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van Peet et al. 2009, A&A, in press, Astro-ph: 0902.4470

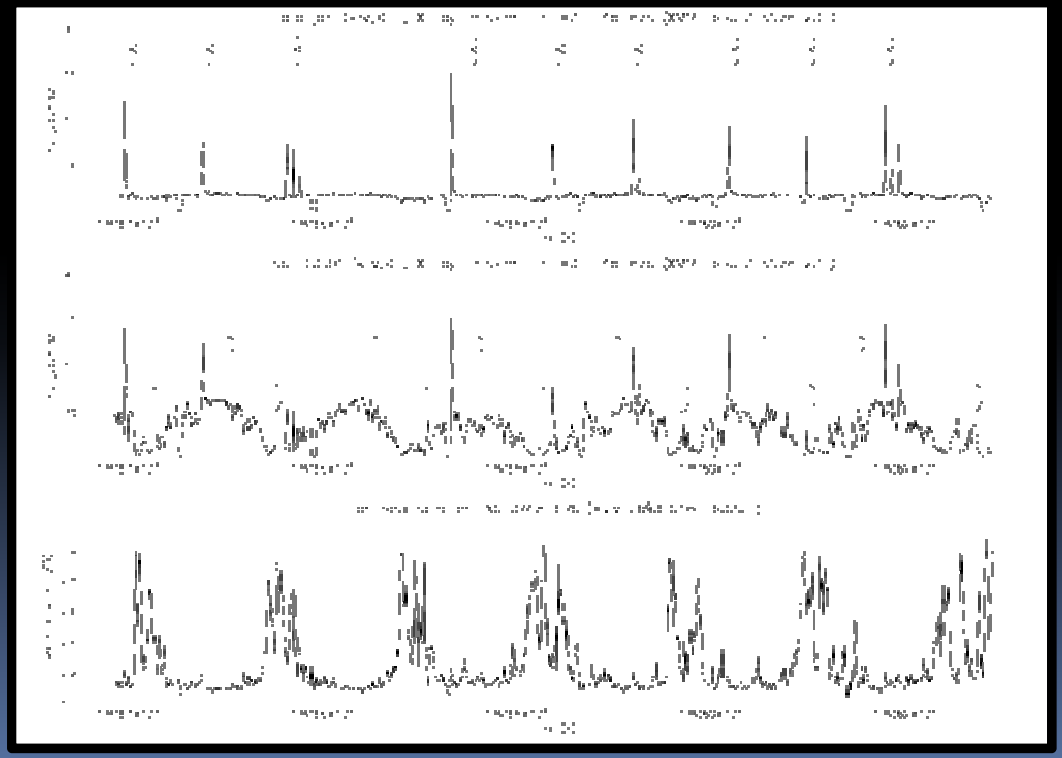
PROPERTIES OF THE IONIZED GAS IN EXO 0748-676

Ionized gas in binary systems

- High-resolution spectroscopy allowed us to detail the gas environment of binary systems.
  - Relativistic effects (e.g. Cottam +2001)
  - magnetic effects (Miller+2006)
  - Geometry of the system in dippers (e.g. Boirin+ 2005, Diaz-Trigo +2006)

EXO 0748-676

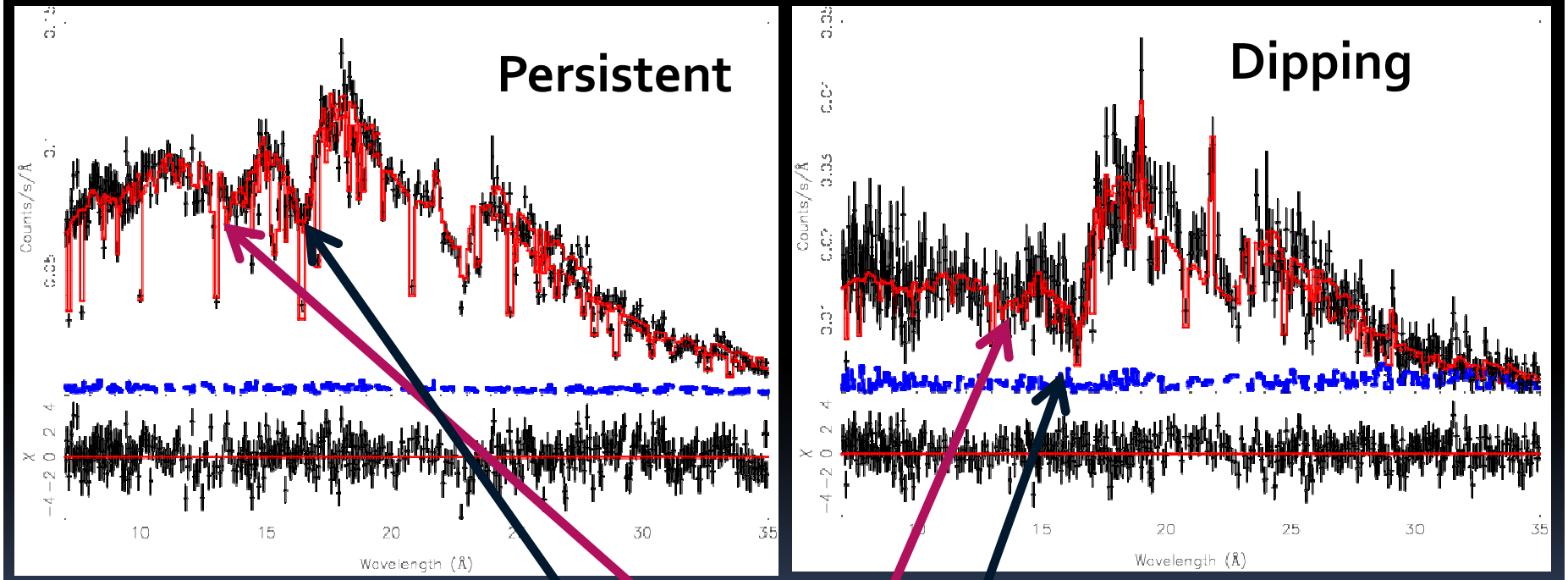
- Extensively studied LMXB
  - Dipper → undergoes obscuration periods aside from normal eclipses (e.g. Parmar +86)
  - Burster → single and triple bursts (Boirin+07)



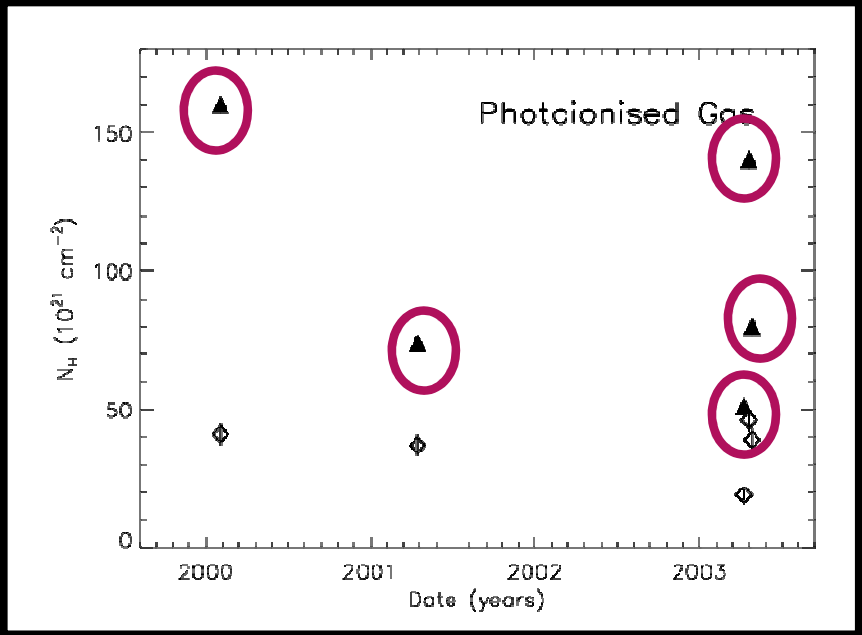
The XMM-data set

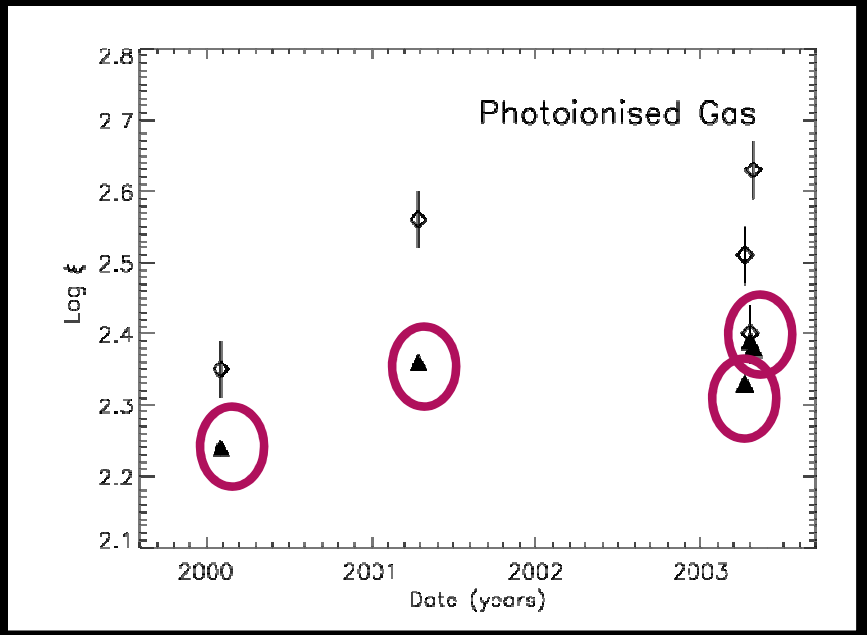
- Collection of 17 observations , grouped according to equal flux and equal spectral parameters.
- Focus on RGS data only (PN used for broad band continuum)
- Study of the dipping and persistent states
  - → dipping phenomenon
  - → physical parameters of the gas
  - → MORE?

Dips and persistent emission



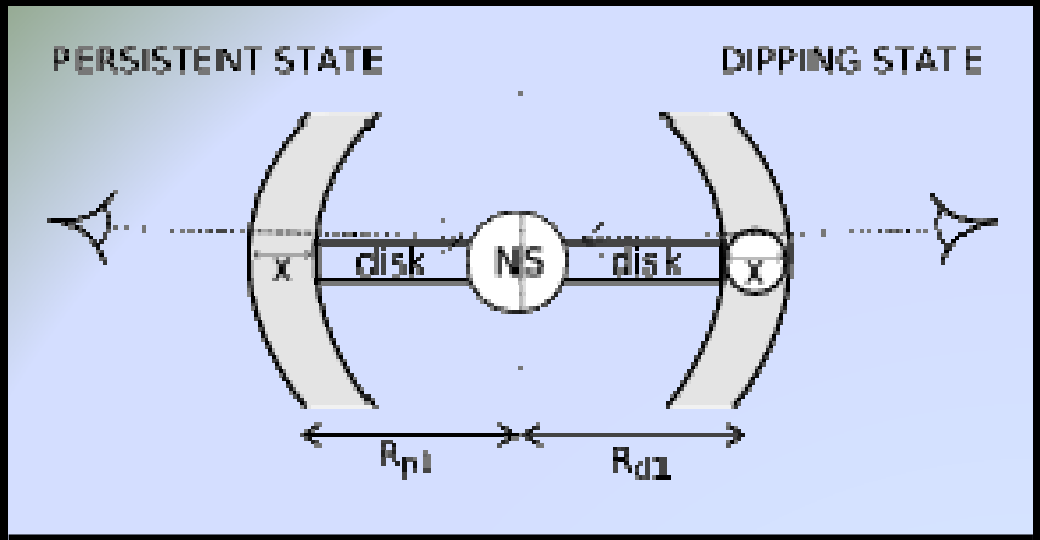
The photoionized gas





Column density of the photoionized gas systematically increases while ionization parameter ξ decreases for each epoch
→Consistent with the idea that dipping is caused by a bulge of denser material intercepting our line of sight

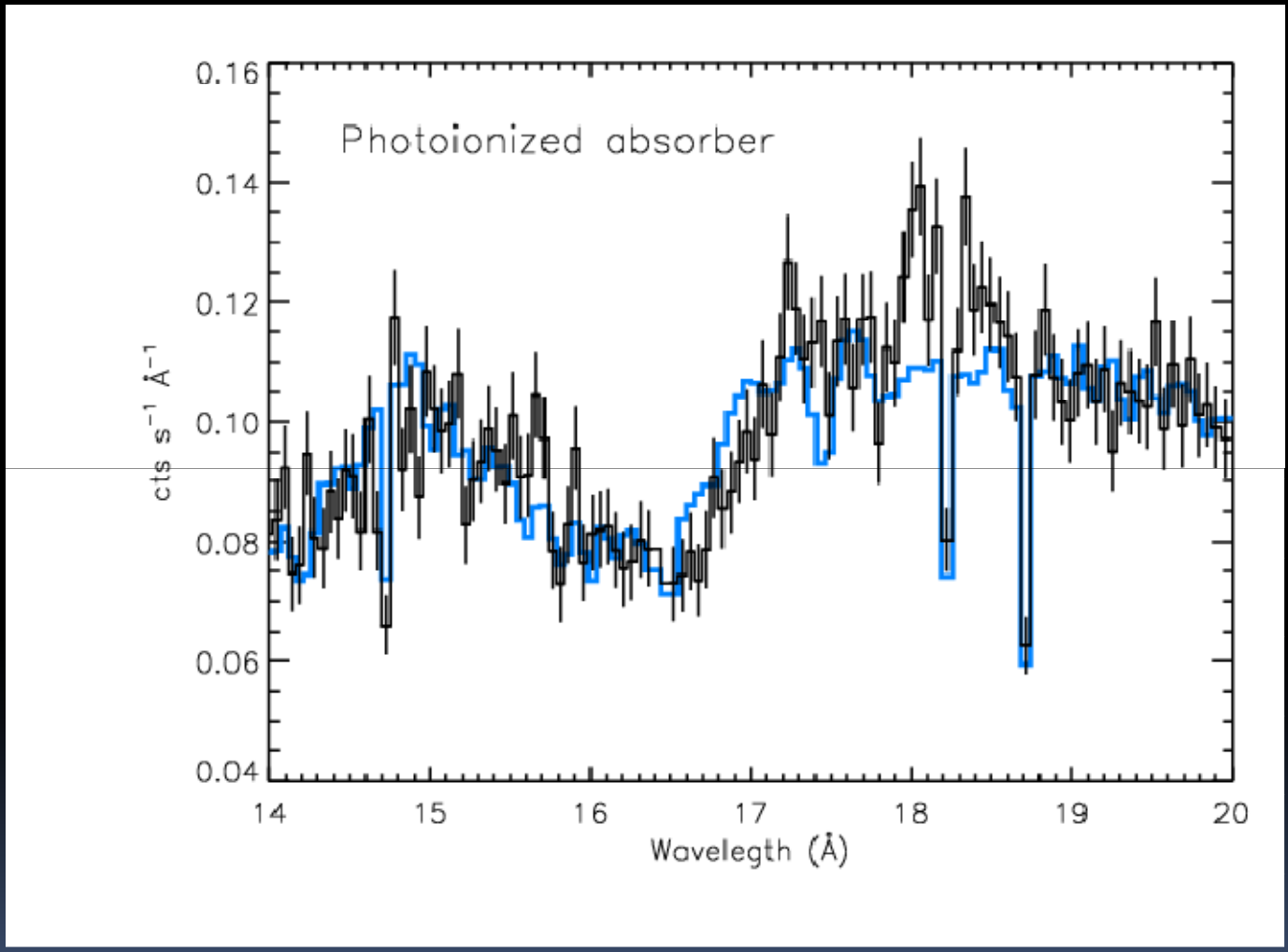
Geometry of the PI gas



shell-like gas
→ the persistent gas is a trailing tail of the dipper bulge

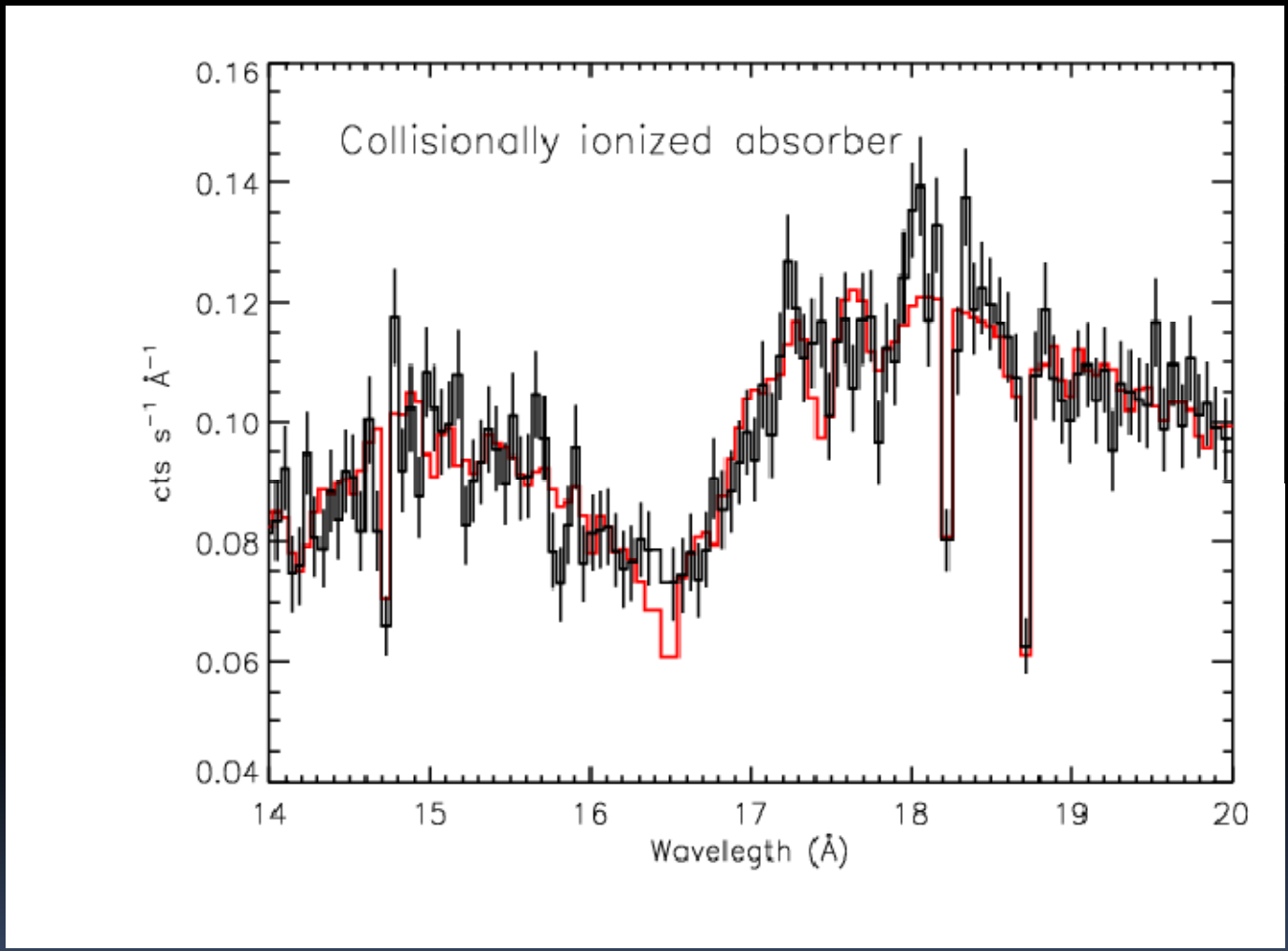
Comparing emission and absorption
(with some assumption on the luminosity and density)
→**Flattening of the gas: 18°**
→ **Distance of the gas: R~few^{e}10 cm~L1**

Going deeper with the spectral analysis



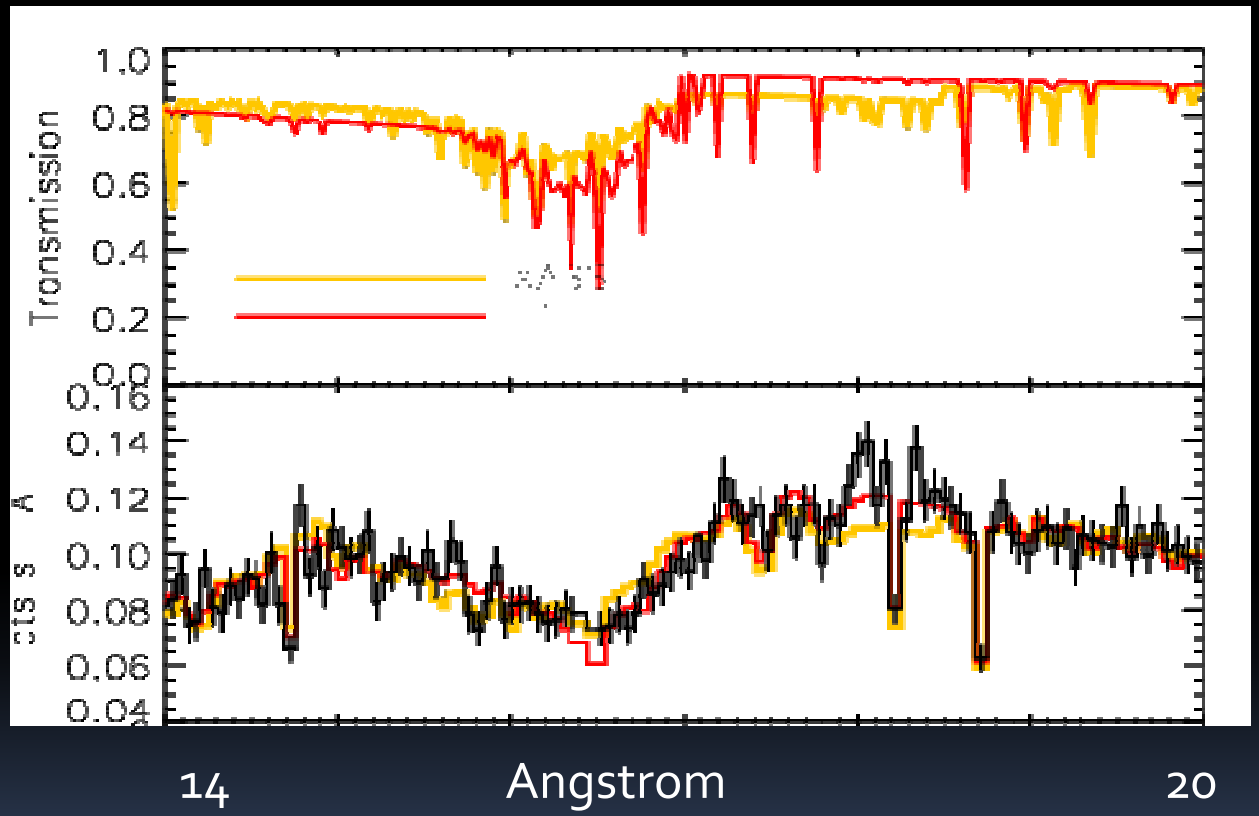
A second photionized absorber fails to reproduce the OVII edge + iron UTA

Collisionally ionized gas

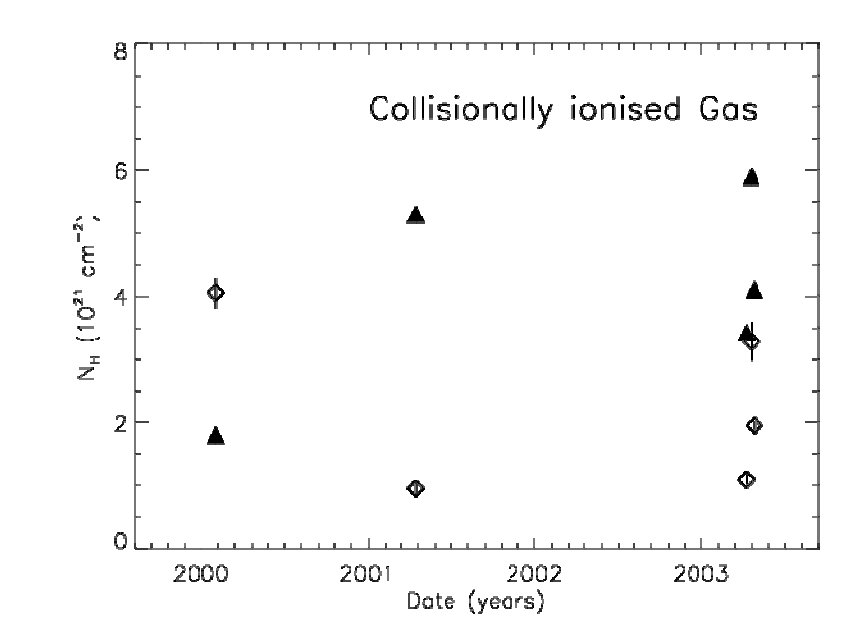


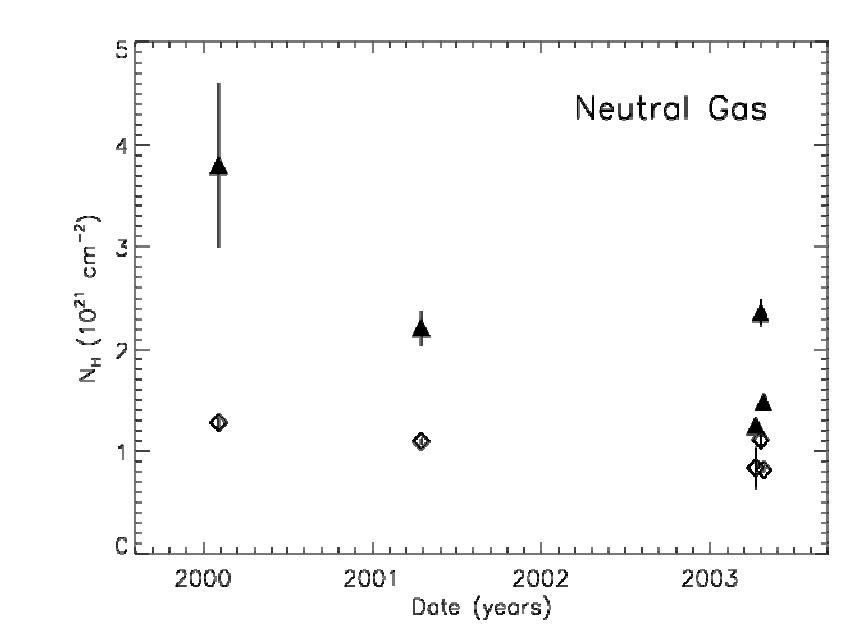
A collisionally ionized absorber correctly fits the spectrum :
In a CI gas for each temperature a peak ion exist: OVII @ T~70 eV

The collisionally ionized gas



The nature of the Ci gas





- Column density of gas increase during dips, while temperature remains constant

→ Phenomenon intrinsic to the source and associated with dipping

→ Is it associated with a circumbinary disc?

A circumbinary disk? (1)

- Where is located the CI gas?

→Far enough not to be photoionized

R>1^{e}11 cm

→ High density n> few 1^{e}14 cm^{-3} (emission lines are consistent with this picture)

→ very small layer of gas (150 km!) or a smoke-like medium (i.e. low filling factor)

A circumbinary disk? (2)

- Cold CB disks are detected in IR in CV, novae (Deufel +99) and XRB (Muno & Mauerhan 06)
- Disk extention is > twice the accrection disk

- Strong constraint on the distance, as thermal velocity can reach easily the escape velocity

→ **R_{Cl} ~ few x 10^{11} cm**

→ **Are we detecting the first portion of a circumbinary disk?**

Conclusions

- The photoionized gas in EXO 0748-676 behaves consistently with the picture of Boirin+05
- The gas is located at ~few^{e}10 cm, consistent with L1 and it has a flattened geometry
- We detected for the first time a collisionally ionized plasma, which might be the first portion of a circumbinary disk.