THE HIGHS AND LOWS OF Be/X-RAY TRANSIENTS UNVEILED BY *SWIFT*

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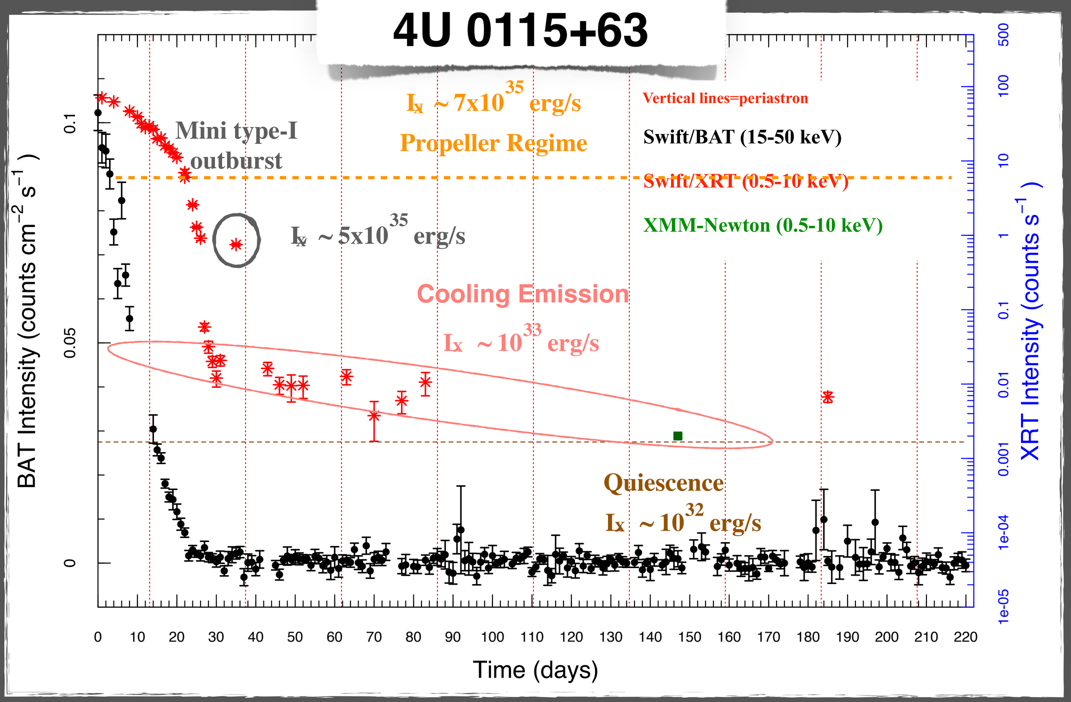
Be/X-ray binary systems are the most common sub-type of high-mass X-ray binaries in which magnetized neutron stars (NSs; B~10^{12-13} G) accrete from their massive companions (normally Be-type stars). These Be/X-ray systems show two kinds of X-ray transient behaviours: type-I and type-II outbursts. Type-I outbursts are short (a fraction of an orbital period), periodic and usually peak at L_X~10^{36-37} erg/s. These phenomena are caused by the accretion of matter onto the NS when the compact object passes through the decretion disk of the companion during the periastron passage of the system. Type-II outbursts are very bright and normally last for more than an orbital period, reaching or even exceeding the Eddington limit for a NS (L_X>10^{38} erg/s). The physical mechanisms behind these events remain unclear, although some studies focus on the structure of the Be-star decretion disk and its alignment with the NS orbit.

Swift, with its flexibility and quick response, is the most suitable observatory to study Be/X-ray transients at their high and low X-ray luminosity. I summarise the main outcomes of our Swift monitoring study where both the NS spin period and magnetic field strength are essential to understand the physical scenarios at the low X-ray luminosity states in these systems.

FAST ROTATORS: P_{spin} < 10 s

4U 0115+63



Entering Propeller Regime[a, b] after outburst

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Potential cooling emission from the accretion-heated NS surface[c, d]

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Detection of some short-lived accretion events during periastron passages (mini type-I outbursts)

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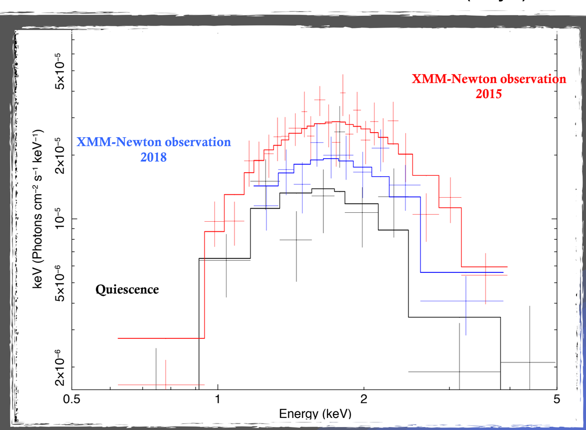
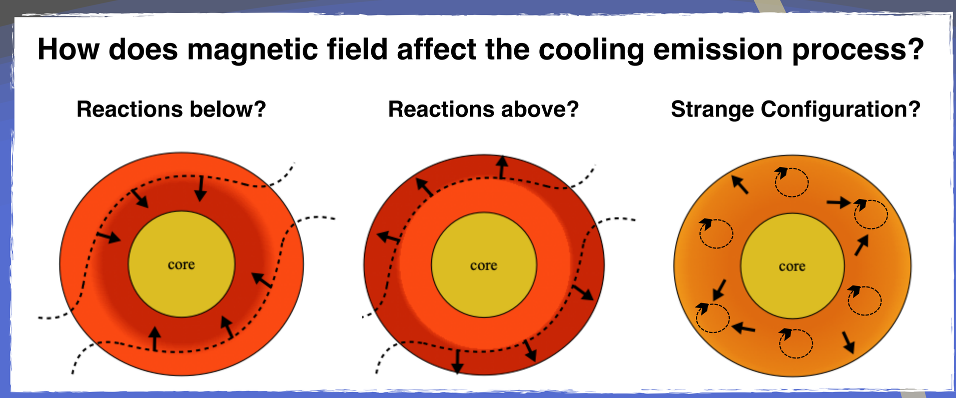
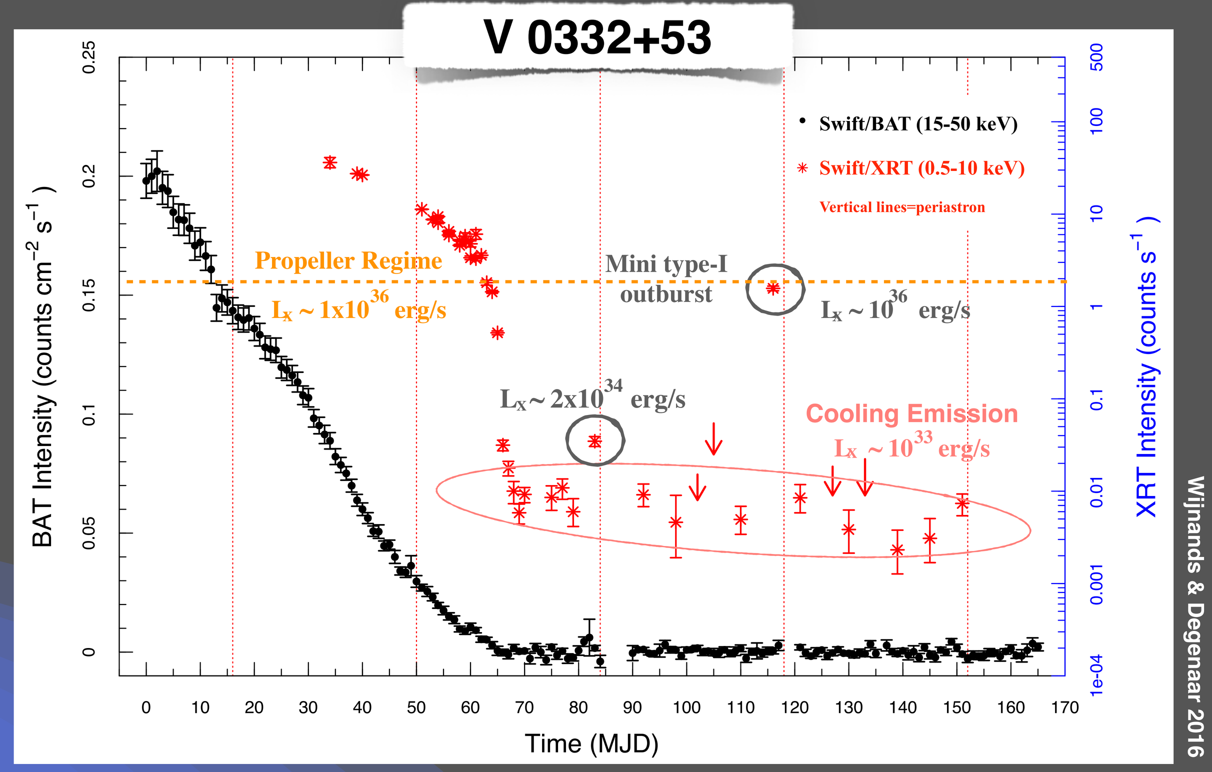
Expected that the cooling emission decays till quiescence



Confirmed thermal emission from cooling @ low X-ray Luminosity (*XMM-Newton* observations)



V 0332+53



SLOW ROTATORS: P_{spin} > 100 s

Not entering Propeller Regime after outburst

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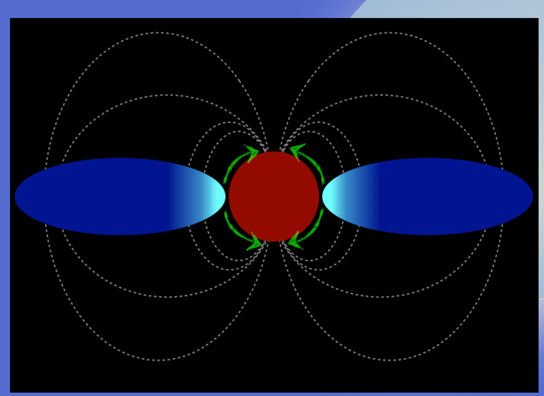
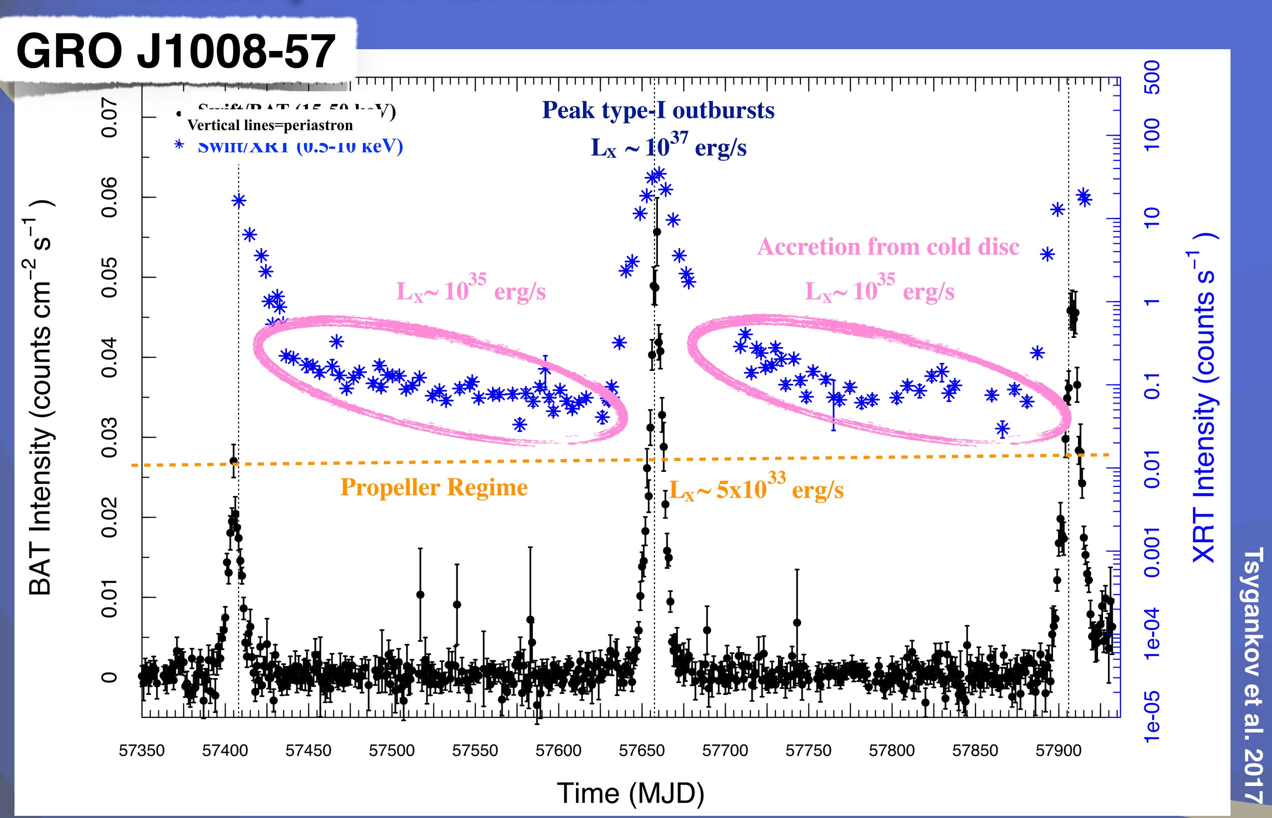
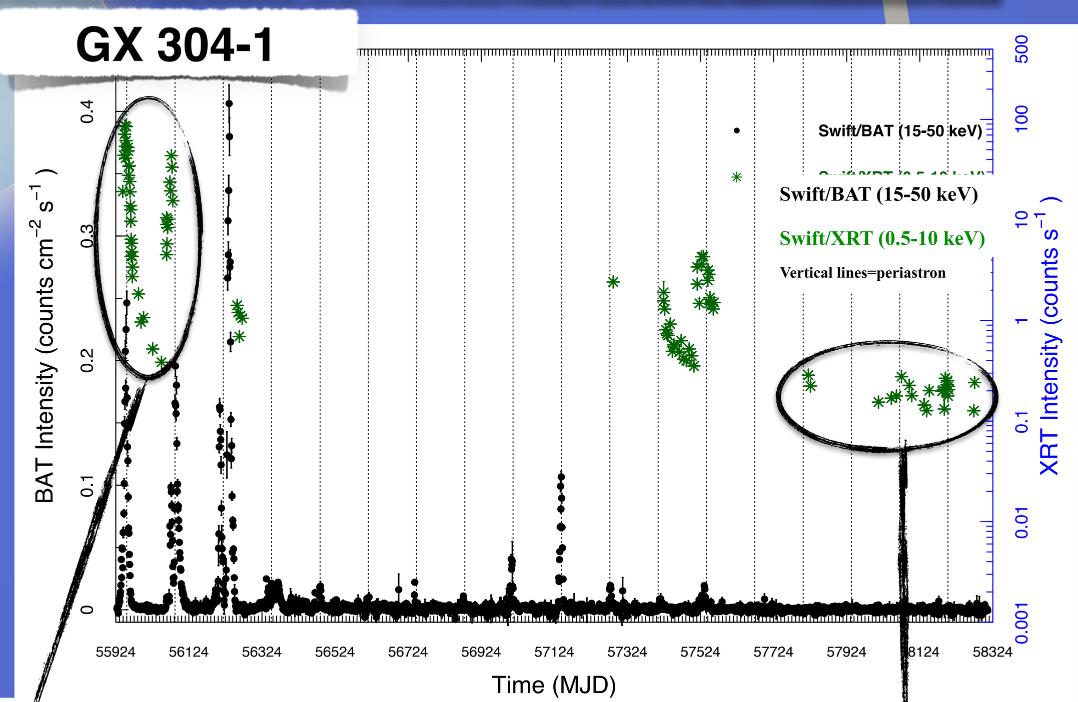
Emission due to accretion from a non-ionised disk ('cold disk'[e]) with low viscosity. The luminosity in this phase is higher than the cooling luminosity in the fast rotators

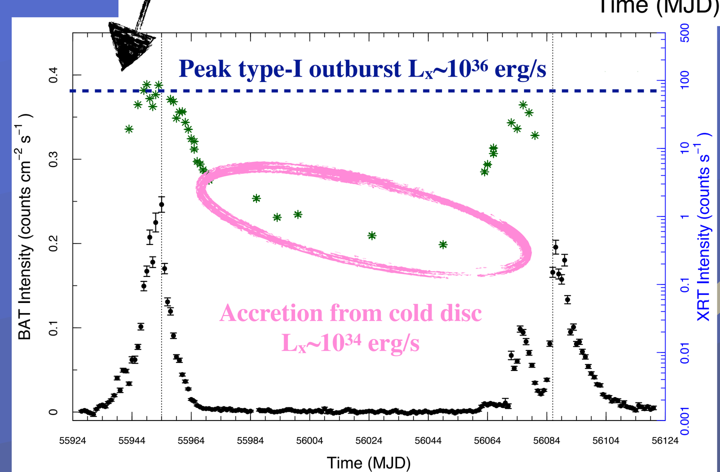


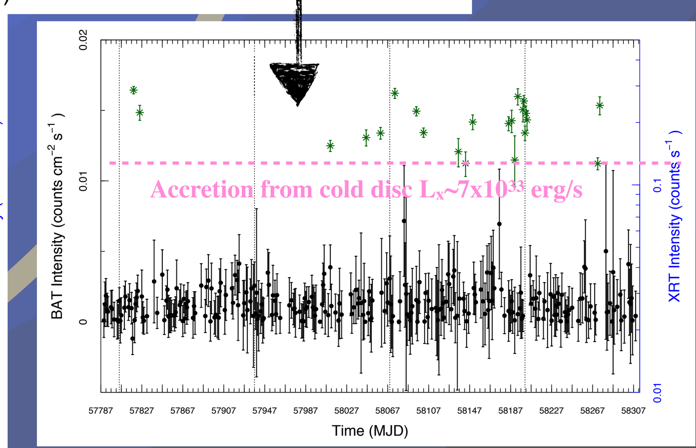
GRO J1008-57



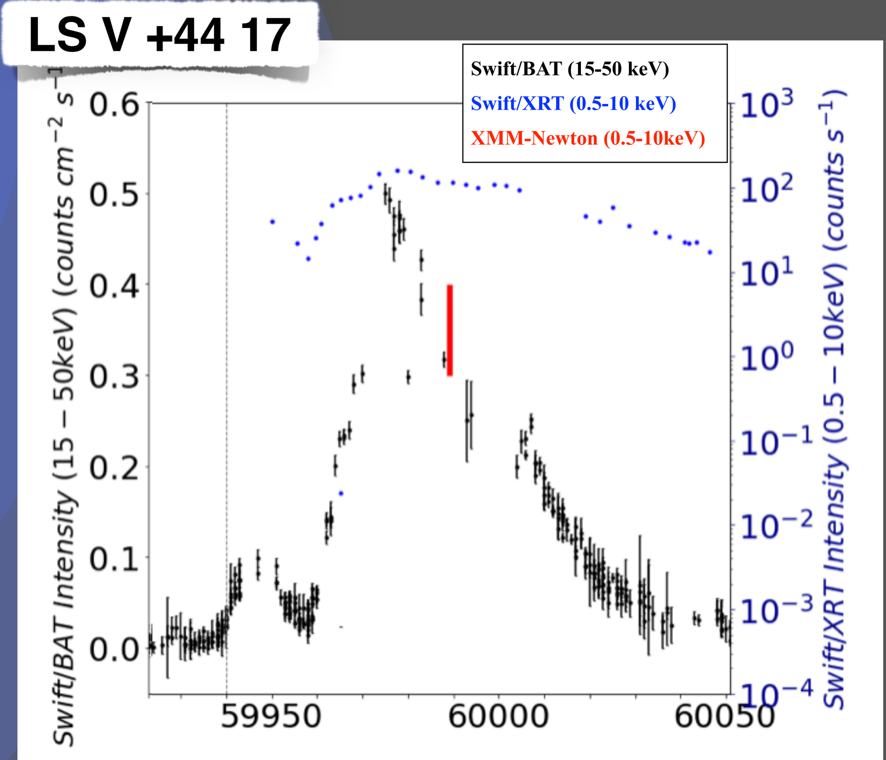
GX 304-1







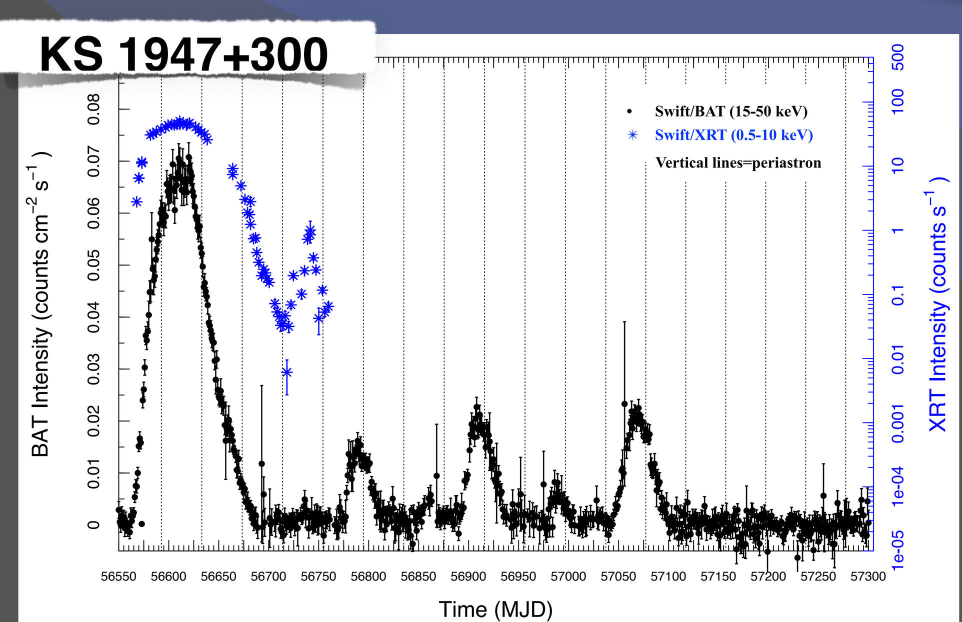
LS V +44 17



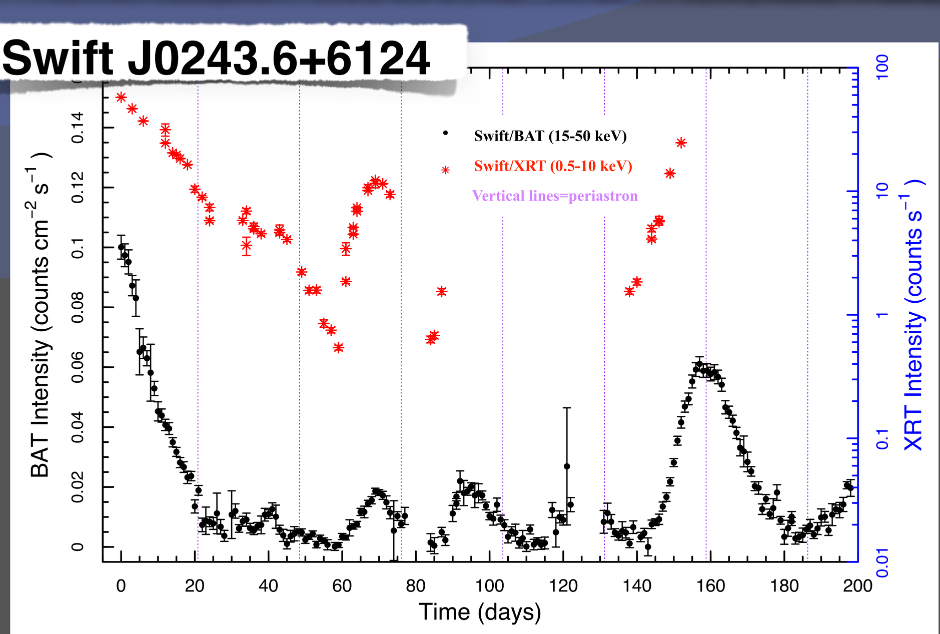
In 2023, LS V +44 17 underwent the brightest type-II outburst ever detected for this source. The cold disk should empty as it is not refilled during periastron passage, this leads to a decreasing observed luminosity

INTERMEDIATE ROTATORS: 10 s < P_{spin} < 100 s

KS 1947+300



Swift J0243.6+6124



After type-II outbursts

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Some systems show reflaring activity

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Are these reflares related to periastron passages?
Do these periastron passages induce some instabilities in the NS accretion disc?

Sometimes these reflares are not related to periastron passages

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Detection of reflares also in apoastron, therefore the explanation requires more complex causes than the passage close to the companion

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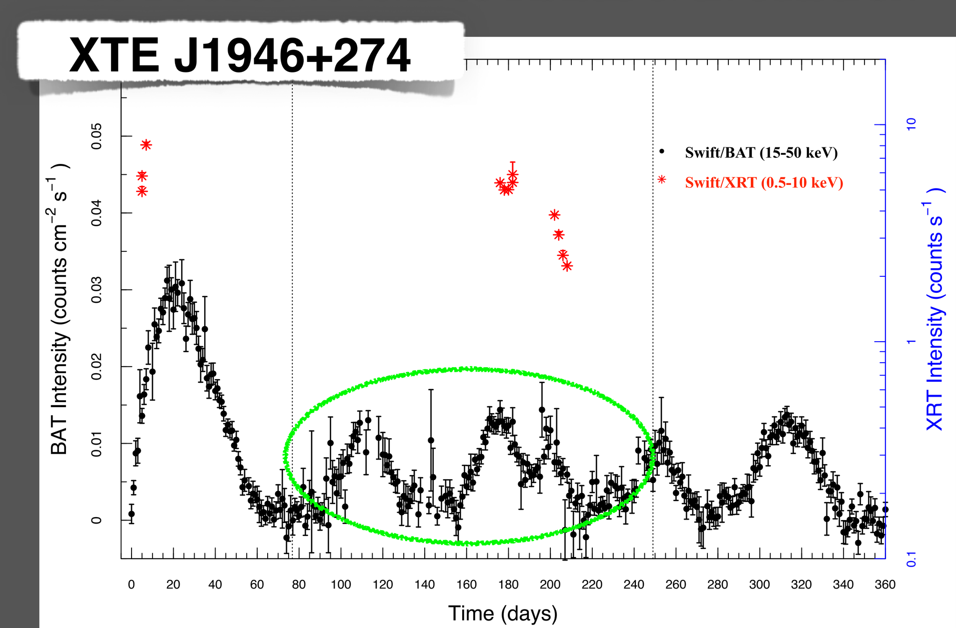
One reason may be that the decretion disk is extended till the apoastron[f] but then why do we observe reflares instead of an outburst?

XTE J1946+274



There are systematics in the source behaviour at low X-ray luminosity related to the NS spin and magnetic field

Any Question?

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References

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