Broad X-ray Fe lines in Seyfert Galaxies

The Case of the Seyfert 2 IRAS 18325-5926

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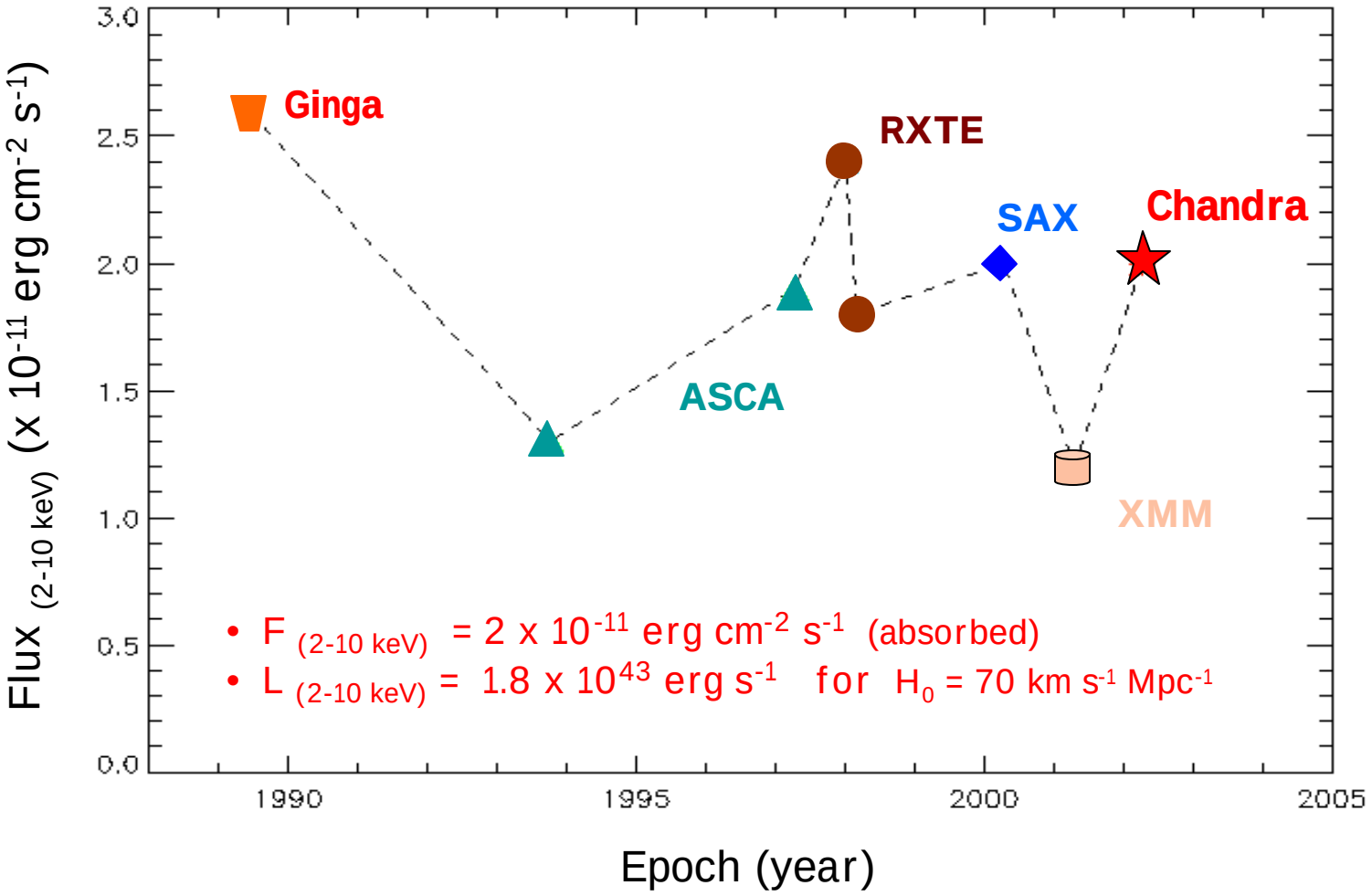
Chandra Fellows Symposium 2003

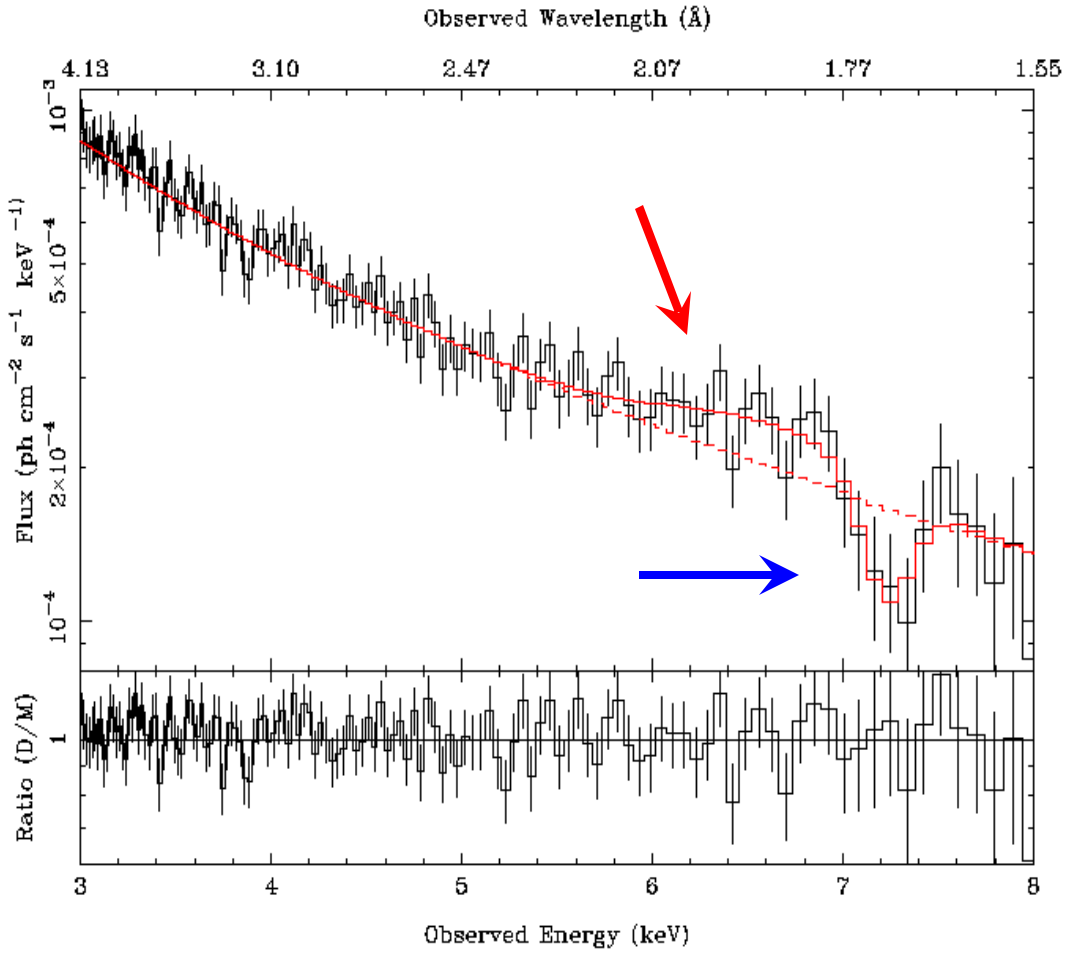
IRAS 18325-5926 (Fairall 49)

- Seyfert 2 @ z = 0.02 (DeGrijp et al. 1985)
- $N_H \sim 1 \times 10^{22}$ cm^{-2} ; $N_{Gal} \sim 7 \times 10^{20}$ cm^{-2}
- $\Gamma \sim 2 - 2.2$ (steeper than typical)
- Broad Fe emission line with large (> 200 eV) EW
- 16 hour period from ASCA 1997 Observation; not confirmed: (Iwasawa et al. 1998)
- Highly variable

The ~13 year X-ray flux history of IRAS 18325-5926



The broad Fe emission & absorption features in IRAS 18325-5926

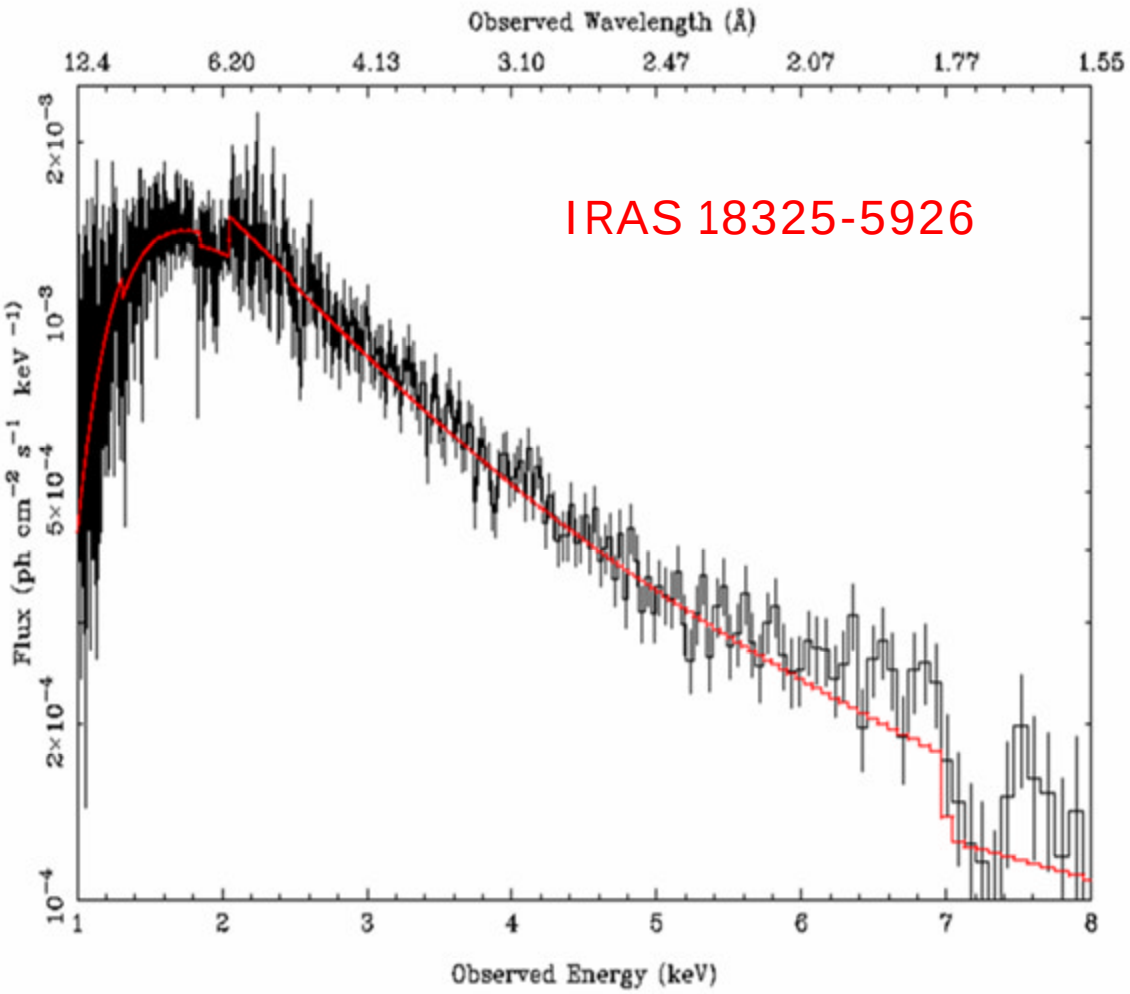


The Continuum :
(based on broad-band spectra)

- Absorbed Power-law
- Power-law : $\Gamma = 2$
- $N_{Gal} = 7 \times 10^{20}$ cm^{-2}
- $N_{IR18} = 1 \times 10^{22}$ cm^{-2}

The discontinuity at ~7 keV

A Neutral Iron K edge ?

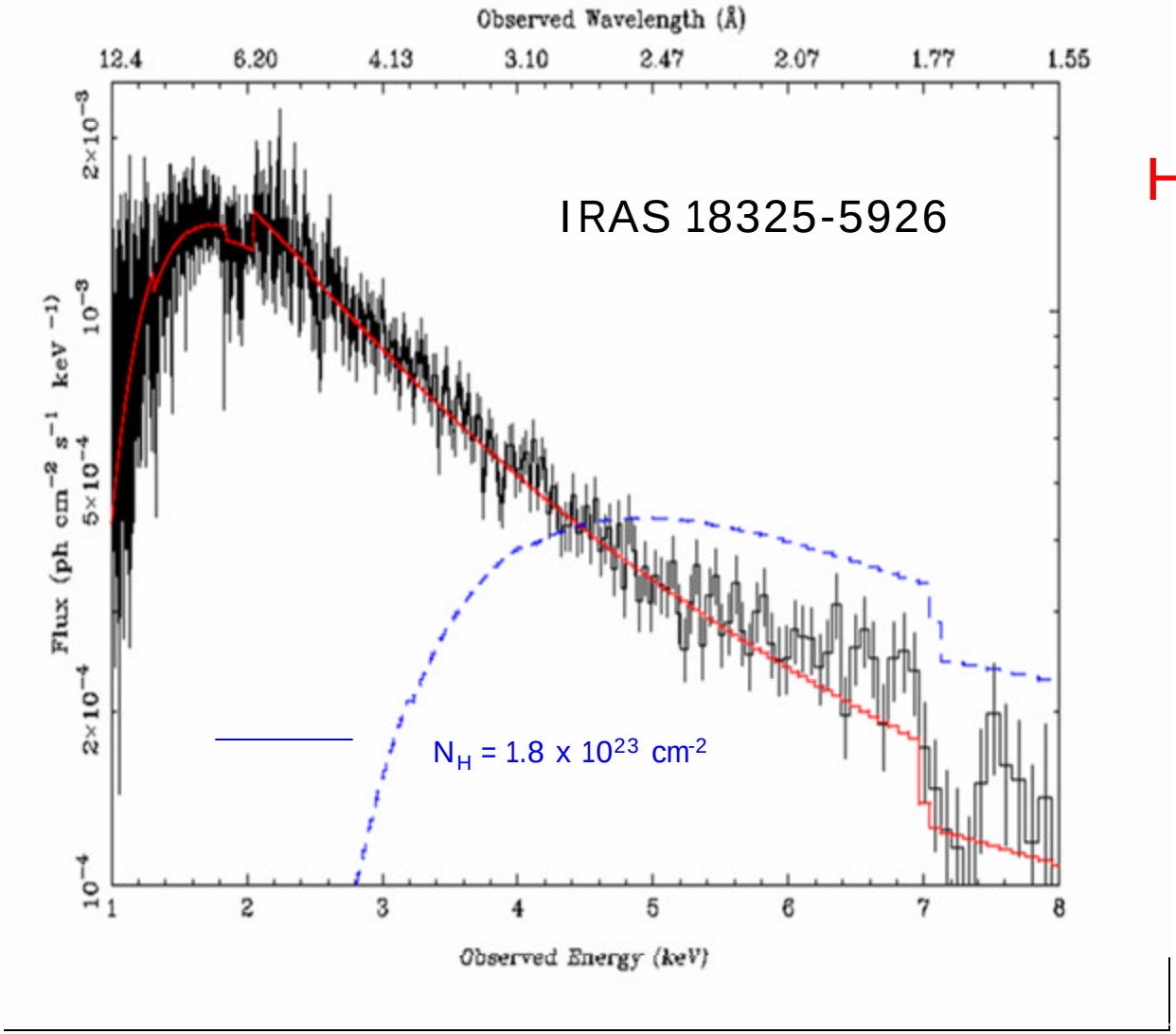


E_{edge} = 7.1 keV

t = 0.32

$N_H = 1.8 \times 10^{23}$ cm^{-2}

A Neutral Iron K edge ?



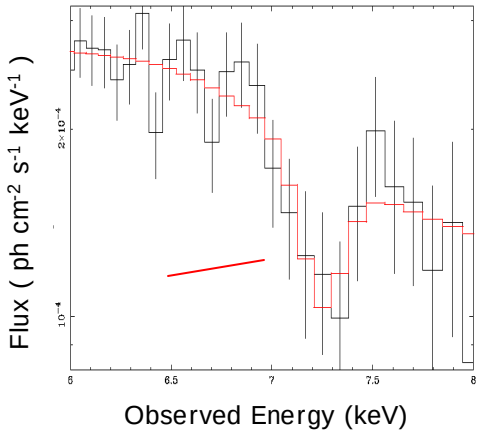
Hard to reconcile !

E_edge = 7.1 keV

t = 0.32

N_H = 1.8 x 10^{23} cm^{-2}

A high velocity ionized outflow ?



$$\dot{M}_{accretion} = \frac{L_{bol}}{? c^2}$$

$$\dot{M}_{acc} < 7 \times 10^{-2} M_{solar}\ yr^{-1}$$

($L_{bol} \sim L_{IR} \sim 4 \times 10^{44}$ erg s^{-1} ; $\eta = 10\%$)

Lee et al., in prep.

$$\dot{M}_{flow} = 4p\ r^2 n\ m_p\ v\ (\frac{O}{4p}) = 4p\ m_p\ v\ (\frac{L_x}{?})(\frac{O}{4p})$$ (**W = solid angle of outflow**)

	V_{flow}	$\dot{M}_{flow}(4p\ /\ \Omega)$	N_j (cm^{-2})	N_H (cm^{-2})
Fe XXV	0.12 c	9.2 $M_{sun}\ yr^{-1}$	1.4×10^{18}	5.6×10^{22}
Fe XXVI	0.08 c	1.9 $M_{sun}\ yr^{-1}$	3.0×10^{18}	1.3×10^{23}

QSOs with highly ionized X-ray flows

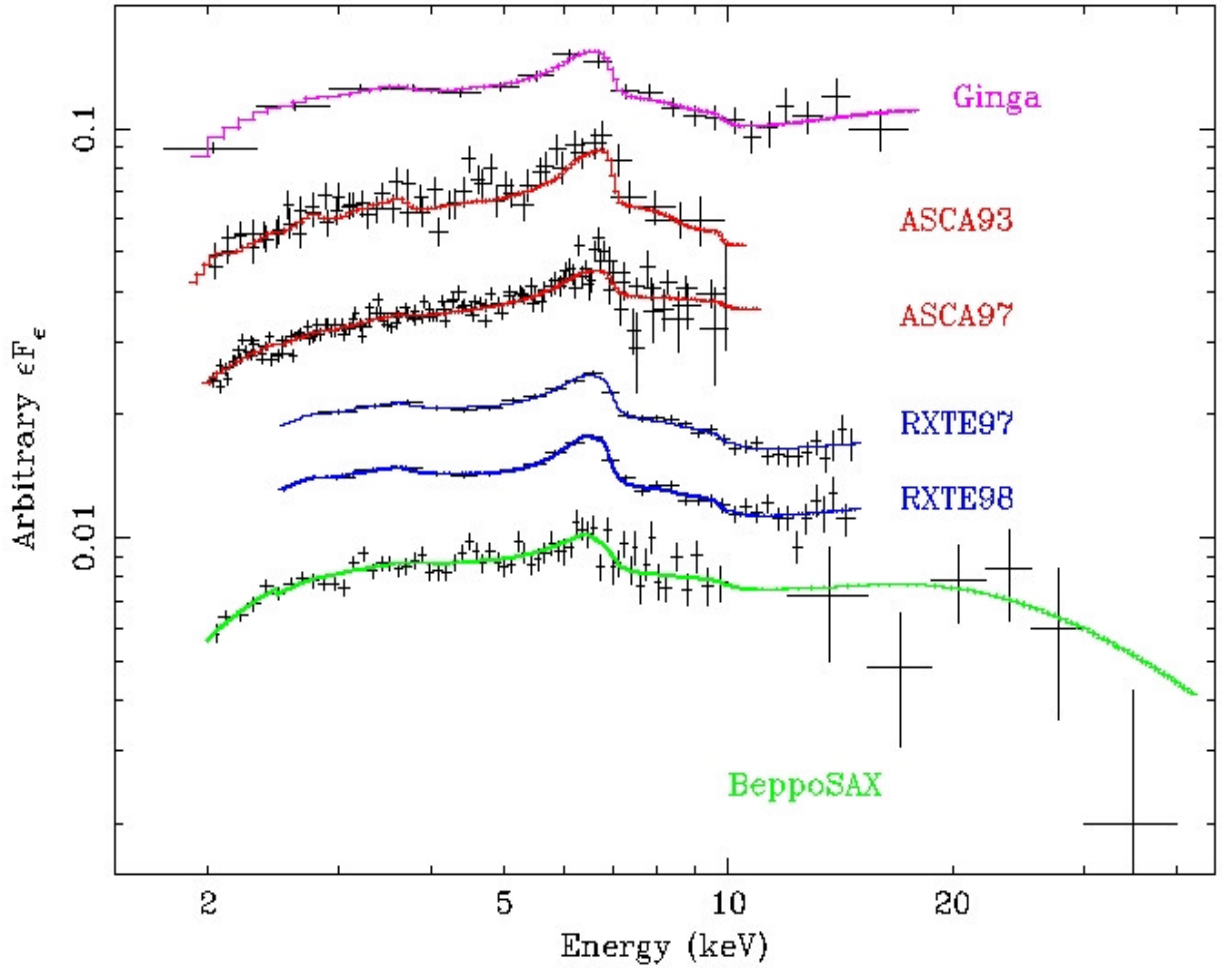
BALs

NLSy

QSO	z	Outflow	References
APM 08279+5255	3.91	0.2-0.4 c	Chartas et al. 2003, Hasinger et al. 2002
PG 1115 + 080	1.72	0.1 – 0.34 c	Chartas et al. 2002
PDS 456	0.184	0.17 c	Reeves et al. 2003
PG 1211+143	0.08	0.08 c	Pounds et al. 2003
PG 0844+349	0.064	0.2 – 0.26 c	Pounds et al. 2003
IRAS 18325-5926	0.02	0.08 - 0.12 c	Lee et al., in prep.

The ~ 13 year view of the broad Fe emission

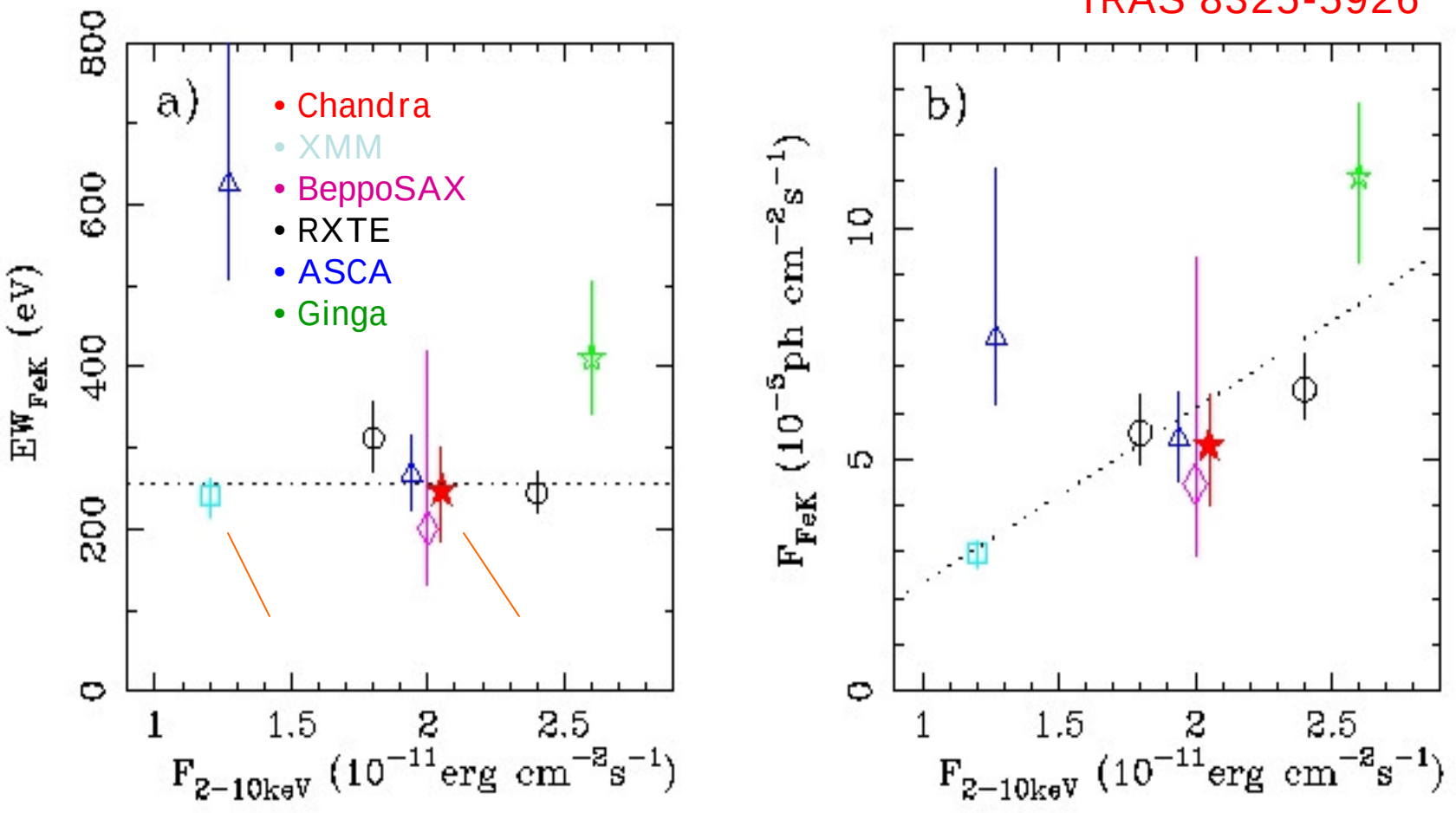
IRAS 18325-5926



Iwasawa, Lee, Young, Reynolds, Fabian, 2003, MNRAS, in press

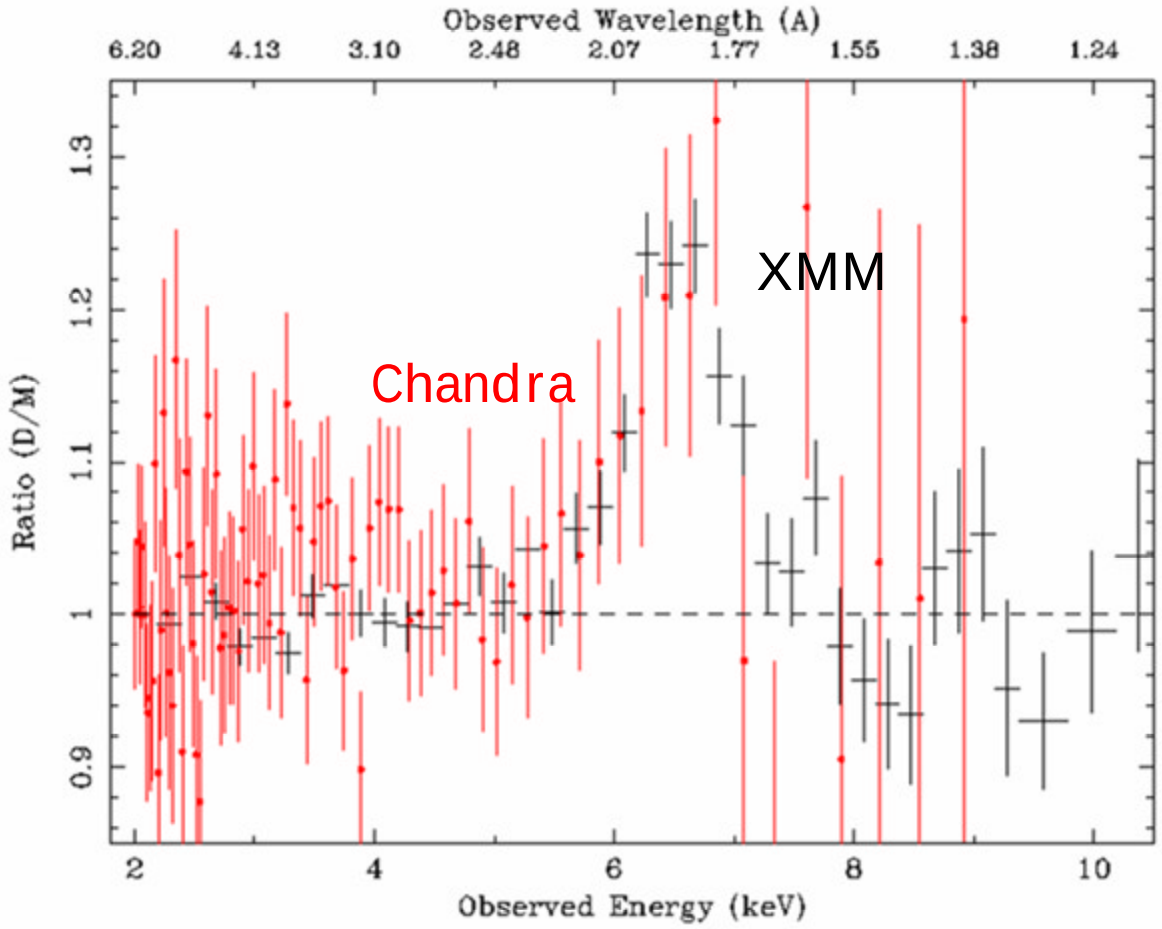
Long time-scale Fe line behaviour

IRAS 8325-5926



Iwasawa, Lee, Young, Reynolds, Fabian, 2003, MNRAS, in press

An Ionized Accretion Disk ?



E = 6.7 keV

σ = 23,000 km s^{-1}

EW = 247 eV (68 mA)

F = 5.9×10^{-5} ph cm^{-2} s^{-1}

Preliminary Findings

- Broad absorption trough
  - highly ionized Fe XXV or Fe XXVI
  - from high velocity wind (v ~ 0.08 – 0.12 c)

- Broad emission line
  - Fe XXV from ionized accretion disk

Stay Tuned …

- Chandra HETGS : determine state of the photoionized plasma (Lee et al., in prep.)
  - Narrow absorption lines and RRCs seen
  - Determine Nj, temperature, ionization
  - Nature of the soft excess

- XMM : Short term variability behaviour of the broad iron emission & absorption
  (Iwasawa et al. in prep.)