Hunting discrete features in Rapid Burster type I bursts

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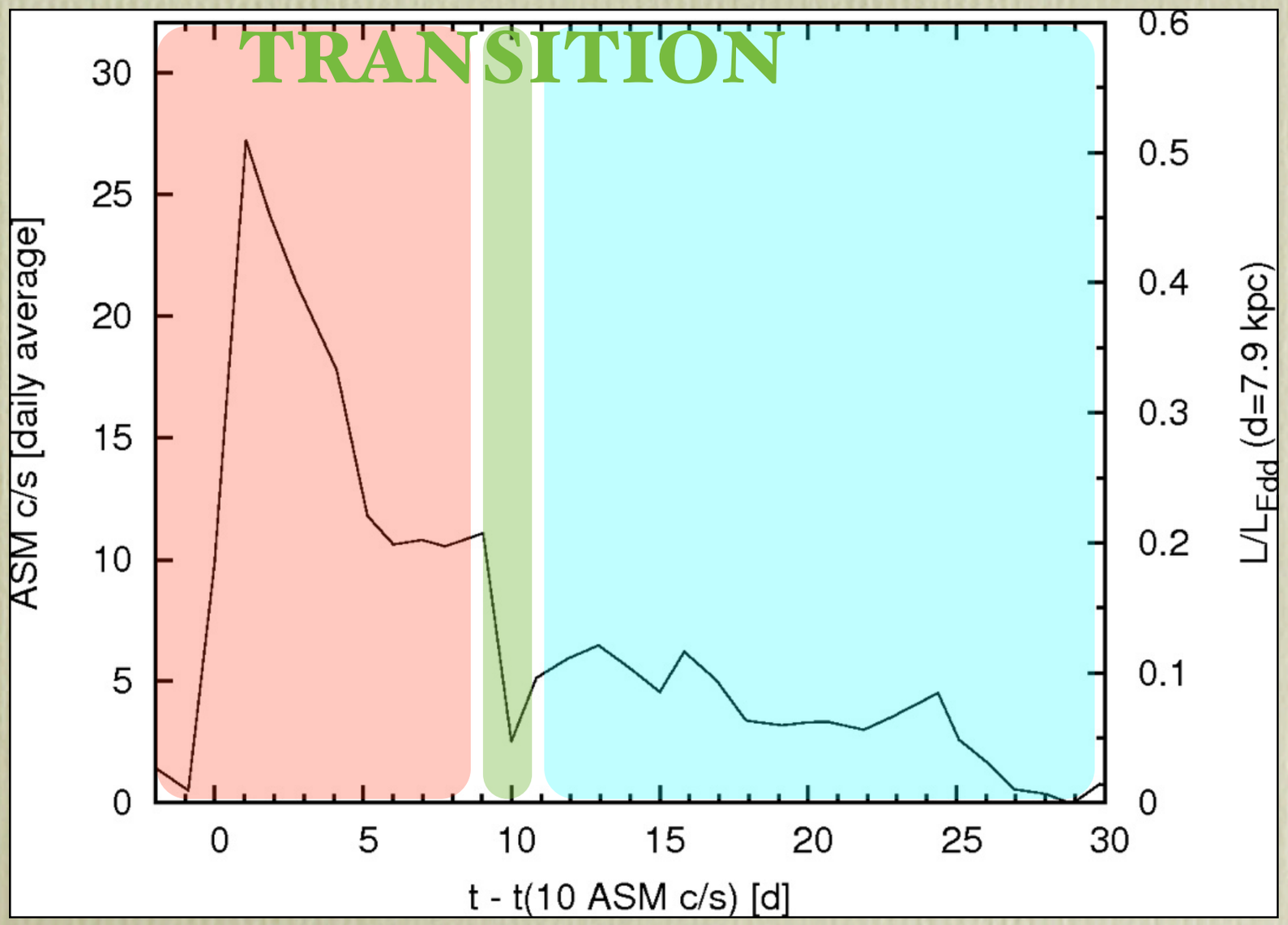
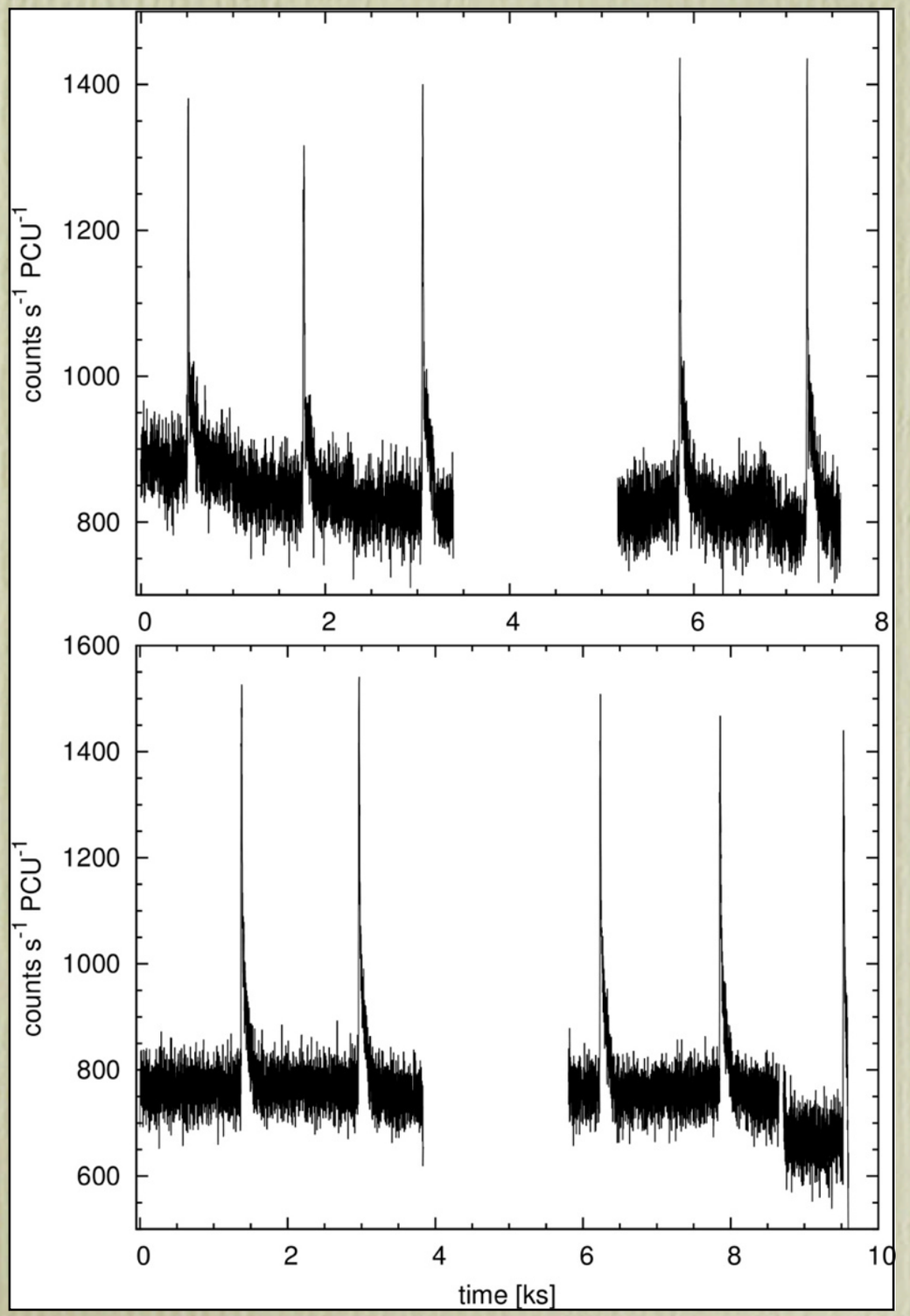
Rapid Burster outbursts

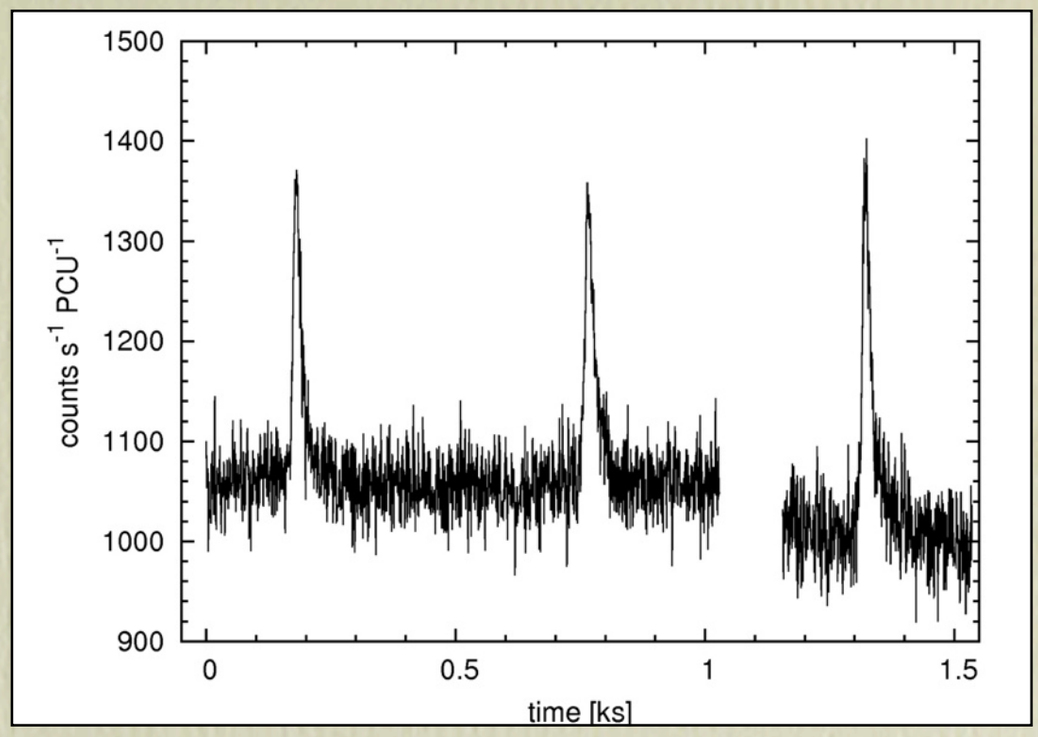
SOFT STATE **HARD STATE**



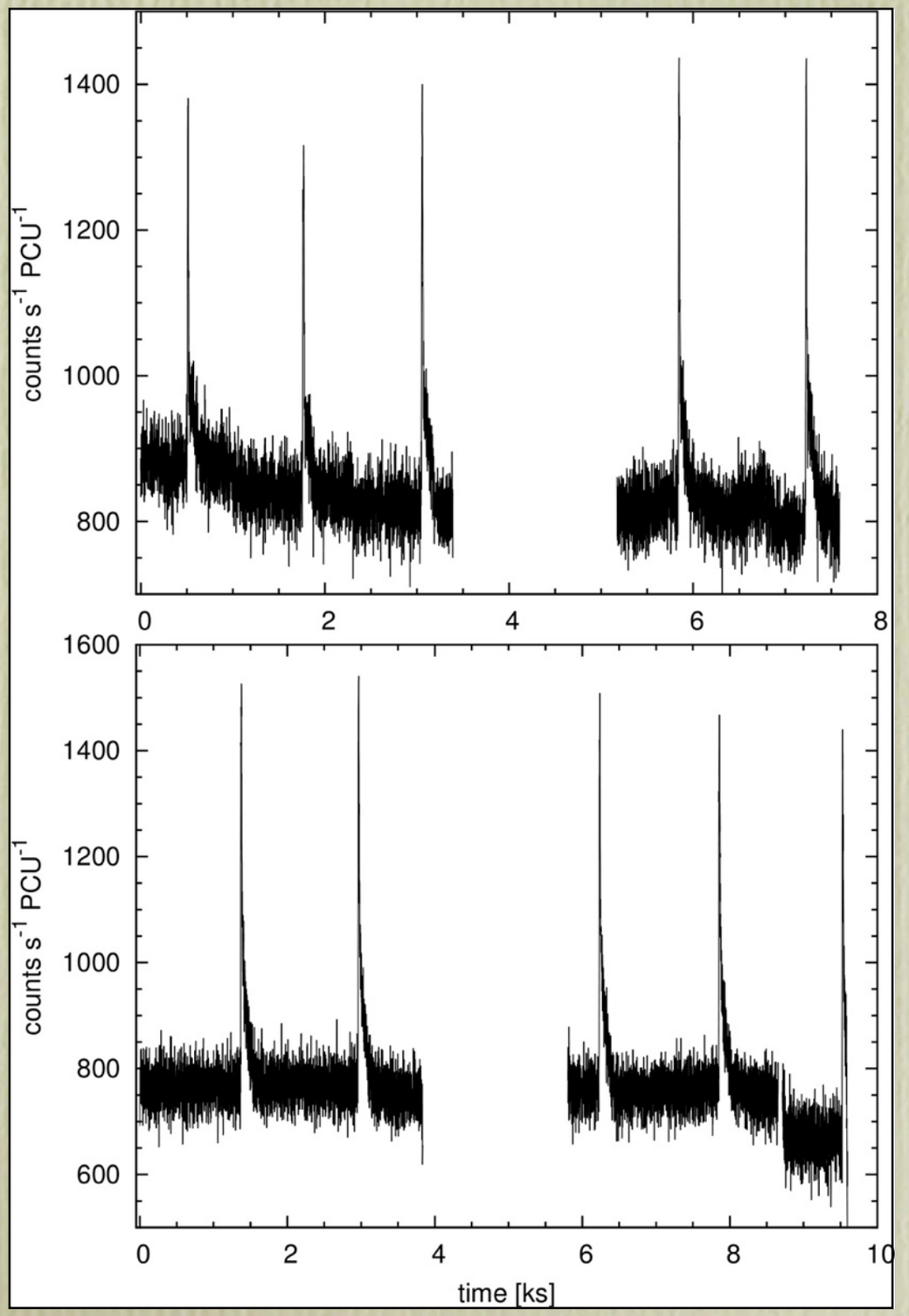
- SOFT state: only type I
- TRANSITION: funky stuff..
- HARD: both type I & II

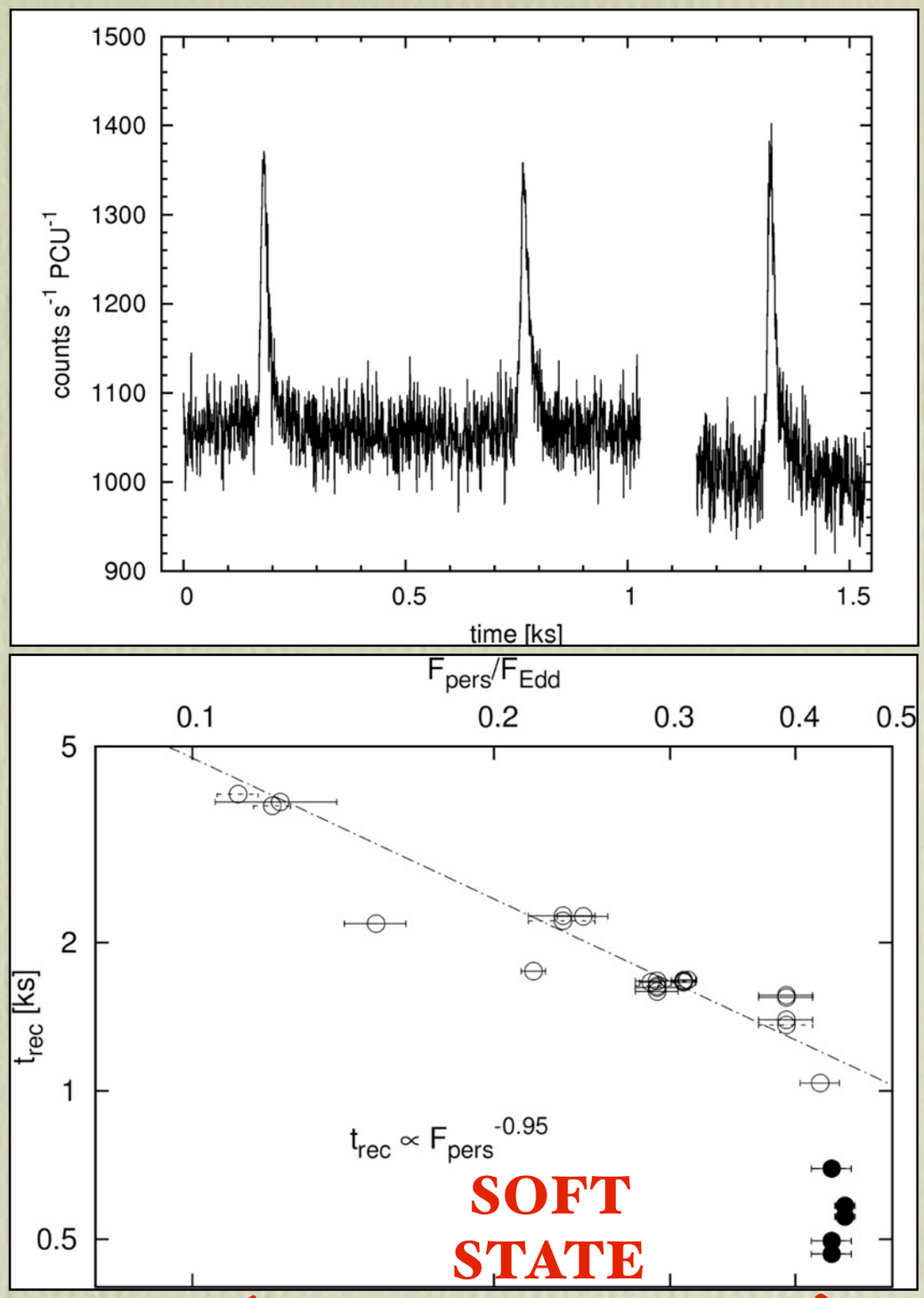
type I burst rate





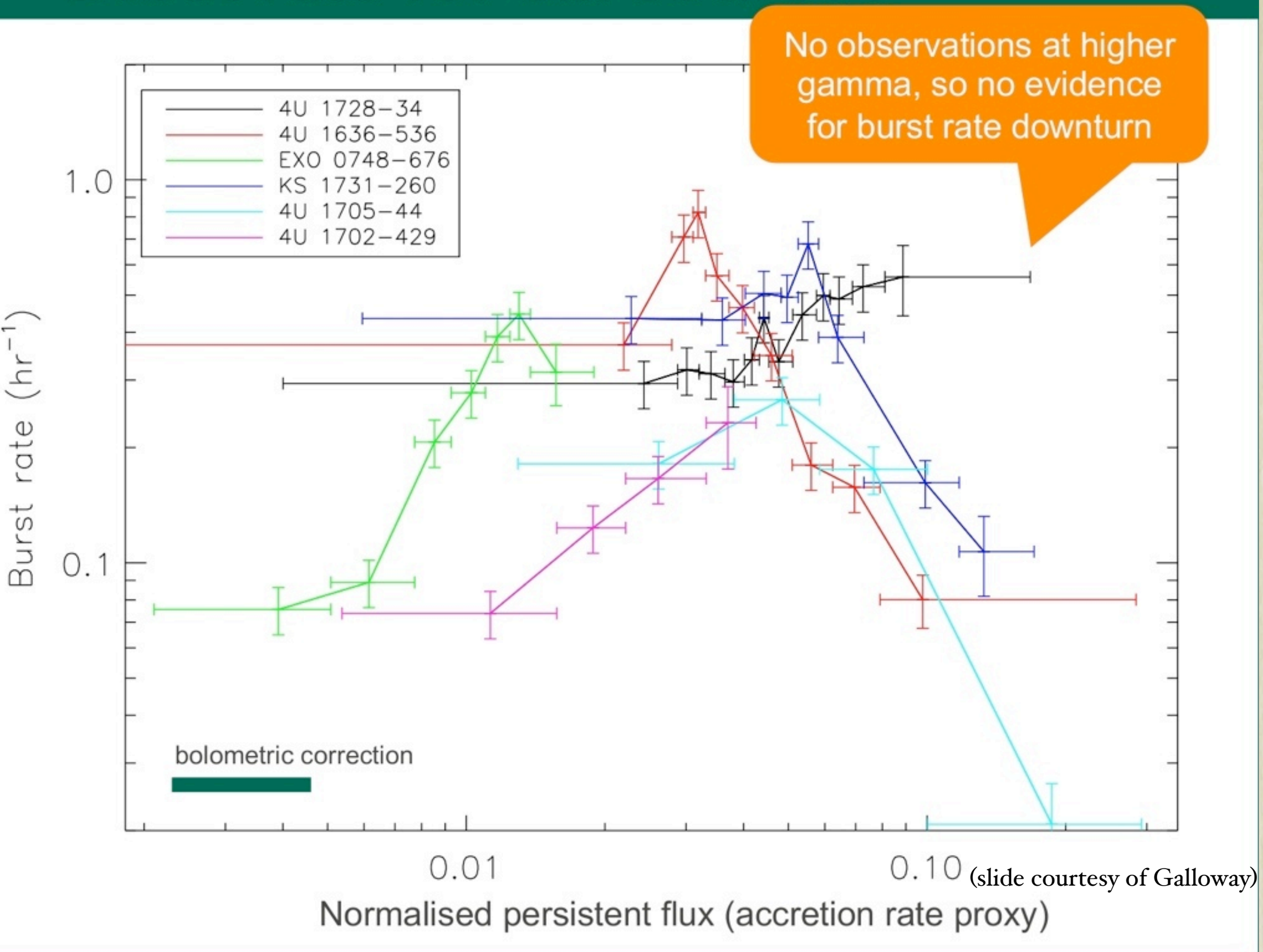
type I burst rate



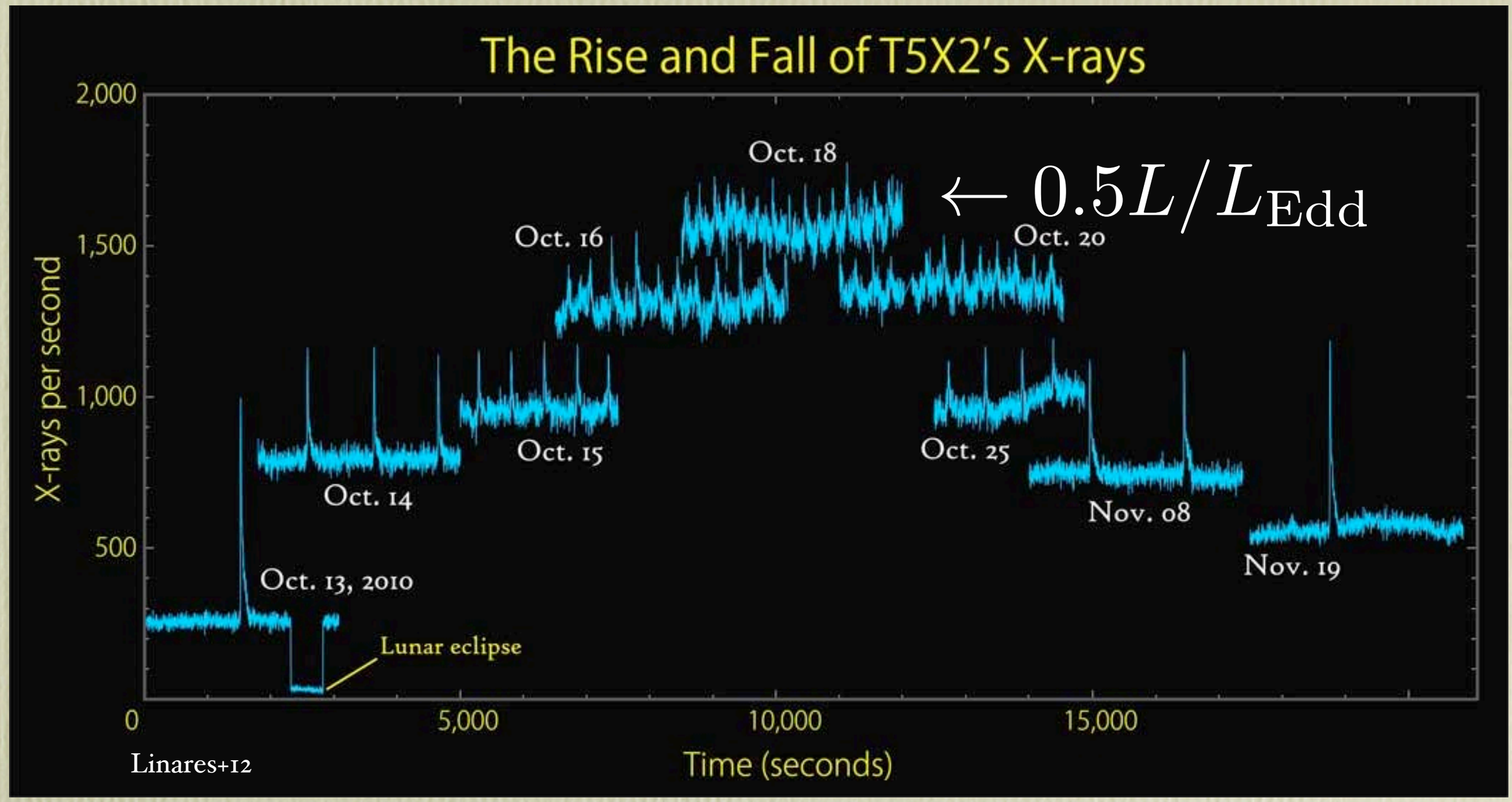


Bagnoli+13

Burst rate for six sources



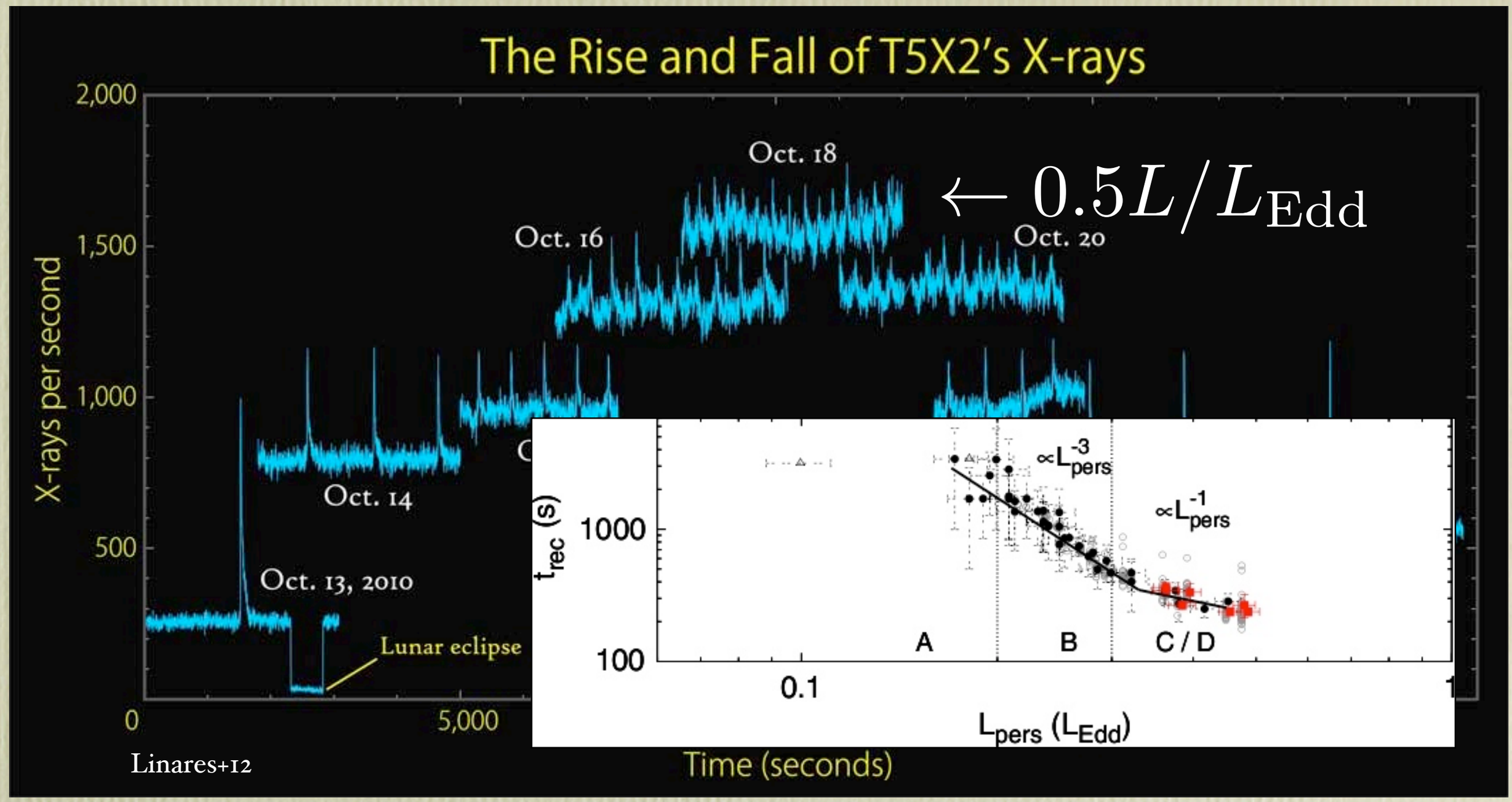
(slide courtesy of Galloway)



T5X2 is the **only other** source to behave well

11 Hz: **slowest rotator** among bursters (245-620 Hz)
Bursting Pulsar (only other type II burst source): 2 Hz

is the **RB a slow rotator** too?



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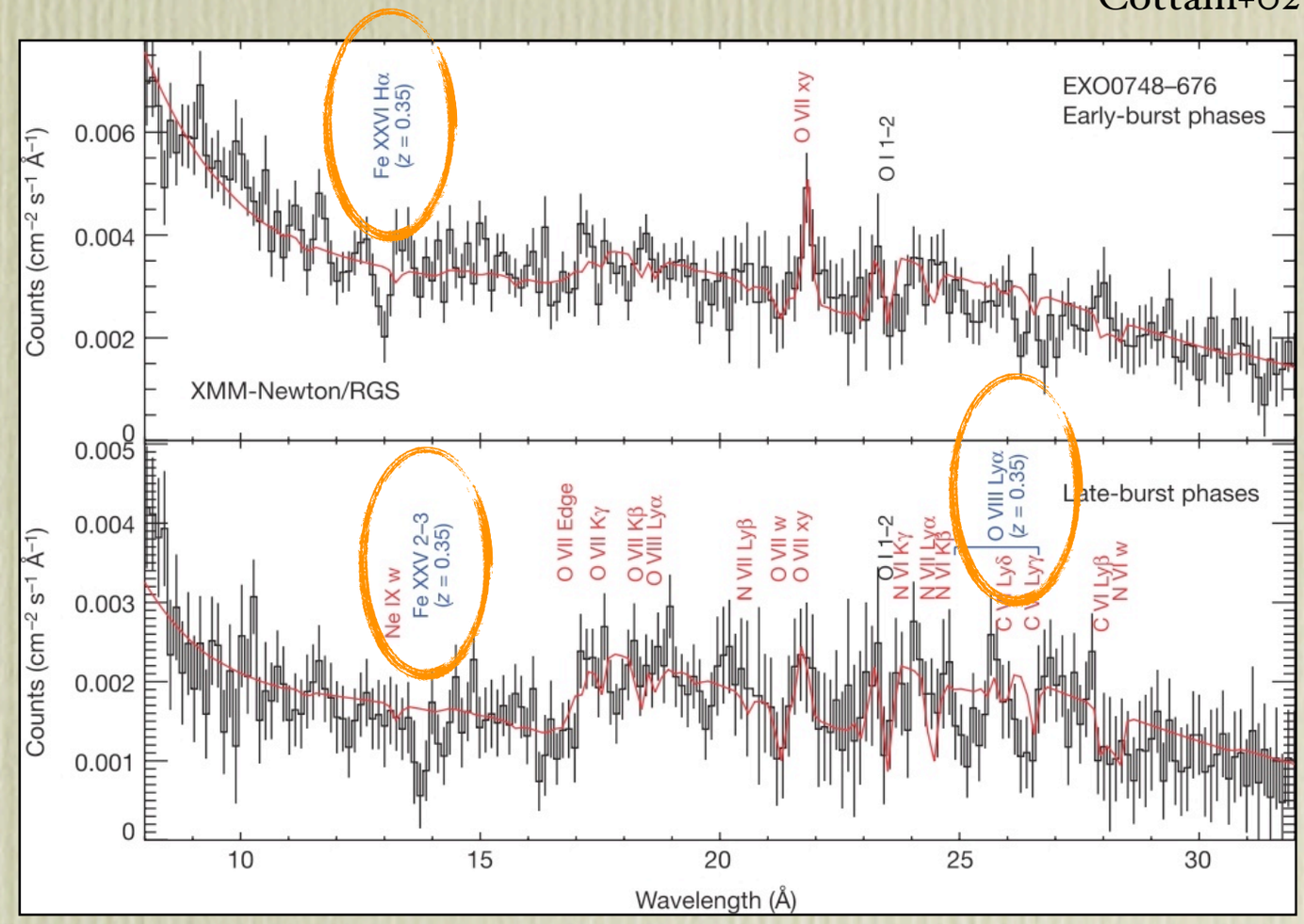
hunting the surface redshift

- the **GOAL**:
  a measurement of **gravitational redshift** at the photosphere!

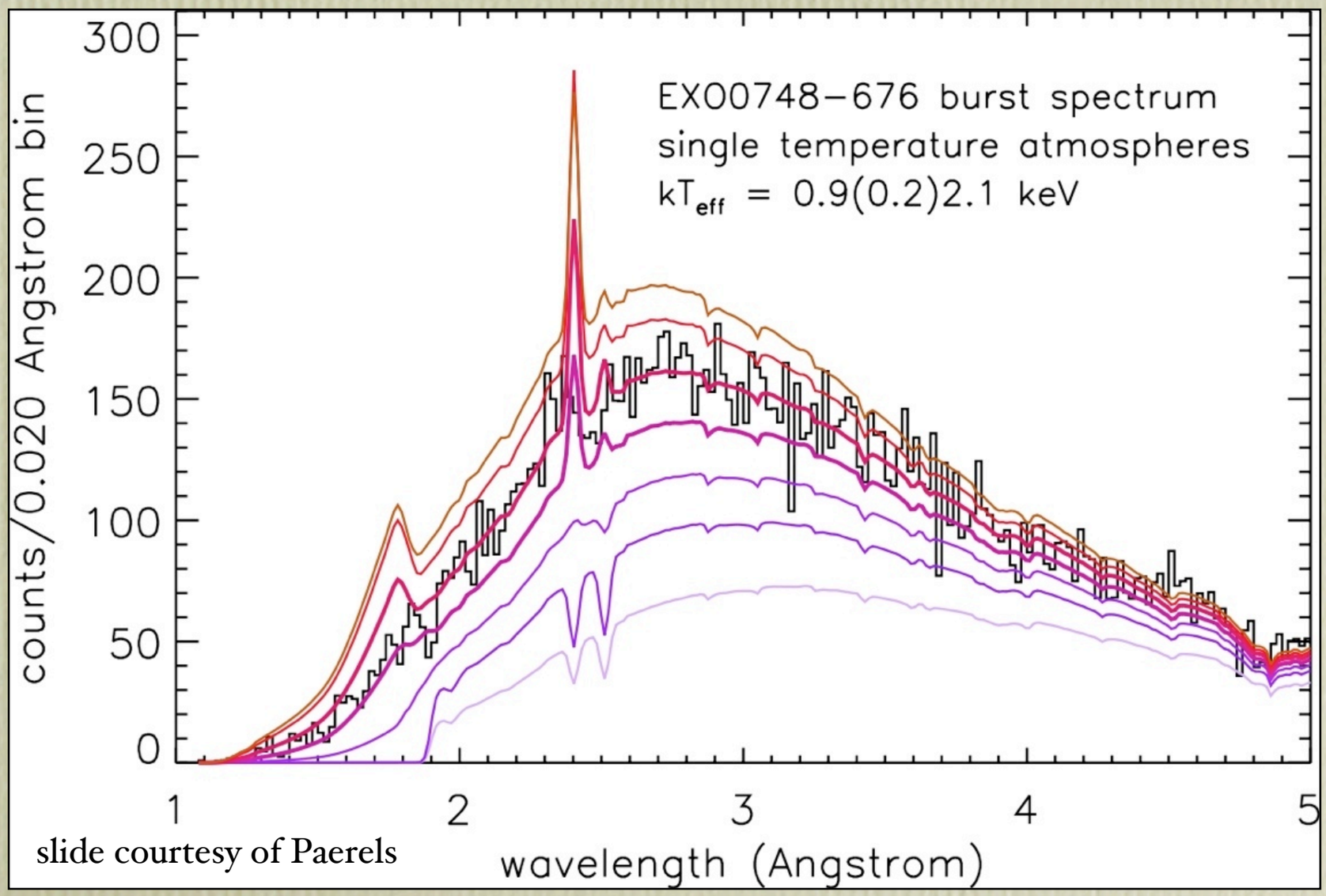
- source requirements:
  -slow rotator
  -fast-recurring bursts
  -predictable outbursts

Cottam+02



$$\frac{M}{R} = \frac{c}{2G}\left[1 - \frac{1}{(1+z)^2}\right]$$

new predictions of discrete features

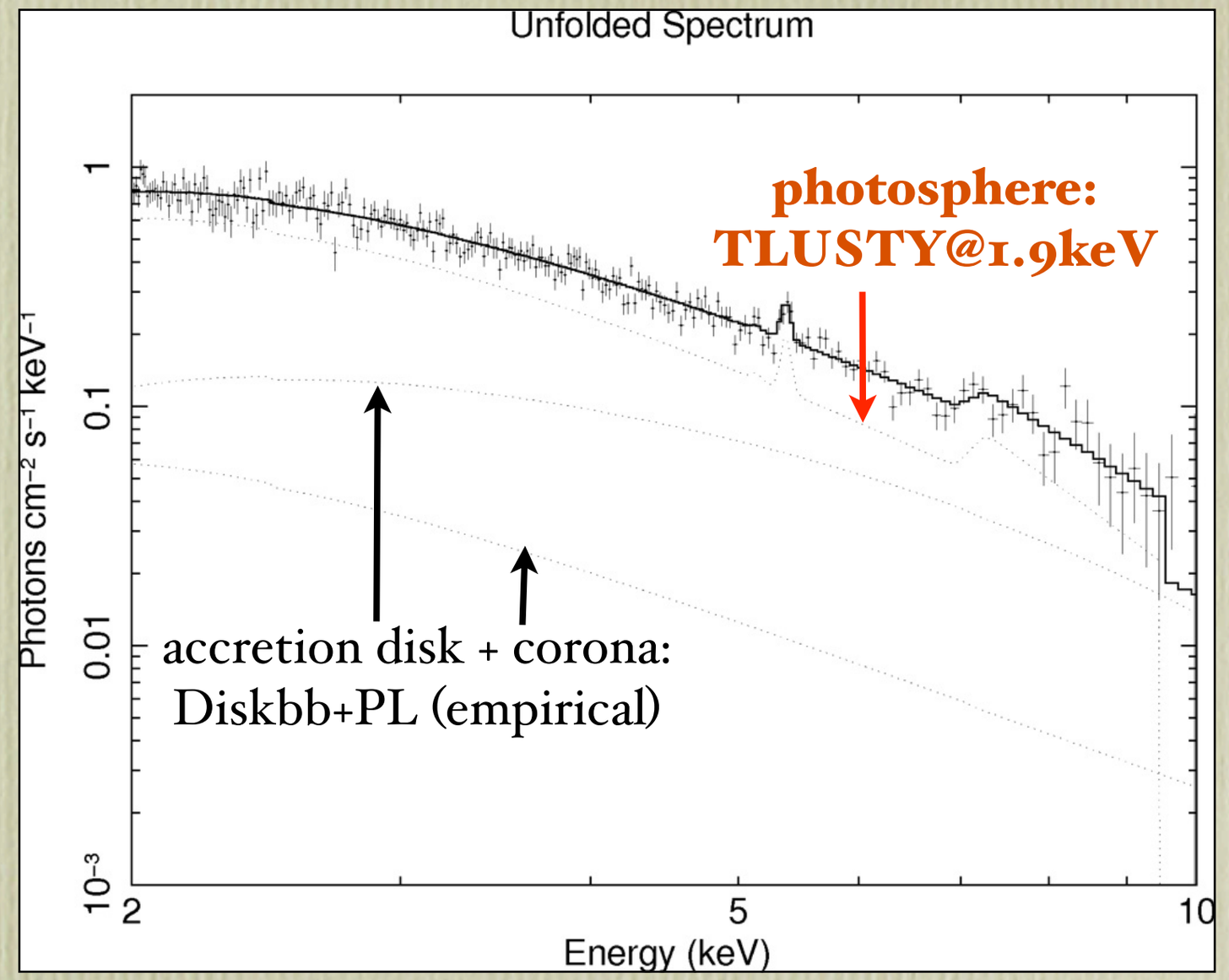


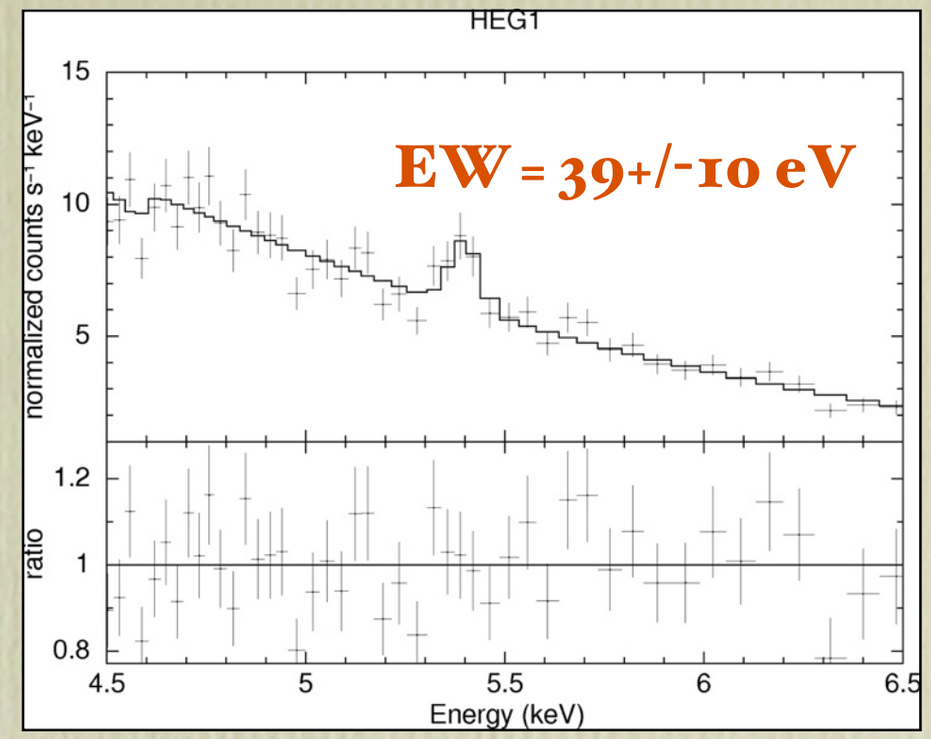
slide courtesy of Paerels

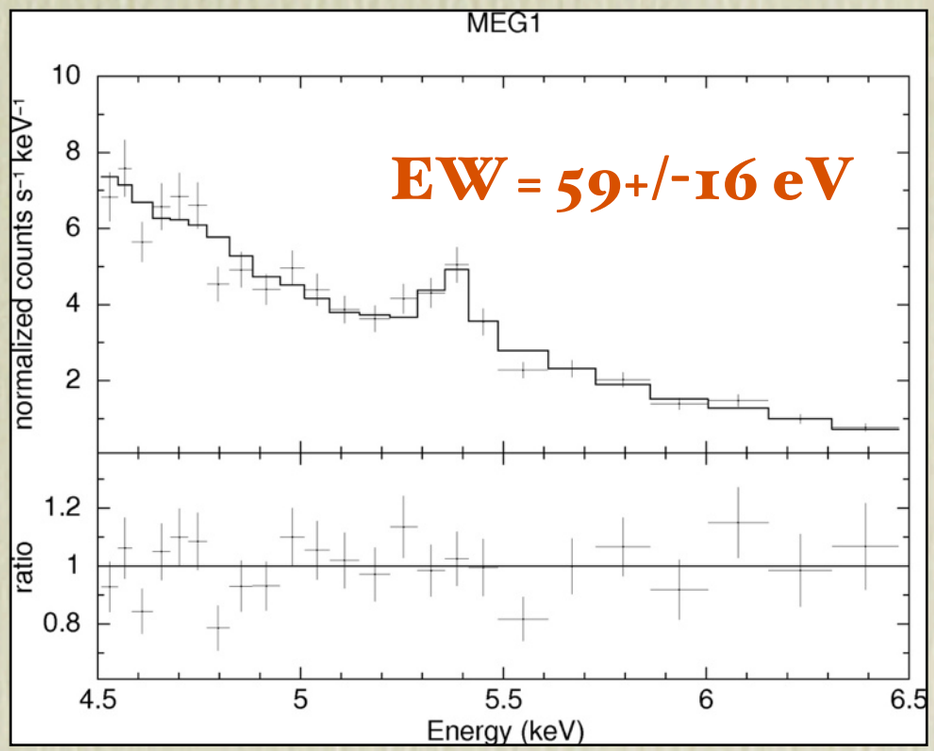
- radiative transfer code TLUSTY adapted for NSs: Fe atom treated in full NLTE

- radiative decays from low levels >> collisional rates

- enhanced resonance scattering -> **emission line!**



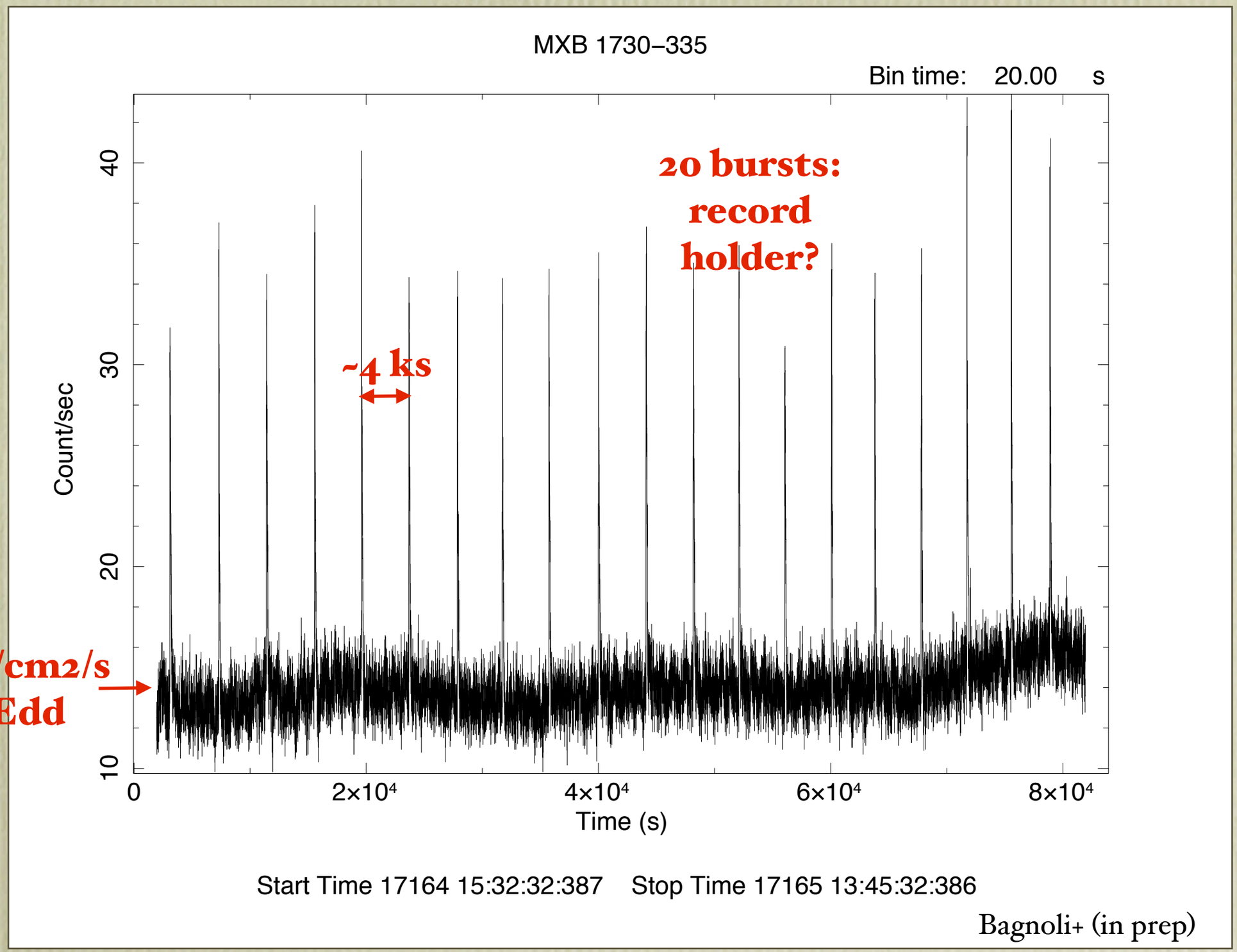




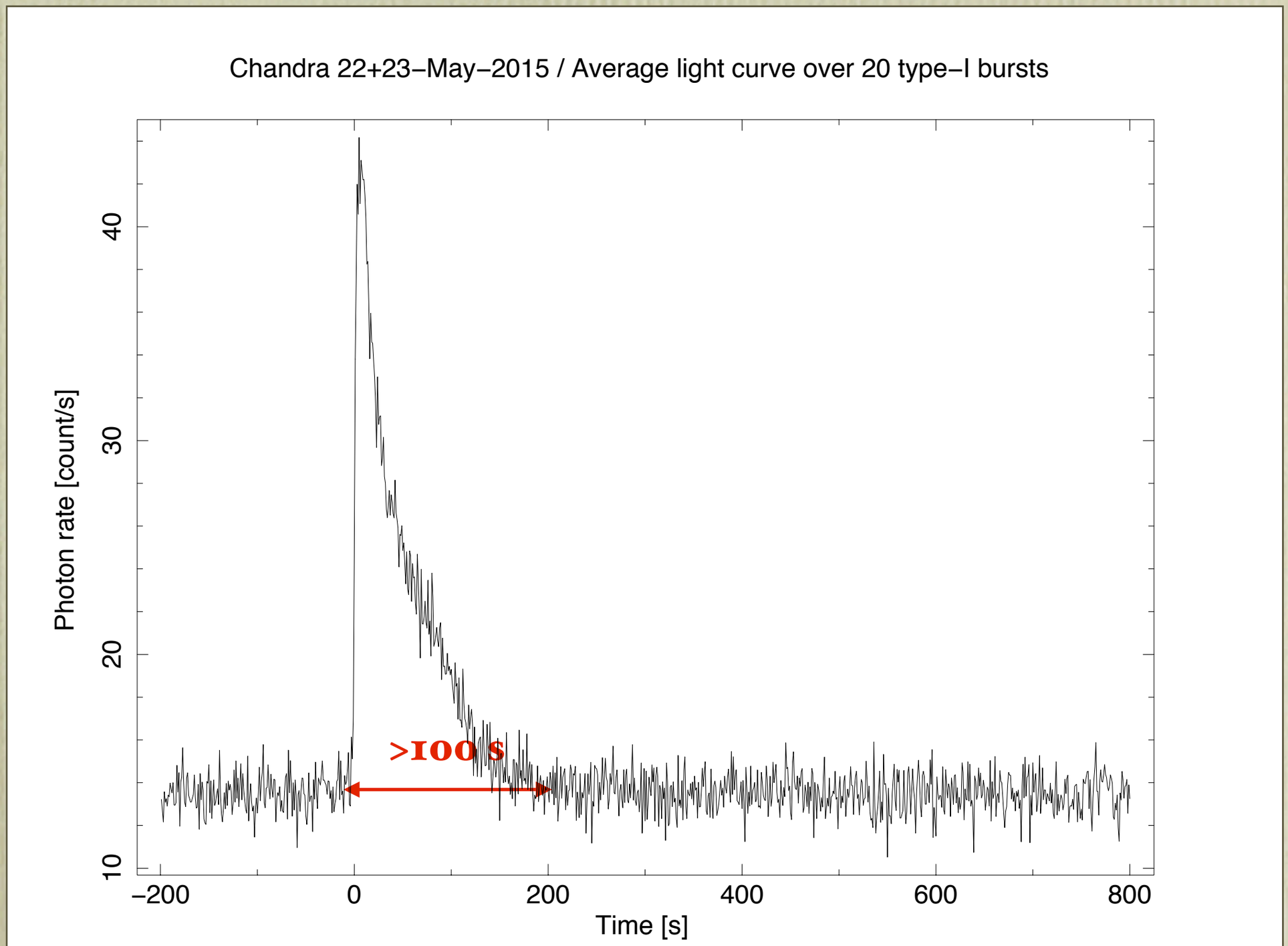
- 6d into outburst $\rightarrow t_{\rm rec} = 2 - 4$ ks
- for each burst, ~10s at $T \geq 1.9$ keV
- 80 ks yield 20-40 bursts -> 200-400s
- $\sigma = 5.1 - 7.3$

FEASIBILITY

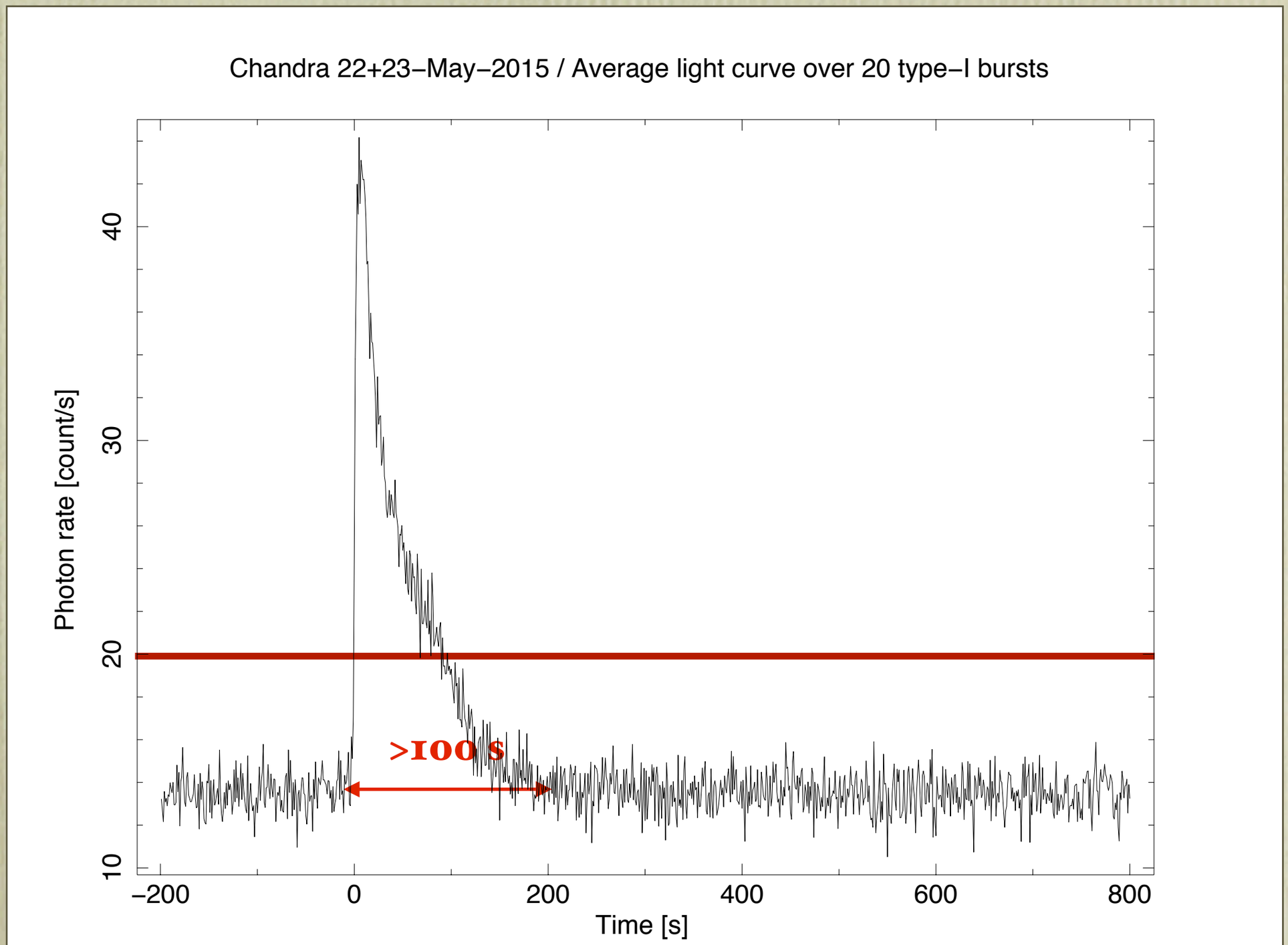
Chandra TOO


MXB 1730–335
Bin time: 20.00 s
20 bursts: record holder?
~4 ks
~2e-9 erg/cm2/s
~ 10% Edd
Count/sec
10
20
30
40
0
2×10⁴
4×10⁴
6×10⁴
8×10⁴
Time (s)
Start Time 17164 15:32:32:387 Stop Time 17165 13:45:32:386
Bagnoli+ (in prep)

Chandra TOO


Chandra 22+23–May–2015 / Average light curve over 20 type–I bursts
Photon rate [count/s]
10
20
30
40
–200
0
200
400
600
800
Time [s]
>100 s

Chandra TOO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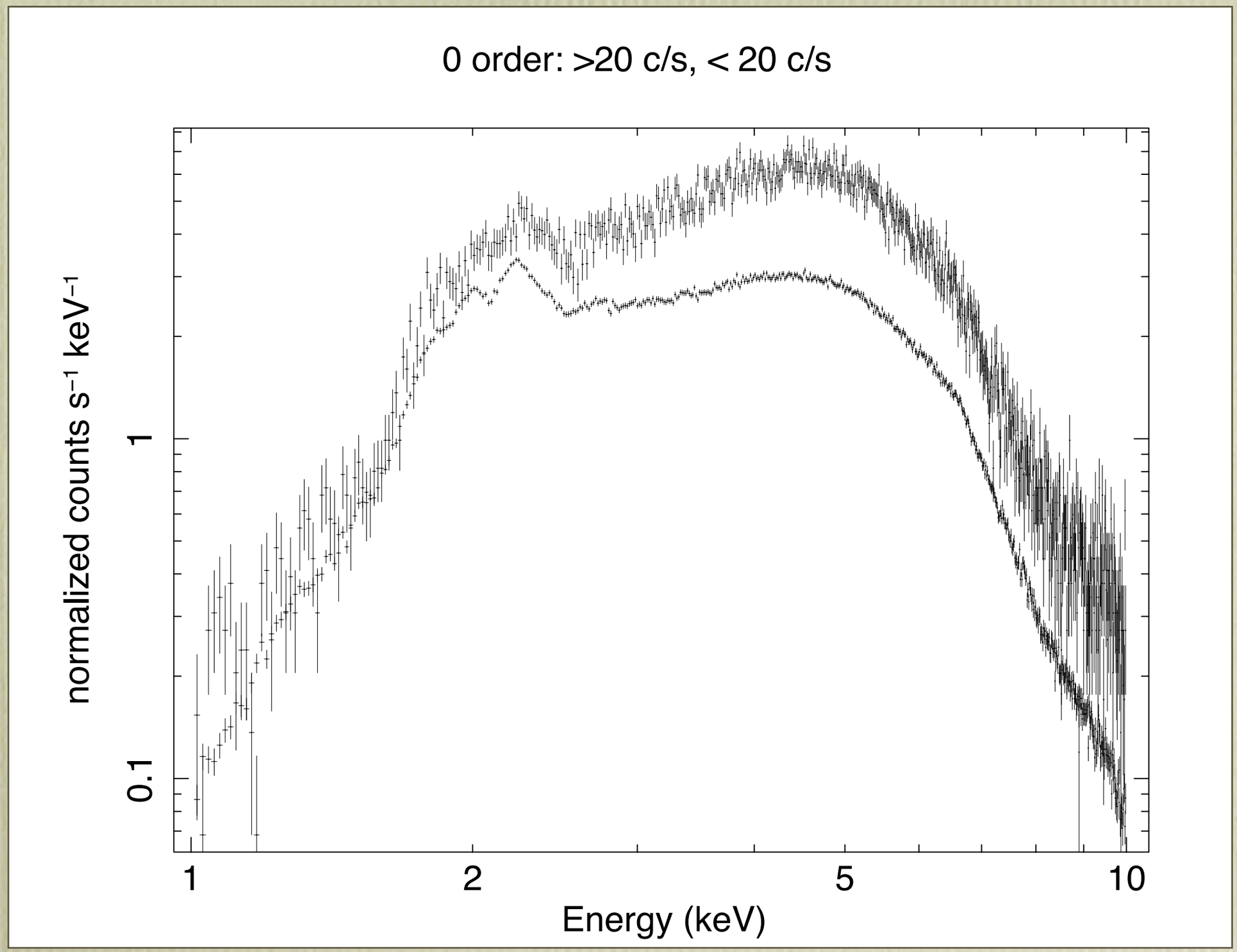
PRELIMINARY



conclusions

- the RB doesn't have a "missing bursts" problem
- slow rotation / young age
- search for spectral features is ongoing