

Long duration X-ray bursts observed with INTEGRAL

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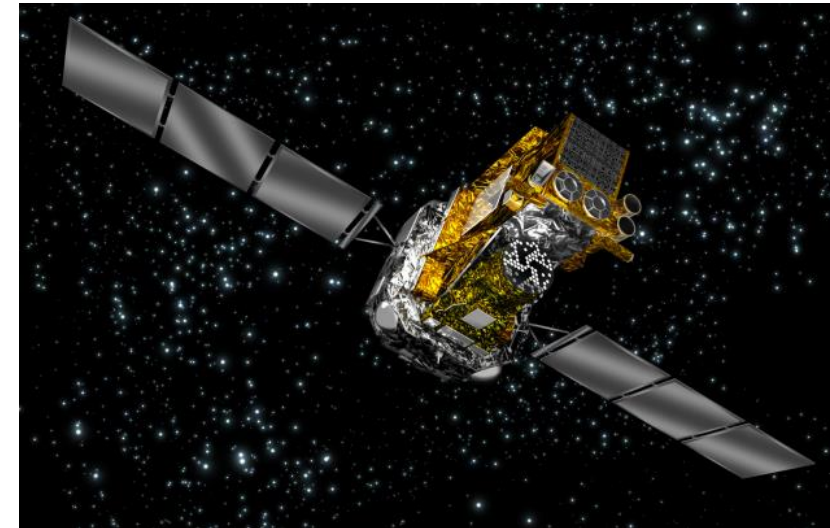
Carol Anne Oxborrow

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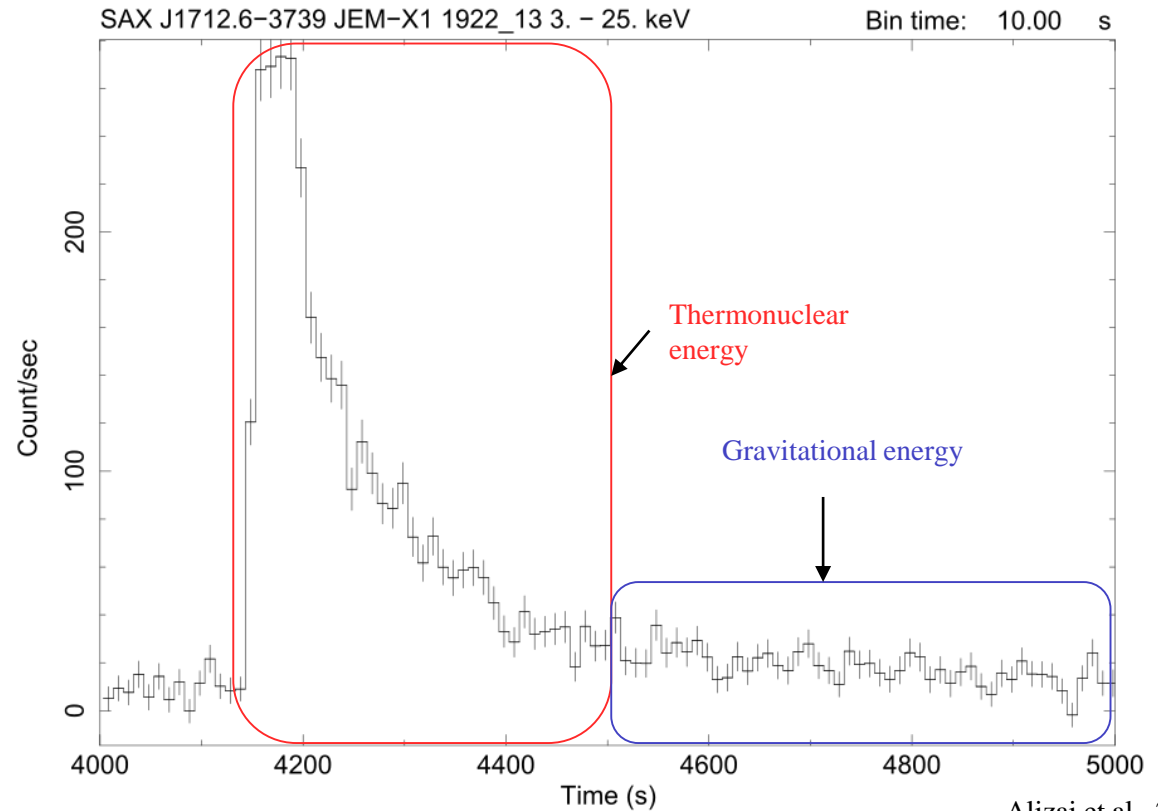
Maurizio Falanga

And more..



Type I X-ray bursts

- Low-mass X-ray binary systems (LMXB's)
- Mass transfer – Roche lobe
- NS LMXB's
- Mass accretion rate: \dot{M}
- Characteristic: fast rise and exponential decay. Spectral softening /cooling
- Relevance: probe for nuclear physics, NS and EOS



Start Time 18169 22:54:58:184 Stop Time 18169 23:51:08:184

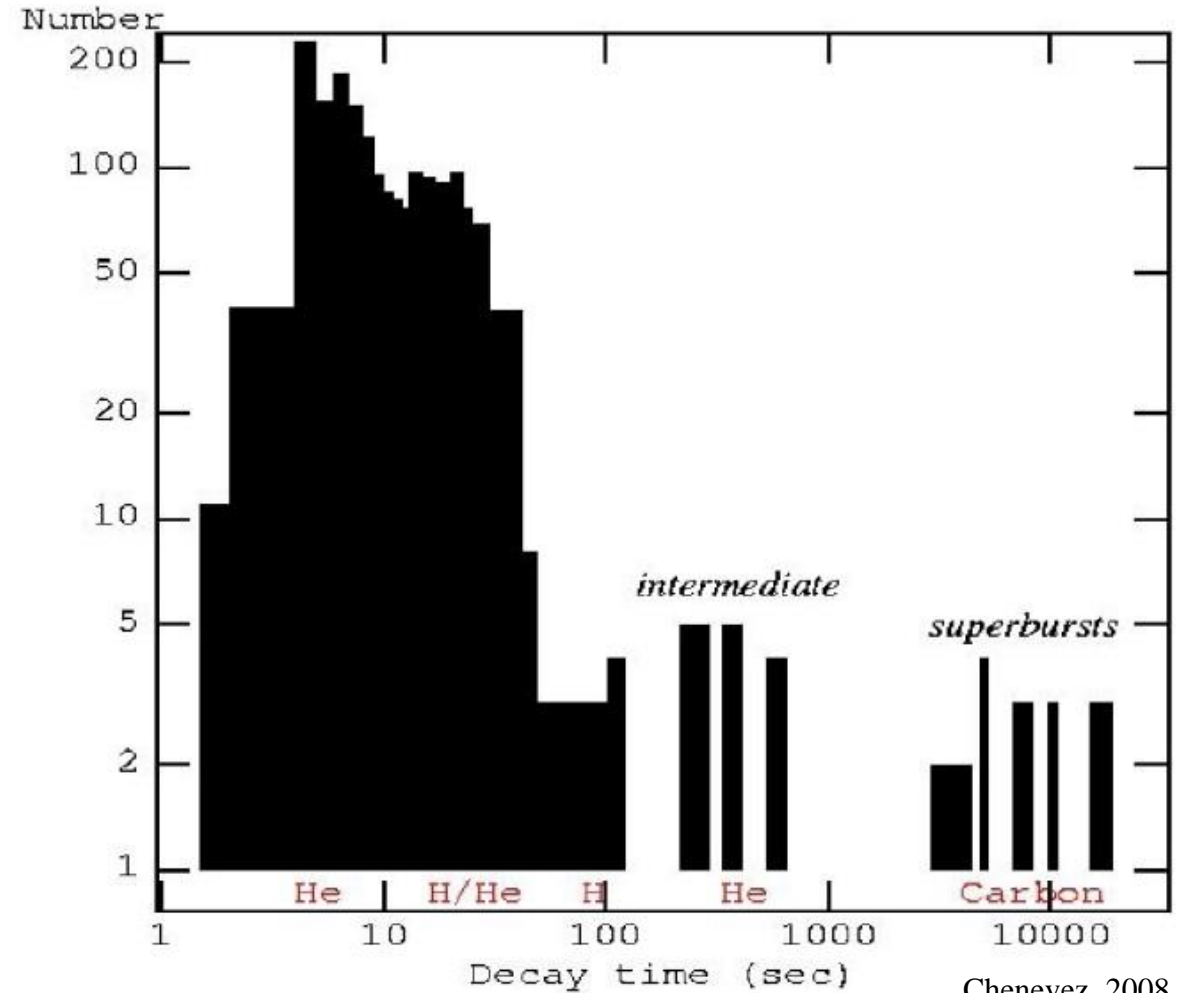
Seward, 2010

Type of X-ray bursts

- Short Type I X-ray bursts.
 - duration: *s-min*
 - Thousands observed
 - recurrence time of min/days
 - $E_b \sim 10^{38} - 10^{39} \text{ erg}$
 - Ignition of H&He layer,

- Intermediate long bursts
 - ~ 70 observed
 - recurrence time of weeks/months
 - $E_b \sim 10^{40} - 10^{41} \text{ ergs}$
 - deep He layer ignition

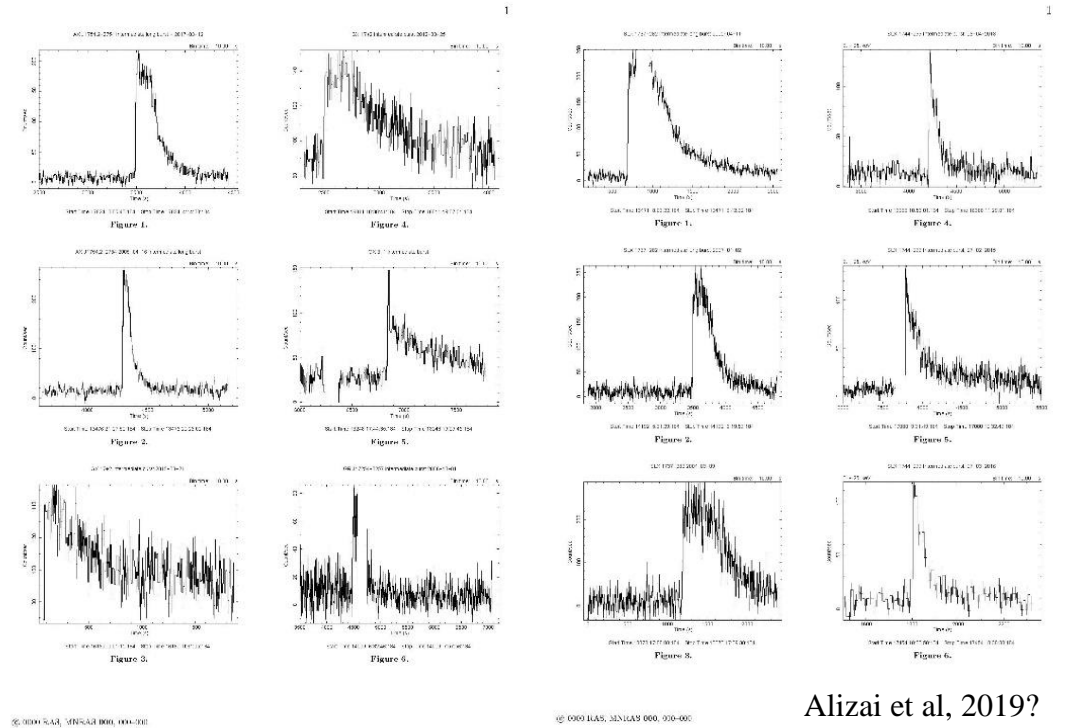
- Superbursts
 - ~ 27 observed
 - recurrence time of months/years
 - duration of hours/day



Chenevez, 2008

Long burst in INTEGRAL

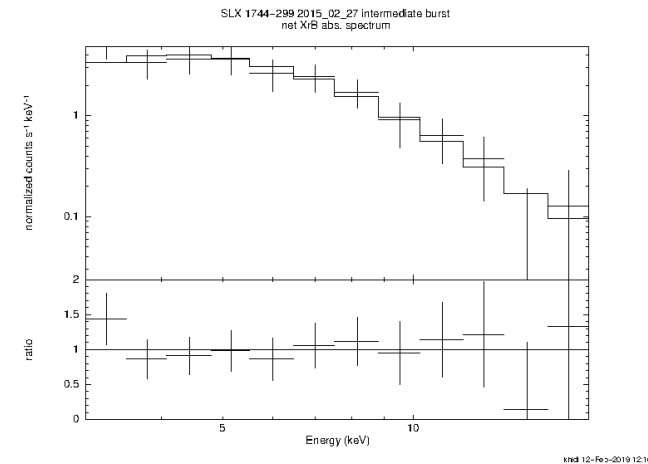
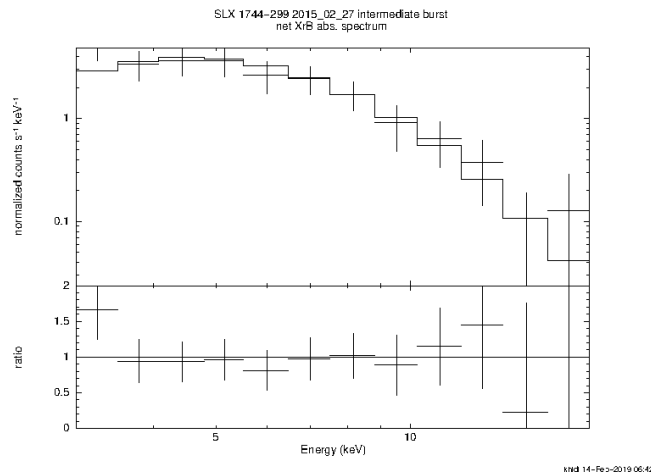
- Reported: 16
- Confirmed: 15
- Intermediate burst reported by Seguera in ISGRI 2004 not detectable with OSA 10.2 or 11
- 9 bursts reanalyzed
- First time analyses of 6 bursts



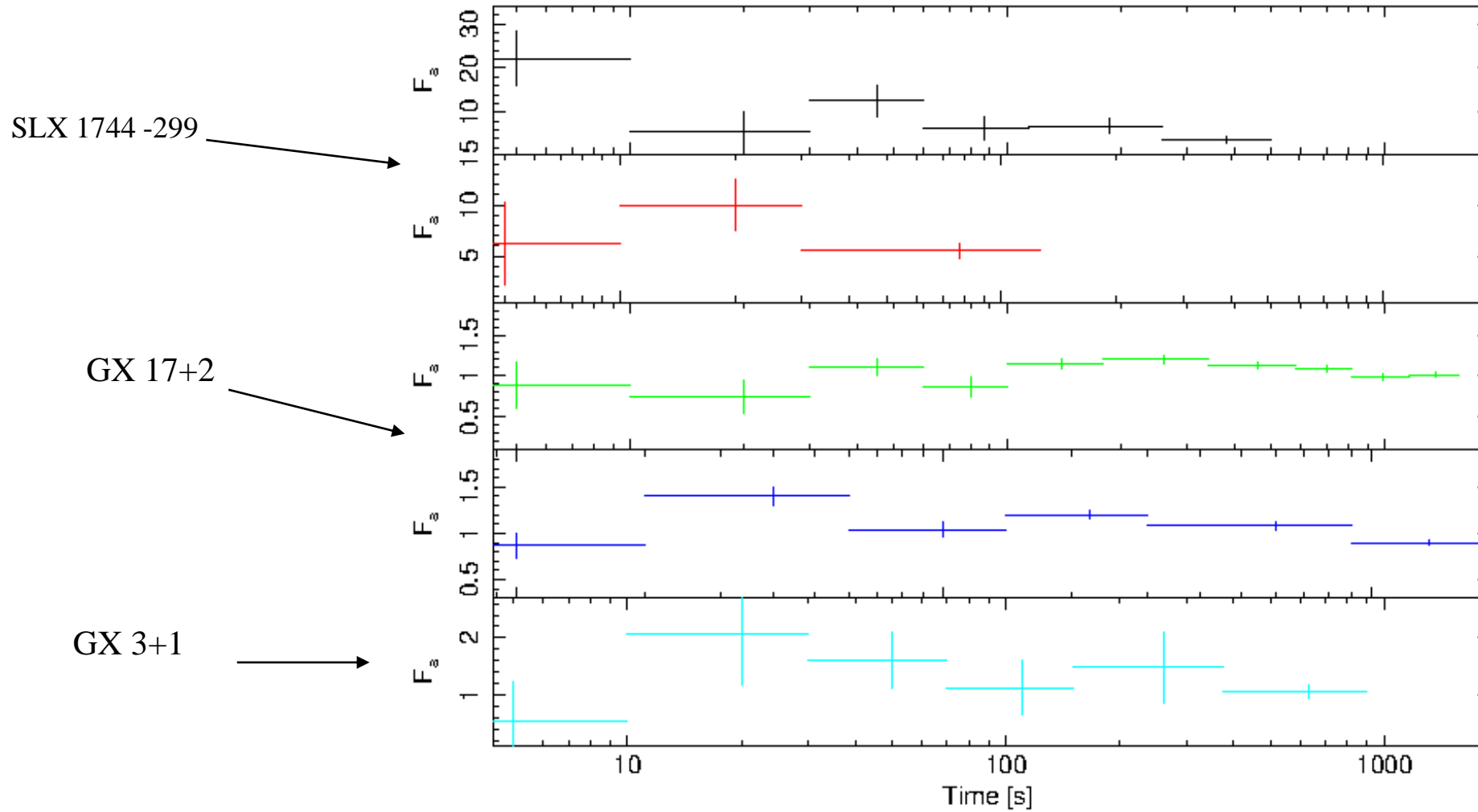
Alizai et al, 2019?

Changing persistent emission

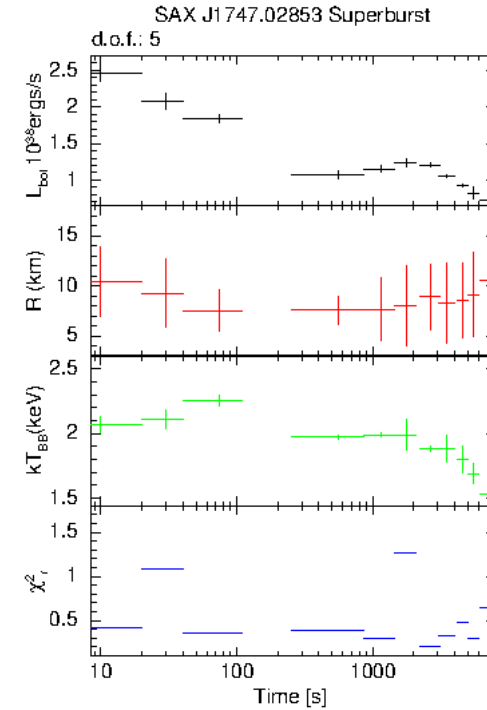
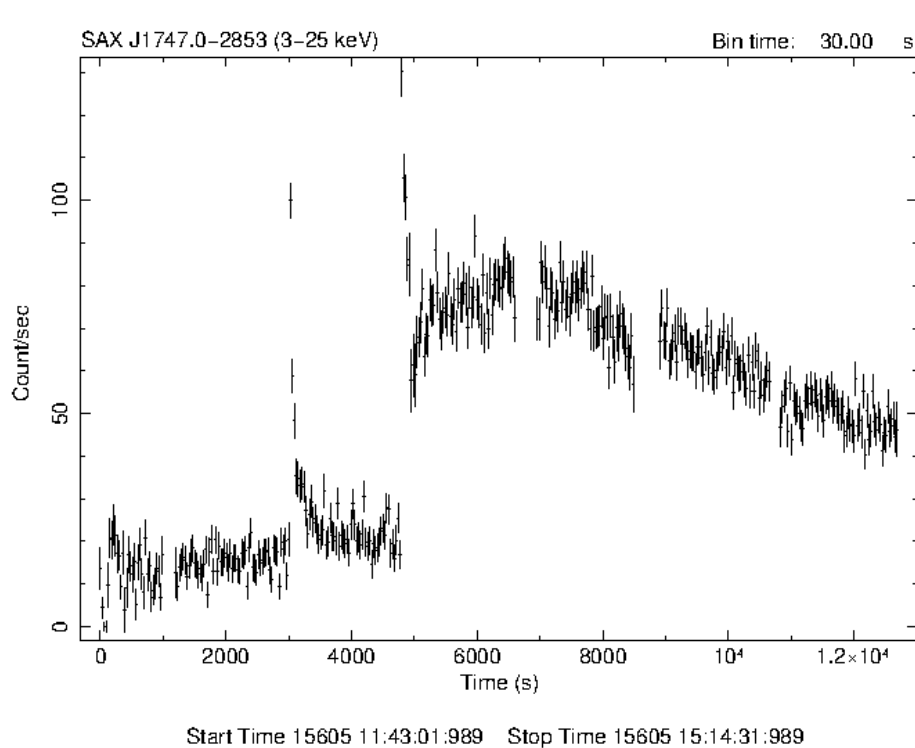
- Analysis method: Time-resolved spectral analysis
- Until 1986: standard method of burst analysis – one component spectral fit (BB)
- Van Paradijs & Lewin (1986) proposed two component spectral fits (BB+non-BB)
- Recent year: changing the persistent emission component in the spectral fits.



F_a -factor for the brightest sources during burst-events



SAX J1747.0-2853: peculiar bursting event



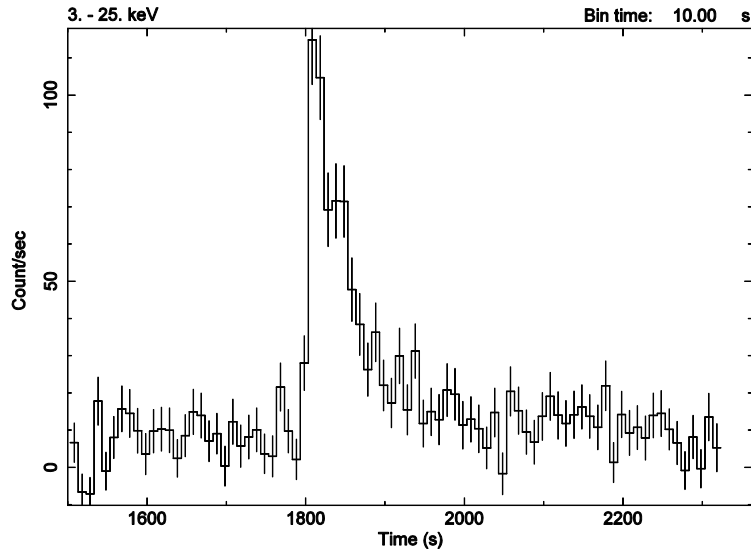
Chenevez & Alizai, 2019?

SLX 1744-299: a UCXB candidate?

In 't Zand et al.
(2007)

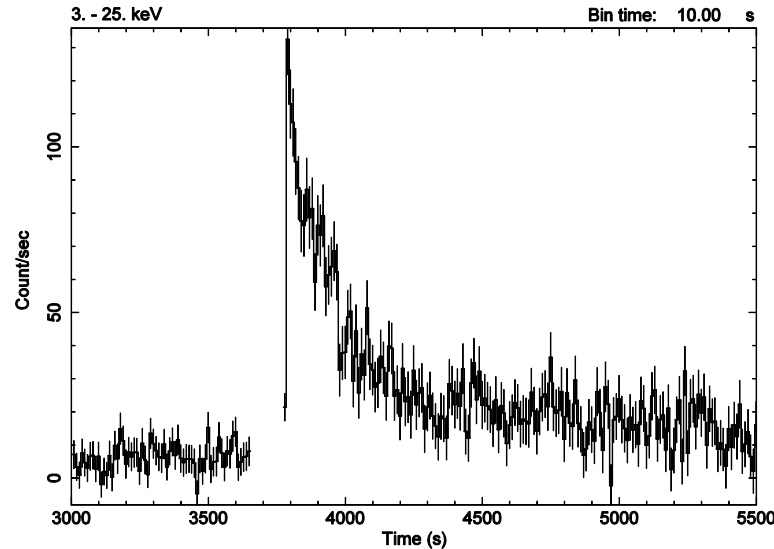
tified with SLX 1744-299. The other 45 bursts are short and twice as faint. This is consistent with archival burst measurements which consistently reveal long and relatively bright bursts from SLX 1744-299 and short and faint ones from SLX 1744-300. The longevity and slow recurrence of bursts from SLX 1744-299 are consistent with a UCXB nature.

SLX 1744-299 Intermediate burst: 07-03-2016



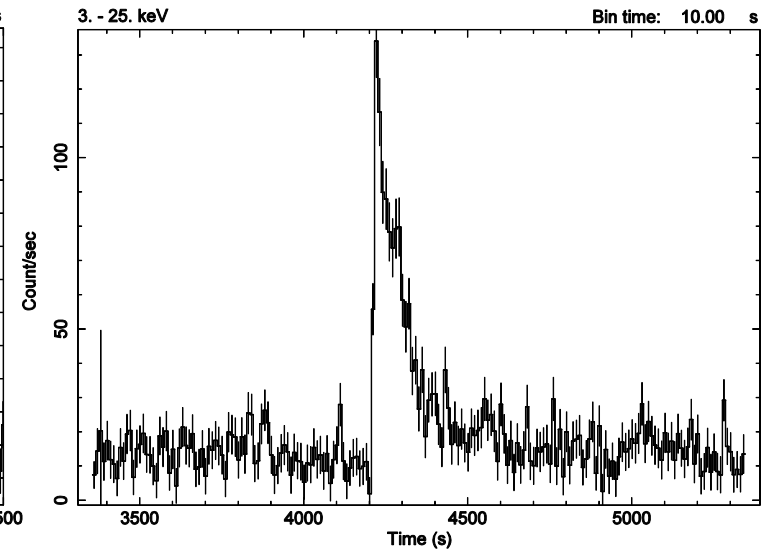
Start Time 17454 10:08:58:184 Stop Time 17454 10:38:38:184

SLX 1744-299 Intermediate burst: 27-02-2015



Start Time 17080 9:31:49:184 Stop Time 17080 10:32:49:184

SLX 1744-299 Intermediate burst: 06-04-2013



Start Time 16388 10:56:01:184 Stop Time 16388 11:29:01:184

Future work

- Create a multi-observatory catalog of long duration bursts
- Investigate the impact of long duration bursts on accretion flow
- Probe crust-cooling properties of NS with long duration bursts.

Thank you for listening!