A propelling neutron star in the enigmatic Be-star γ Cassiopeia

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γ Cassiopeia (γ Cas), is known to be a binary system consisting of a Be-type star and a low-mass ($M \sim 1M_\odot$) companion of unknown nature orbiting in the Be-disc plane. Here, we apply the quasi-spherical accretion theory on to a compact magnetized star and show that if the low-mass companion of γ Cas is a fast spinning neutron star, the key observational signatures of γ Cas are remarkably well reproduced [1]. Direct accretion on to this fast rotating neutron star is impeded by the propeller mechanism. In this case, around the neutron star magnetosphere a hot shell is formed which emits thermal X-rays in qualitative and quantitative agreement with observed properties of the X-ray emission from γ Cas. We suggest that γ Cas and its analogues constitute a new subclass of Be-type X-ray binaries hosting rapidly rotating neutron stars formed in supernova explosions with small kicks. The subsequent evolutionary stage of γ Cas and its analogues should be the X Per-type binaries comprising low-luminosity slowly rotating X-ray pulsars. The model explains the enigmatic X-ray emission from γ Cas [2], and also establishes evolutionary connections between various types of rotating magnetized neutron stars in Be-binaries.

References

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