Feeding Compact Objects: Accretion on All Scales
Proceedings IAU Symposium No. 290, 2012
C. M. Zhang, T. Belloni, M. Méndez & S. N. Zhang, eds.

doi:10.1017/S1743921312019862

The type I X-ray bursts of 4U 1735-44

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Abstract. With *RXTE* data ranging from 1997 August to 1998 May, we detected 8 type I X-ray bursts from the atoll source 4U 1735-44. The bursts are present at all the branches, and most occur at an inferred low mass accretion rate. We find no correlation between the peak flux of the bursts and the mass accretion rate. The results are different from that of 4U 1728-34, whose bursts' peak flux are anti-correlated with the mass accretion rate.

Keywords. X-ray binary, accretion rate, X-ray bursts

1. Introduction and Data Reduction

Low mass X-ray binaries(LMXBs), consisting of an accreting neutron star and a main-sequence star, are usually divided into Z-type and atoll-type sources based on their color-color diagram(CCD) or hardness-intensity diagram (HID) (Hasinger & van der Klis 1989). For atoll sources, the main states are the extreme island state (EIS), the island state (IS), and the lower banana branch (LB) and upper banana (UB) states. For several atoll sources, correlations have been found between timing properties and the position of the source in the CCD (e.g., Di Salvo *et al.* 2001). Type I X-ray bursts occur in many LMXBs and are caused by explosive unstable burning of the accreted matter, which are characterized by a fast rise and exponential decay with durations ranging from seconds to tens of minutes (e.g., Chen *et al.* 2012).

The observations of 4U 1735-44 analyzed in this paper are from the Proportional Counter Array (PCA) on board the *RXTE* satellite during 1997 August to 1998 May. In this work, only PCU2 data are adopted. Fig. 1 shows the type I X-ray bursts detected by generating light curves with 0.125 s resolution. For CCDs analysis, the data of X-ray burst are excluded. We define the soft color as the ratio of the count rate in 3.5-6.0 keV to 2.0-3.5 keV. Similarly, we define the hard color as the logarithm of the ratio of the count rate in 9.7-16 keV to that in the range 6.0-9.7 keV (Fig. 2). To obtain HID, we also calculate the intensity, the count rate in the energy band 2.0-16.0 keV.

2. Results

We have searched *RXTE* data of the atoll source 4U 1735-44 during 1997 August to 1998 May for type I X-ray bursts. We have found 8 bursts in all branches, and most occur at an inferred low mass accretion rate. The bursts' peak flux is not well correlated with the position of the source on the atoll track in CCD by our results, which is not consistent with the results of 4U 1728-34 (Falanga *et al.* 2006). The bursts have rise times 1 ± 0.5 s, and the decay time at 10-20 keV energy is significantly shorter than that in 2-10 keV range, indicating spectral softening during each burst decay. For burst 3, the flux is higher, a double peak profile is evidence at high energy and hardness ratio, while during this time the intensity at lower energy remains constant, which can be interpreted as a consequence of a photospheric radius expansion (PRE)(see e.g., Verbunt & van den Heuvel 1995).

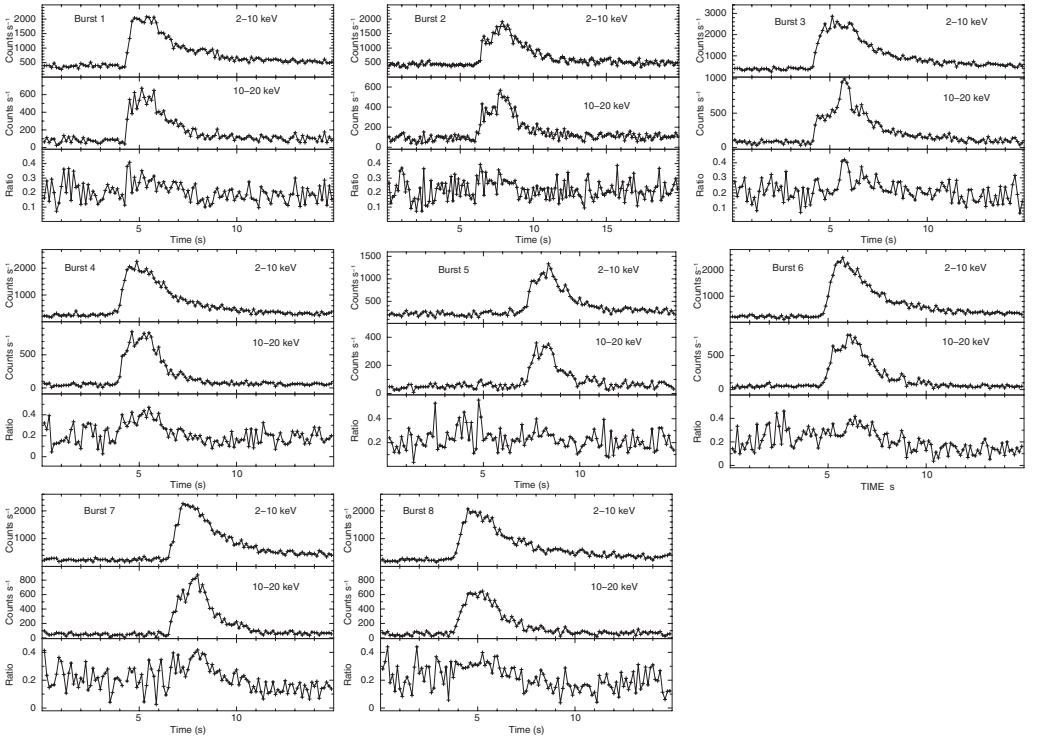

Figure 1. Type I X-ray bursts detected from 4U 1735-44. For each burst, the light curves and ratios of 2-10 keV and 10-20 keV are shown with 0.125s time bin.

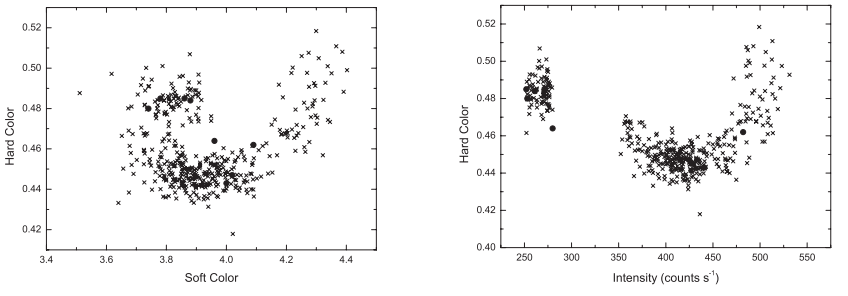

Figure 2. CCD and HID of 4U 1735-44. Each point (burst-subtracted) corresponds to 256 s of integration time. The bursts detected are indicated by the filled dotted points.

Supported by NSFC 10903005, 11173034, 11173024 and 2009CB824800, 2012CB821800.

References

Chen, Y. P., Zhang, S., Zhang, S. N., Li, J., & Wang, J. M. 2012, *ApJL*, 752, L34

Di Salvo, T., Méndez, M., van der Klis, M., Ford, E., & Robba, N. R. 2001, *ApJ*, 546, 1107

Falanga, M., Götz, D., Goldoni, P., *et al.* 2006, *A&A*, 458, 21

Hasinger, G. & van der Klis, M. 1989, *A&A*, 225, 79

Verbunt, F. & van den Heuvel, E. P. J. 1995, *in X-ray Binaries*, ed. W. H. G., Lewin, J., van Paradijs, & E. P. J. van den Heuvel (Cambridge, UK: Cambridge Univ. Press), 457

https://doi.org/10.1017/S1743921312019862 Published online by Cambridge University Press