IGR J17091-3624 undergoes 'heartbeat' oscillations similar to those of GRS 1915+105

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Referred to by ATel #: 3266, 3299, 3418, 3667, 3913, 4773, 8948

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We report on the follow up observations after the report of ~10 mHz quasi-periodic oscillations (QPO -- ATel #3225) in the X-ray light curve of the ongoing outburst of the black hole candidate IGR J17091-3624 (ATel #3144, #3159, #3167, #3203) RXTE/PCA observations performed on March 19th and March 22nd, 2011, show a continuous progression of flare-like events which occur very regularly in a quasi-periodic manner at a rate between 25 and 30 mHz. This indicates that the oscillation detected on March 14th (ATel #3225) has increased its frequency by a factor of ~3. In each flare the 2-60 keV intensity varies by up to a factor of ~3 from valley to peak. Not all flares are exactly the same: most of them show an exponential rise and fast decay; we found both single and double-peaked flares; in the double-peaked ones, the peaks are generally separated by 3-6 seconds, and the second peak of a pair is generally at a lower intensity than the first peak. We also analyzed the Swift/XRT observations which are being carried out on a daily basis. The observations on March 19-22, 2011, are all performed in windowed timing mode, and also show the same type of flaring we observe in the RXTE observations. The XRT field of view did not contain the close by source IGR J17098-3628 (not detected by INTEGRAL, see ATel #3229) and demonstrates that the QPOs originate from the black hole candidate IGR J17091-3624. The high frequency (up to 30 mHz), strength and energy dependence that we find are not consistent with the known mHz QPOs in neutron star systems. The type of variability we observe in IGR J17091-3624 is similar to the so-called "heartbeat" variation observed in the unique BHC GRS 1915+105 (also known as "rho" class variations; see, e.g., Belloni et al. 2000, A&A, 355, 271). The flux of IGR J17091-3624 is at the moment ~50-60 mCrab (3-25 keV, ATEL#3229),

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4282 Recent activity of the black hole X-ray binary IGR J17091-3624 as observed with the SWIFT/XRT : spectral hardening following the sharp drop in X-ray intensity
4173 Swift/XRT Observations of IGR J17091-3624: Continued Activity
4077 Swift detects an increase in the hard X-ray emission from the BHC 4U 1630-47
3945 INTEGRAL detects the hard X-ray brightening of 4U 1630-47
3916 A possible state change in the black-hole candidate IGR J17091-3624
3913 The black hole candidate IGR J17091-3624 is still active
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while the GRS 1915+105 flux is more than an order of magnitude higher when it shows the same type of variability. The difference in flux is unlikely to be due to a difference in distance (GRS 1915+105 is thought to be at ~12 kpc, see Rodriguez et al., 1995, ApJS, 101, 173, and IGR J17091-3624 would have to be much further away), so we conclude that the mechanism producing the "heartbeat" variations, if the same in both sources, is independent of the luminosity of the source. IGR J17091-3624 continues to be detected in hard X rays (15-50 keV) at a steadily declining rate. On 2011-Mar-22, it was at 0.006 +/- 0.0015 cts/s/cm^2 (~25 mCrab) down from a peak of 0.026 +/- 0.0015 cts/s/cm^2 (115 mCrab) on 2011-Feb-15. The current outburst has now lasted more than 55 days compared to ~40 days in the 2007 outburst. In the XRT 0.3-10 keV light curve, the source has remained between 40 and 47 ct/s for all but one observation since 2011-Feb-24 with variations. The average error in the XRT rate is 0.16 ct/s. Further RXTE and Swift observations are planned. Observations at all wavelengths are strongly encouraged to follow the evolution of IGR J17091-3624.

occultation observed by RXTE

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