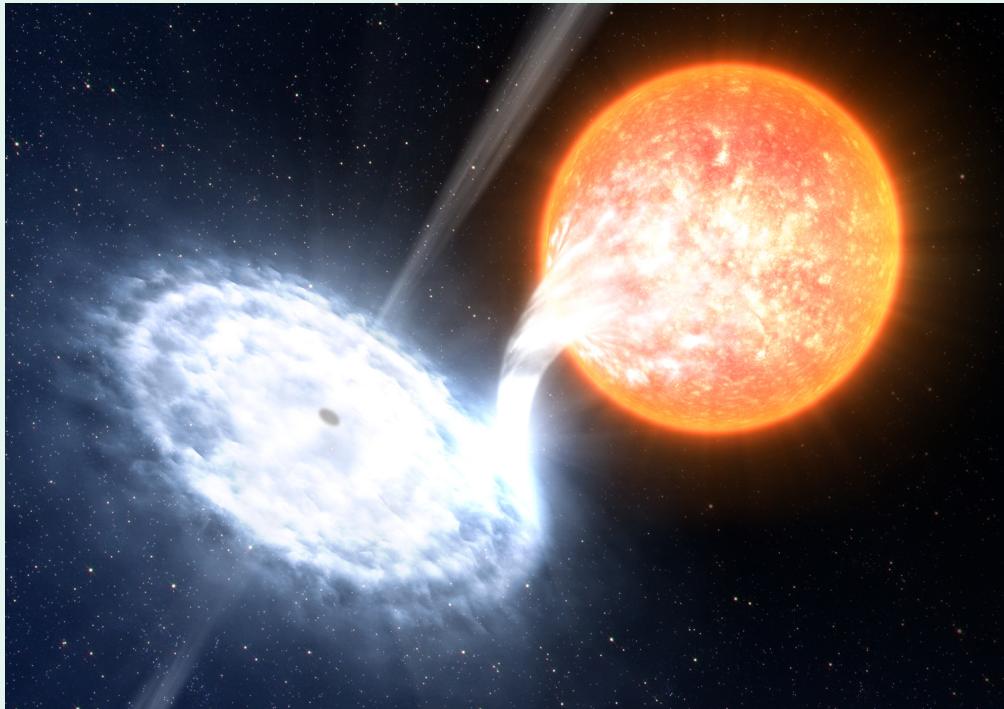


On the origin of optical-IR flares in accreting black holes



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+

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Ilia Kosenkov (Turku)

Mikhail Revnivtsev (IKI)

Poutanen & Veledina, 2014, SSRv, 183, 61

Poutanen, Veledina, Revnivtsev, 2014, MNRAS, 445, 398

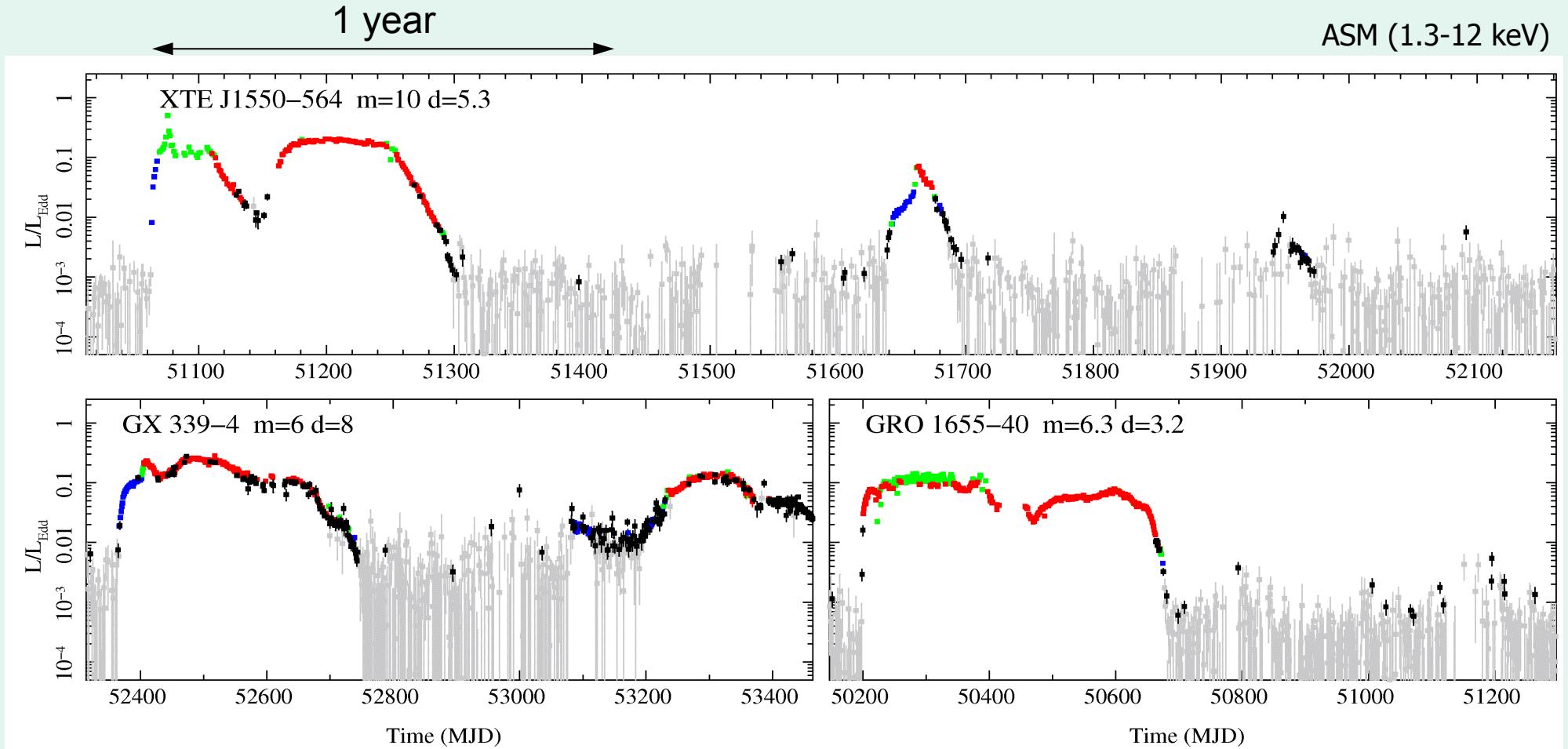
Kosenkov et al. in prep.

Kathmandu, 18.10.2016

Plan:

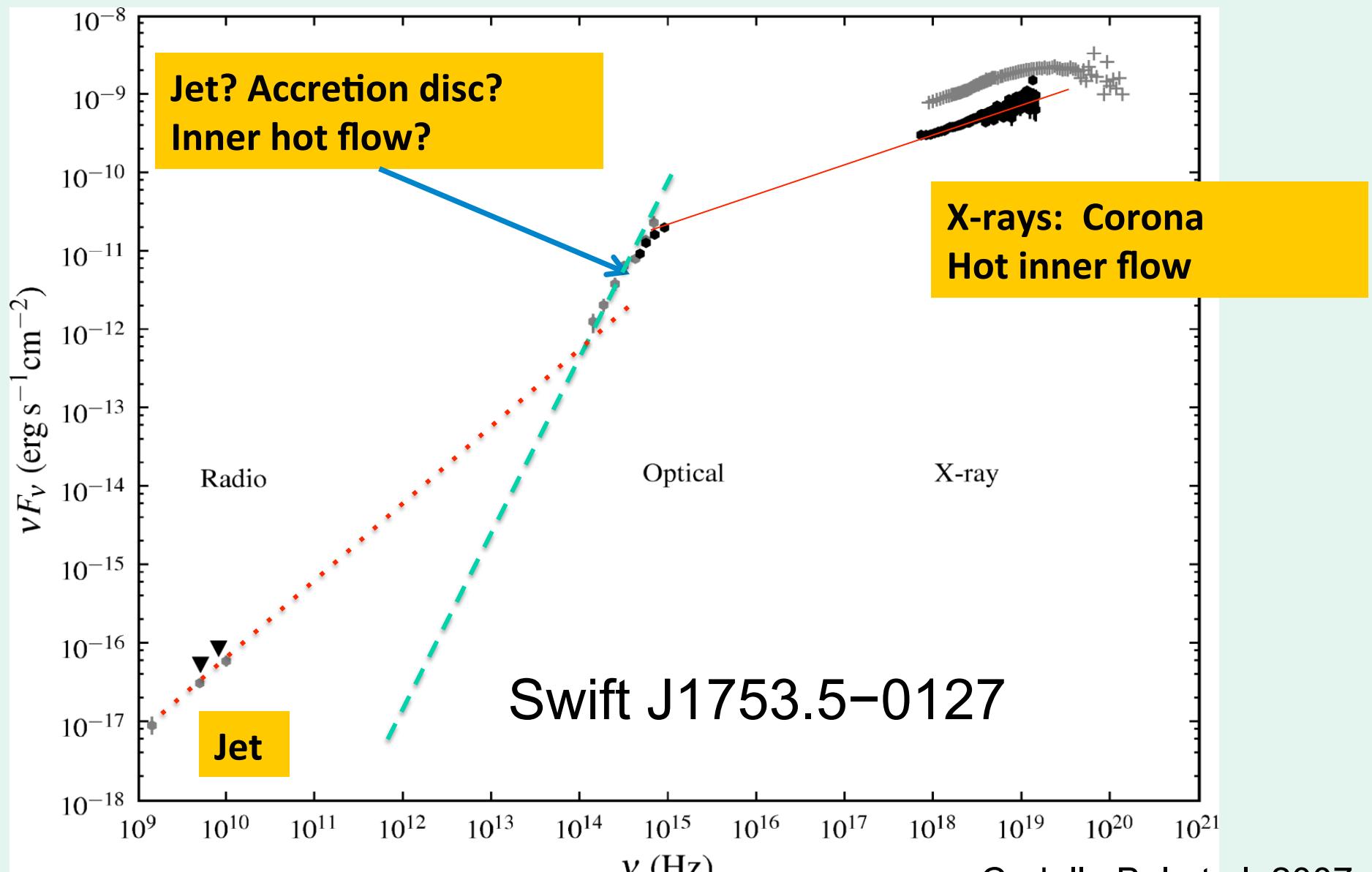
- Introduction: transient black hole X-ray binaries; spectral states and truncated disc model
- Spectral properties of optical/IR emission and flares
- A (hybrid) hot flow scenario

Black hole binaries: transients



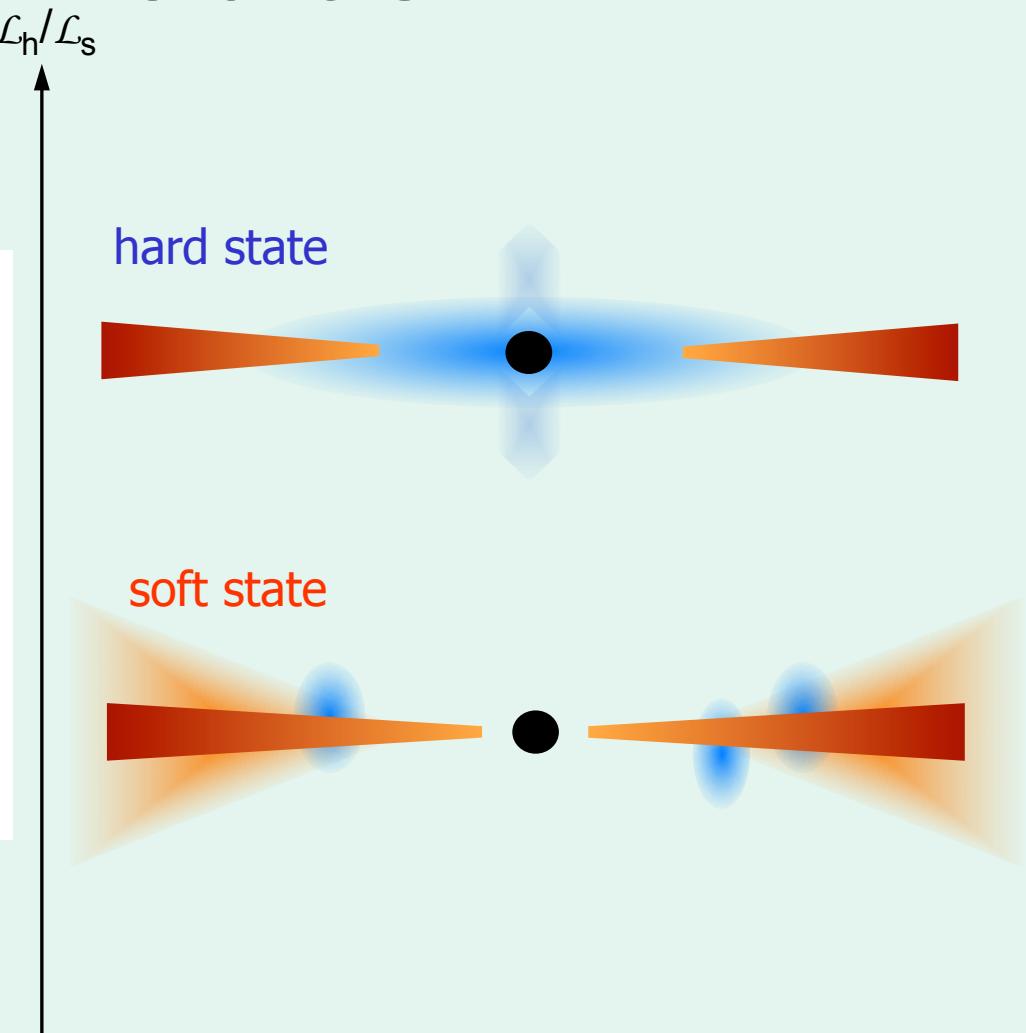
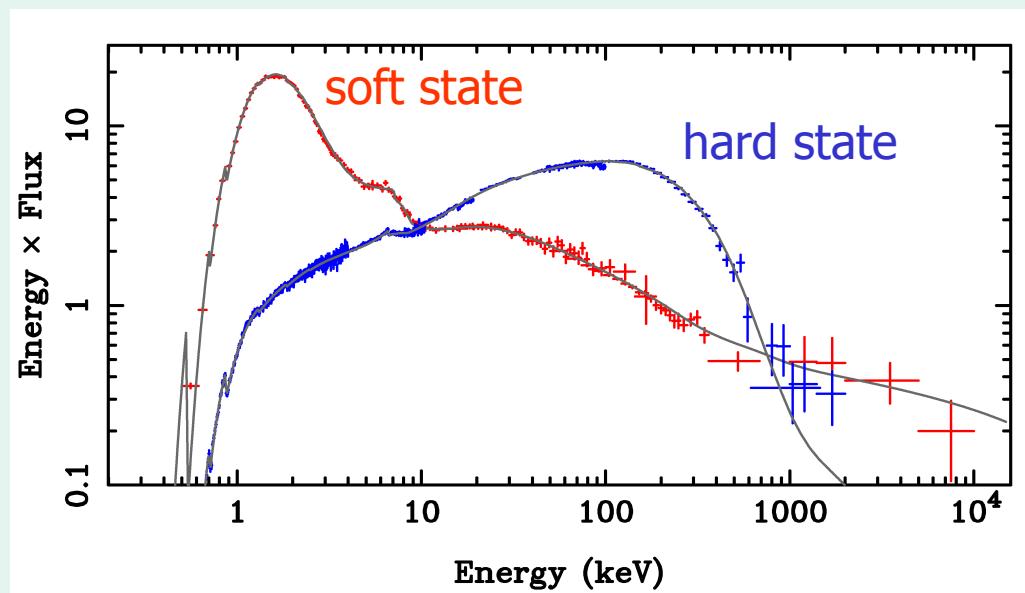
Done, Gierliński & Kubota 2007

Broad-band spectrum of LMXB

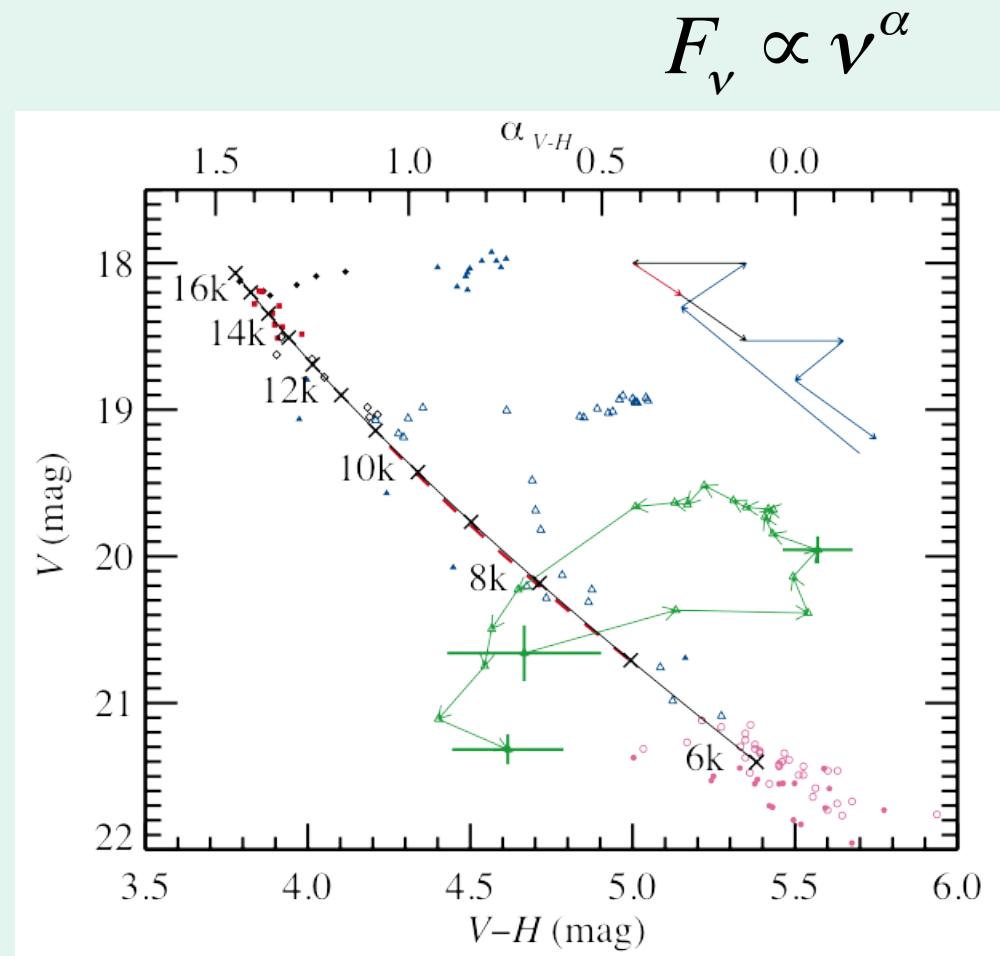
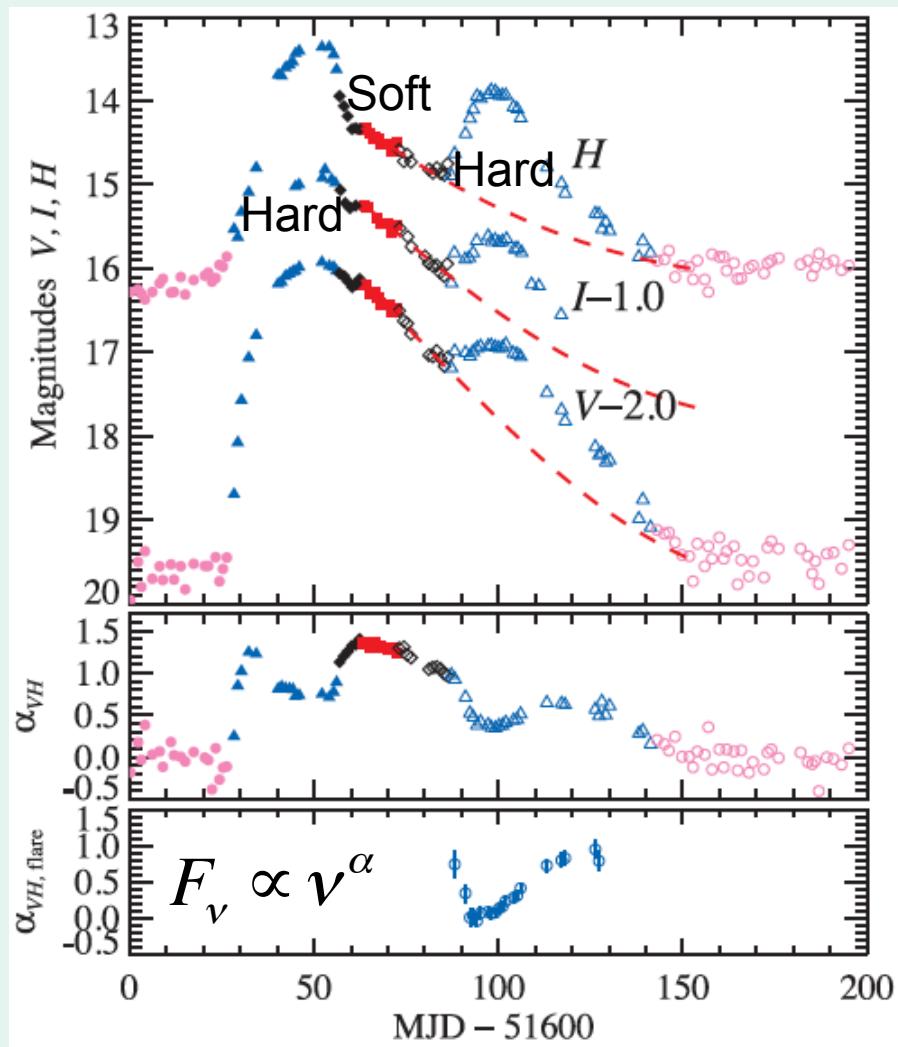


Cadolle Bel et al. 2007,
Durant et al. 2009

Spectral states – moving truncation radius

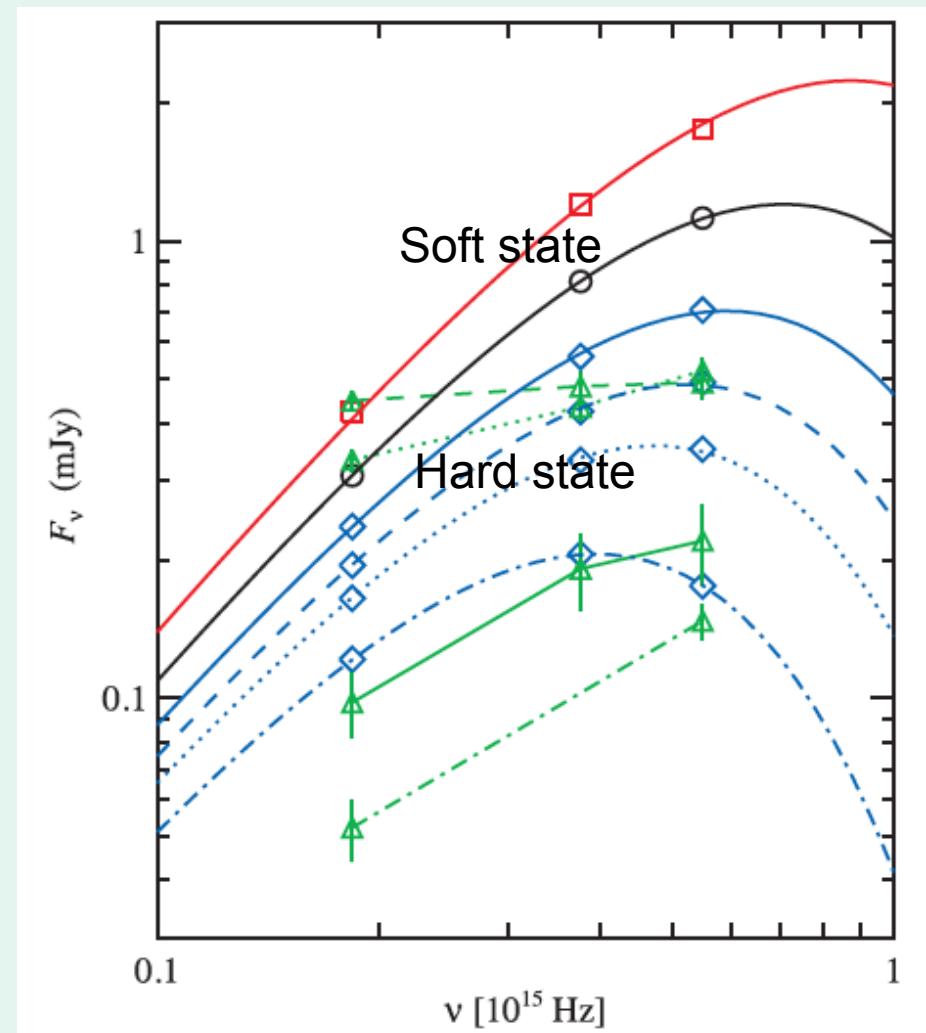
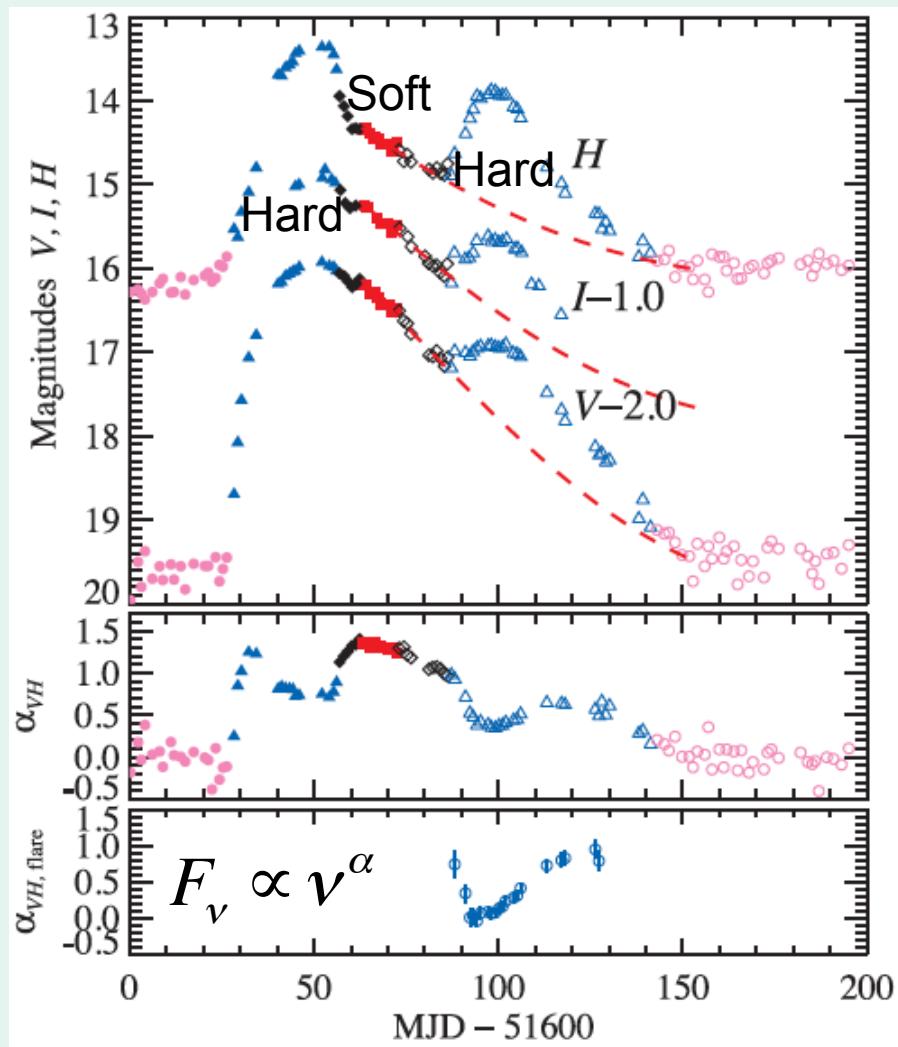


XTE J1550–564 in 2000 in OIR



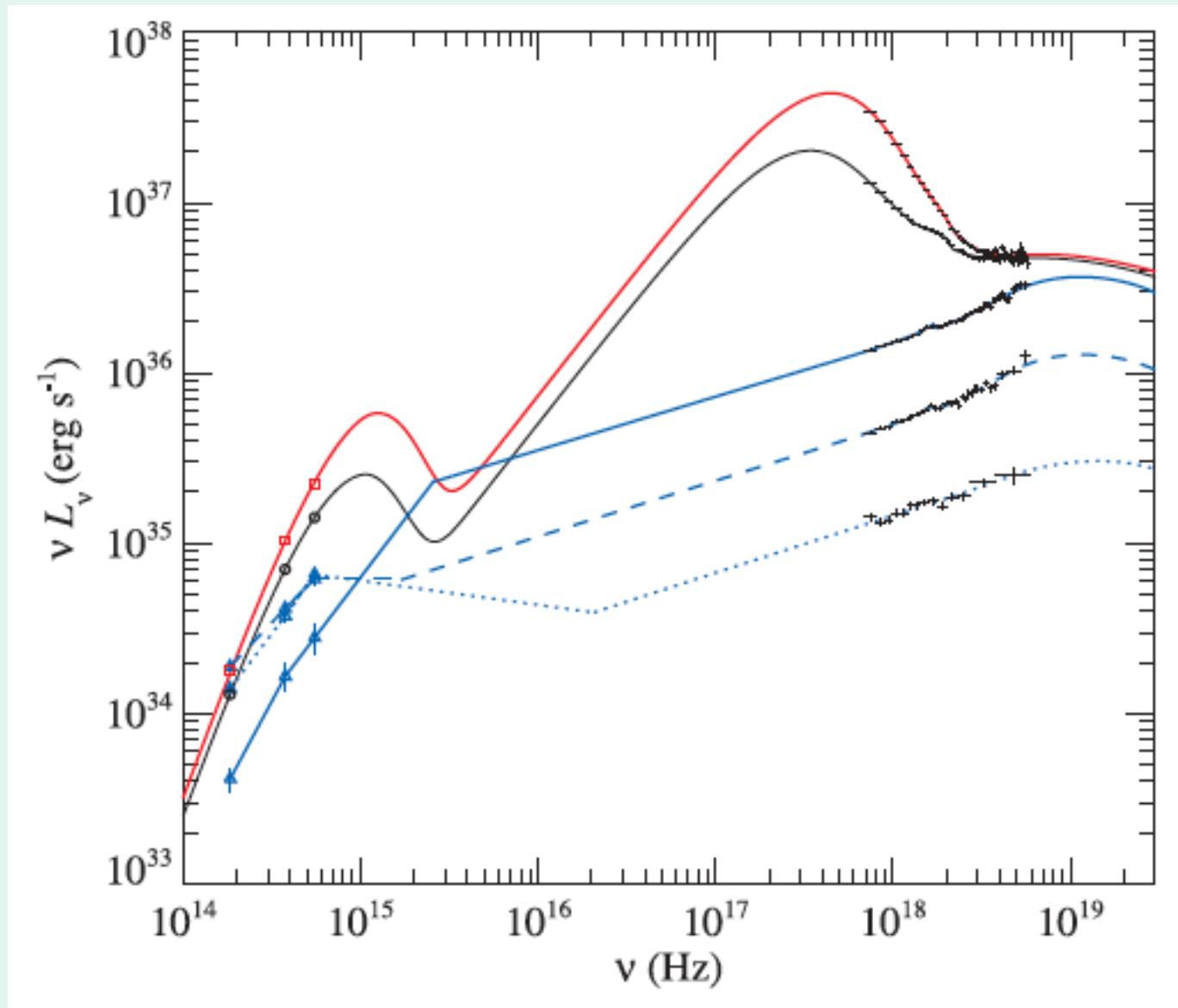
Flare in the OIR starts with alpha=+0.7. This contradicts the jet models (Russell et al. 2010, 2011).

XTE J1550–564 in 2000 in OIR

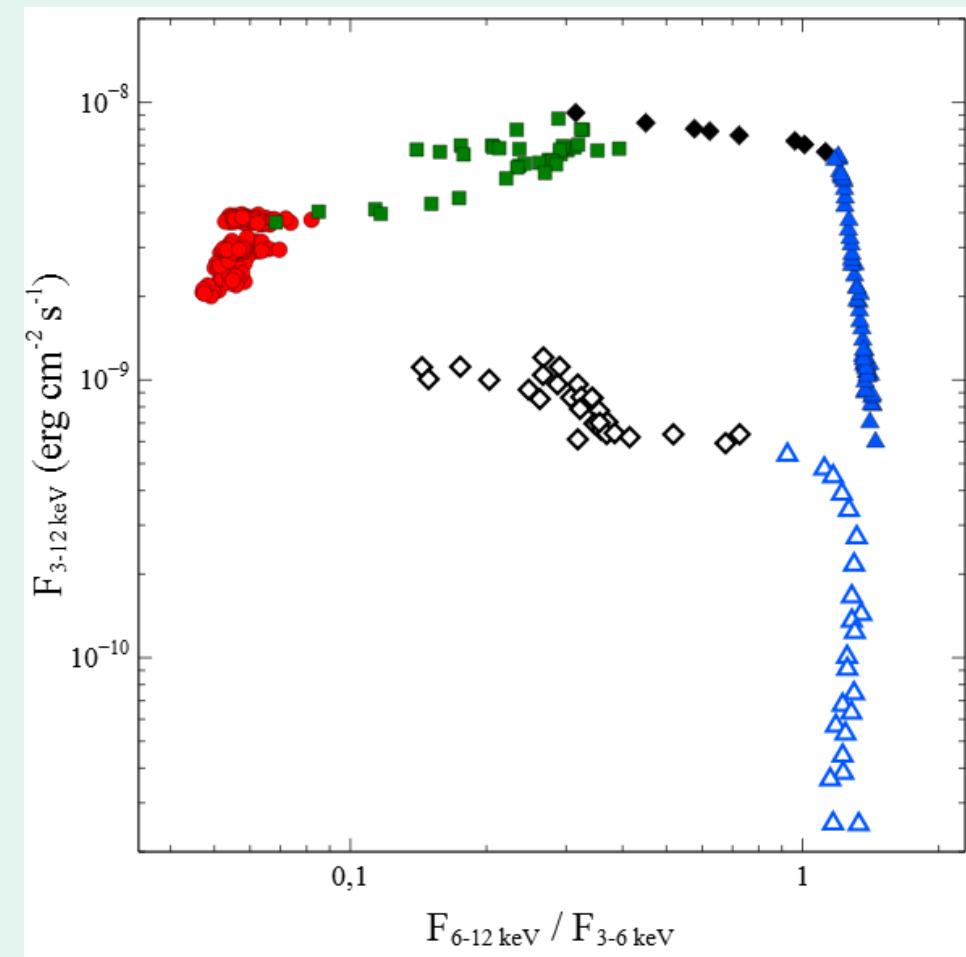
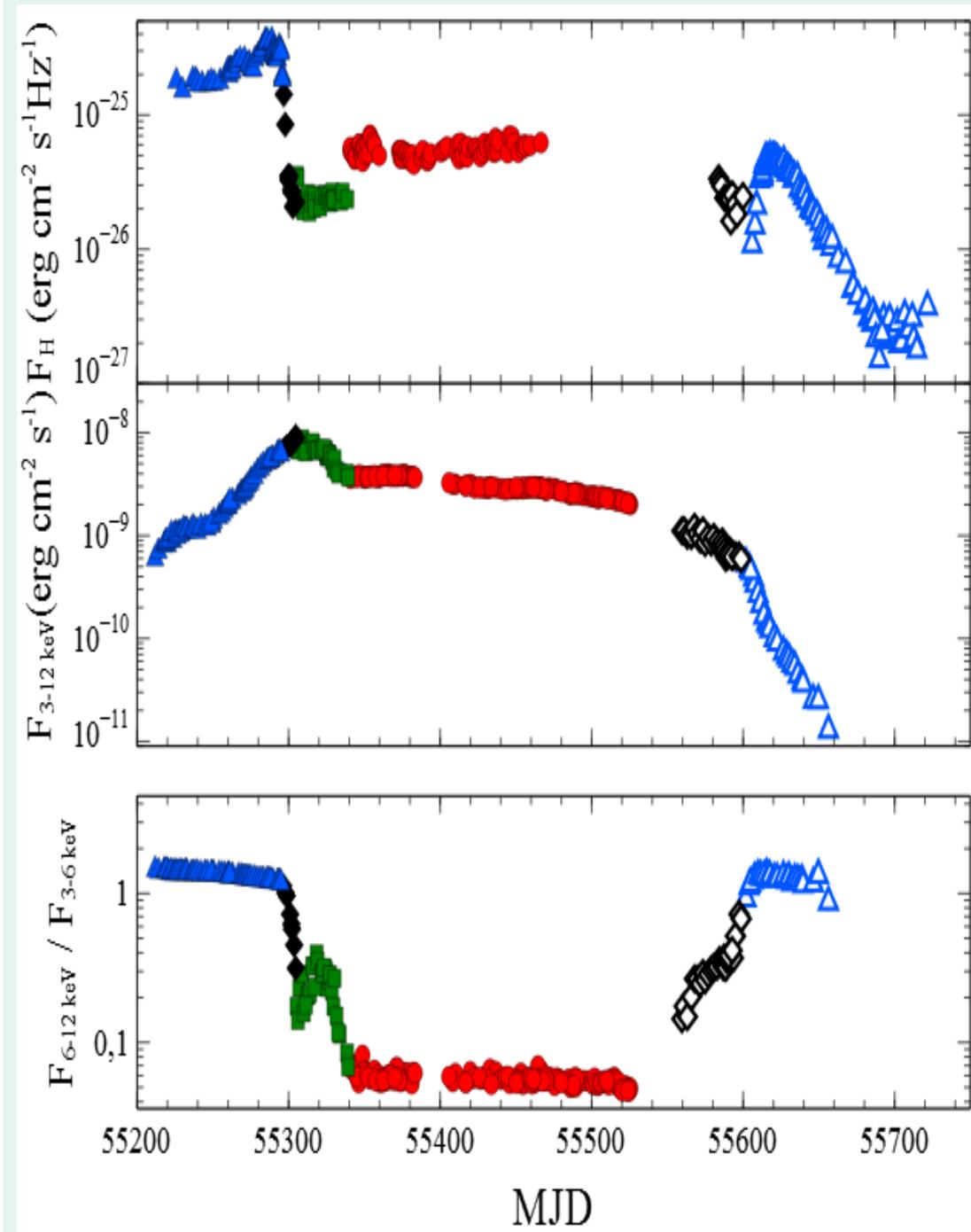


Flare in the OIR starts with alpha=+0.7. This contradicts the jet models (Russell et al. 2010, 2011).

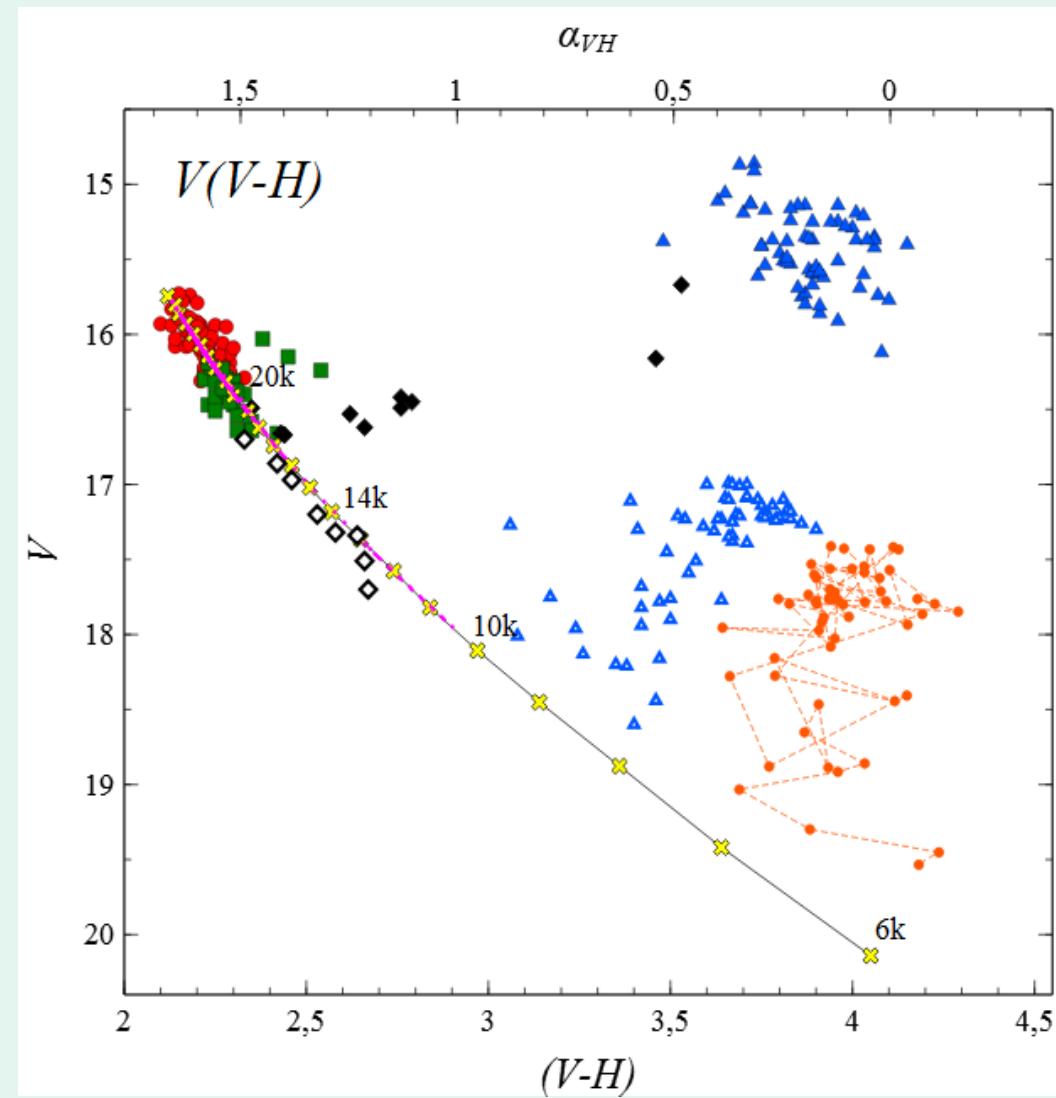
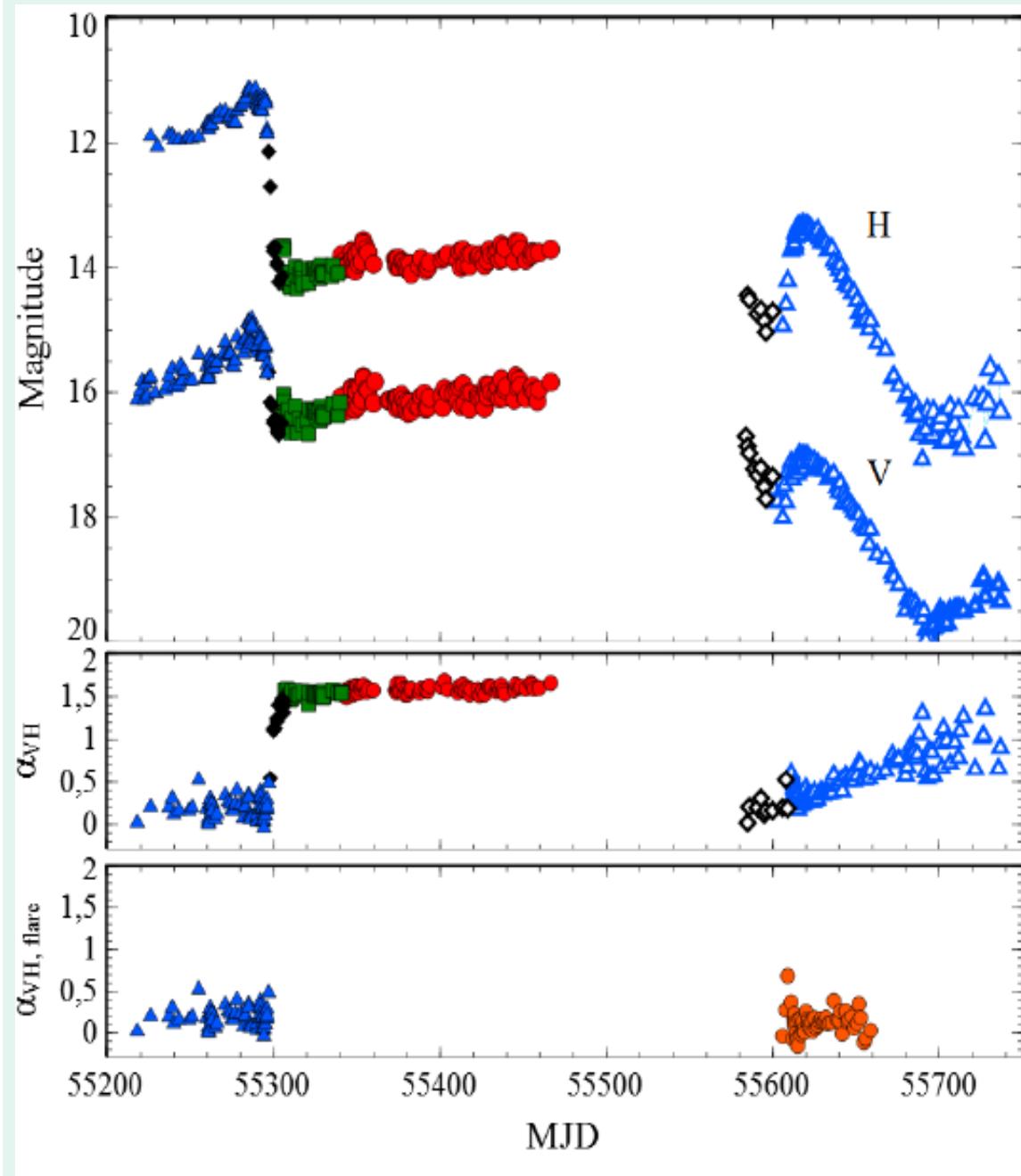
Broad-band spectrum of XTE J1550–564 in 2000



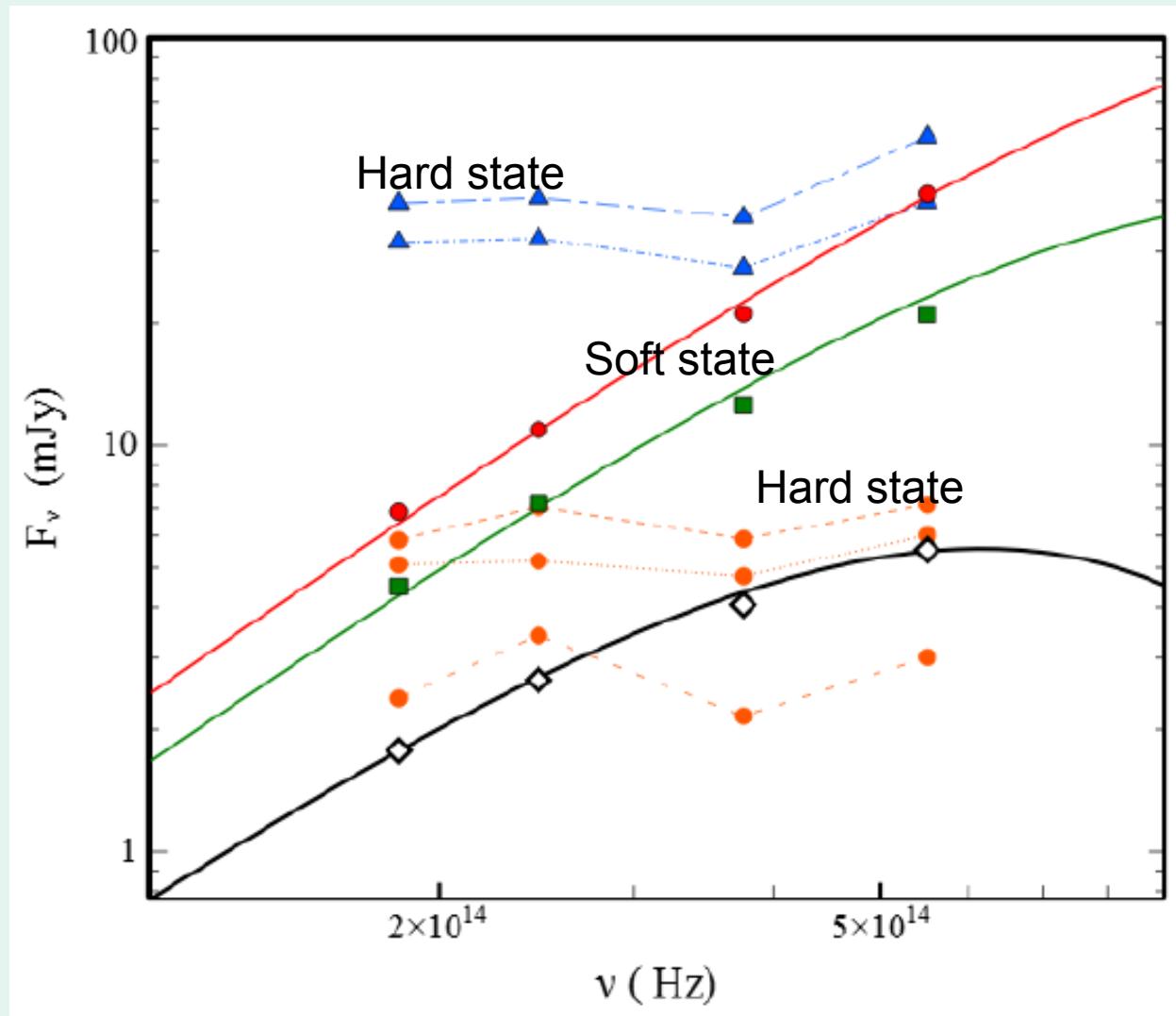
GX 339-4 in 2009-2010



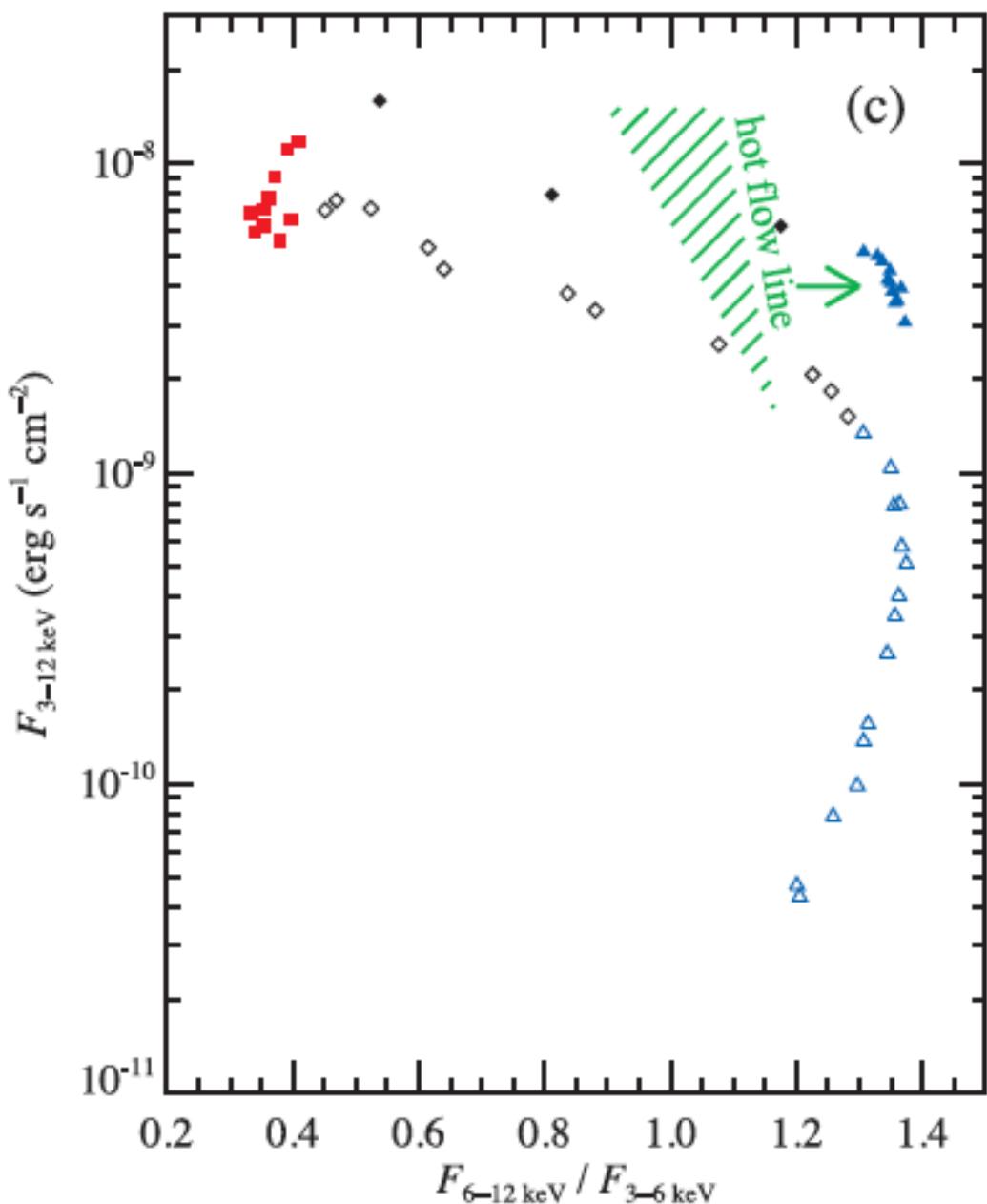
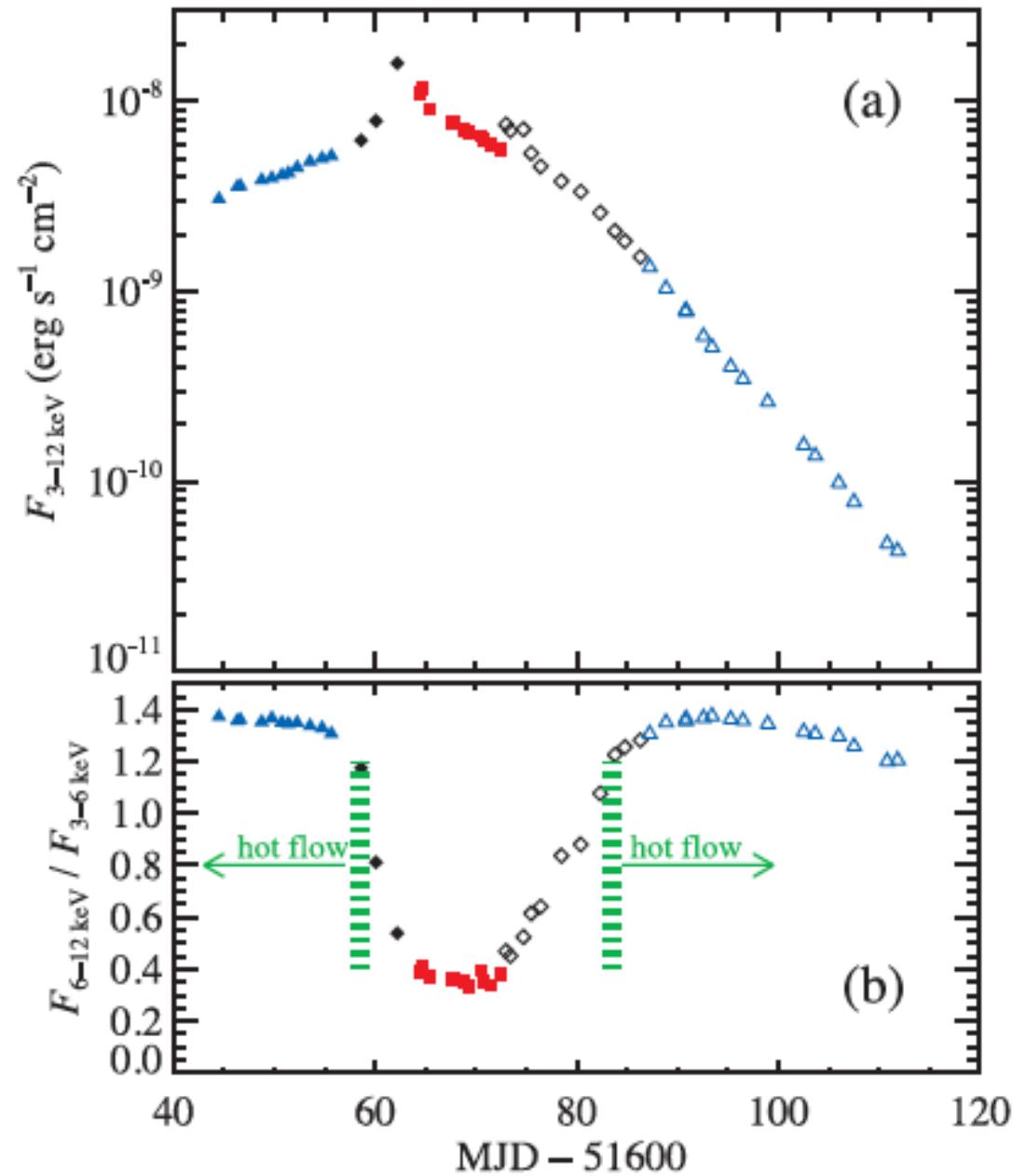
GX 339-4 in 2009-2010



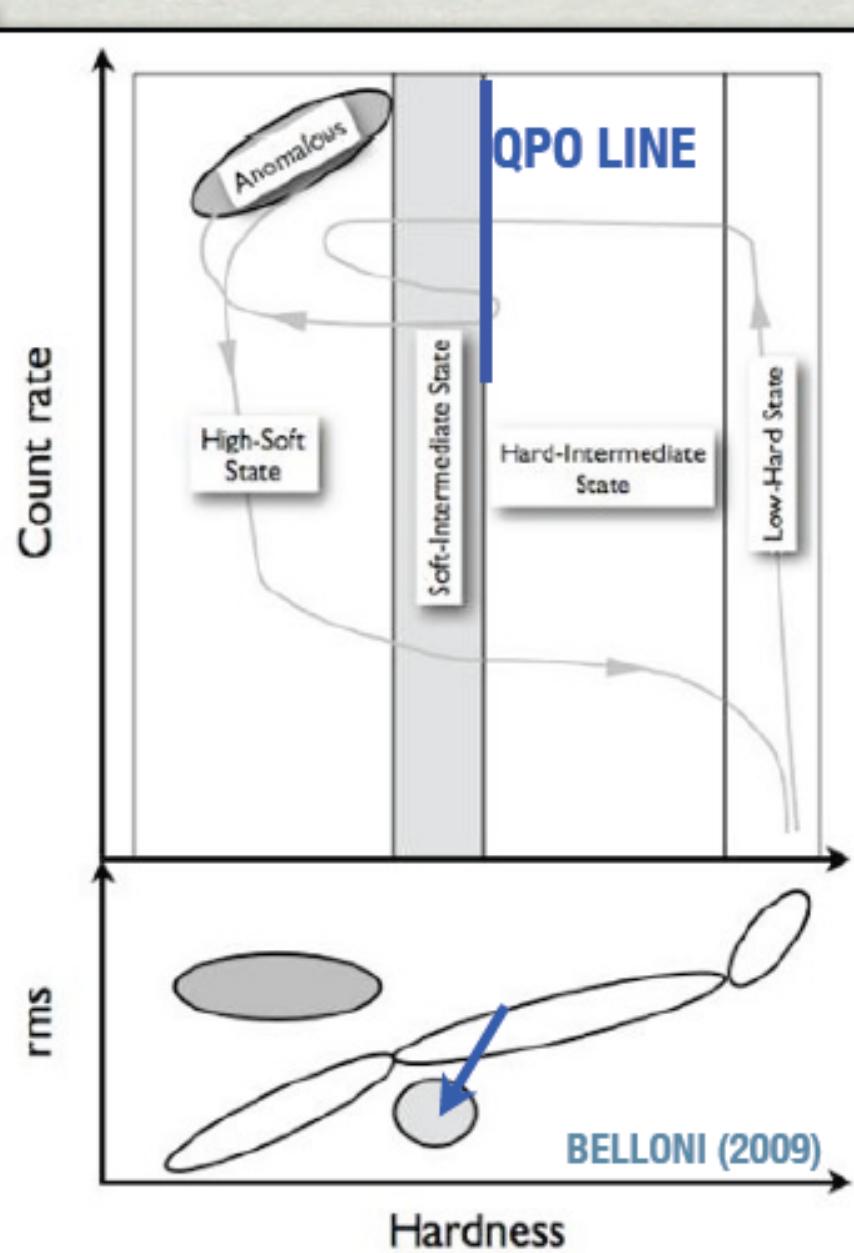
GX 339-4 in 2009-2010



XTE J1550–564 in 2000 in X-rays

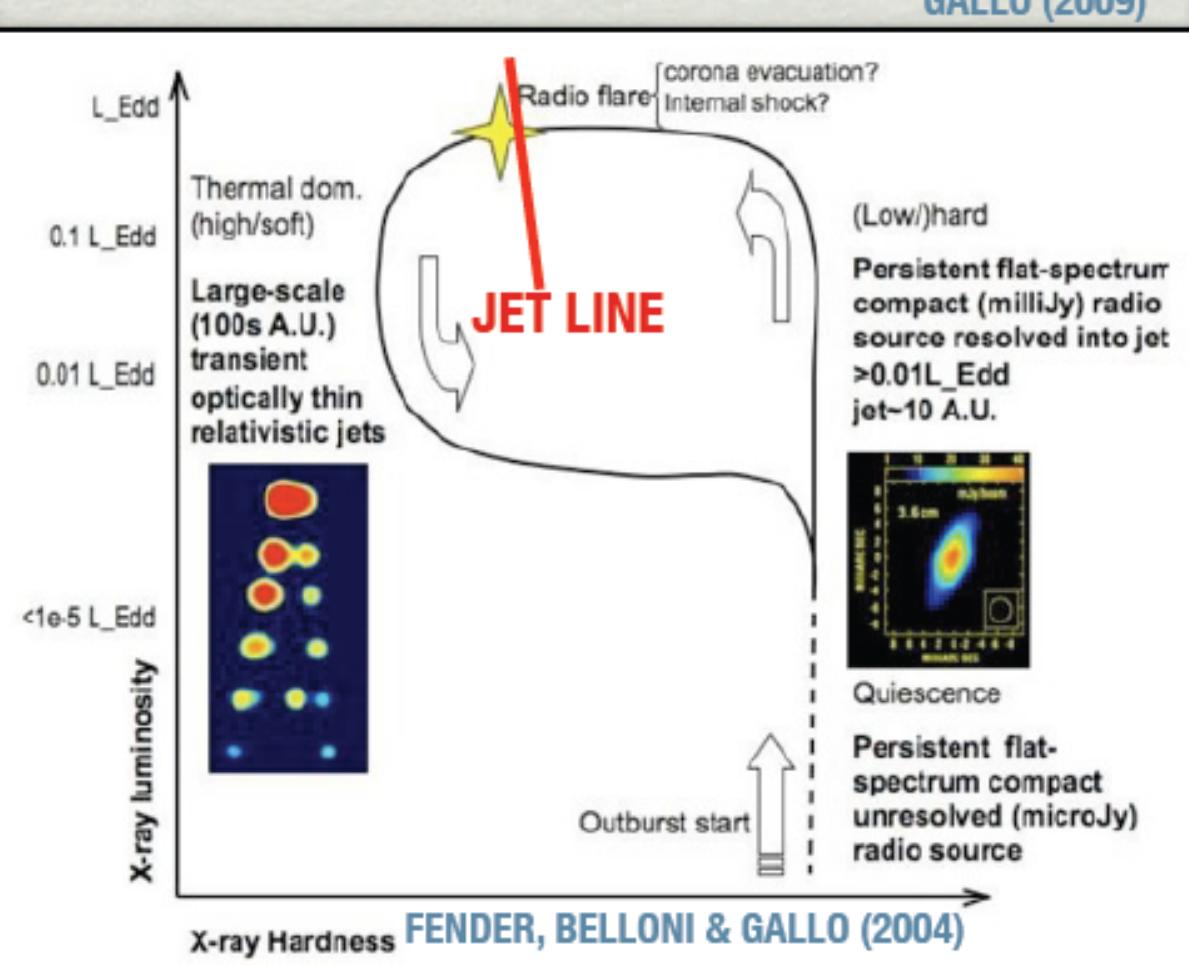


Radio vs X-rays: the jet and QPO line



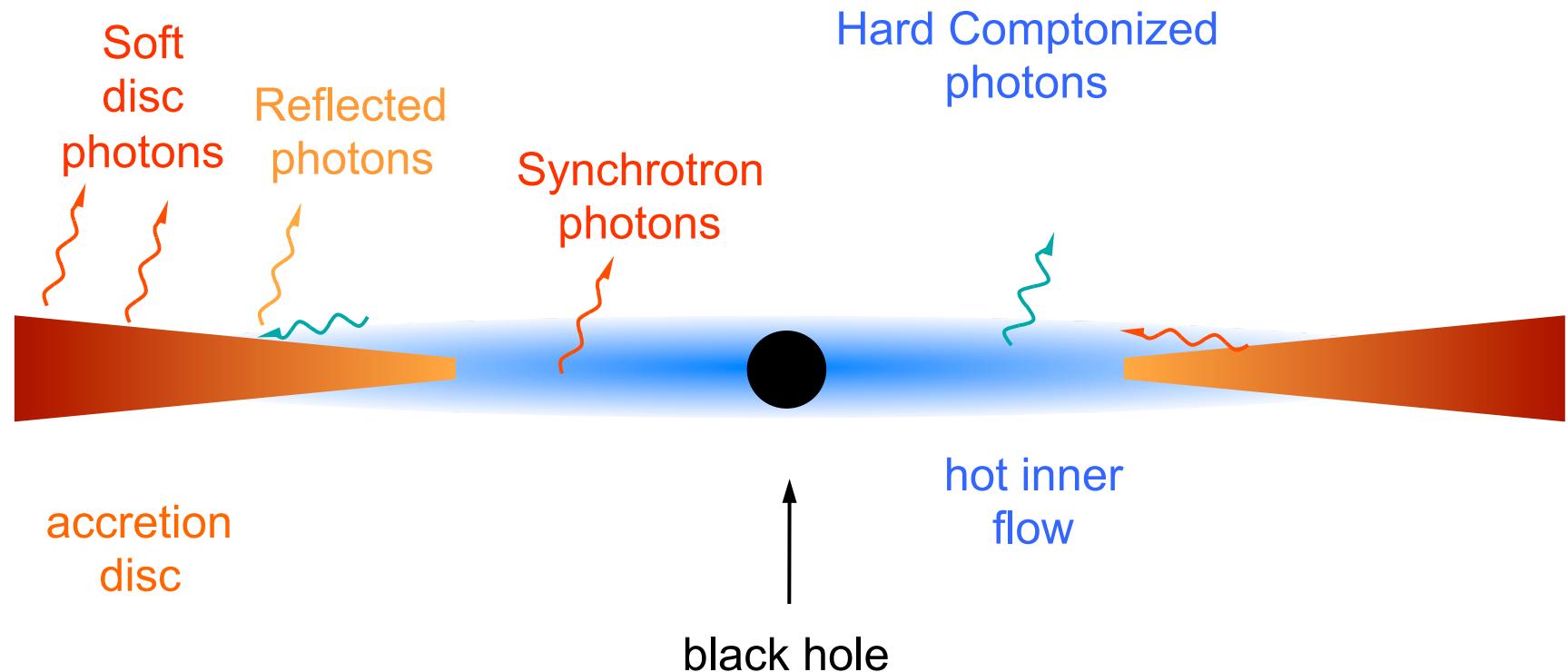
* A clear picture of their evolution

GALLO (2009)

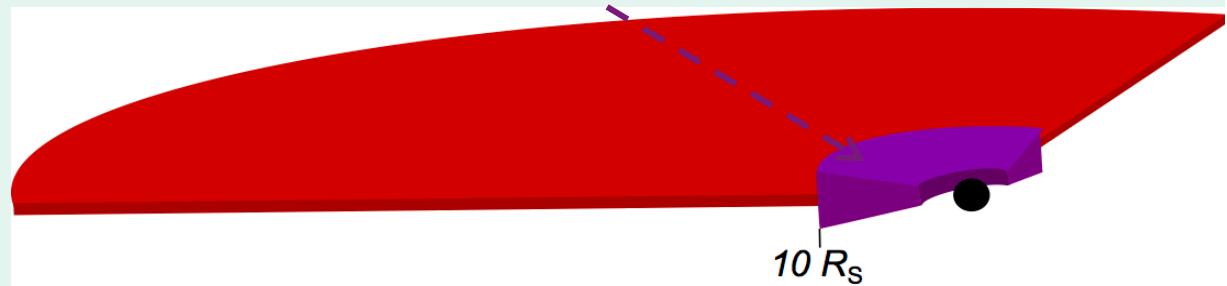
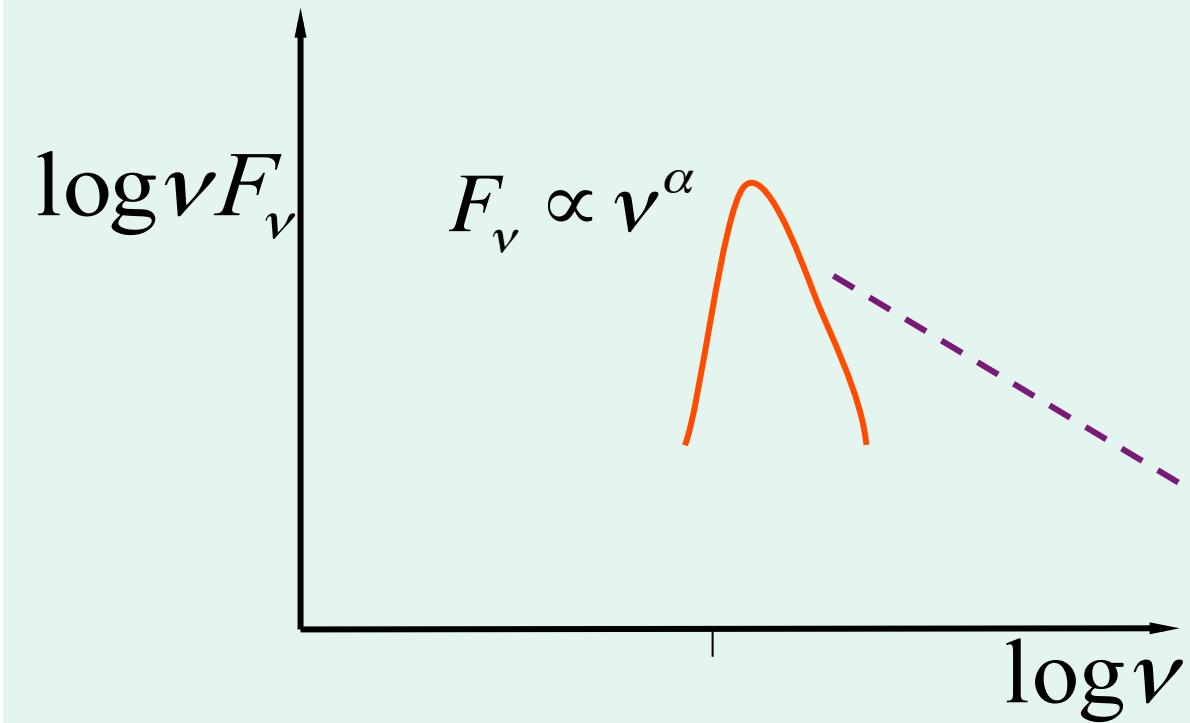


FENDER, BELLONI & GALLO (2004)

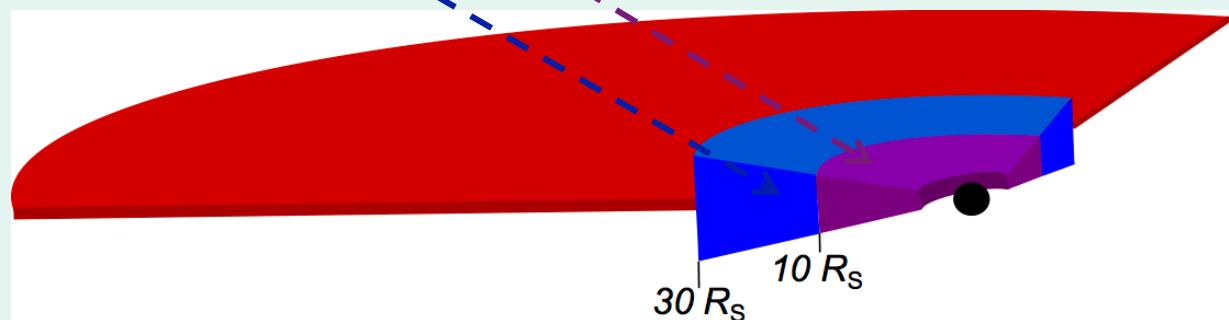
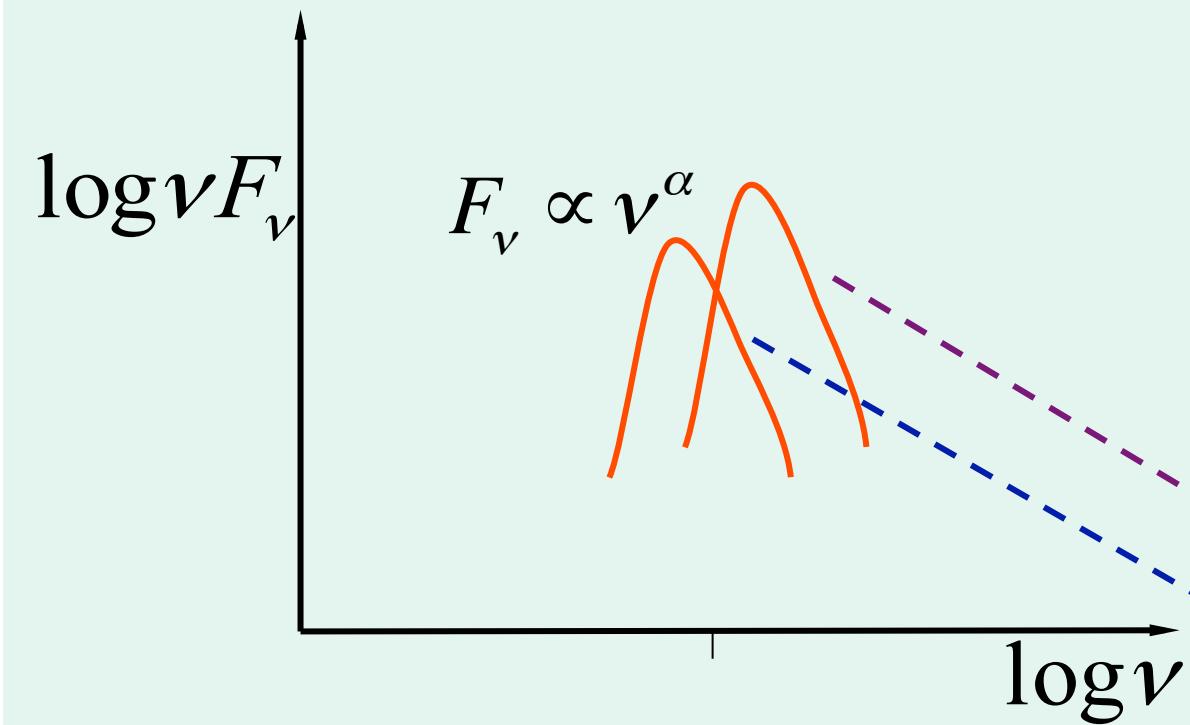
Hot inner flow in the hard state



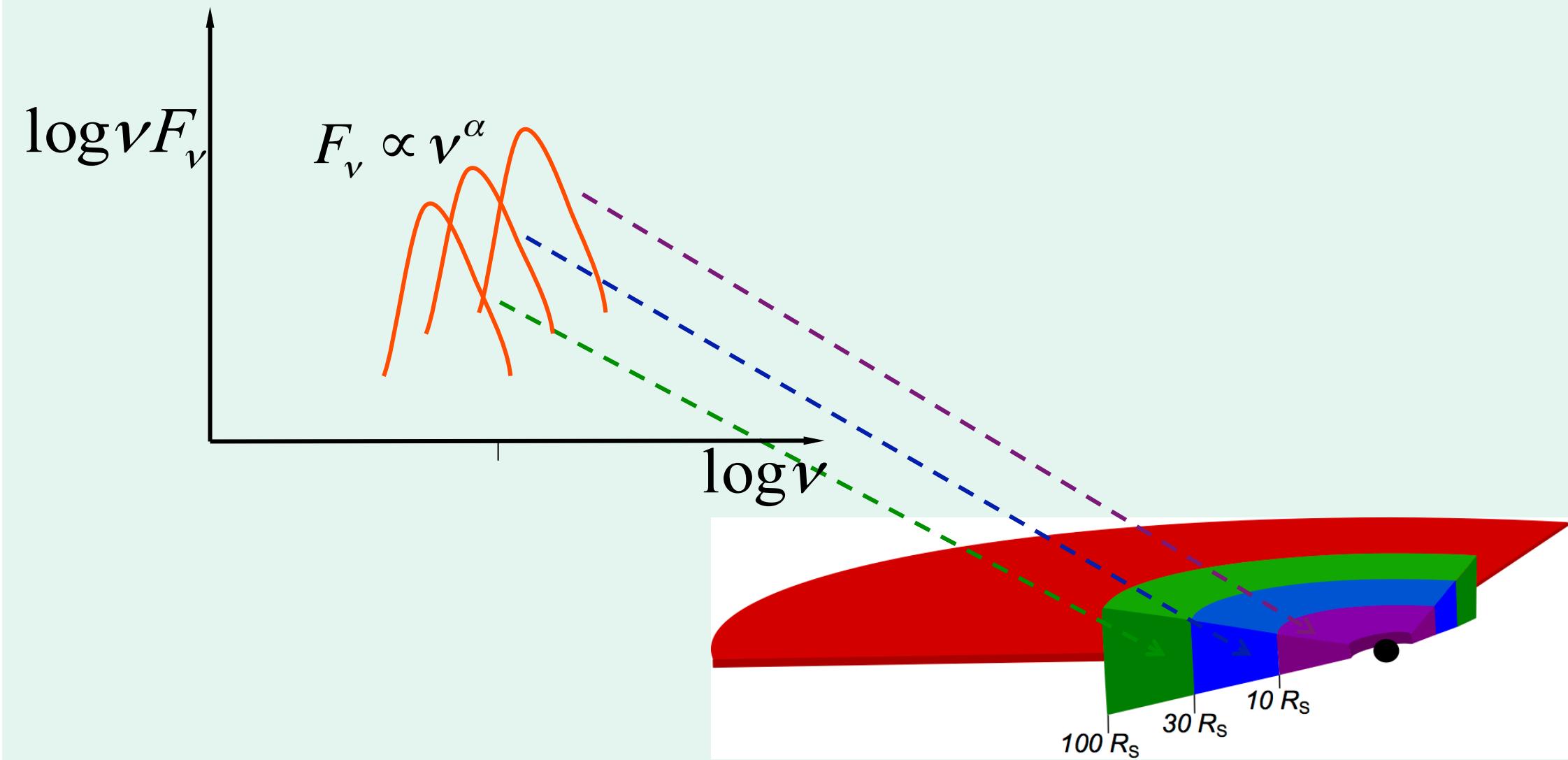
Inhomogeneous accretion flow



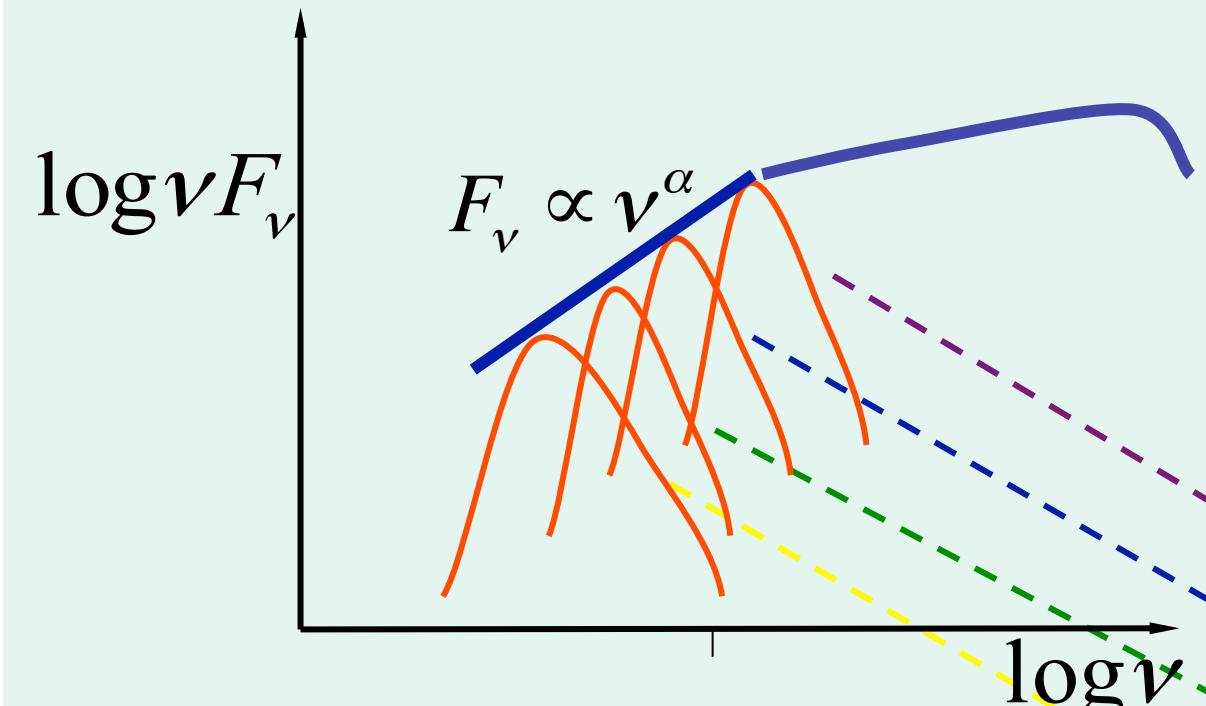
Inhomogeneous accretion flow



Inhomogeneous accretion flow



Inhomogeneous accretion flow



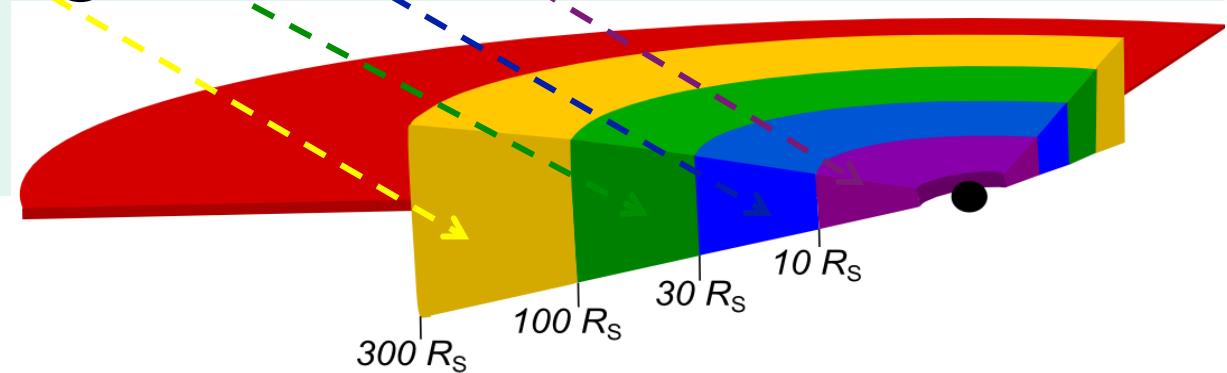
$$B \propto R^{-\beta}$$

$$\tau \propto R^{-\theta}$$

$$\tau(\gamma) \propto \gamma^{-p}$$

$$\nu_t \propto R^{-[\beta(p+2)+2\theta]/(p+4)}$$

$$\alpha = \frac{5\theta + \beta(2p + 3) - 2p - 8}{\beta(p + 2) + 2\theta}$$



Conclusions

- OIR spectrum of LMXBs in the hard state is a power-law.
- In the soft state, OIR emission is thermal and the irradiated disc is the likely source.
- OIR flares are consistent with the synchrotron emission from the hybrid hot flow. The “hot flow line” seems to coincide with the “radio jet line” and the “QPO line”.