Analysis of the LMXB GX 17+2

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Abstract

I present a small study about the Low Mass X-ray-Binary GX 17+2, consisting of my approachs' description (including tables of the determined intensity values) as well as a light curve and the spectrum.

Data Analysis

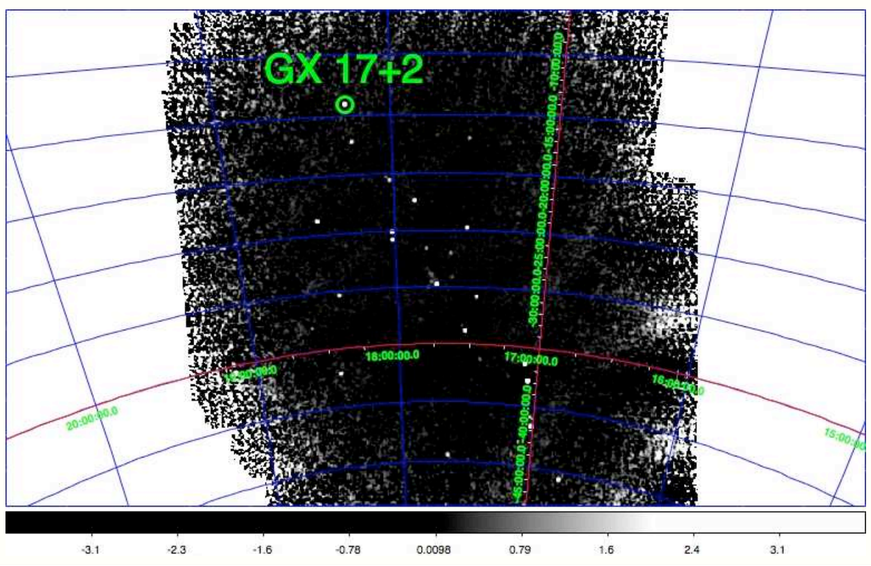
Before starting my analysis I extracted the main information about the used instruments and time dates by using the software "fv". My first step was searching for a suitable object using the intensity image data (mosa 103-981). This object should be the main element of my further analysis. More details about the identification can be found under the topic "source identification". After finding "GX 17+2", I went on reading out the intensities of this object with the software "ds9" in different time segments. Using the maximum value of the intensities, I was able to create the following table:

time (MJD)	20-35 keV	35-65 keV	65-100 keV
52869	7.047	0.000	0.000
53051	10.368	0.463	0.000
53234	9.480	0.510	0.000
53417	11.200	0.450	0.000
53775	7.618	0.413	0.000
53963	8.976	0.486	0.000
54146	7.380	0.010	0.000
54331	7.653	0.431	0.000
54507	8.730	0.471	0.000
54696	7.645	0.259	0.000
54883	7.846	0.594	0.000
55063	9.478	0.497	0.000
55237	13.666	0.979	0.000
55421	7.060	0.838	0.000

After that, I constructed a spectrum, which shows the intensity in different energy bands. This spectrum is compared to a spectrum of an other object to highlight the differences. Further details are given in the thread "spectrum". In sequence I drew the specific light curve of "GX 17+2" in the three energy bands. This light curve shows the intensity depending on the time, given in "DATE-OBS" in the header of the intensity files and converted to MJD. More information and a short description are given at the thread "light curve". For the construction of the tables, spectrum as well as the light curve I used an "Excel" spreadsheet.

Source Identification

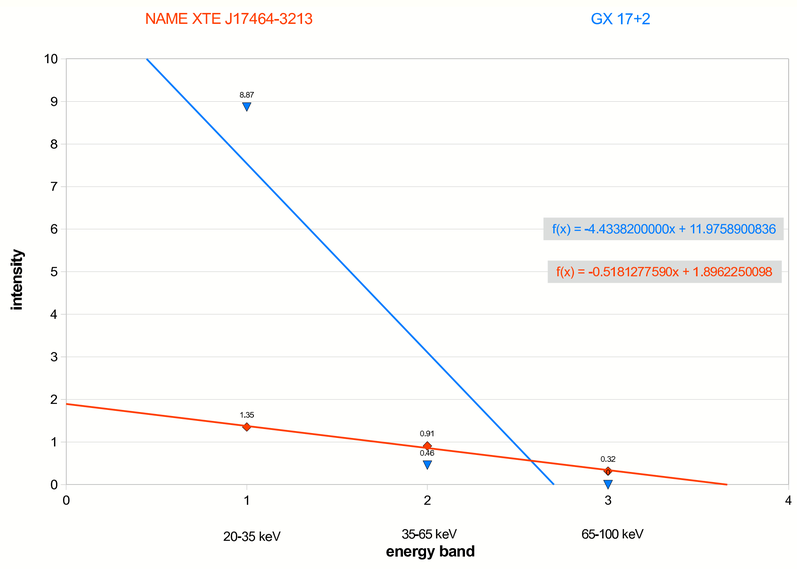
First of all, I started with reading out coordinates of my object in "ds9". Herefore, I created different frames to highlight specialities in order to find an appropriate object. Because of its strongly different intensity values in certain energy bands, I selected the object with the coordinates "RA 18:16:01.104 DEC -14:02:25.40". Thereafter I used the homepage "SIMBAD" (`http://simbad.u-strasbg.fr/simbad/`) to identify my object with the function "search by coordinates". Improving the search, I increased the radius (given in "arc min") up to "5" to receive more results. The coordinates I used were: 18:16:01.104 -14:02:25.40. Based on this information, I obtained different objects with various energetic levels. Examples: [DMA99] Star A (*) ; TYC 5689-195-1 (*) ; [DMA99] Star B (*) ; V* NP Ser (LXB) . Knowing the fact, that the object must send out gamma rays I came to to conclusion that the object must be " V* NP Ser (LXB)". Using the function "basic query" by the homepage, I figured out the name "GX 17+2" , which is usually used.



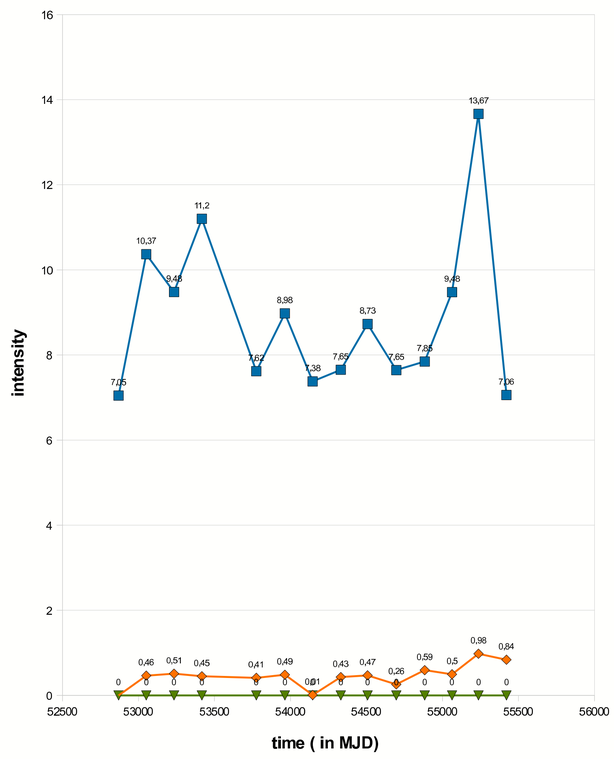
Spectrum

At first, I will describe how I created the spectrum and after that how it is constructed and what is shown. My first step was calculating the average intensity value of each energy band with "Excel", which was the basic of creating the spectrum. Then, I used these values to draw the diagram still using excel. The energy band is depicted on the x-axis and the intensity on the y-axis. Furthermore I plotted a trendline of the values. The terms with the grey background belong to the graphs with the equal colors. The spectrum shows GX 17+2 in contrast to XTE J17464-3213. As you can see, GX 17+2 exhibits much higher intensities in the low energy band than XTE J17464-3213, whose values are around 1.35. However, the graph of GX 17+2 shows a relatively steep slope, its intensities are even lower in the second energy band and almost equal 0 in the third. On the other hand, the graph of XTE J17464-3213 has just a gentle slope, which leads to the fact, that the intensities in the second and third energy band are even higher than these of GX 17+2. Therefore, GX 17+2 must be an object, which mainly sends out low energetic radiation, because of the high intensities in the low energy band and the very low intensities in high energy bands.

energy band	GX 17+2	XTE J1746
1	8.868	1.354
2	0.457	0.909
3	0.000	0.318



Lightcurve



The concept to create the light curve was the same as for the spectrum. First of all, I created a diagram using Excel in which the time (in MJD) is depicted on the x-axis and the intensity on the y-axis. As in the spectrum, the descriptions with grey background belong to the graphs with the same color in the diagram. As you can see, the graph of 20-35 keV is located at higher intensities (compare to "spectrum"). The source shows a rather high variablility in this lower energy band compared to the other two energy bands. Furthermore, the graph shows an atypic eruption at MJD 55237 and also two noticeable eruptions at MJD 53051 and MJD 53417 that exceed an intensity value of 10. The orange graph of the second energy band is located at very low intensities and exhibits not so frequent intensity changes than the first graph. It is noticeable, that at times of MJD 54146 and MJD 52869 the values of the intensity are almost equal "0". At last, the third graph (green), which shows the intensity values of the energy band "65-100 keV", is always located at "0". This leads to the conclusion that the object sends out almost no higher energetic radiation (compare to "spectrum").

Conclusion

Based on my results I can say that GX 17+2 is an object which radiates very strong in low energy band and hardly in high energy bands. Consequently, it can not be a black hole concerning of the low energetic values in high energy bands. So I came to the conclusion, that it probably must be a neutron star. This statement was strengthend by the information given about GX 17+2 given in the paper of Tananbaum et al. (1979). This was the first article about GX 17+2, where this object is also described to be an X-ray-source that sends out low energetic rays (compare to spectrum).

Acknowledgements

Finally, I want to thank my cooperation partners Colin Meyer and Michael Werthmann for using his achievements in relation to XTE J17464-3213.