High-resolution global MHD simulations of quiescent resistive compact binary discs

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Dwarf Novæ and low-mass X-ray binaries are eruptive binary systems comprised of a Roche-lobe overflowing solar-type star and an accreting compact object. Their recurrence time can be explained by a low-accreting phase called quiescence, during which the angular momentum transport parameter is inferred to be $\alpha \approx 0.01$ by the Disc Instability Model. Non-magnetics mechanisms, such as spiral wave transport, only achieve angular momentum transport an order of magnitude too low, at best, because these discs are so thin ($H/R \approx 0.001$) during quiescence. During this phase, the Magneto-rotational Instability is known to be suppressed by the increased resistivity of the plasma which is very little ionised. Studying these very thin magnetised disc poses a hard numerical challenge because of the wide separation in scales requiring to be properly resolved.
Thanks to the new GPU-accelerated code Idefix, I am able to produce global 3D MHD simulations of very thin disc ($H/R \approx 0.01$) for the first time. I explore the possibility that an MHD wind arises and increases the angular momentum transport in low magnetic Reynolds number ($Rm \approx 100$) and realistic plasma parameter ($\beta \approx 1000$) regimes. We observe that the MRI is only quenched in the very resistive disc bulk but survives in the disc atmosphere. This drives strong accretion and wind launching. I quantify the efficiency of the arising MHD wind and measure its global effect on the accretion disc. I explore the effect of the initial disc magnetisation and compare the the accretion/ejection regime with and without resistivity.