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Correlating spectral and temporal features in bright neutron stars

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Abstract. We have analysed *Rossi X-ray Timing Explorer (RXTE)* data of bright neutron stars in low mass X-ray binaries to study the evolution of spectral and temporal features. We notice a correlation between low-frequency quasi-periodic oscillations (QPOs) and comptonized disk emission along the color-color track. The preliminary results show that low frequency QPOs are probably related to the dynamics in the inner disk.

Keywords : stars:neutron – X-rays:individuals:GX 17+2, GX 5-1

1. Introduction

The persistently bright neutron stars low mass X-ray binaries (LMXBs) were classified as Z-sources as they trace a Z-like track on color-color diagrams (CDs) (Hasinger and van der Klis 1989). These sources are GX 17+2, GX 5-1, GX340+0, GX349+2, Cyg X-2 and Sco X-1. The Z-like track consists of horizontal branch (HB), flaring branch (FB) and normal branch (NB). It has been observed that as the nature of energy spectra evolve along the track, power spectra of sources also exhibit different types of low frequency QPOs (ν<100 Hz) and noise components (van der Klis 1995).

2. Observations and Results

We analysed RXTE data in event mode (timing) and standard2 (spectral) for GX 17+2 and GX 5-1. The details of observations are provided in Table 1. The data was extracted and analysed using *Heasoft 6.11.1* and *Xspec 12.11.0* packages.

Spectral and timing analysis were carried out along the track for the two sources.

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Table 1. Observations used in this analysis

Source	Observation	Source	Observation
GX 17+2	9-12 OCT 1999 (~290 ks)	GX 5-1	20-22 NOV 1998 (~120 ks)

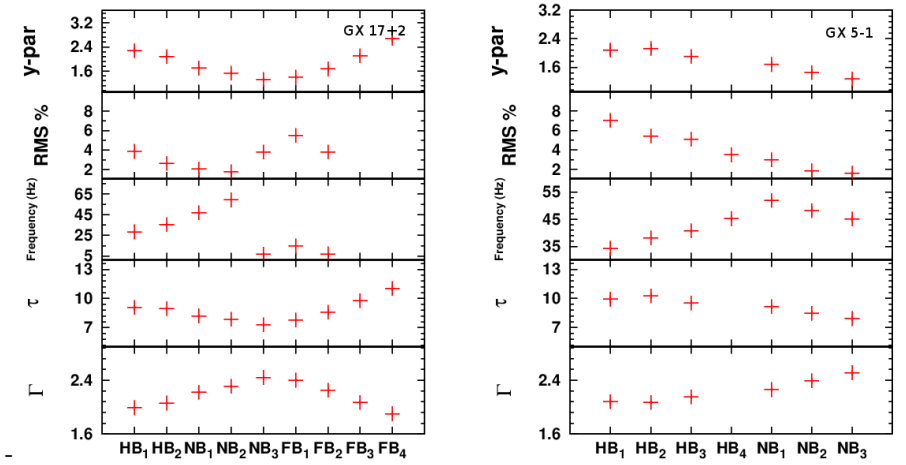

Figure 1. Spectral and timing parameters (top to bottom) : Compton parameter (*y-par*), RMS% of QPO, central frequency of QPO (ν), optical depth (τ) and slope of comptonized emission (Γ) for GX 17+2 (left) and GX 5-1 (right) along Z-track segments from HB to FB.

Energy spectra were fitted with *diskbb+nthcomp+gaussian* model and parameters for Comptonizing medium (τ, Γ and $y\text{-}par = 4kT_e\tau^2/m_ec^2$; m_e and T_e are mass of electron and electron temperature of Comptonizing corona respectively.) were calculated, simultaneously power spectra provided QPO parameters (ν and RMS%). We note that the strength of Comptonizing corona (*y-par*) weakens as the sources move from HB to NB (see Figure 1). At the same time strength of QPO (RMS%) also decreases. This suggests that QPO is most probably produced by 'hot'corona.

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References

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