

Spectral/timing evolution of black-hole binaries

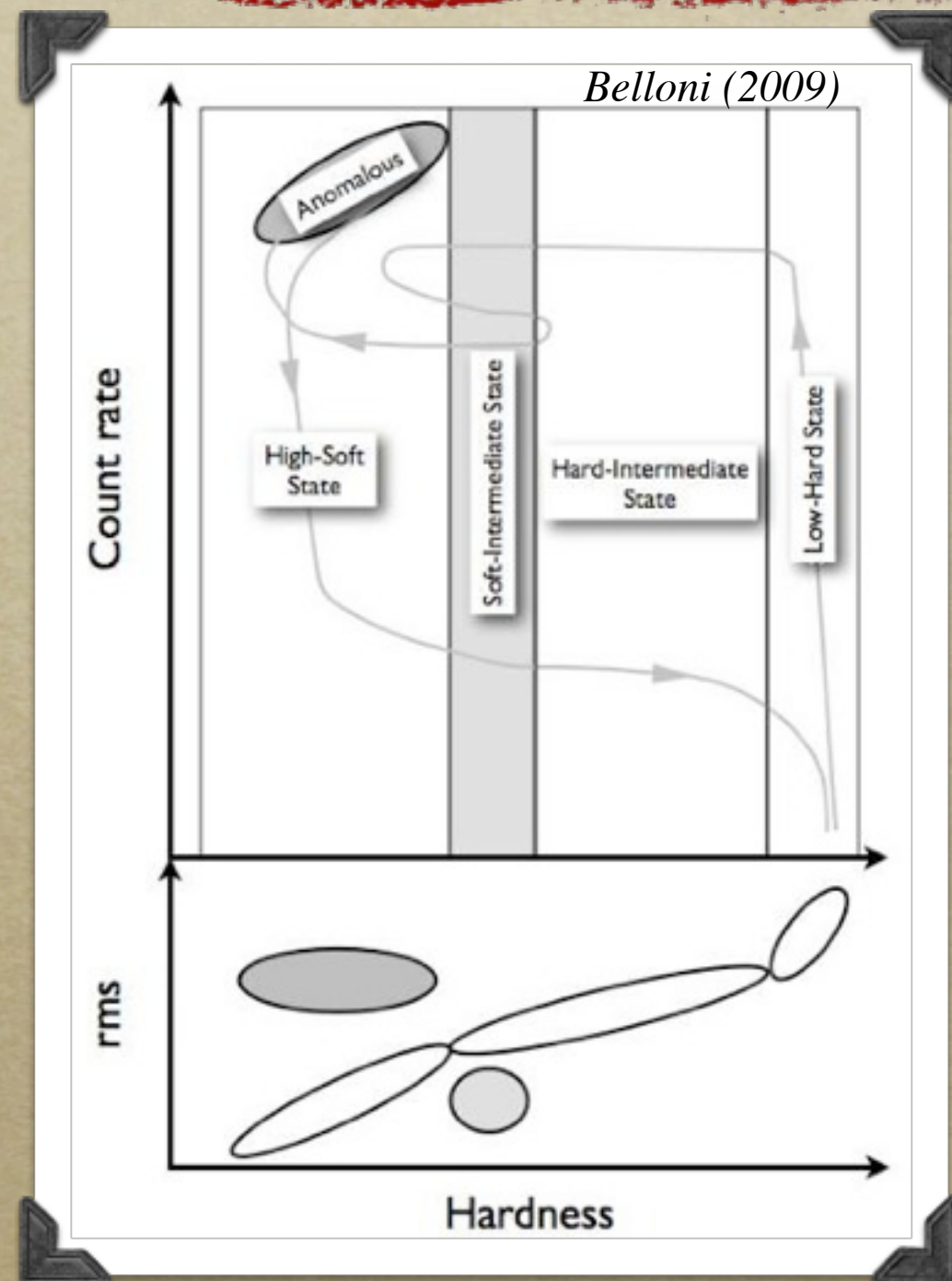
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Main points

- *Evolution through states*
- *State transitions are sharp*
- *Jet ejection is clearly connected*
- *Neutron-star binaries do the same*
- *High (> 20 keV) energy is crucial*

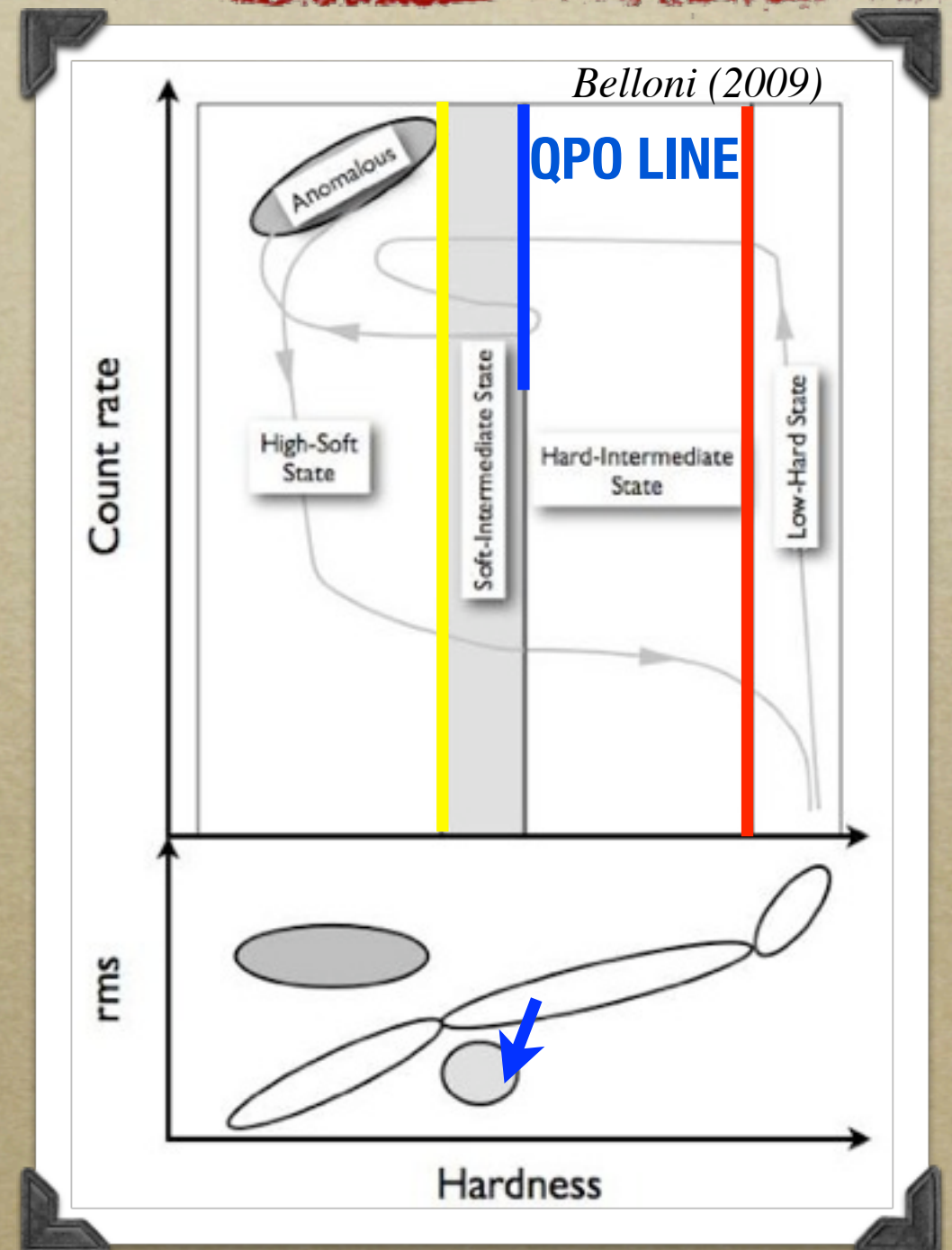
Evolution through states

- *Hard and soft states are not everything*
- *Four distinct states can be identified*
- *Time variability is important*
- *Transitions mark states*



Transitions are sharp

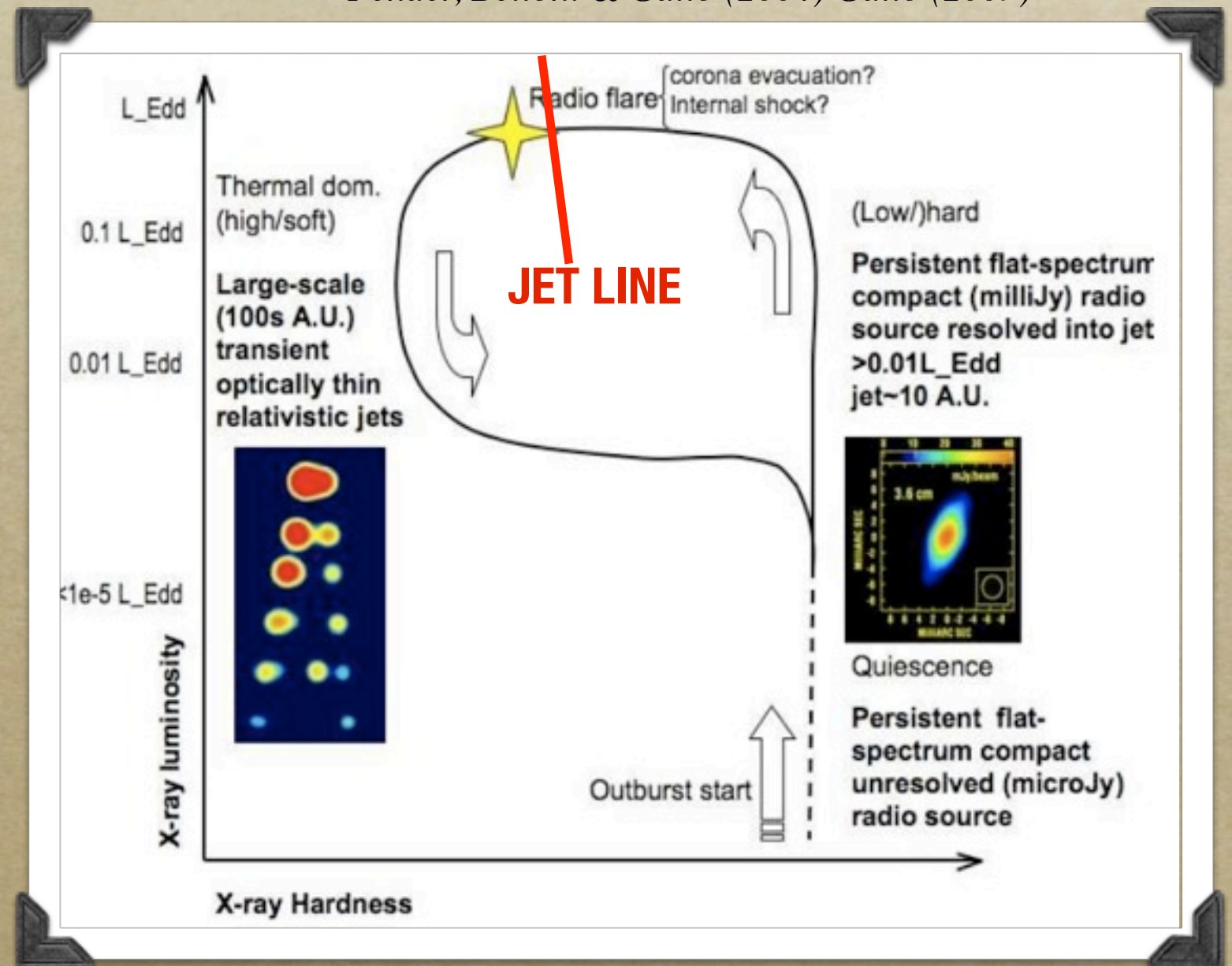
- *Grey region: low variability, high-frequency oscillations*
- *QPO line: variability changes, a new QPO appears*
- *Transition can take a few seconds*



Jet ejection is clearly connected

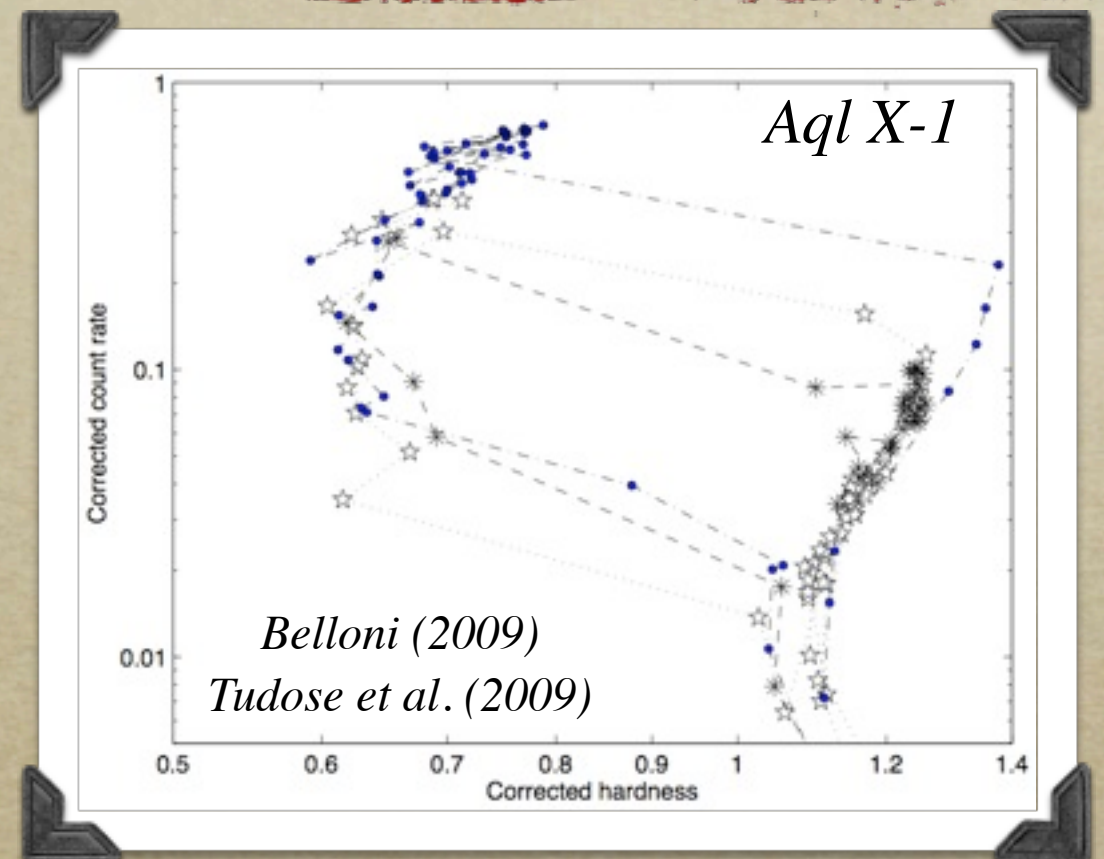
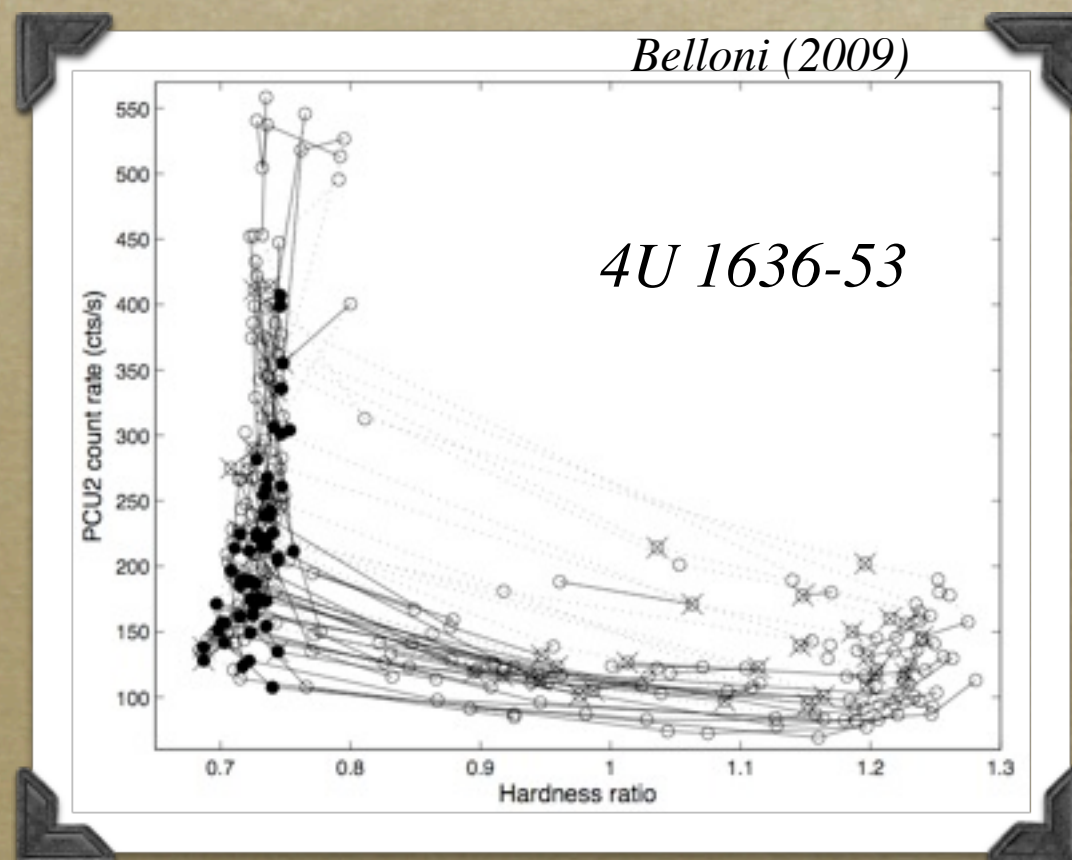
Fender, Belloni & Gallo (2004) Gallo (2009)

- *Hard, variable: steady jet*
- *Soft, quiet: no jet*
- *Transition: jet line*
- *\sim QPO line*



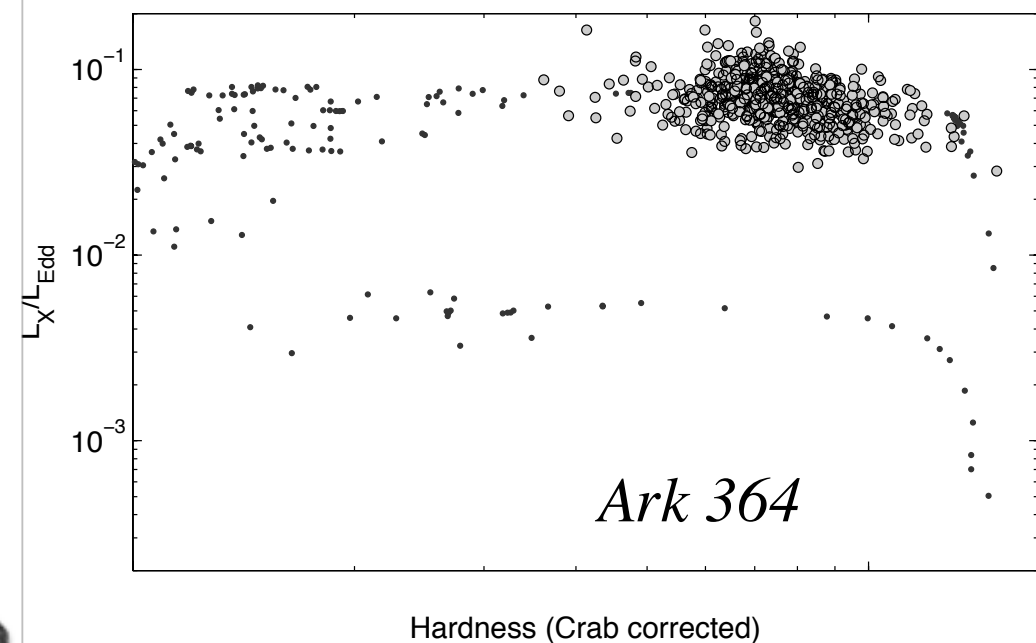
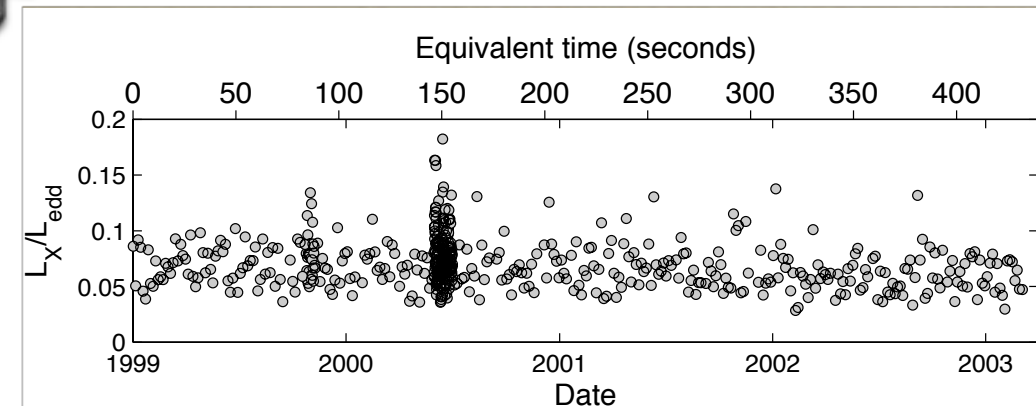
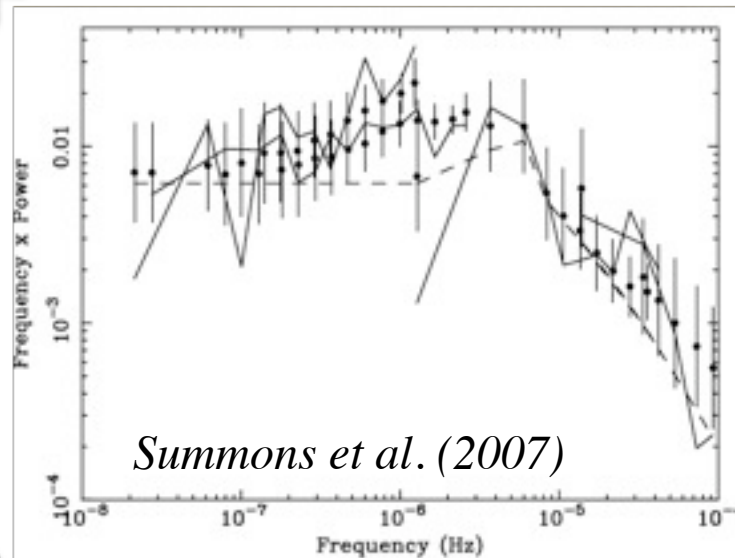
Neutron stars do the same

- *Similar cycle and evolution*
- *Radio ejections during transitions*



AGN do (almost) the same

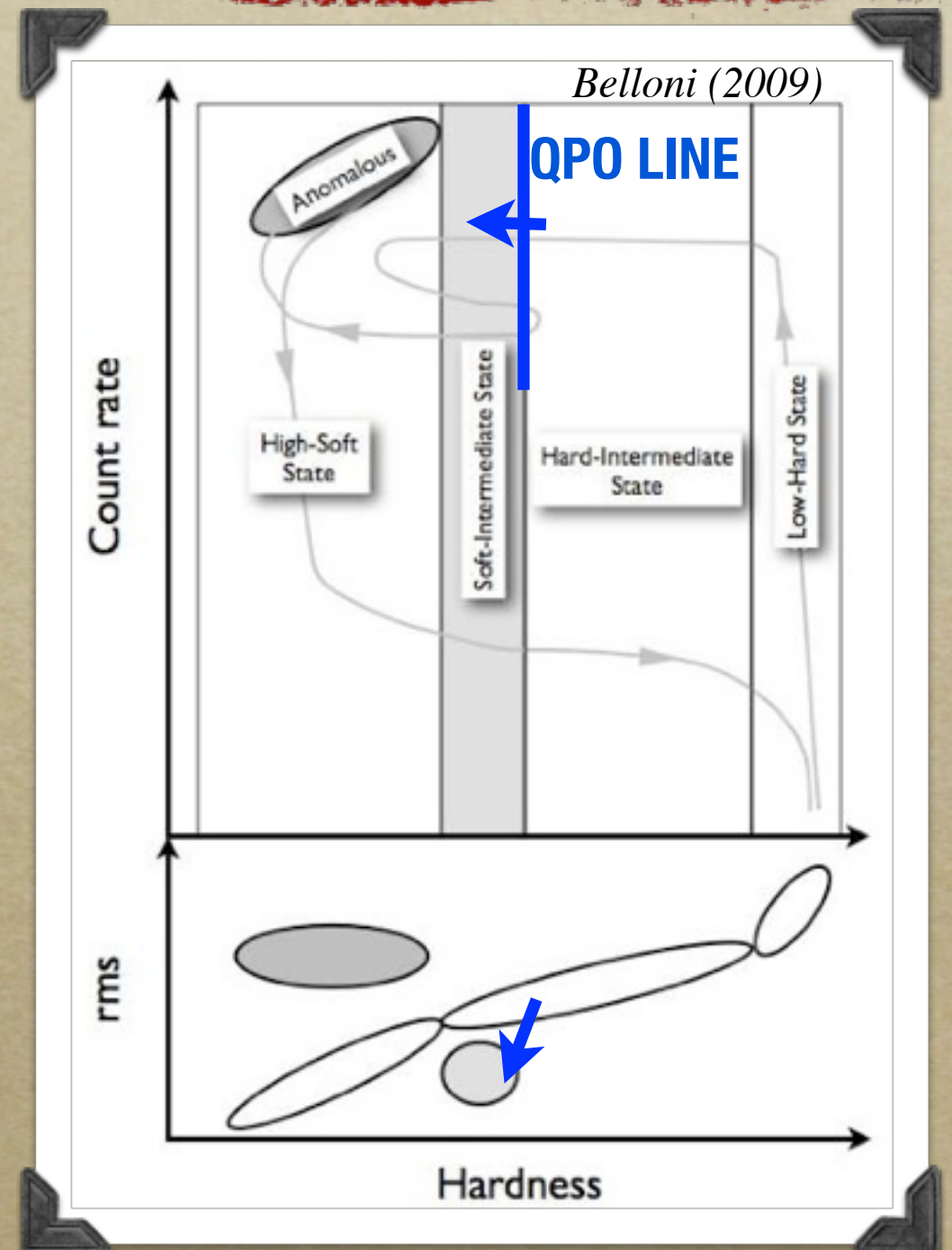
- *Most AGN are on the variable branch*
- *A couple are in HIMS*
- *Variability confirms..*
- *.. only those*



Belloni (2009)

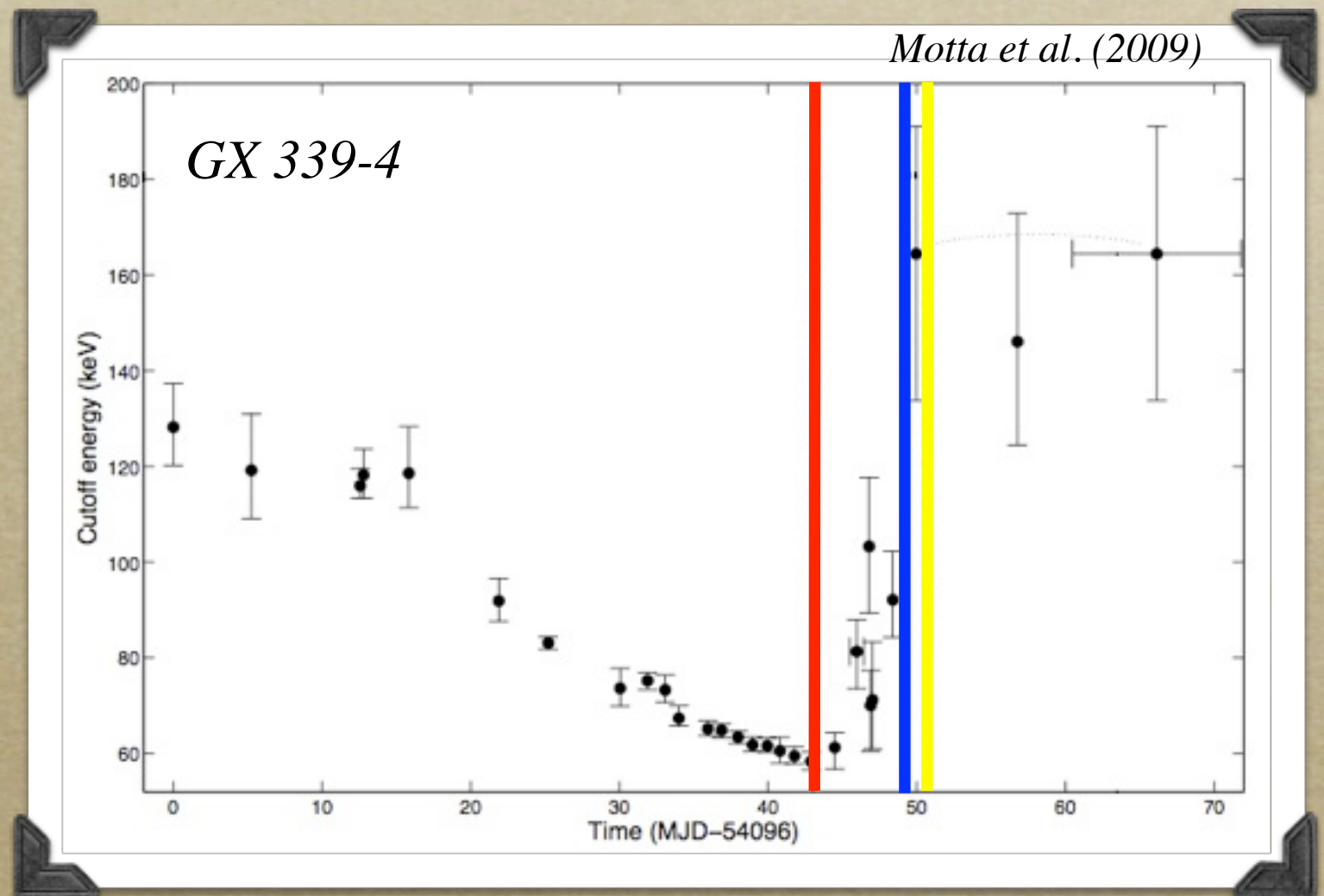
High (> 20 keV) is crucial

- *Timing changes*
- *Spectrum does not change much*
- *Change driven by hard component*
- *What happens at higher energies?*



High (> 20 keV) is crucial

- *High-E cutoff (temperature)*
- *Clear variation*
- *From thermal to non-thermal?*



see poster by S. Motta

The Jet Paradigm: from Microquasars to Quasars

- *Springer Lecture Notes for Physics*
- *10 chapters*
- *Publication: November 2009*
- *X-ray Binaries to Active Galactic Nuclei*
- *Papers on arXiv next week*

COSPAR 2010 event

- *Bremen, July 2010*

