The X-ray Pulsar 2A 1822-371 as a Super Eddington source

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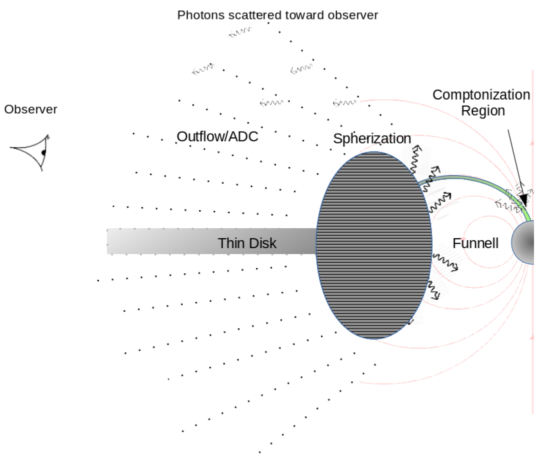

Figure 1: The illustration shows the geometry of 2A 1822-371, according to the super-Eddington solution we propose. The observer is located at an inclination angle of about i=82°. The thick part of the accretion disk begins at the spherization radius and ends at the magnetospheric radius where the plasma becomes channeled towards the neutron star poles.

The LMXB pulsar 2A 1822-371 is a slow x-ray pulsar in an accretion disc corona system, which show properties that are inconsistent with standard theories on how these systems should behave. The pulsar has been observed to spin up continuously over a baseline of 13 years with a spin frequency derivative that gives a spin up timescale of about 7000 years, much shorter than expected for this type of systems [1]. An open question is whether this system will show torque reversal in the future, such as seen for example in 4U 1626-67, or if it is really spinning up exceptionally fast. The orbital period is also expanding on a timescale much smaller than expected. Furthermore, to explain some of the peculiarities of this system, it has historically been suggested that the accretion disc must be surrounded by a thick accretion disk corona [2]. This, however, poses a problem, since we observe X-ray pulsations which would otherwise be smeared out by the thick corona. We propose a solution to the above problems by suggesting that the system may be a super Eddington source. We suggest that 2A 1822-371 has a thin accretion outflow (which is due to a super Eddington mass transfer from the donor, evolving on a thermal timescale) being launched from the inner accretion disk region. The inner part of the accretion disk itself is instead geometrically thick (as seen on the Figure). The solution we suggest reconciles both the need for an accretion disk corona, the fast spin-up and the change in the orbital separation [3].

References

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