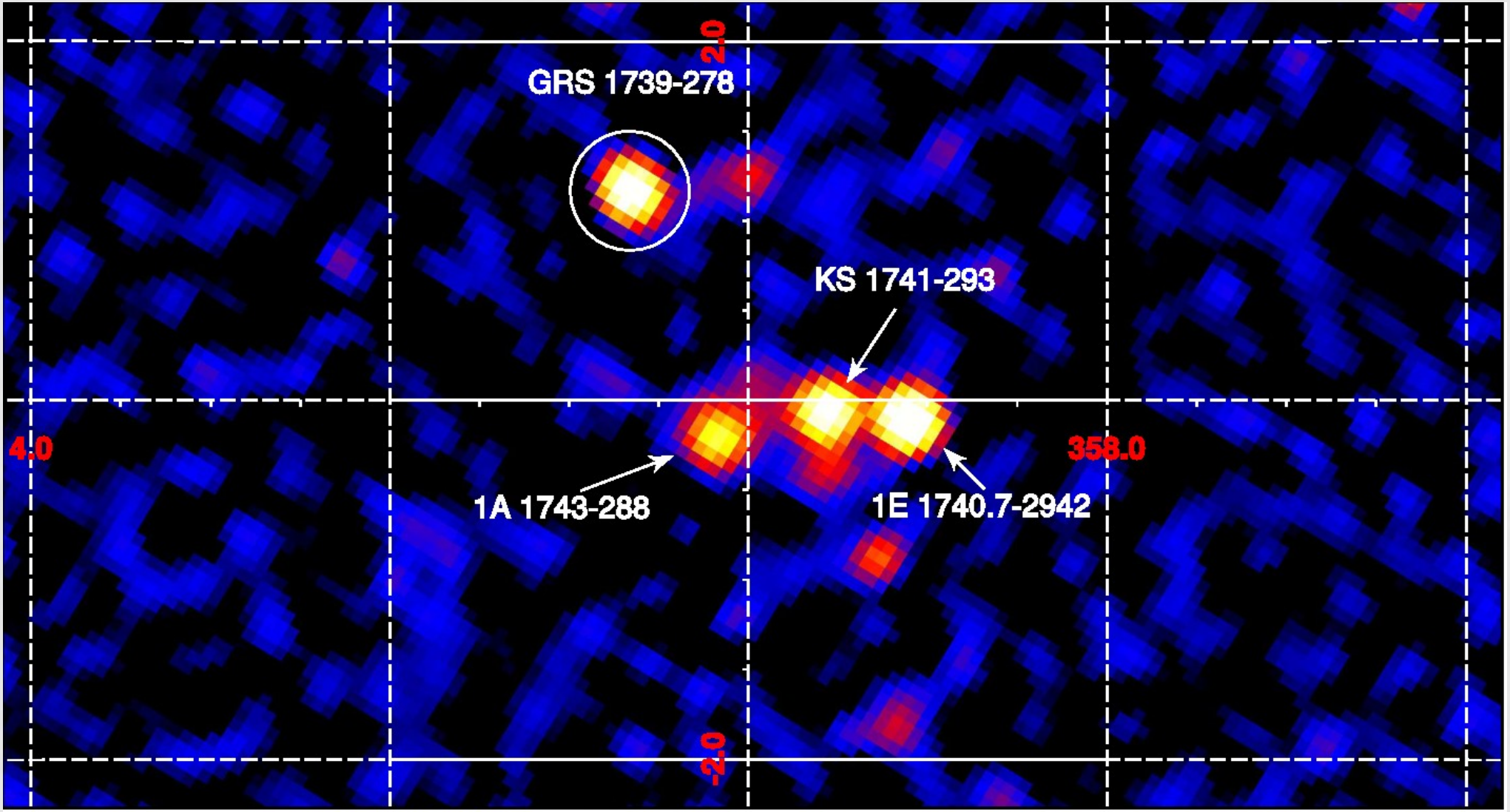
Timing and spectral view on accretion disk truncation radius

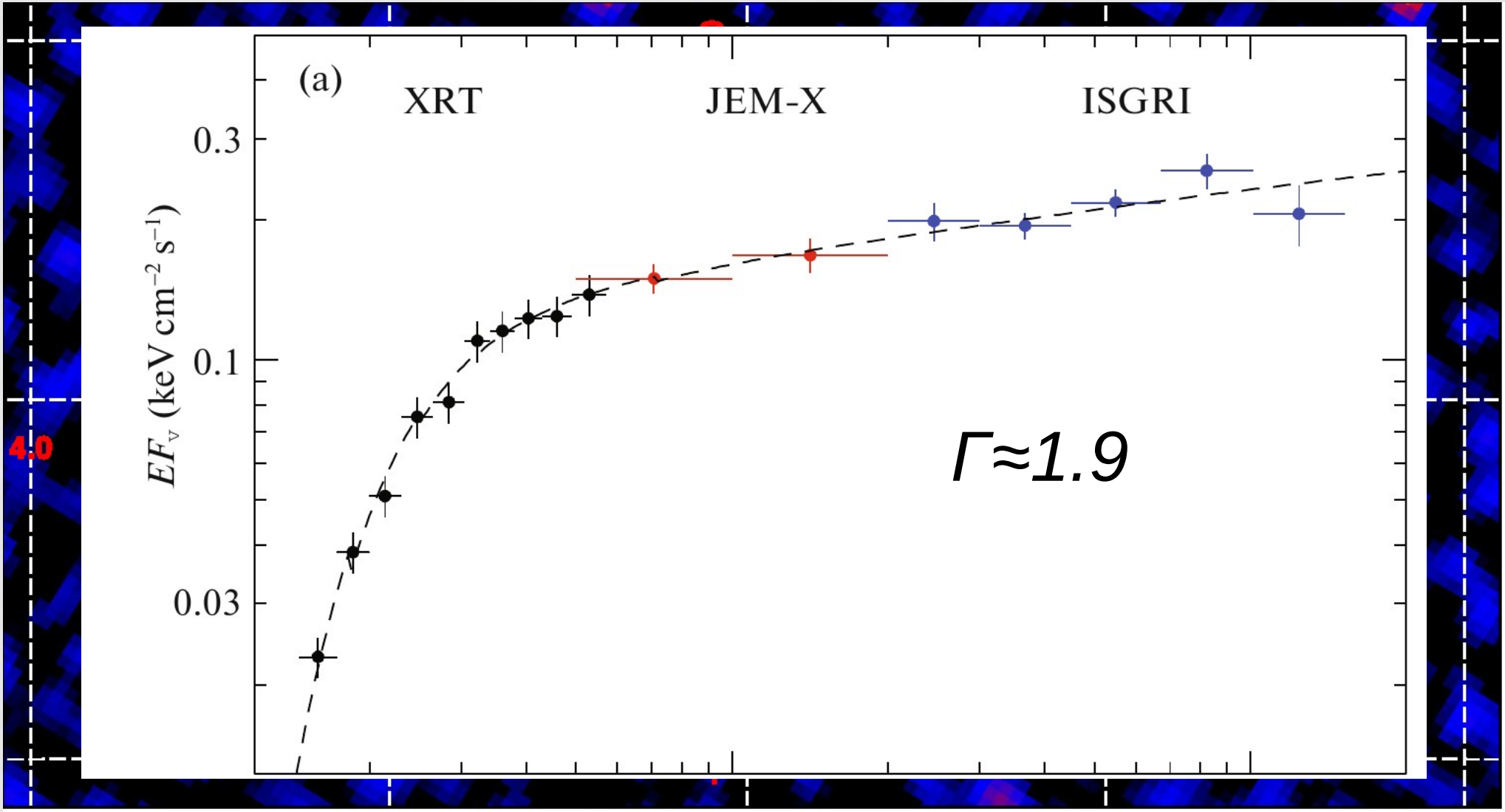
Ilya Mereminskiy, IKI RAS, Moscow

14 February, 12th *INTEGRAL* Conference, Geneva

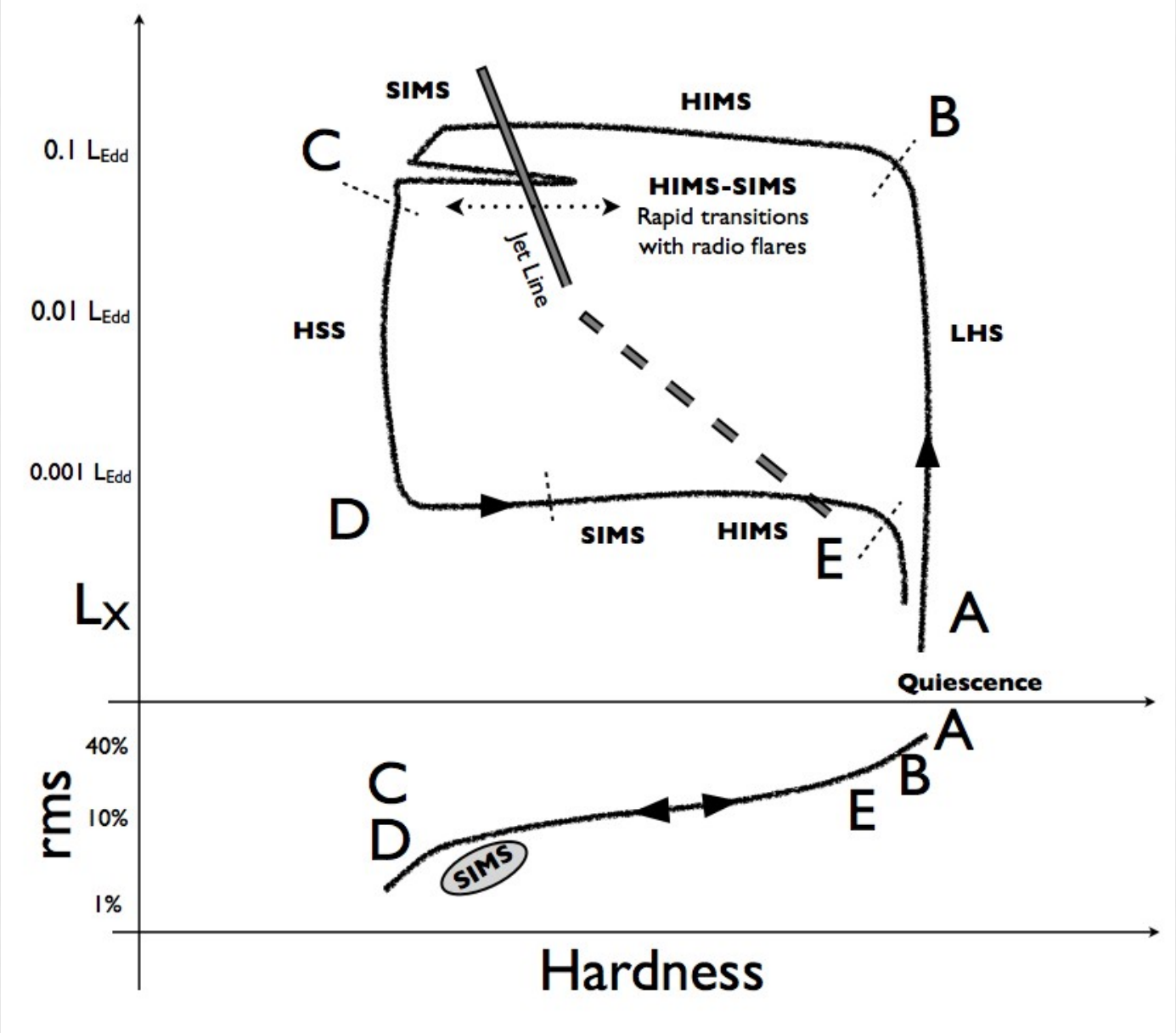
Keeping the eye on the Galaxy



GRS 1739-278 in 2016

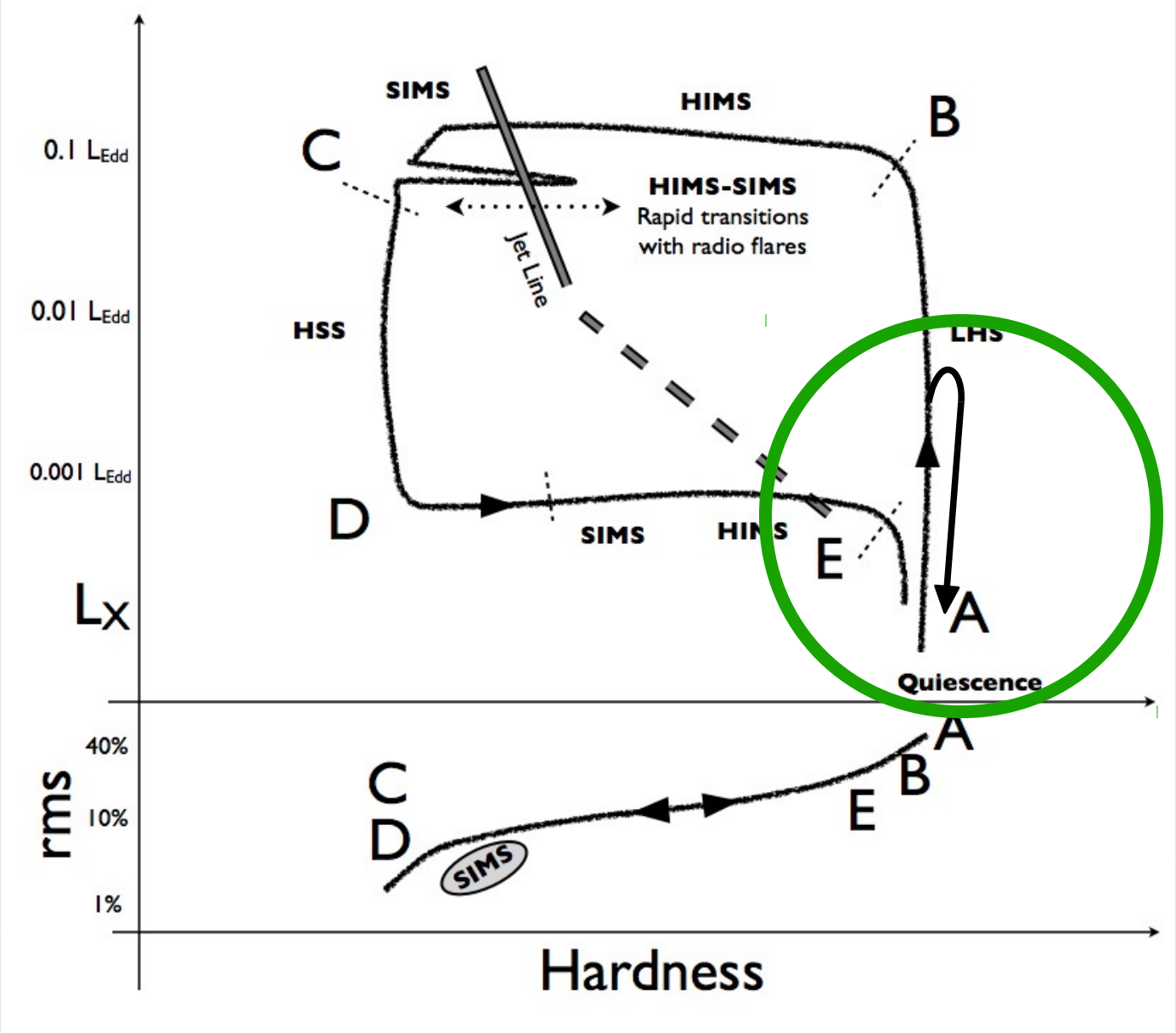


X-ray novae states



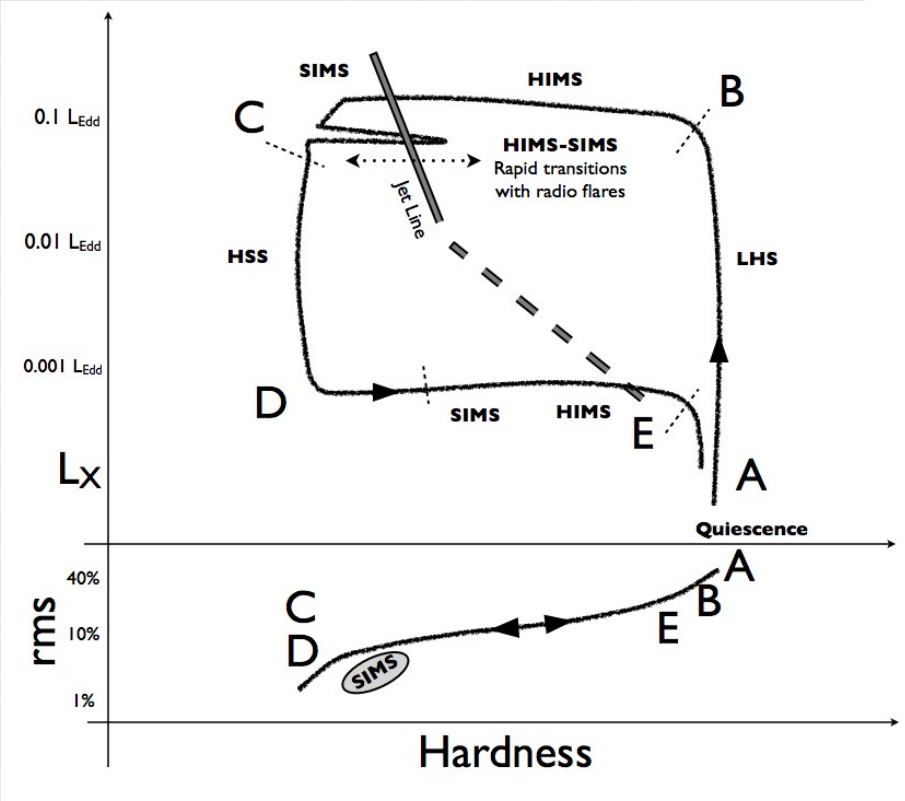
Kylafis+15

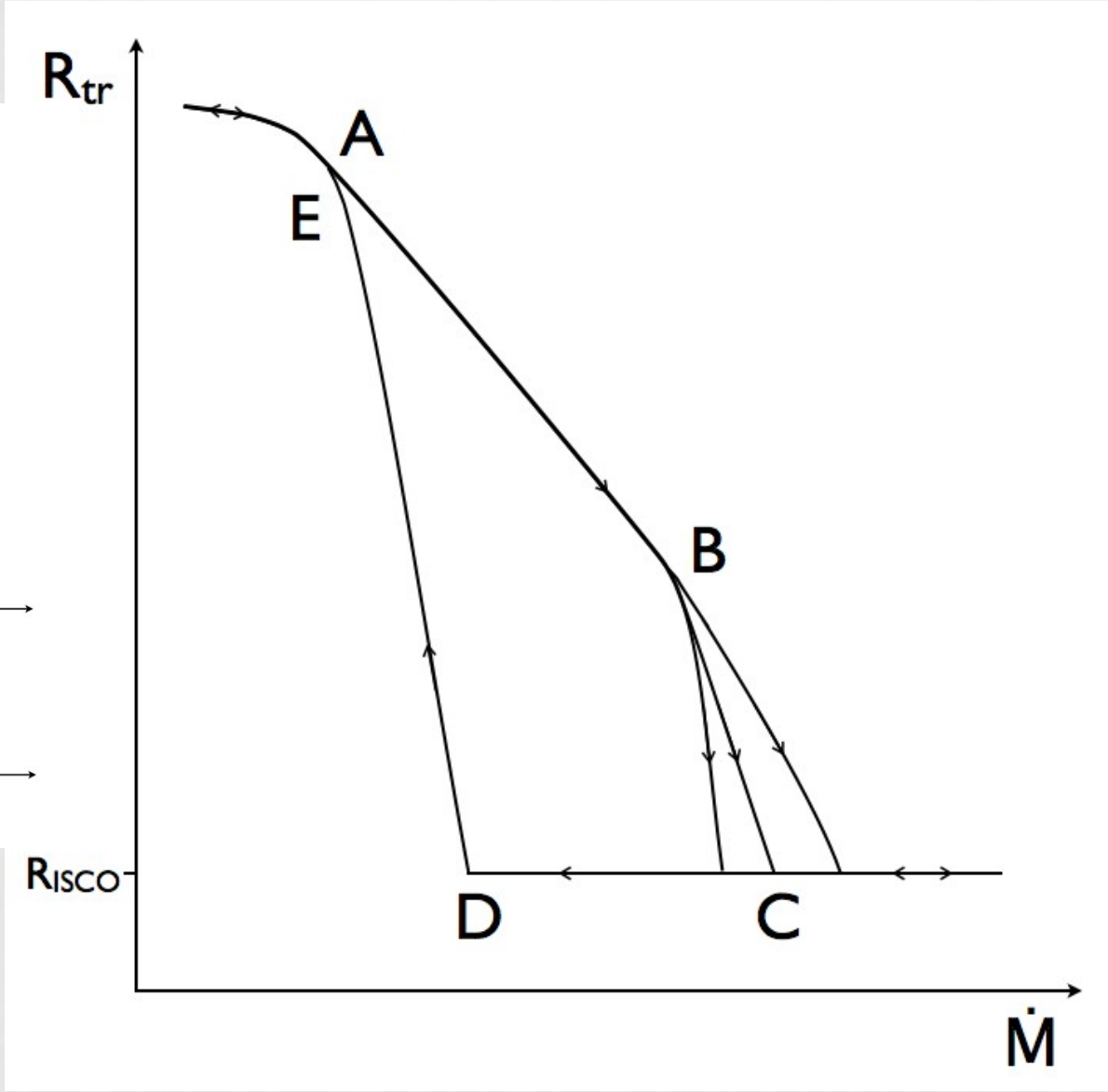
X-ray novae states



Kylafis+15

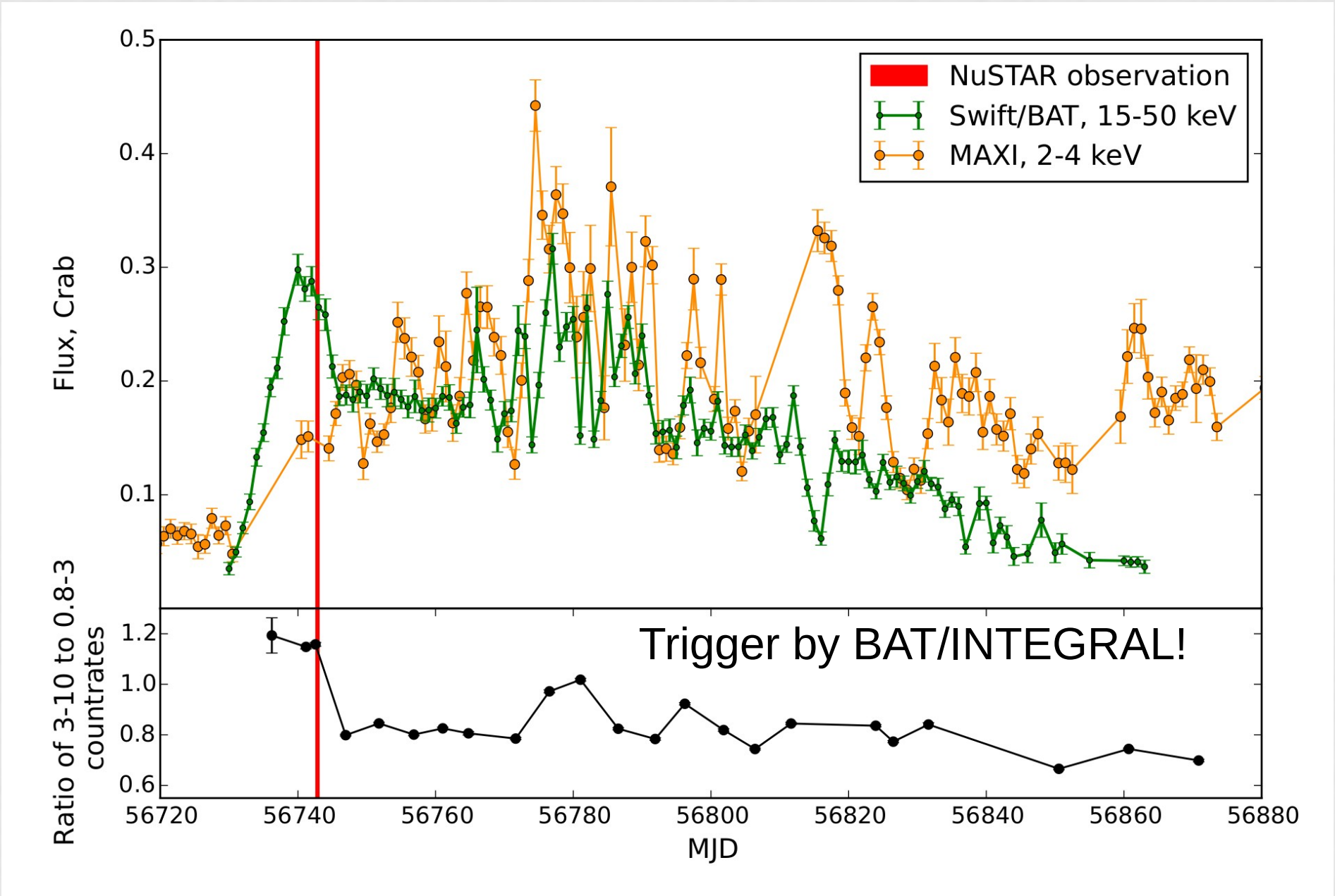
X-ray novae states



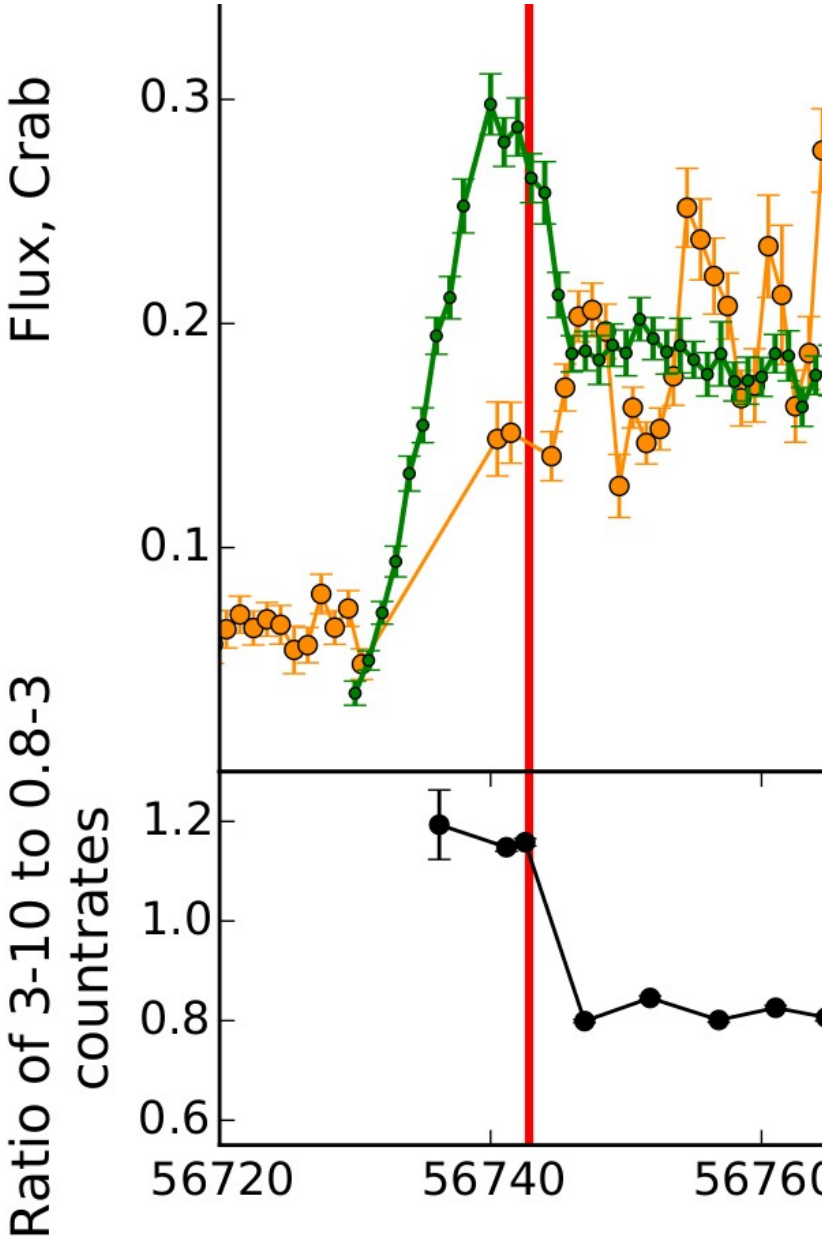


Kylafis+15

GRS 1739-278 in 2014

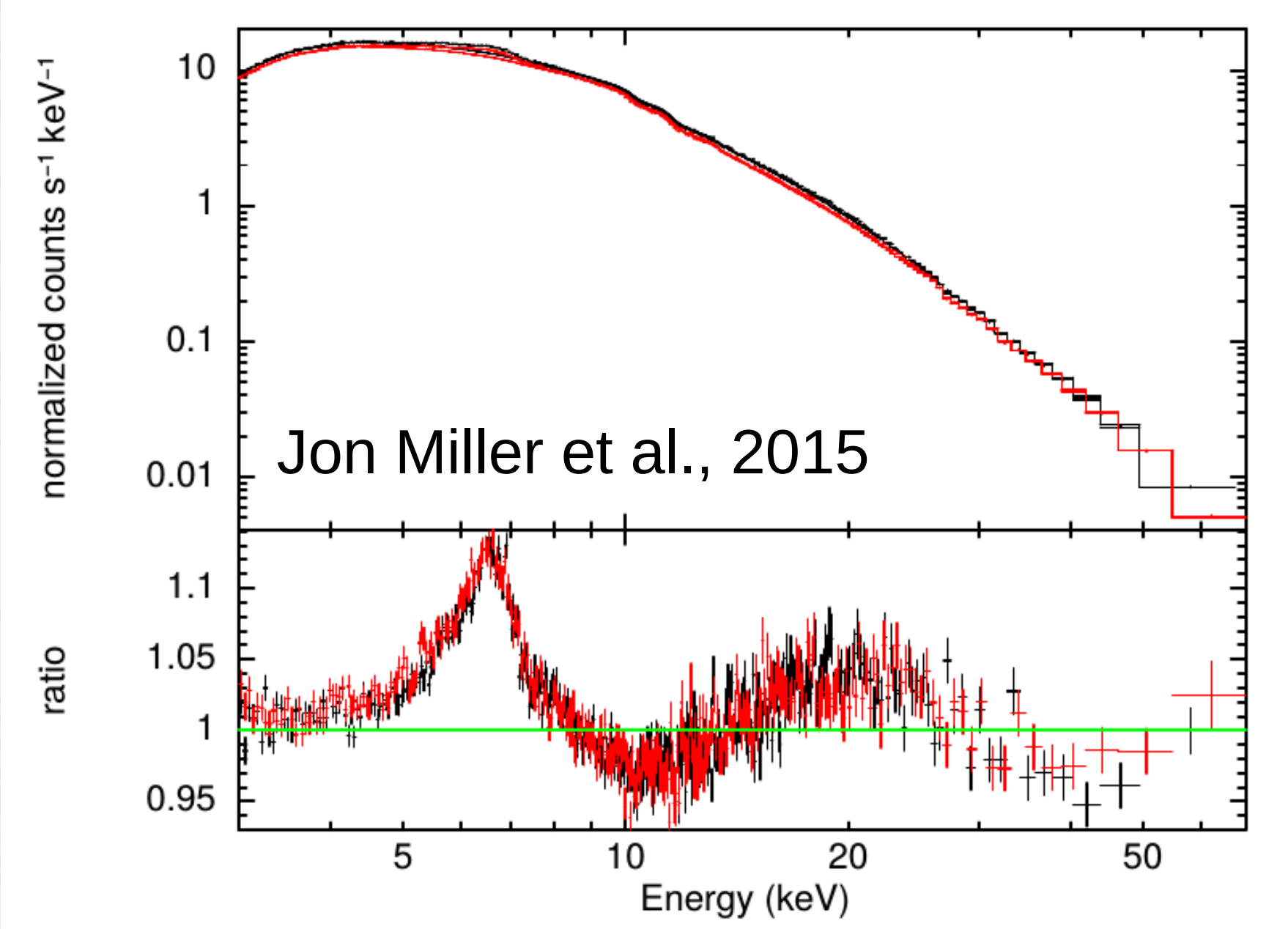


GRS 1739-278 in 2014

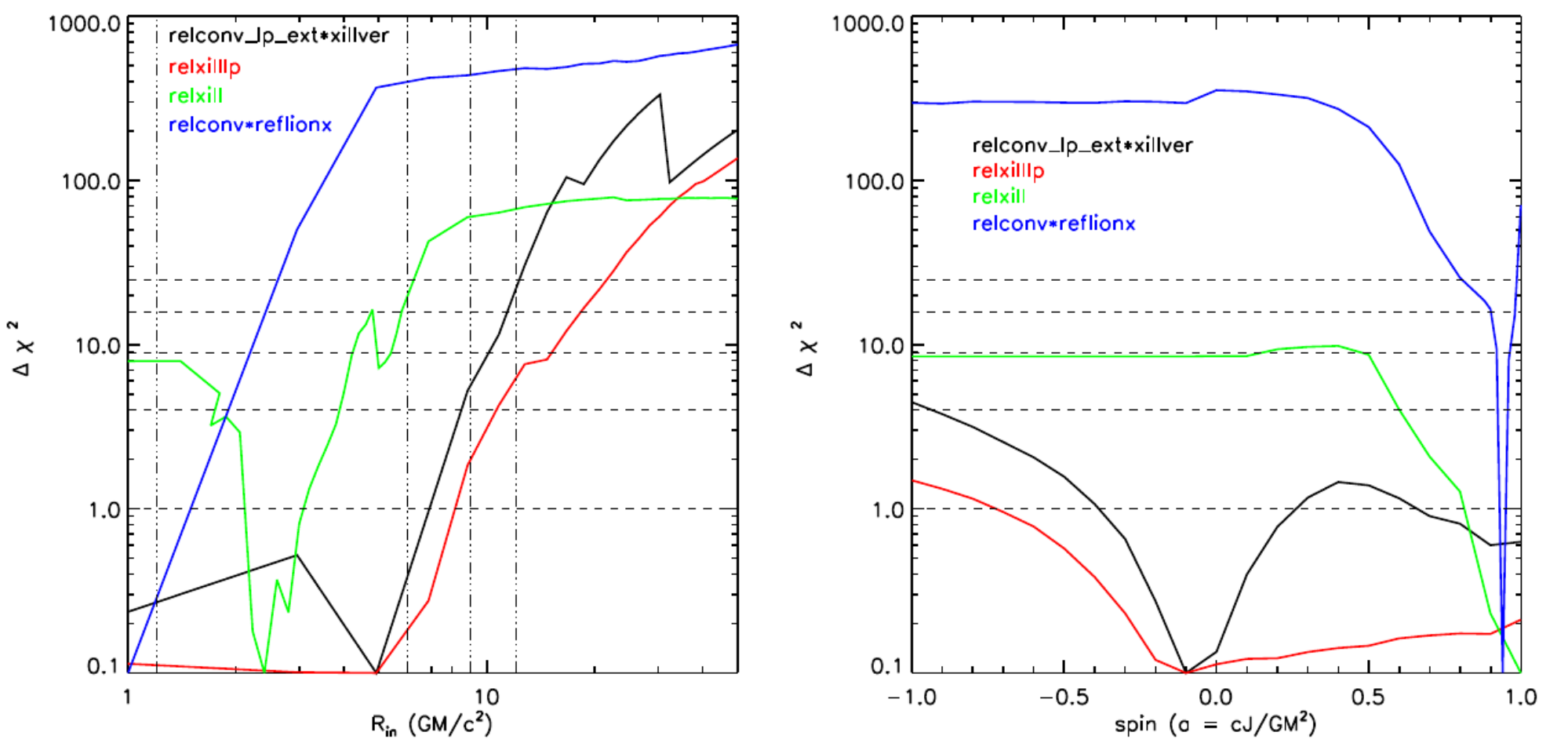


Caught at transition?

...in low-hard state!



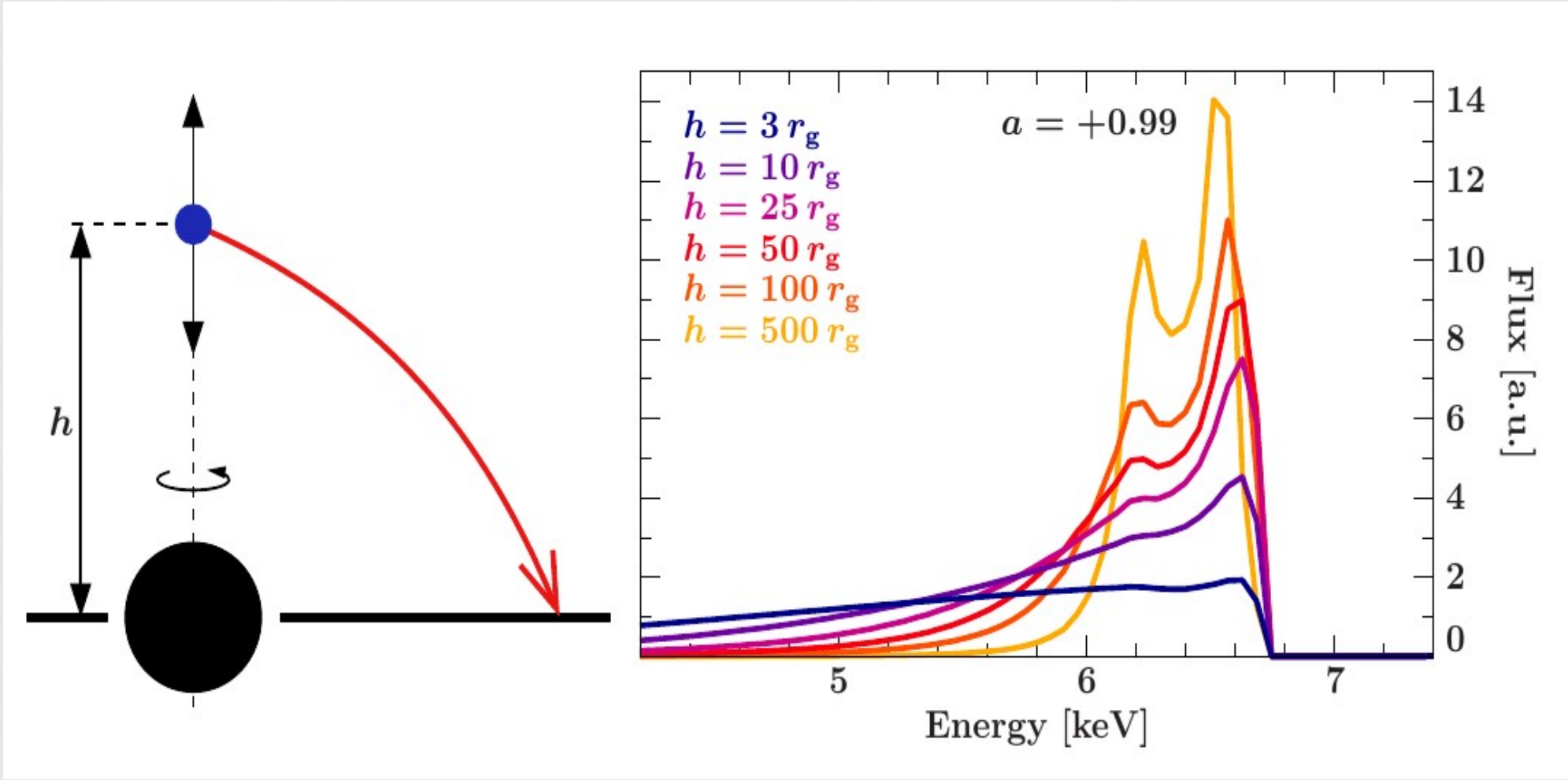
Peculiar low-hard state!



$R_{tr} < 5\ (+4,-3)\ R_g$

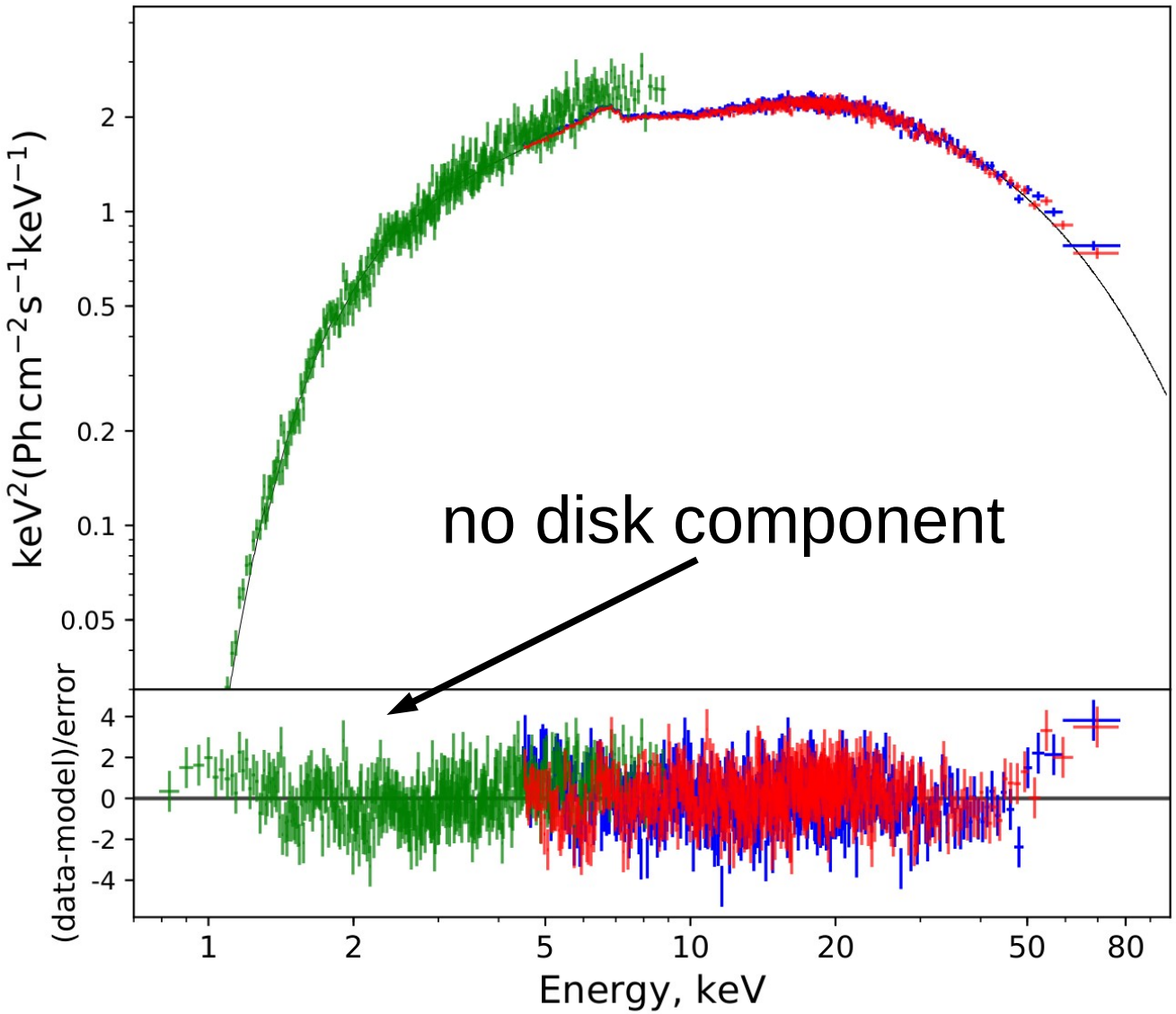
Miller et al., 2015

relline_lp



Dauser+2010, Dauser+2016

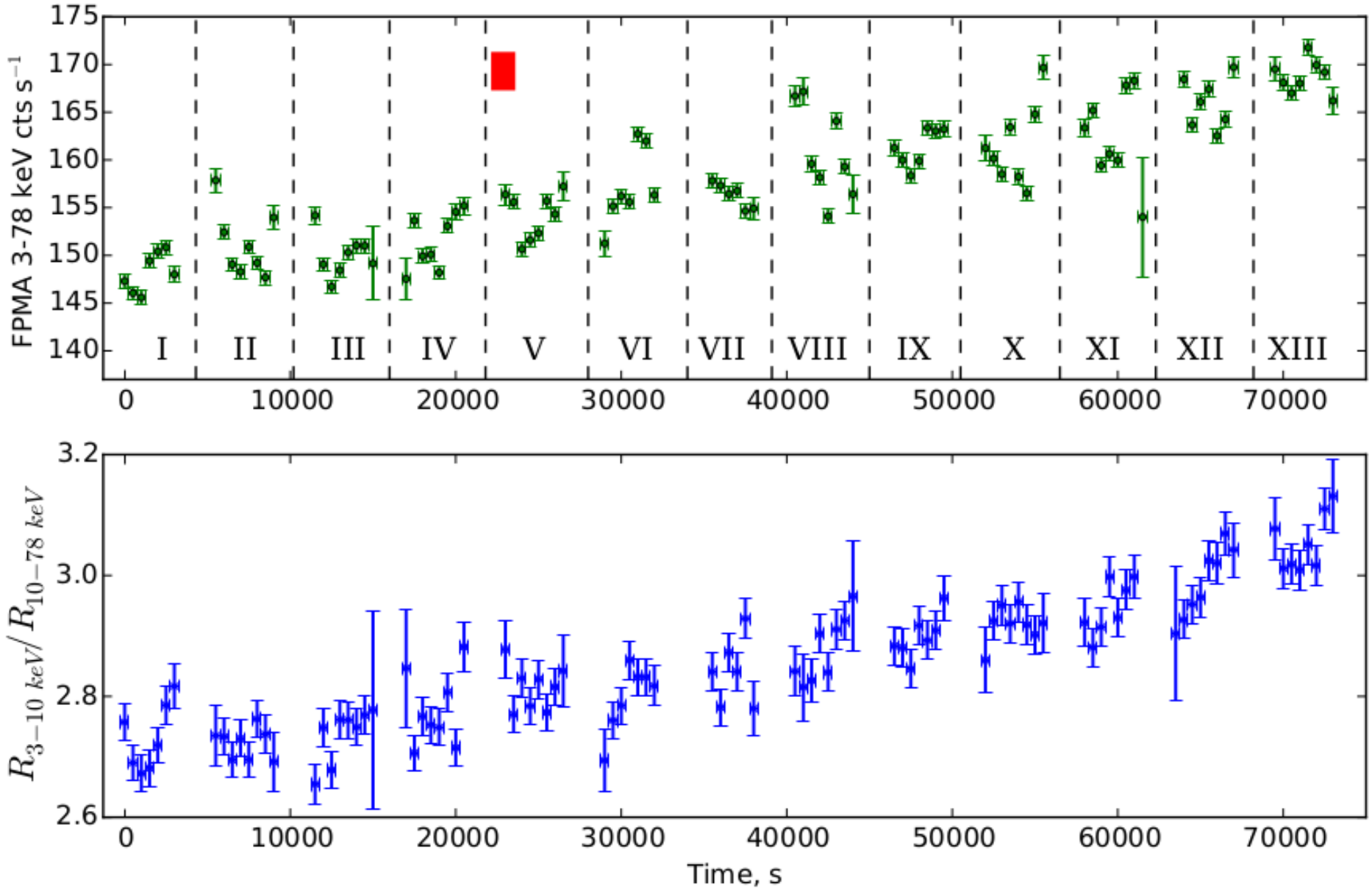
Averaged spectrum



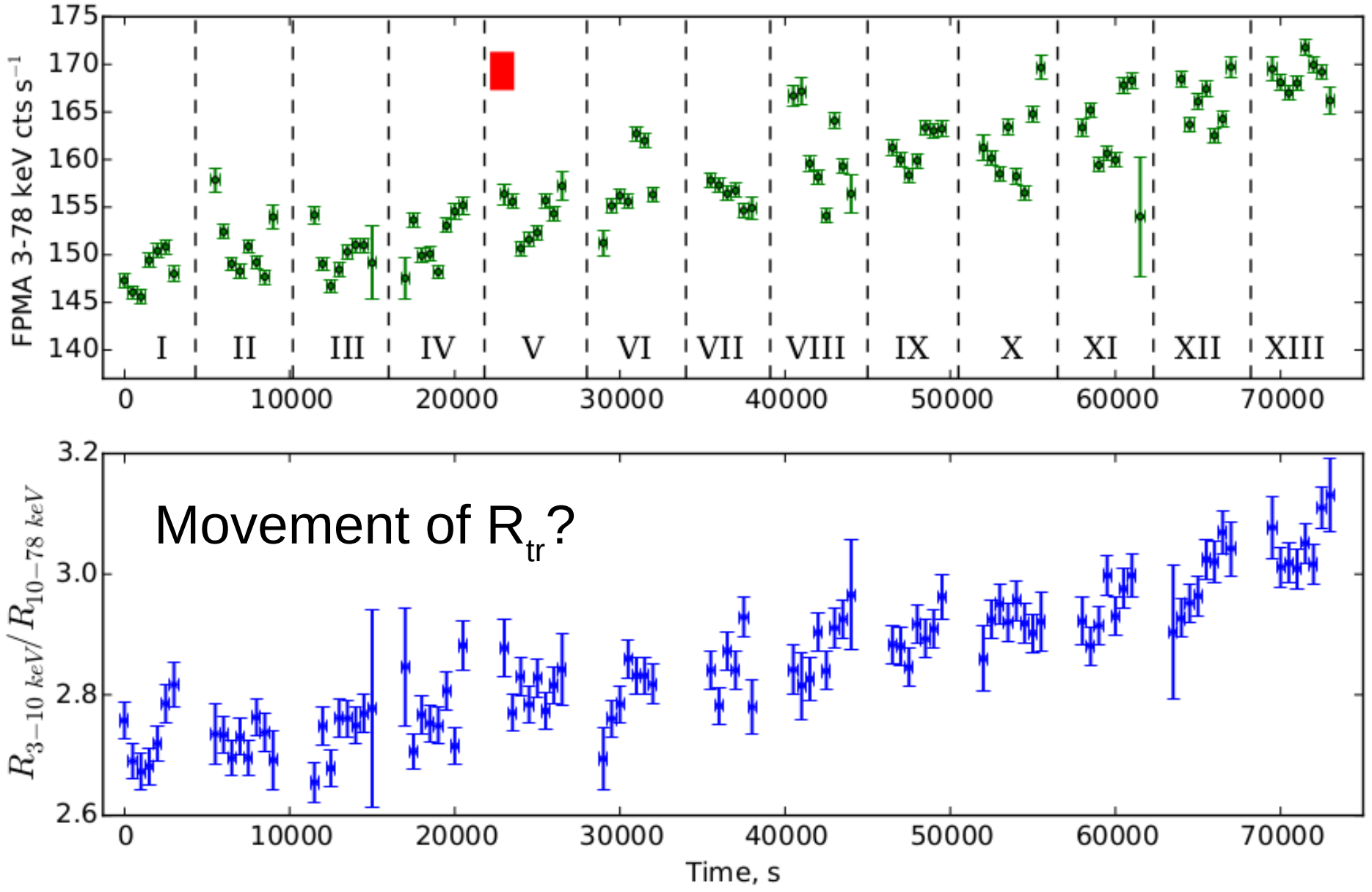
Parameter	Value
$N_H, 10^{22} cm^{-2}$	$2.64^{+0.05}_{-0.03}$
$h, GM/c^2$	$22.3^{+0.6}_{-4.3}$
$a, cJ/GM^2$	$0.73^{+0.26}_{-0.23}$
$incl, deg$	$22.1^{+2.9}_{-2.0}$
$R_{in}, ISCO$	$1.05^{+1.73}_{-0.02}$
Γ	$1.40^{+0.01}_{-0.01}$
$\log \xi$	$3.52^{+0.05}_{-0.07}$
A_{Fe}	$3.0^{+0.6}_{-0.3}$
E_{cut}, keV	$26.3^{+0.3}_{-0.5}$
R_{refl}	$0.42^{+0.03}_{-0.03}$
$N_{FMPA}, \times 10^{-2}$	$1.49^{+0.09}_{-0.03}$
C_{FMPB}	$1.017^{+0.002}_{-0.001}$
$C_{Swift-XRT}$	$1.04^{+0.01}_{-0.01}$
$\chi^2_{red.}$	$1.1 = $
	$= 3366.21/3062$ d.o.f

$R_{tr} < 7.4 R_g$

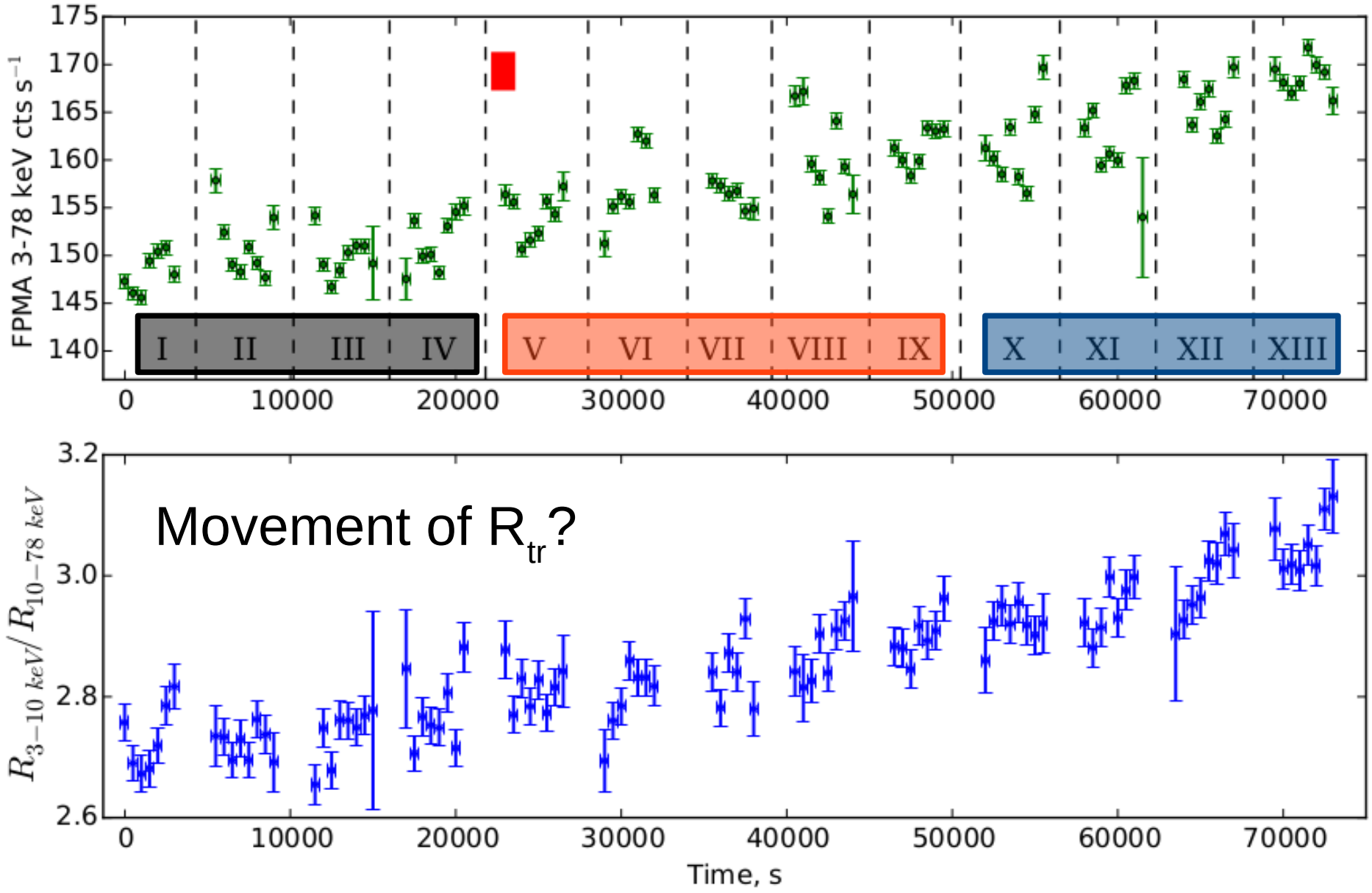
Closer look at data



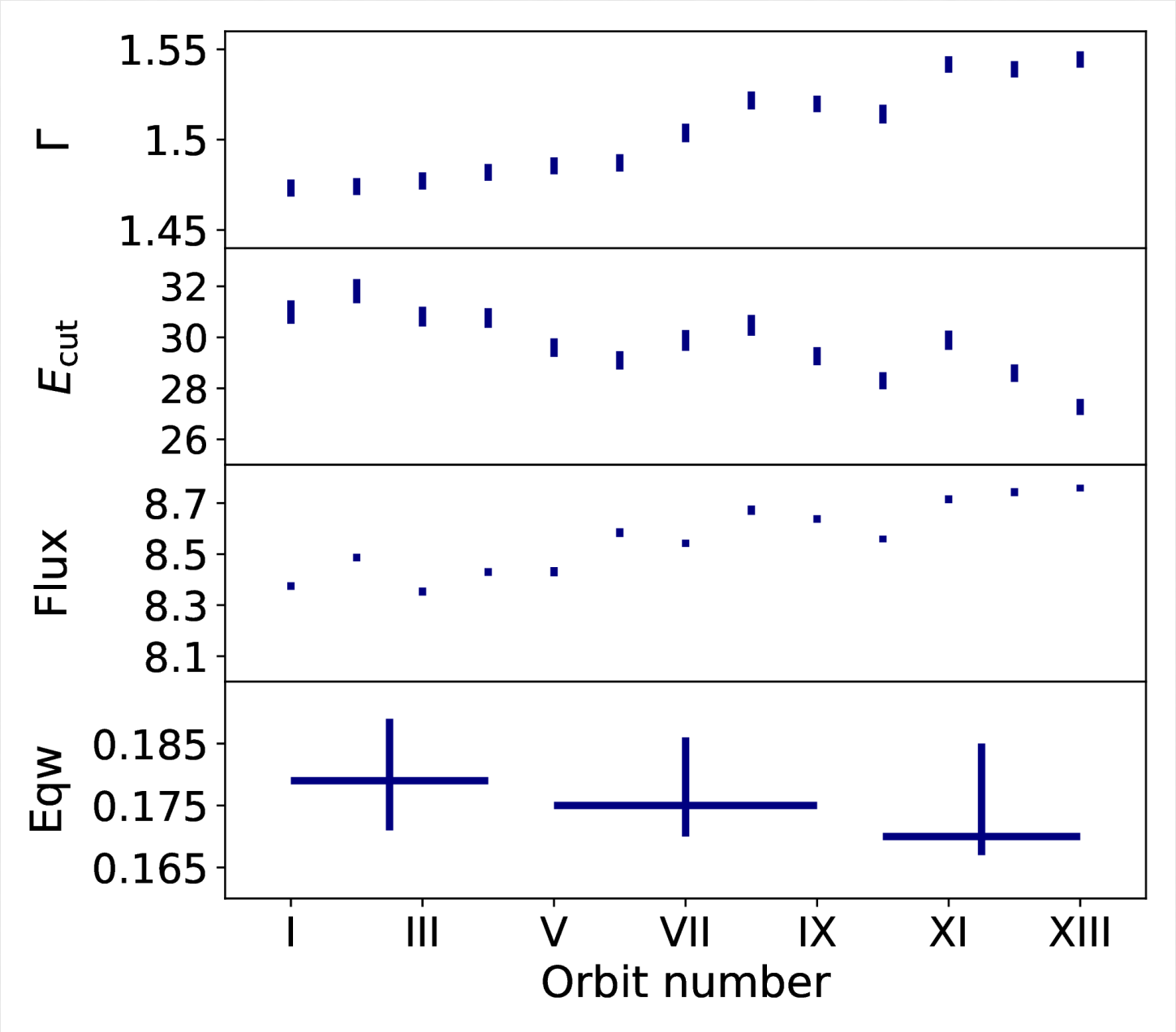
Closer look at data



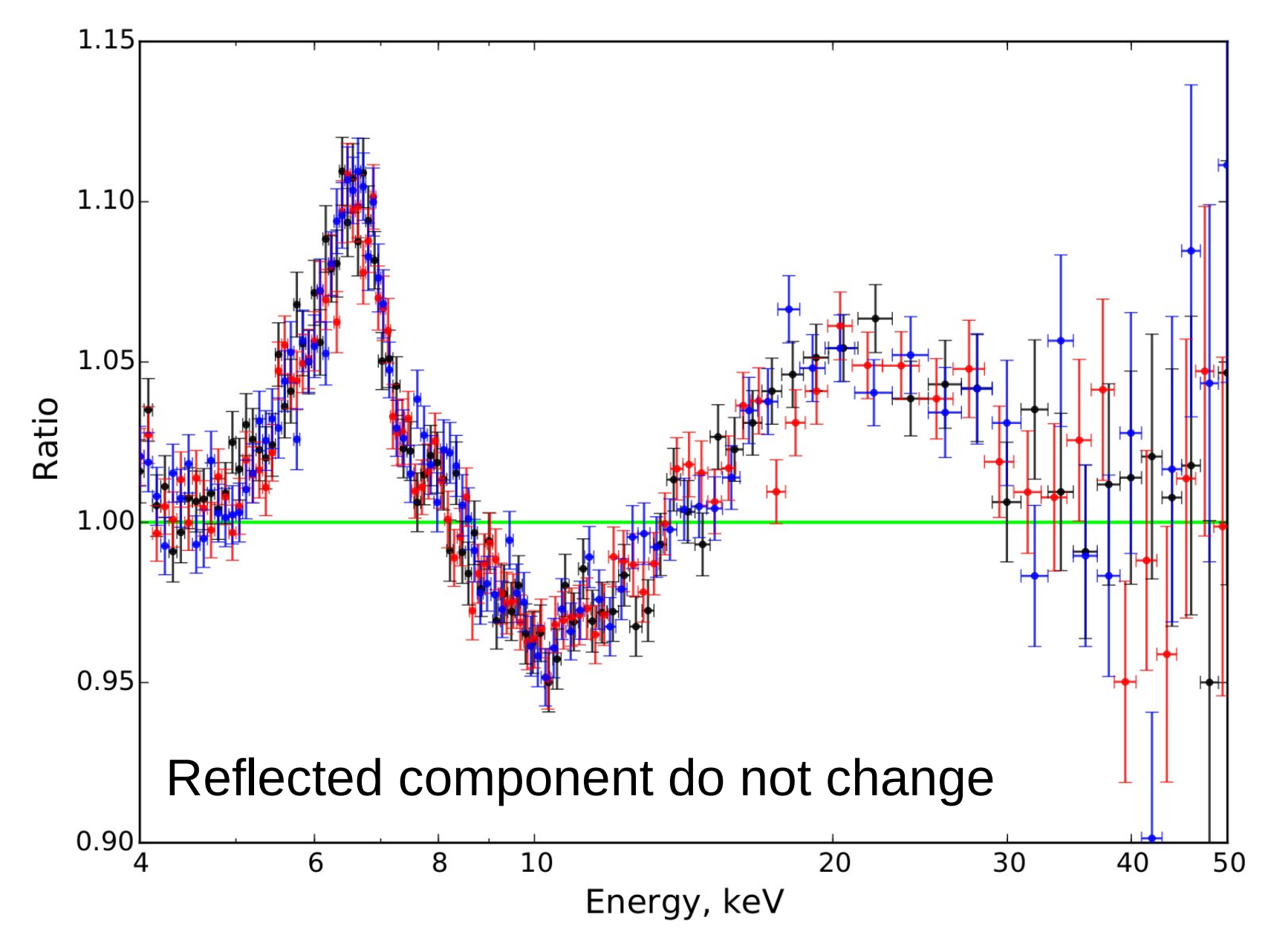
Closer look at data



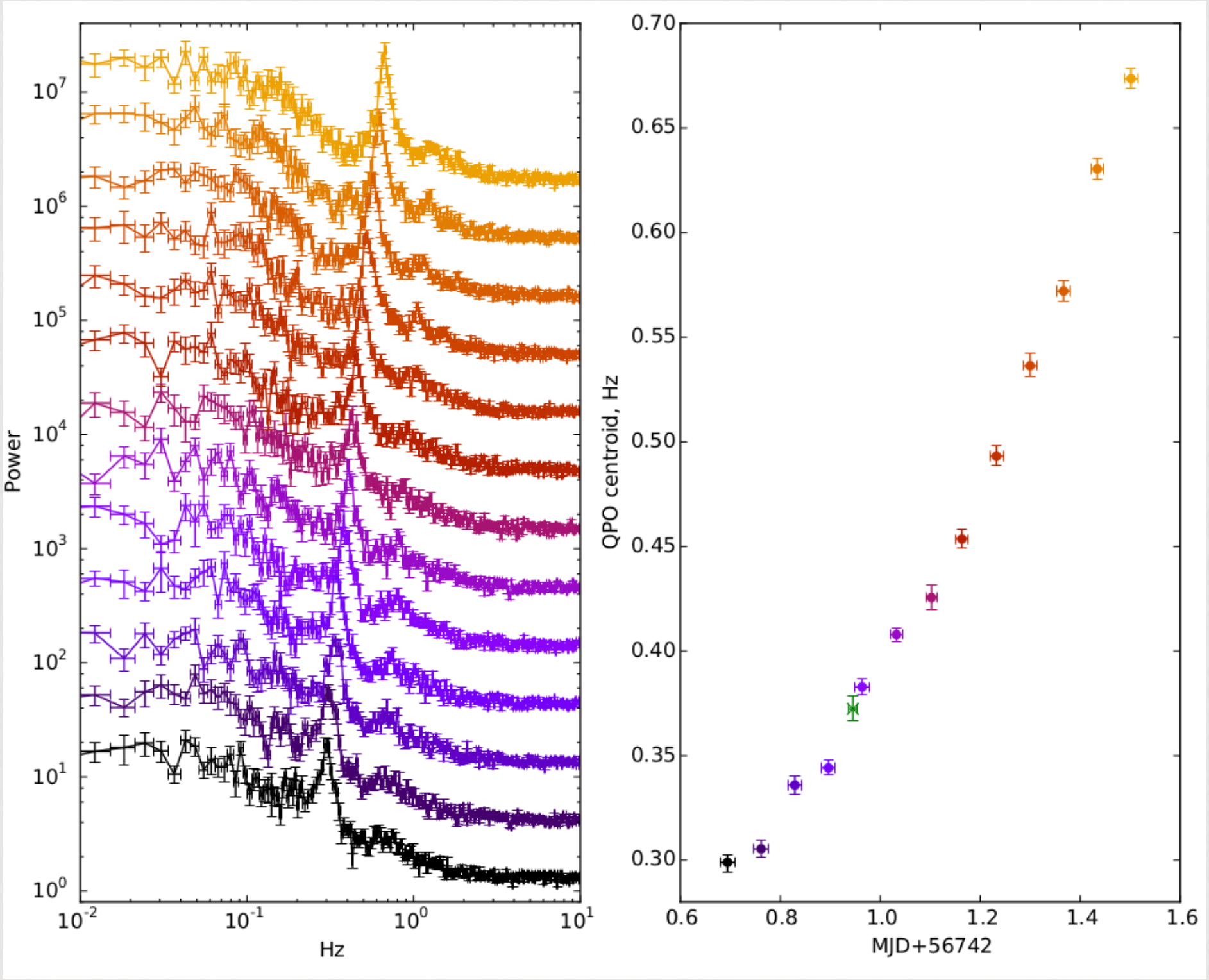
Closer look at data



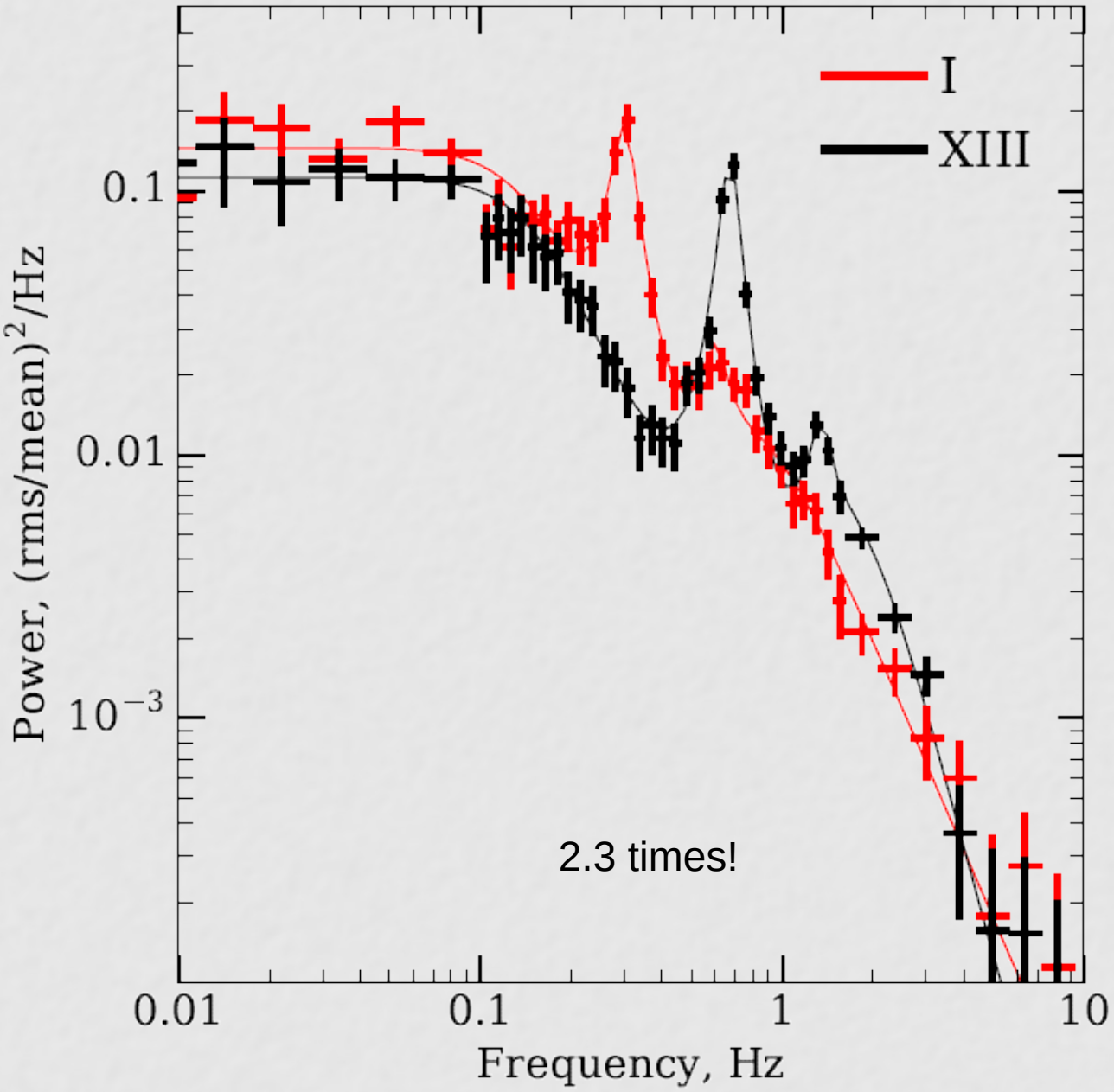
Closer look at data



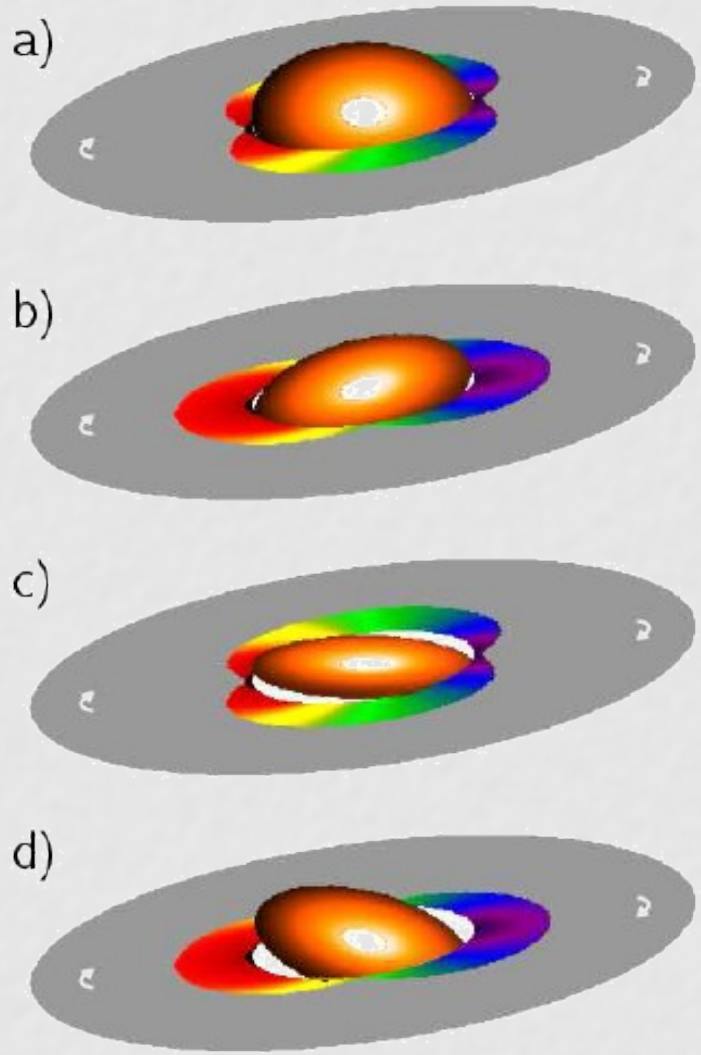
..timing, maybe?


Power
Hz
QPO centroid, Hz
MJD+56742

QPO, cospectra

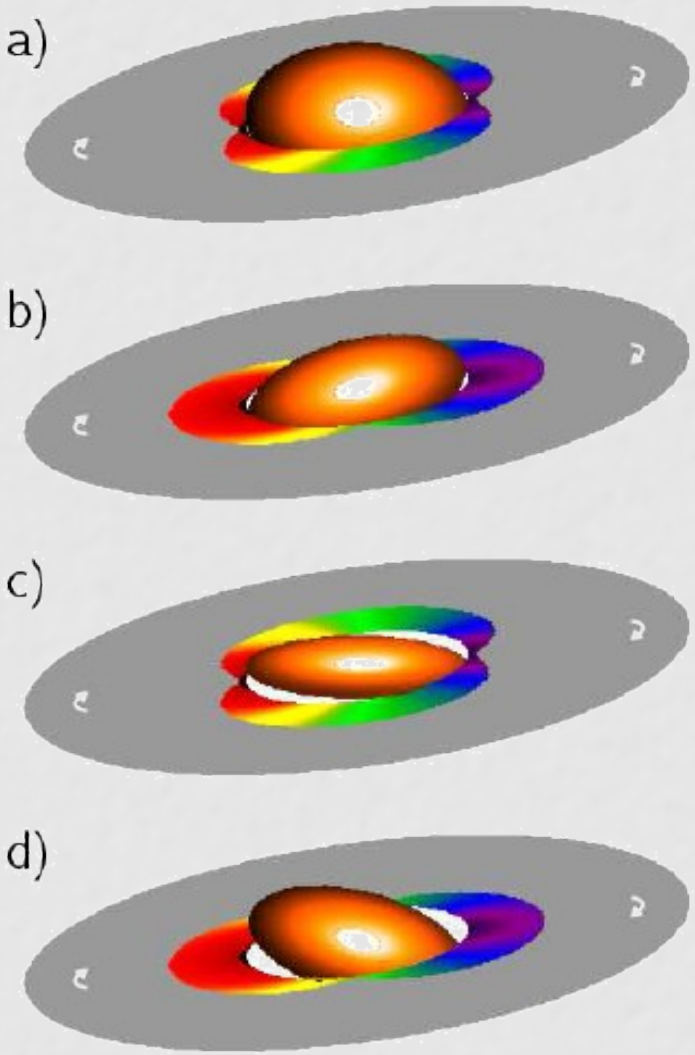


LF QPO – Lense-Thirring precession?



Stella&Vietri 98,99
Ingram+09,
Veledina+13

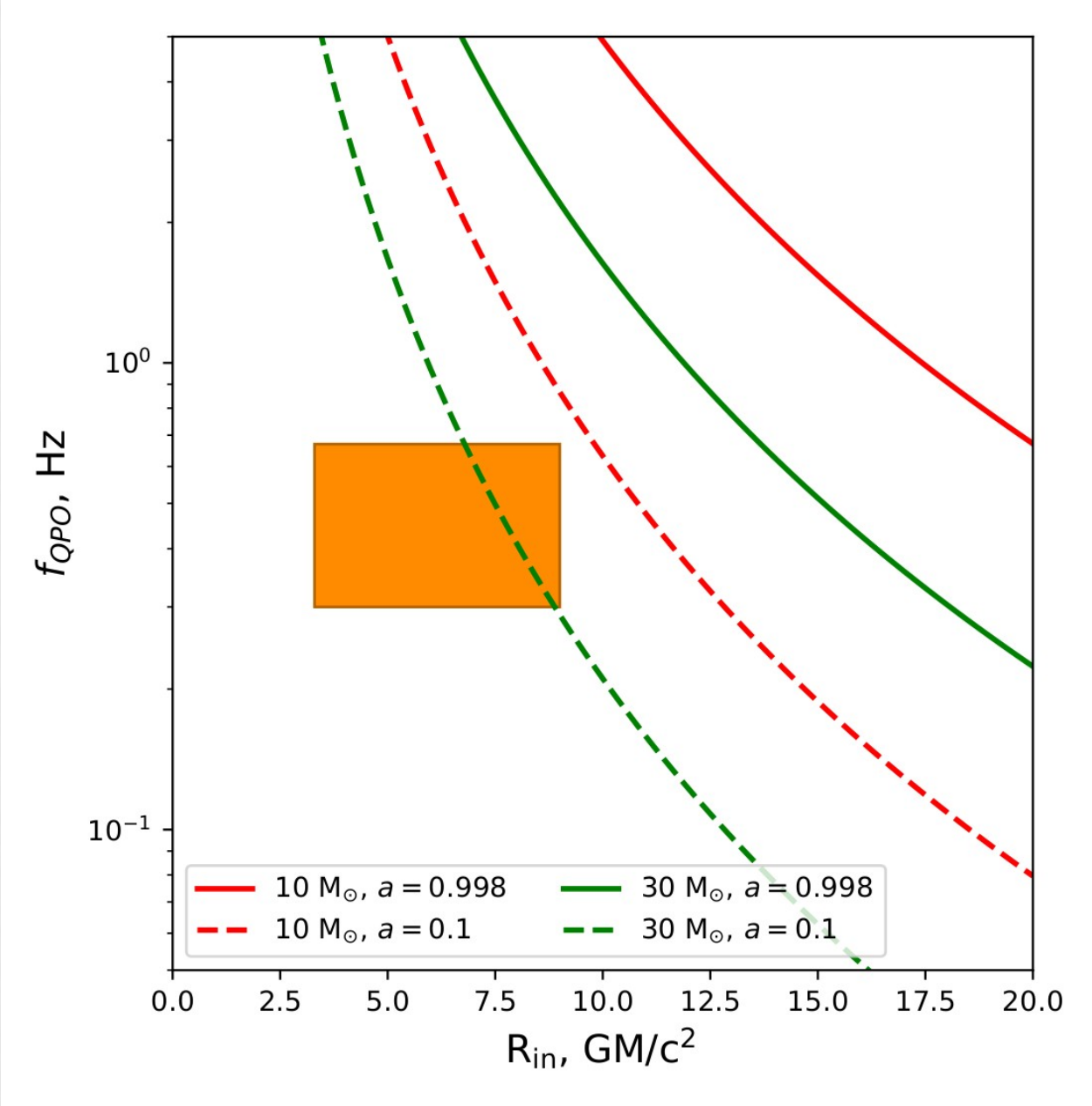
LF QPO – Lense-Thirring precession



Frequency depends on
BH mass, spin and R_{tr}

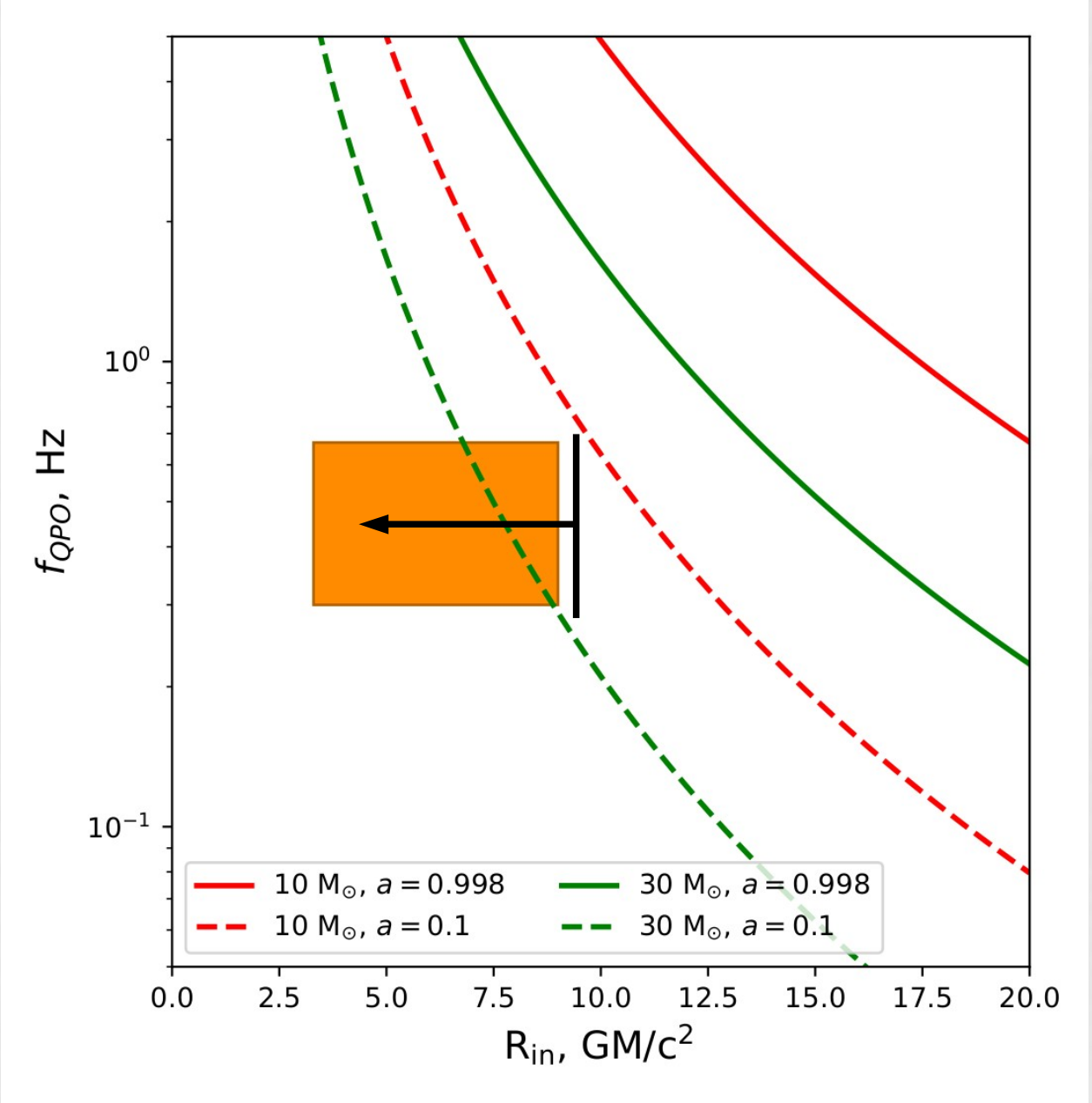
Stella&Vietri 98,99
Ingram+09,
Veledina+13

Spectra-timing



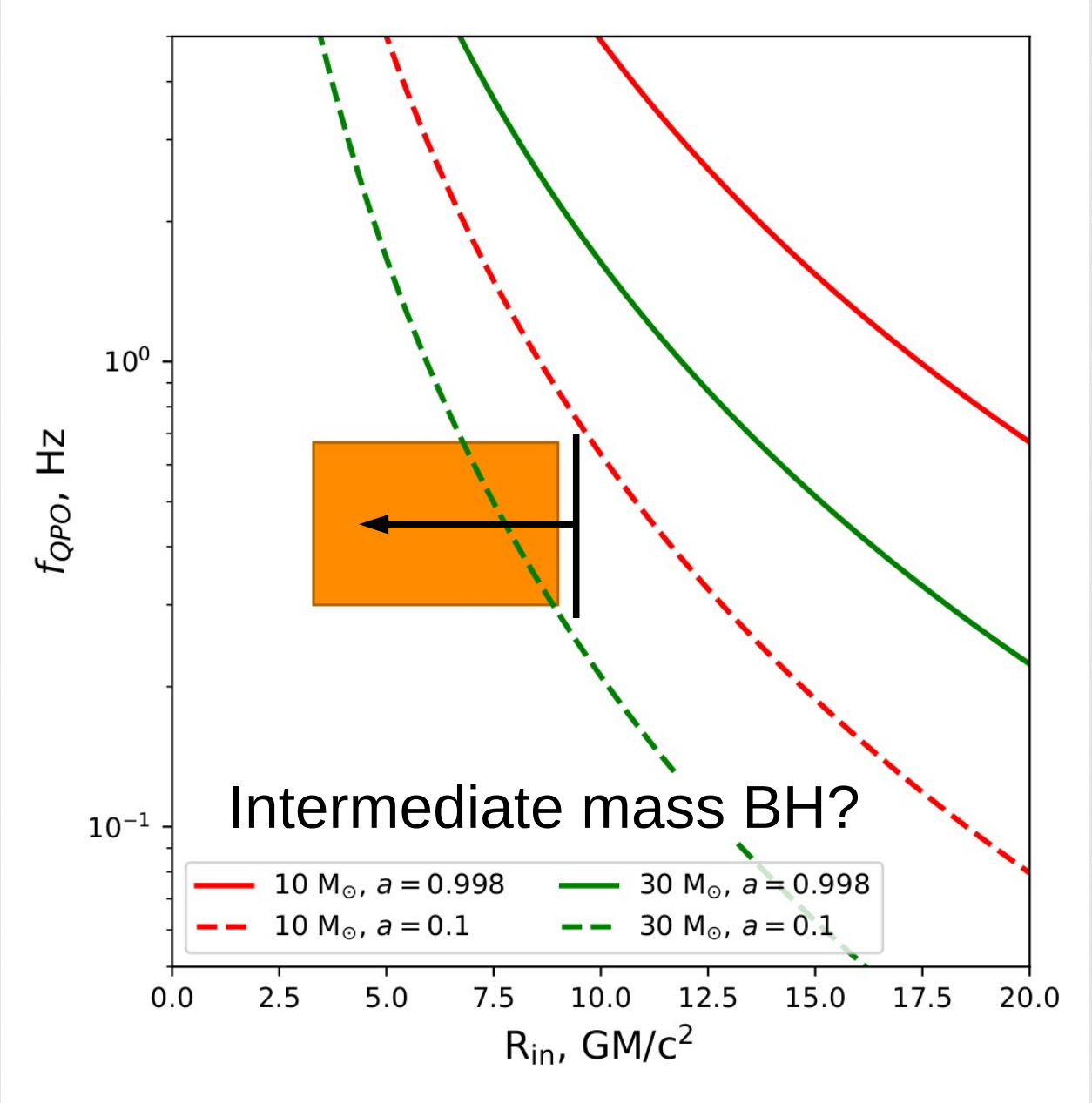
Mereminskiy+19

Spectra-timing



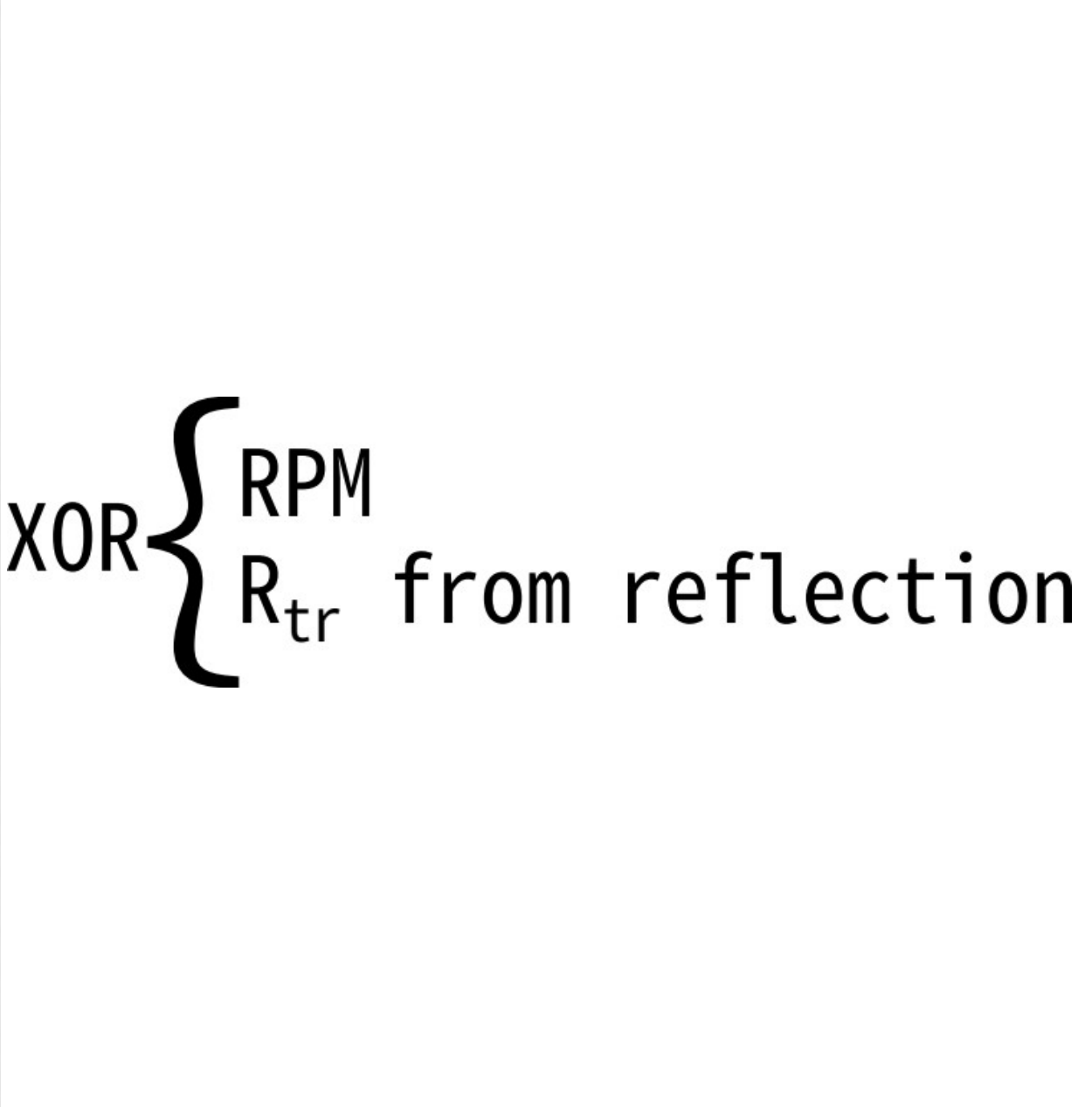
Mereminskiy+19

Spectra-timing

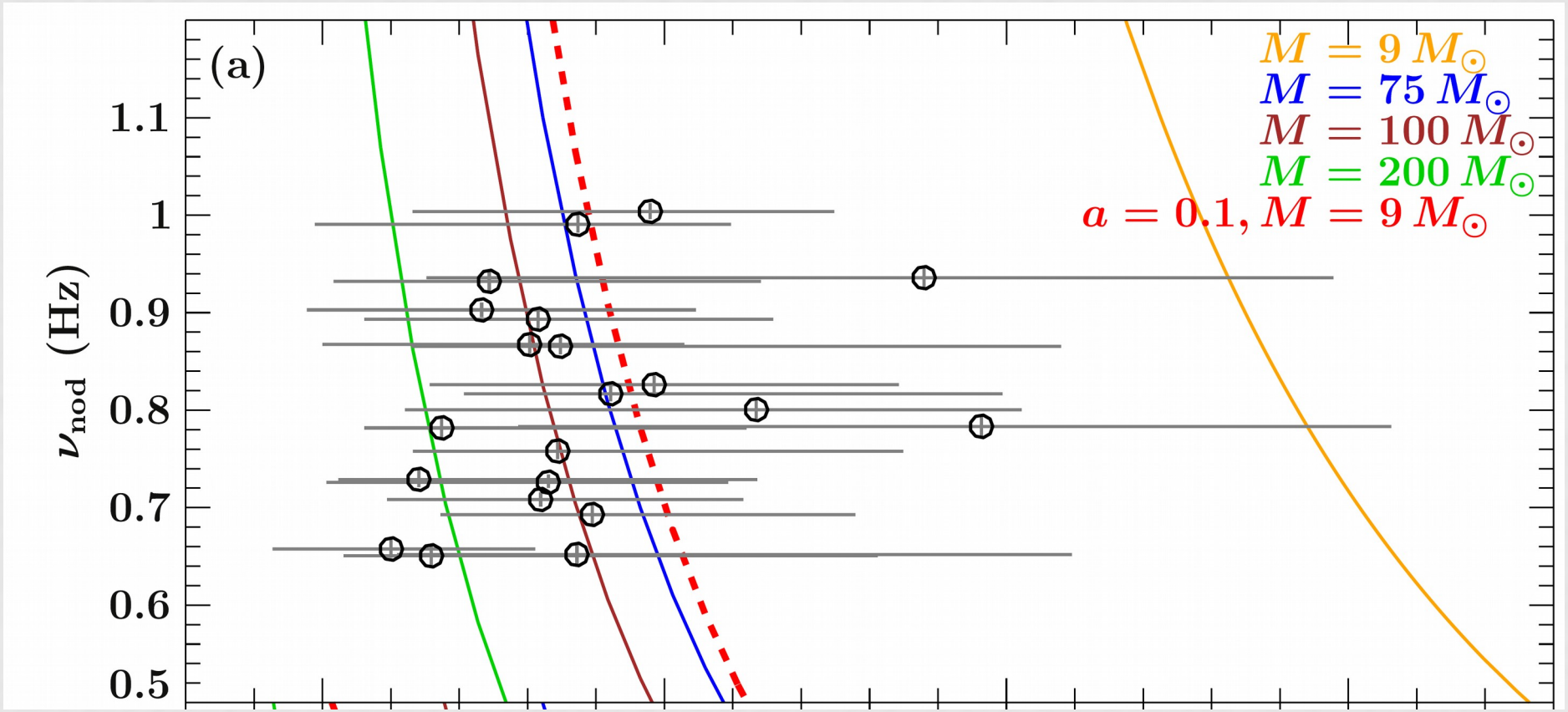


Mereminskiy+19

Skeptics conclusion



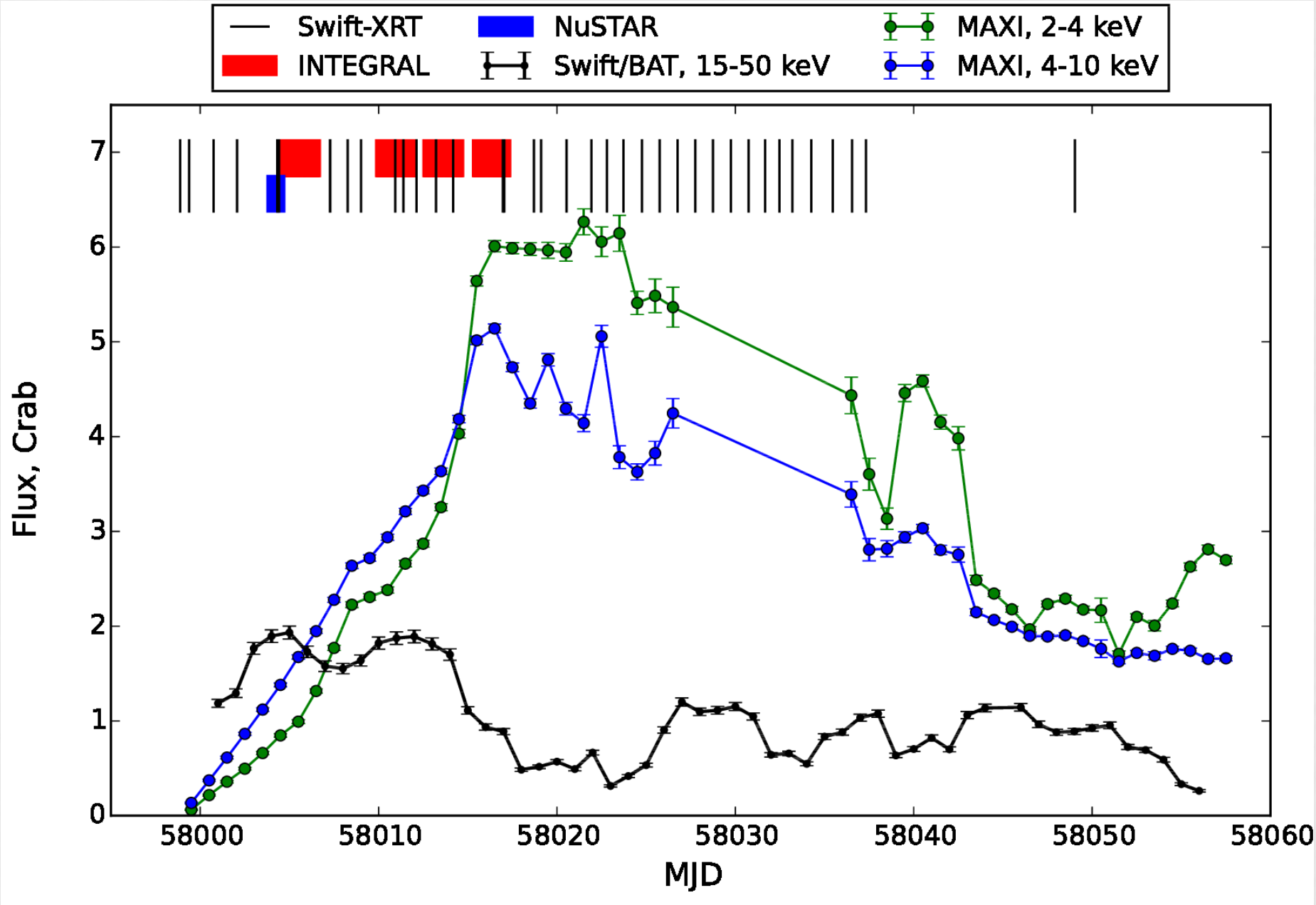
GX 339-4



Furst et al., 2016

$M_{BH} = 9^{+1.5}_{-1.2} M_\odot$

MAXI J1535-571



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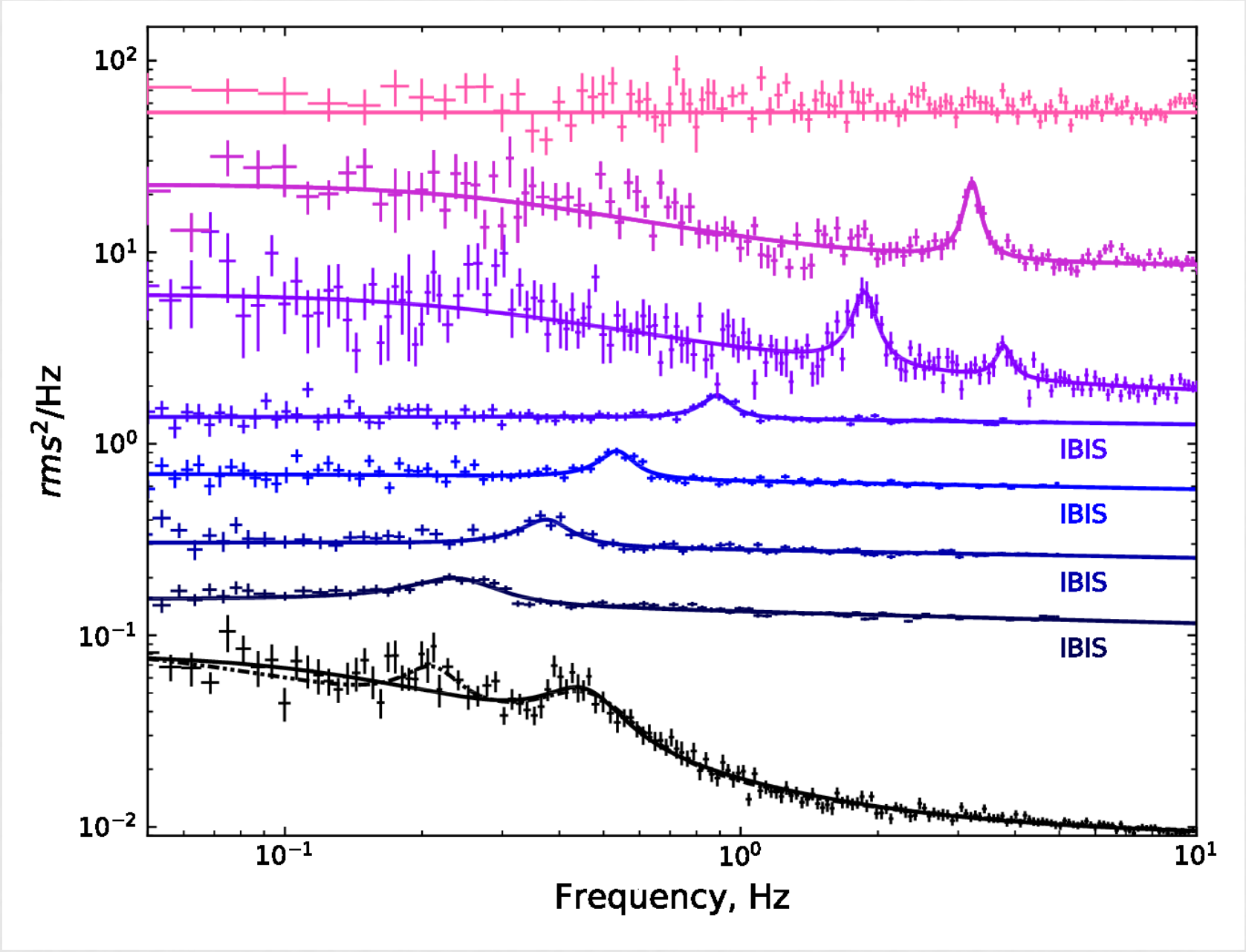

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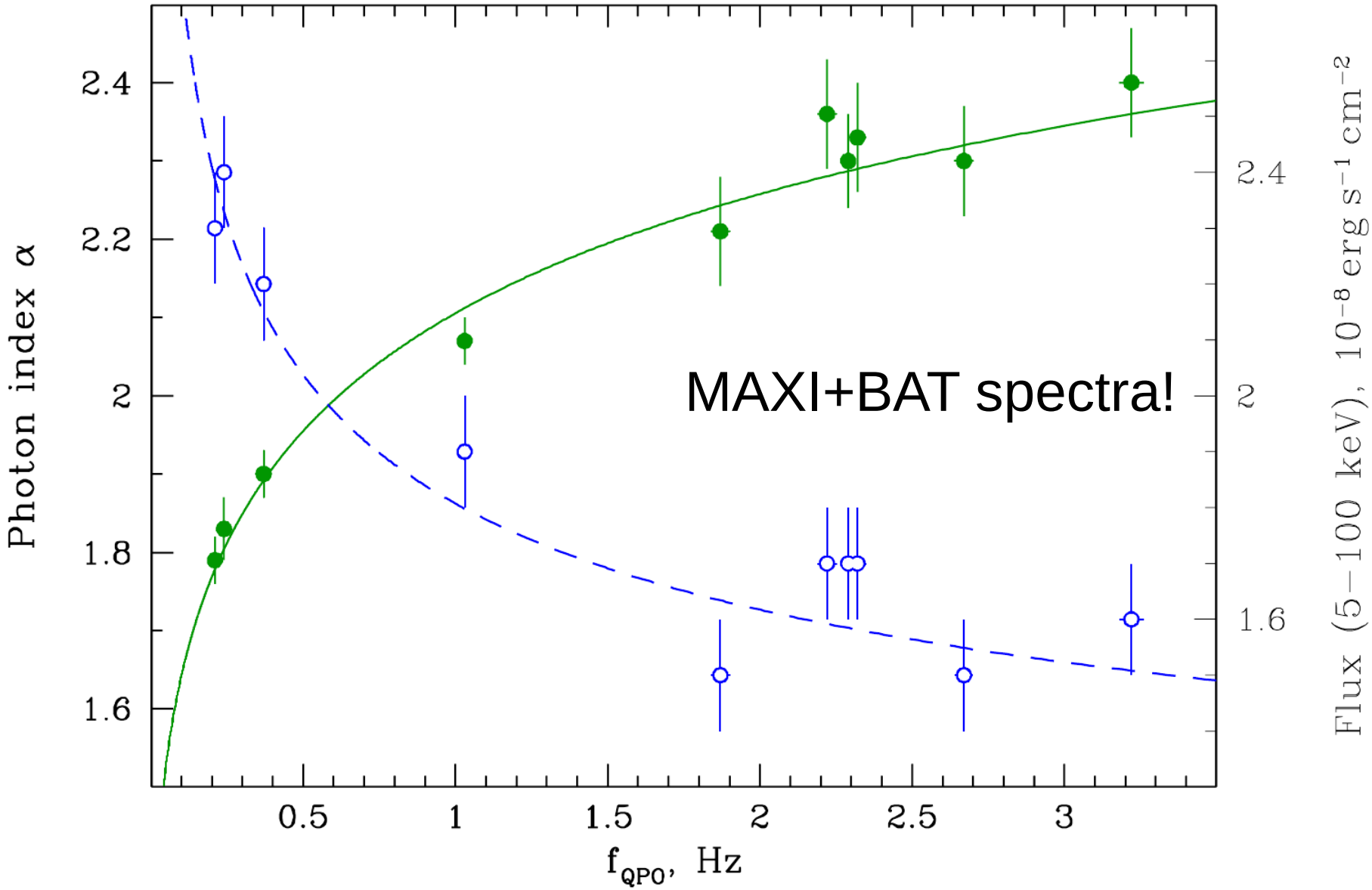

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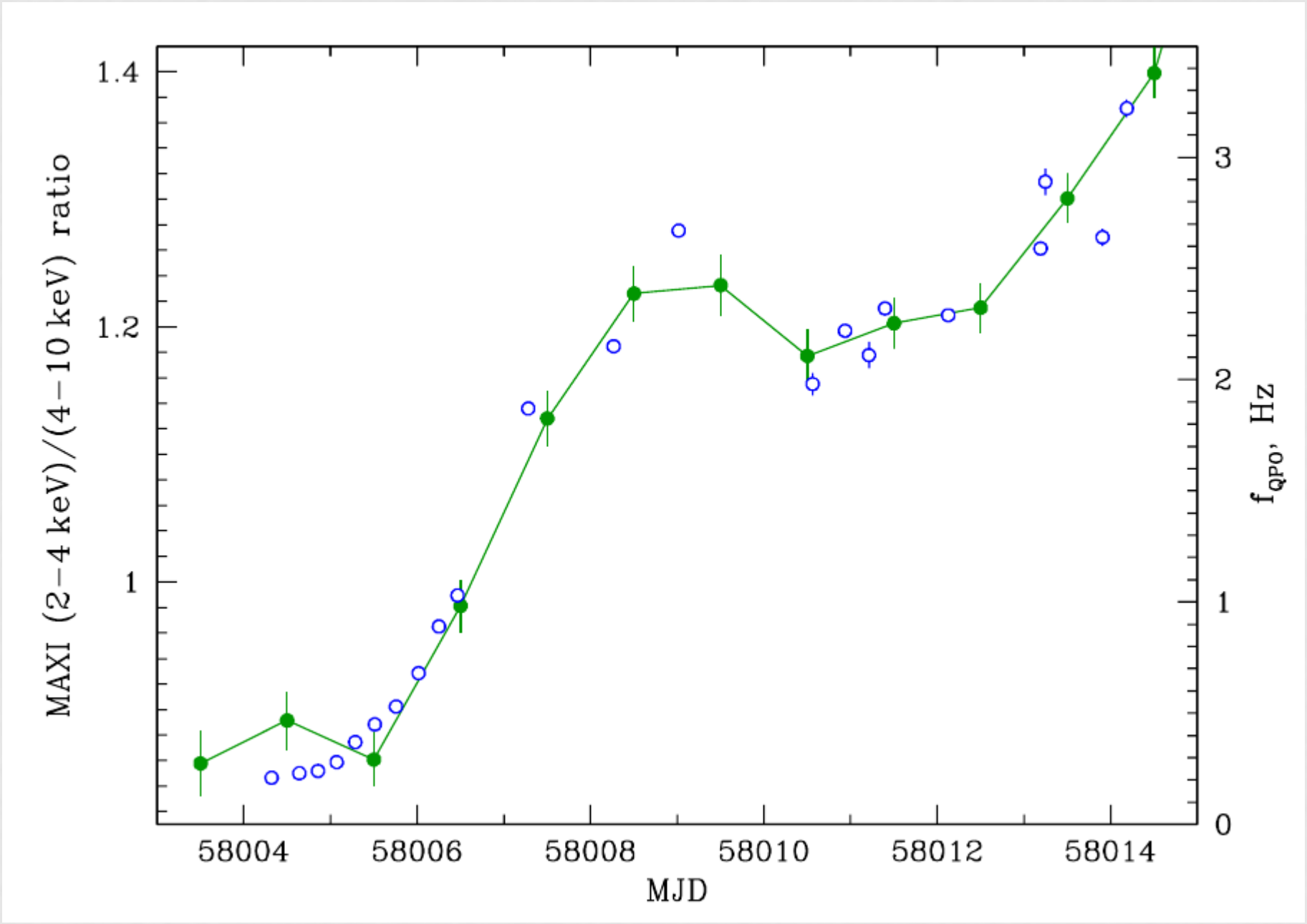

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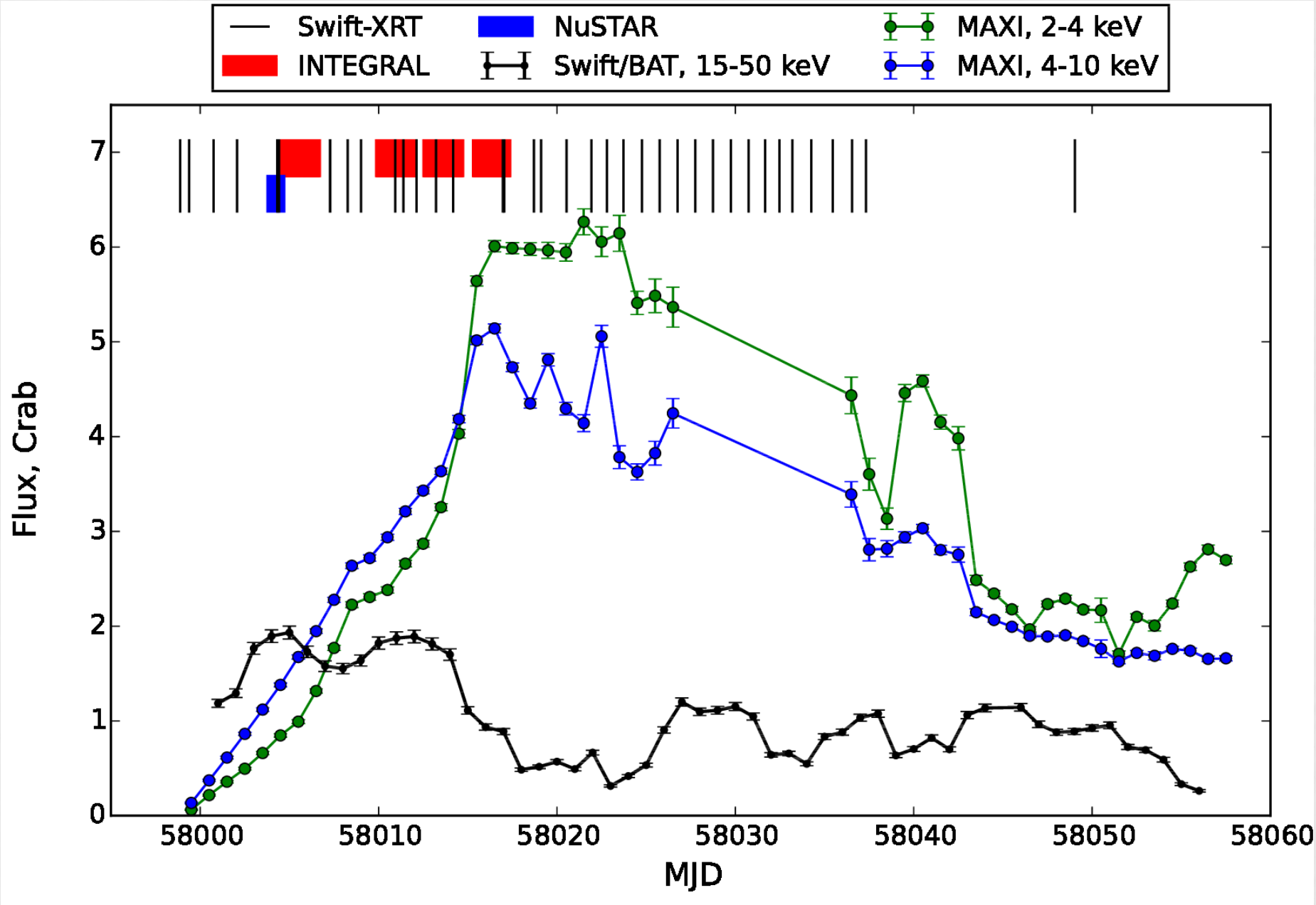

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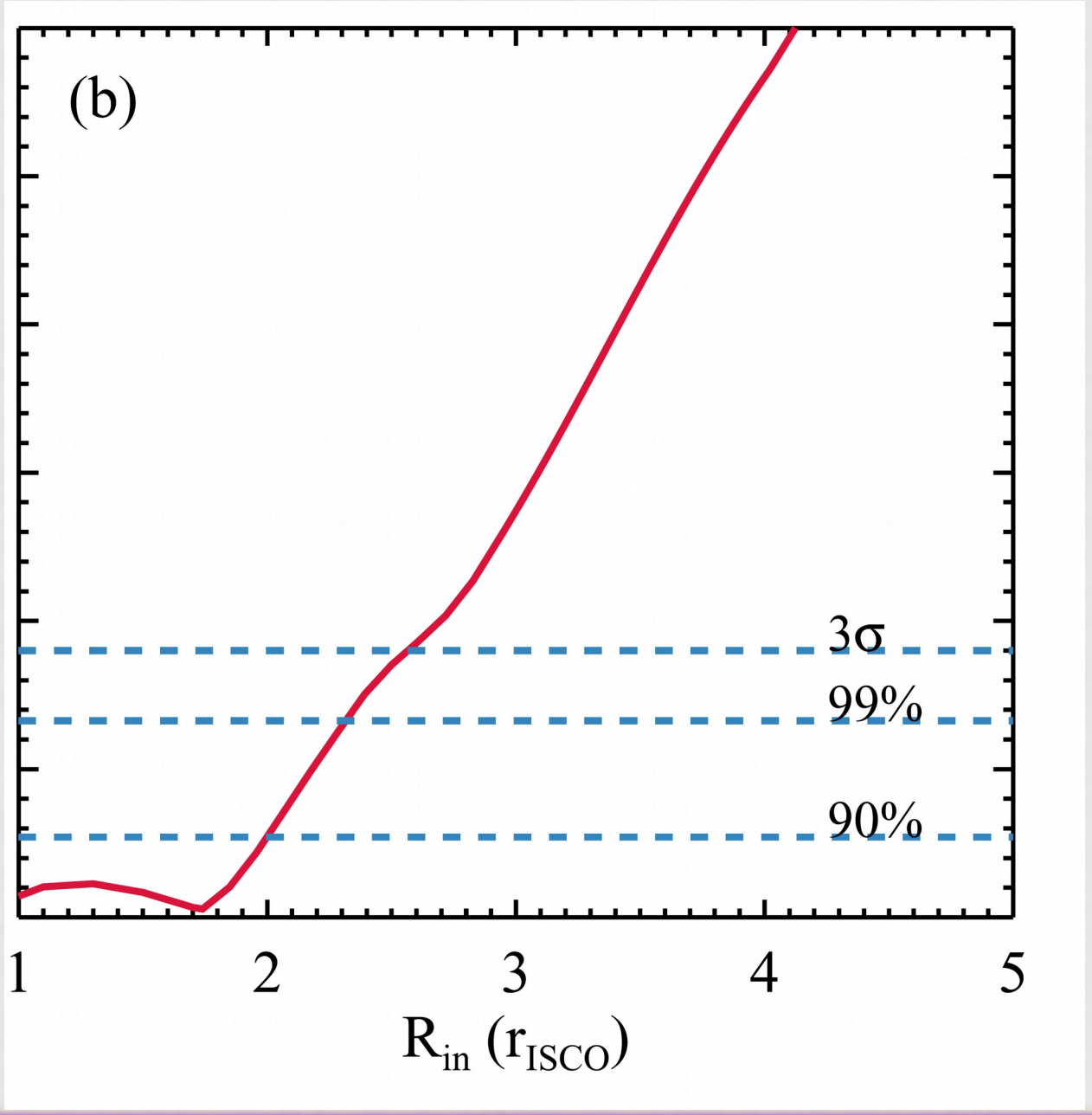

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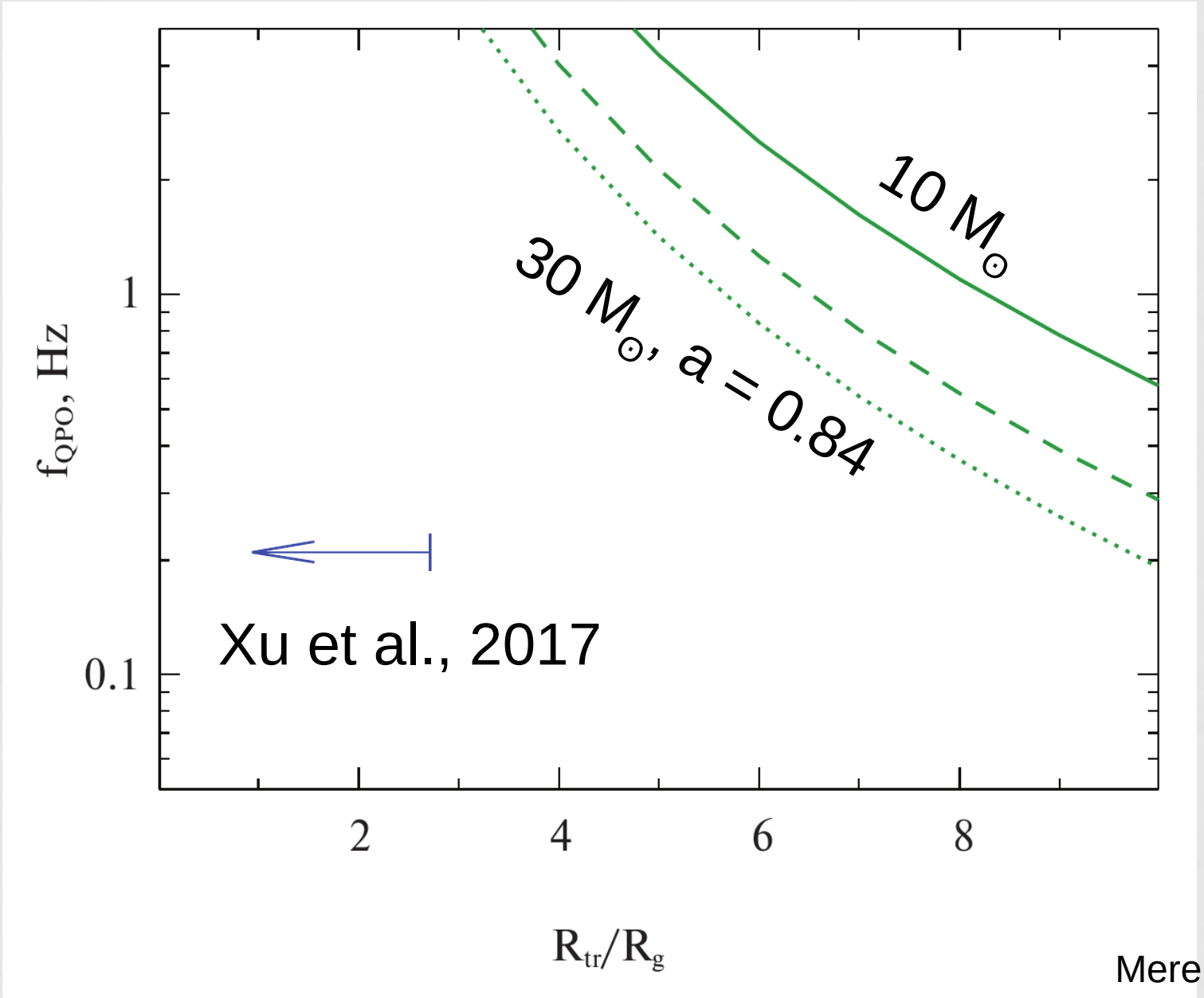

Mereminskiy+18

Conclusions

Measurements of R_{tr} from reflected spectra and RPM models cannot be simultaneously correct

Reflection models need independent verification! (Poutanen+2018, etc)

INTEGRAL provides unique data on initial stages of X-ray novae outbursts

Thank you for attention!