Abstract Submitted
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Characterizing the Long-term Variability of X-ray binary 4U1705-44: Evidence for an Underlying Double-Welled Nonlinear Oscillator REBECCA NICHOLS, None, GODDARD SPACE FLIGHT CENTER HIGH ENERGY ASTROPHYSICS DIVISION COLLABORATION[1] — 4U 1705-44 is a bright low mass x-ray binary (LMXB) containing a neutron star and a close, low mass companion. The Rossi X-ray Timing Explorer (RXTE) All-Sky Monitor obtained approximately 14 years of daily monitoring on 4U 1705-44 in the 2-20 keV energy range. Understanding the x-ray variability of 4U1705-44 is critical to the study of all low mas x-ray binaries because they share many of the same global characteristics in their high-amplitude transitions and non-periodic variability. After comparing the long-term light curve and phase space trajectories of 4U1705-44 to various nonlinear oscillators, the Duffing Oscillator was revealed to be a strong candidate to describe these systems. The parameters of the Duffing equation were optimized and six solutions sharing the same characteristics as 4U1705-44 were found. Striking commonalities were revealed via a phase-space analysis of both 4U1705-44 and the six Duffing solutions: the low-order driving period is no less than 87 days and spans up to 180 days, which is seen and highlighted in the power spectra, zero-crossings and close returns analysis of 4U1705-44. Furthermore, the driving frequency of all six Duffing solutions tend to converge to a range of 3.6 – 4.5, corresponding to driving periods in the range from 130 to 175 days, in agreement with that found in 4U1705-44. Nonlinear analysis methods such as close returns and zero-crossings of the Duffing solutions also show the same trends. This strongly suggests that 4U1705-44 shares the same topological characteristics as the Duffing equation.

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