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Recent results in High Mass X-ray Binaries

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Abstract. Thanks to the Galactic plane monitoring performed by the INTEGRAL satellite in the first four years of observations, new interesting sources have been discovered. About 30% of these new X–ray sources have been identified with High Mass X–ray Binaries. Several of them are the new recognized class of the Supergiant Fast X–ray Transients, transient sources displaying short outbursts lasting only a few hours.

Key words. X–rays: binaries

1. Introduction

Before the launch of the INTEGRAL satellite, High Mass X–ray Binaries could be divided into two main classes: the Be-X–ray Binaries, with Be companions and typically transient X–ray emission, and the classical X–ray pulsars with supergiant companions and persistent X–ray emission (Vela X–1-like systems). Thanks to the Galactic plane monitoring performed by INTEGRAL, several new High Mass X–ray Binaries have been discovered: some of them are highly obscured sources (likely persistent), which escaped detection with previous missions. The prototype of these sources is IGR J16318–4848, discovered in January 2003 by the IBIS/ISGRI instrument, with a huge absorption of about 10^{24} cm^{-2}; Courvoisier et al. (2003). Other newly discovered sources are transients with recurrent outbursts, typically shorter than those of the well known Be binaries, their companion is a supergiant star (as in the case of "classical X–ray pulsars") and their X–ray spectrum is similar to that of accreting X–ray pulsars.

These new supergiant transients have been called "Supergiant Fast X–ray Transients" (SFXTs; e.g. Negueruela et al. (2005a)). In Fig. 1 we collected the durations of the outbursts from known SFXTs available to date in the literature, mainly based on INTEGRAL and RXTE observations. The typical duration of the outbursts seems to be below a few hours. The luminosity at the outburst peak from all the known SFXTs are shown in Fig. 2. Typical outburst luminosities at the peak are around 10^{36} erg s^{-1}.

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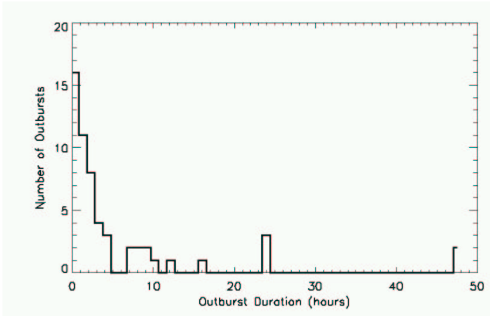

Fig. 1. Distribution of the outburst duration in SFXTs, mainly based on INTEGRAL observations (see e.g. Sguera et al. (2005) and Sguera et al. (2006) for the most recent reviews).

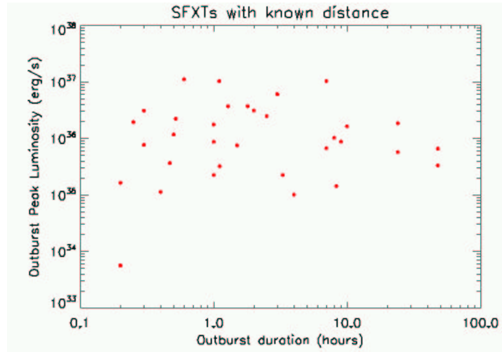

Fig. 2. Peak luminosity versus outburst duration for the SFXTs with known distance.

2. The case of IGR J11215-5952

IGR J11215-5952 is a SFXT discovered with INTEGRAL in April 2005 during a fast outburst (Lubinski et al. 2005), and later optically identified with a B-type supergiant (Negueruela et al. (2005b), Masetti et al. (2006)). From the analysis of archival INTEGRAL data, a recurrence period of ~330 days in the outburst recurrence has been discovered (Sidoli et al. 2006) and later confirmed with RXTE/PCA observations in 2006 (Smith et al. 2006b). A pulsation period of ~187 s has also been discovered with RXTE (Smith et al. (2006b), Swank et al. (2007)). IGR J11215-5952 is a unique source, being the only SFXT to date where a periodicity in the outburst has been discovered. This periodicity can be linked in a natural way to the orbital period of the binary system. A sensitive and complete monitoring campaign was planned to cover the latest outburst, expected on January 9th 2007: the outburst occurred when expected and was monitored for about 20 days by Swift/XRT (Romano et al. 2007). These observations led to the surprising result that the accretion phase in SFXTs lasts longer than previously thought based on less sensitive instruments. The brightest phase of the outbusts lasts less than one day (as observed with INTEGRAL in other sources of this class), with a large X–ray variability (revealing several short flares lasting few hours).

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