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On the maximum accretion luminosity of magnetized neutron stars: connecting X-ray pulsars and ultraluminous X-ray sources

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We study properties of luminous X-ray pulsars using a simplified model of the accretion column based on diffusion approach. The maximal possible luminosity is calculated as a function of the neutron star (NS) magnetic field strength and spin period. It is shown that the luminosity can reach values of the order of 10^{40} erg/s for the magnetar-like magnetic field (B > 10^{14}G) and long spin periods (P >1.5 s). The relative narrowness of an area of feasible NS parameters which are able to provide higher luminosities leads to the conclusion that L ~ 10^{40} erg/s is a good estimate for the limiting accretion luminosity of an NS. Because this luminosity coincides with the cut-off observed in the high-mass X-ray binaries luminosity function which otherwise does not show any features at lower luminosities, we can conclude that a substantial part of ultraluminous X-ray sources are accreting NSs in binary systems.

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