Contribution ID: **52** Type: **Contributed poster**

P08 An application of the Ghosh & Lamb model to the accretion-powered X-ray pulsar X Persei

Monday, 19 November 2018 17:22 (1 minute)

The accretion-induced pulse period changes of the Be/X-ray binary pulsar X Persei were investigated over the period of 1996 January to 2017 September. This study utilized the monitoring data acquired with the RXTE All-Sky Monitor in 1.5–12 keV and the MAXI Gas-Slit Camera in 2–20 keV. The source intensity changed by a factor of 5–6 over this period. The pulsar was spinning down for 1996–2002, and has been spinning up since 2002, as already reported. The spin-up/down rate and the 3–12 keV flux, determined every 250 d, showed a clear negative correlation, which can be successfully explained by the accretion torque model proposed by Ghosh and Lamb (1979, ApJ, 234, 296). When the mass, radius, and distance of the neutron star were allowed to vary over a range of 1.0–2.4 solar masses, 9.5–15 km, and 0.77–0.85 kpc, respectively, the magnetic field strength of B = (4–25) × 10^13 G gave the best fits to the observations. In contrast, the observed results cannot be explained by the values of B ~ 10^12 G previously suggested for X Persei, as long as the mass, radius, and distance are required to take reasonable values. Assuming a distance of 0.81 ± 0.04 kpc as indicated by optical astrometry, the mass of the neutron star is estimated as M = 2.03 ± 0.17 solar masses.

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Session Classification: Poster Short Presentations