Period distribution of pulsars in the Magellanic Clouds: Propeller line versus Equilibrium period

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We consider High Mass X-ray Binaries (HMXB) in which neutron stars accrete matter from the stellar wind of its massive early-type companions. Most of the systems are transients characterized by short luminous outbursts, while spending the majority of time in quiescence. A survey of such quiescent states of transients located in the Magellanic Clouds was recently reported by Christodoulou et al. [1]. They have examined the data in an attempt to trace the lowest propeller line, defined by the equality of the corotational radius and the radius of neutron star magnetosphere. Below this line the accretion onto the star stops due to centrifugal barrier at the magnetospheric boundary, and pulsations cease. The data indeed allows to trace the line with the slope close to the theoretical one. At the same time, the same line is expected if the neutron stars are rotating with the equilibrium period. Moreover, the expected slope of this line is close to the slope of propeller line, but only for relatively fast rotating neutron stars, $P_{\rm eq} \lesssim 100\,{\rm s}$, which undergo accretion of weakly magnetized flow. A scenario of spin evolution of neutron stars within this hypothesis is presented.

References

[1] D. M. Christodoulou, S. G. T. Laycock, J. Yang, & S. Fingerman, *ApJ* 829, 30 (2016)

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