

The X-ray burster 4U 1608-522 as seen by JEM-X onboard INTEGRAL

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Abstract. We present here an overview of the results of a systematic search of Type-I X-ray bursts in the light curves of the transient, atoll system 4U 1608-522 as seen by JEMX onboard *INTEGRAL*.

Keywords. stars: neutron, accretion, nucleosynthesis

1. Introduction

Type I X-ray bursts are thermonuclear explosions on the surface of weakly magnetized accreting neutron stars (NS) in Low-Mass X-ray Binary (LMXB) systems (see reviews in Lewin *et al.* 1993; Strohmayer & Bildsten 2003) that lead to a sudden, rapid, increase of the system X-ray flux. The light curves of X-ray bursts can show a large variety in profiles, but generally they exhibit a fast rise (from less than a second to 10 s) and a longer, usually exponential decay which lasts seconds to minutes. Type-I bursts radiate X-ray spectra with black body shapes and temperatures up to ~ 3 keV, that cool during burst decay. Most of the X-ray bursts are detected from the “atoll” sources, persistent or transient, with luminosities of the order of 10^{36-37} erg s $^{-1}$.

The recurrent transient 4U 1608-522 is an atoll system which experiences outbursts that in some cases can reach peak intensities of the order of the Crab (Gottwald *et al.* 1987). The source is also a X-ray burster (Galloway *et al.* 2008 and references therein) from which a superburst has also been detected (Keek *et al.* 2008). In several occasions, burst oscillations at 619 Hz were measured, making this source a member of the group of rapidly spinning NS LMXB.

2. Data analysis

The Joint European Monitor for X-rays (JEMX) on-board *INTEGRAL* provides X-ray spectra and imaging with arc-min angular resolution in the 3 to 35 keV band (Brandt *et al.* 2003). We have analyzed all JEM-X data available in the *INTEGRAL* archive and have conducted a systematic search of Type-I X-ray bursts in the light curves of 4U 1608-522.

3. Results

The light curve of 4U 1608-522 as observed by JEMX over the *INTEGRAL* lifetime and compiled by us is displayed Figure 1. The plot shows the activity from the system over ~ 8 years. In this period, several outbursts have been detected.

On top of the overall variations in the persistent emission, we have detected 58 type-I X-ray bursts from 4U 1608-522 at various levels of accretion rate, both in outburst and during quasi-quiescence (see Fig. 1). Short bursts were detected, with durations of the

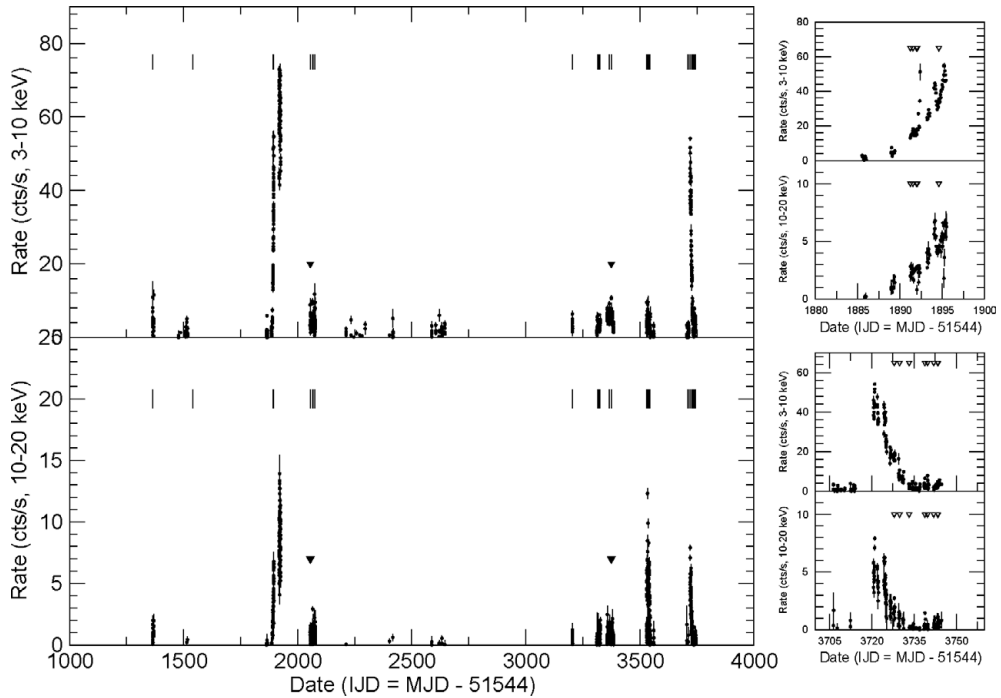


Figure 1. Left panel: The light curve of 4U 1608–522 in two energy bands as seen by JEMX onboard *INTEGRAL* over almost 8 years. Several outbursts were detected from the recurrent transient in this time period. The times of occurrence of double and triple bursts are marked by black vertical arrows in this plot. Right panels: closer view of outburst rise and decline. Superimposed to the plot, are marked the times of occurrence of type-I X-ray bursts.

order of 10–30 sec, rise times of the order of 1–6 sec, 88–1200 cts/sec peak count rates, and e-folding decay times between 3–14 sec.

A detailed analysis of these data is presented in Sánchez-Fernández *et al.* (2010).

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