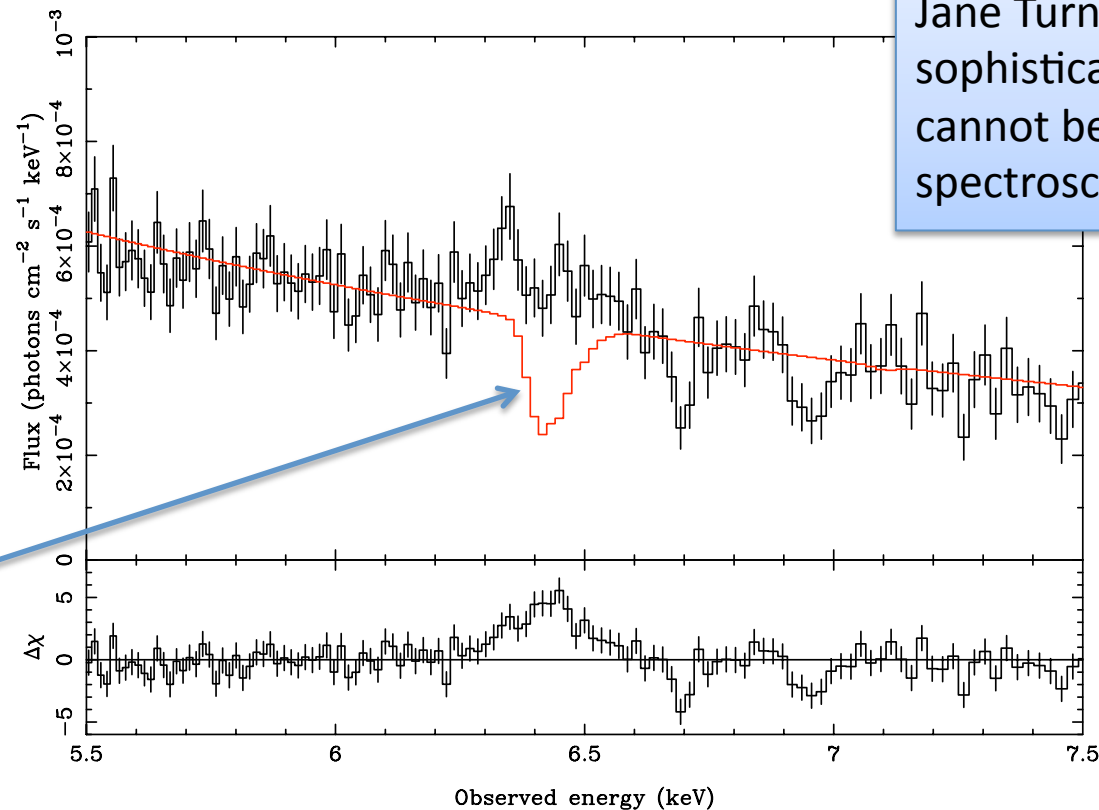


Cartoon of simple ionized absorption model

Can rule out the *simplest* ionized absorption models

See talks by Lance Miller and Jane Turner for more sophisticated models that cannot be simply ruled out spectroscopically

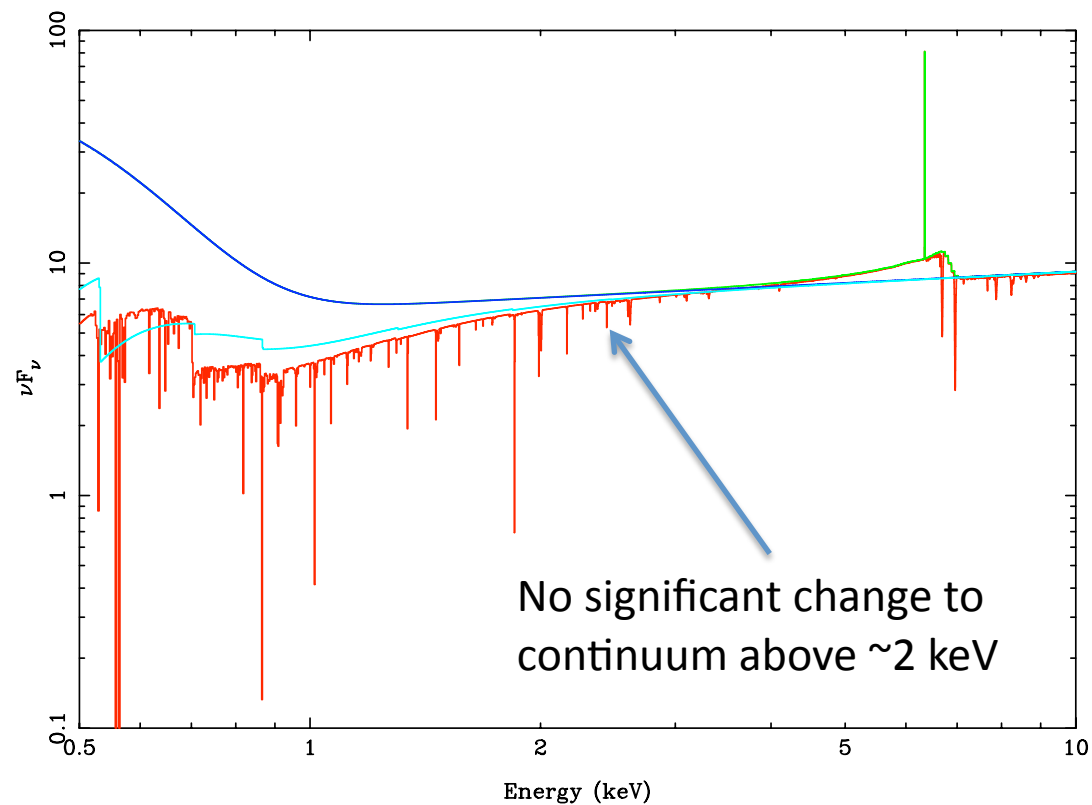
These absorption lines are predicted by all simple ionized absorption models



Young+05

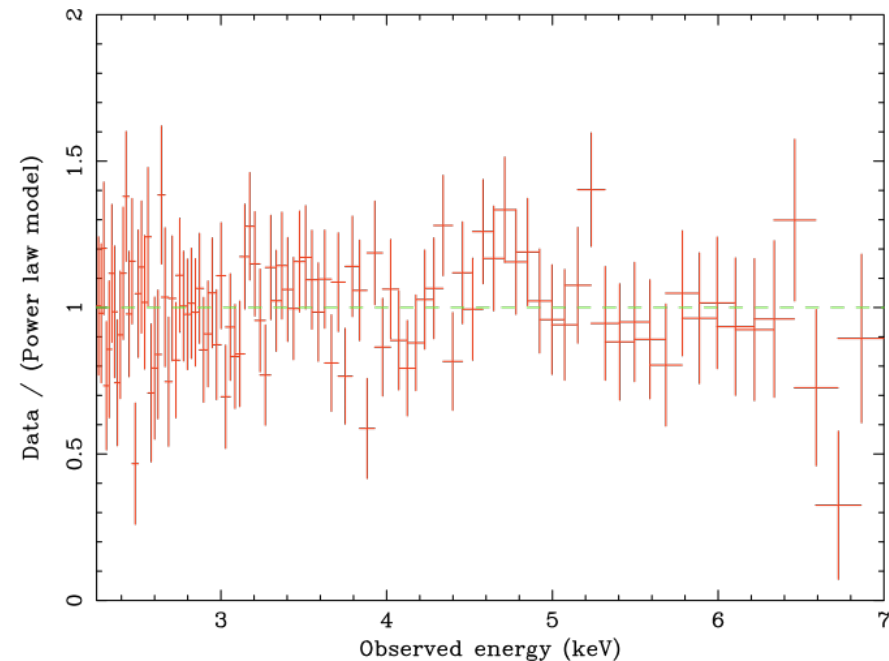
Broad iron line still robust

The best-fitting warm absorber model
still *requires* a broad iron line



Variability

- Difference spectrum of high—low states well described by a power-law
- Also suggests broad Fe K feature is not the result of absorption

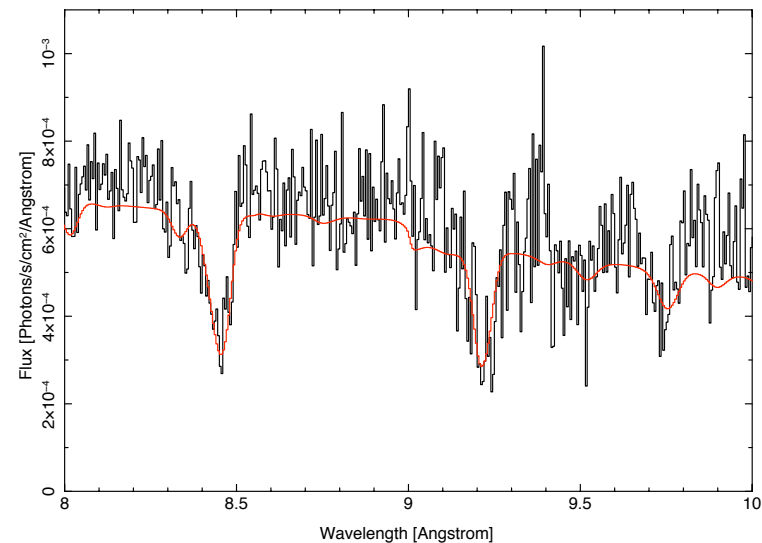
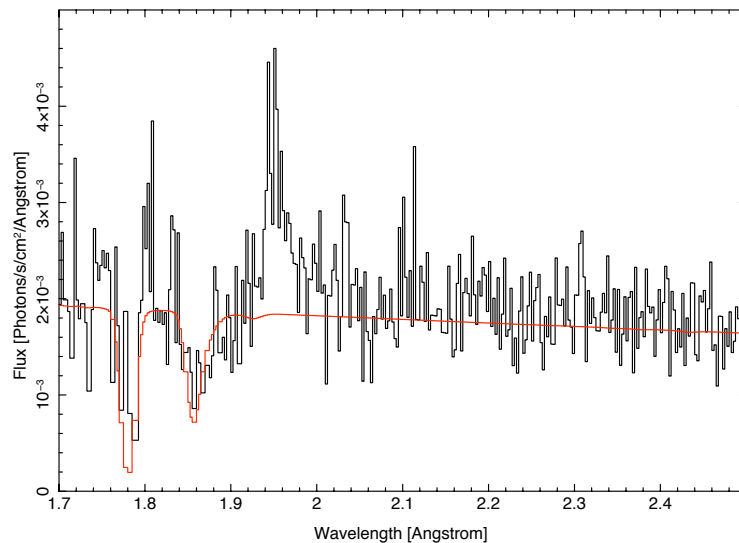


Other AGN, e.g., NGC 3516...

See talk by Jane Turner and poster by Missagh Mehdipour

Fe K bandpass

8-10 A



Need detailed models of ionized absorbers in different spectral states and to consider the hard X-ray spectrum and broad iron line. Self-consistent physical model of warm absorber and broad iron line. Work in progress...

Momtahan+ (in prep)

Towards IXO...

- High resolution spectroscopy up to Fe K band
 - Measure properties of absorber – line strengths, widths, velocities
- Broad bandpass
 - Simultaneously measure continuum across broad X-ray bandpass
- Large area
 - Time- and flux-resolved spectroscopy
 - Routinely allow detailed studies of fainter AGN beyond the usual suspects
- Also need self-consistent physical models of these systems