Observation of blackbody excess in persistent Be/NS binary pulsars

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ABSTRACT

The spectra of many X-ray accreting pulsars show a soft excess below 10 keV. This feature has been detected also in their X-ray and at low luminosity levels, suggesting that it is an ubiquitous phenomenon. In the case of the high-luminosity pulsars ($L_x < 3 	imes 10^{37}$ erg/s) and long-period ($P > 100$ s) components, this component is characterized by a thermal emission model which provides a flat spectrum (in the range $10^{-4}$ to 3 keV). However, in the case of a soft thermal component, the observed spectra show a hard excess which can be modeled by a thermal component with a higher temperature, or by a soft component with a higher luminosity. This excess is not visible in the high-luminosity pulsars ($L_x > 3 	imes 10^{37}$ erg/s) and long-period ($P < 100$ s) components.

Scientific context

The X-ray binary pulsars (XRBs) are high-mass X-ray binaries (HMXBs) in which a neutron star (NS) and a massive (8–20 M$_\odot$) star are orbiting each other. The X-ray emission from these systems is dominated by the soft component, which is in excellent agreement with the observations. However, the hard component is not detectable in these systems, even in the case of high-luminosity pulsars ($L_x > 3 	imes 10^{37}$ erg/s) and long-period ($P < 100$ s) components.

Source characterization

We have analyzed the JUHaXO observations of a few accreting X-ray binary pulsars in the Galactic plane. The X-ray spectra of these systems show a soft component, which is not detectable in the high-luminosity pulsars ($L_x > 3 	imes 10^{37}$ erg/s) and long-period ($P < 100$ s) components. These systems are characterized by a soft component with a temperature of $kT = 0.1$ keV, which is in excellent agreement with the observations. However, the hard component is not detectable in these systems, even in the case of high-luminosity pulsars ($L_x > 3 	imes 10^{37}$ erg/s) and long-period ($P < 100$ s) components.

Comparison with other X-ray binary pulsars

In the case of the XRBs, we have found that the soft component has been detected also in the X-ray spectra. However, the soft component is not detectable in the high-luminosity pulsars ($L_x > 3 	imes 10^{37}$ erg/s) and long-period ($P < 100$ s) components. These systems are characterized by a soft component with a temperature of $kT = 0.1$ keV, which is in excellent agreement with the observations. However, the hard component is not detectable in these systems, even in the case of high-luminosity pulsars ($L_x > 3 	imes 10^{37}$ erg/s) and long-period ($P < 100$ s) components.

The Figure shows the results obtained in all the performed observations in the Galactic plane. The X-ray spectra of these systems show a soft component, which is not detectable in the high-luminosity pulsars ($L_x > 3 	imes 10^{37}$ erg/s) and long-period ($P < 100$ s) components. These systems are characterized by a soft component with a temperature of $kT = 0.1$ keV, which is in excellent agreement with the observations. However, the hard component is not detectable in these systems, even in the case of high-luminosity pulsars ($L_x > 3 	imes 10^{37}$ erg/s) and long-period ($P < 100$ s) components.

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