Accretion and wind structures just around an accreting star

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Abstract

Many exoplanets have been identified within the inner regions of protoplanetary disks, underscoring the critical nature of investigating these inner disk structures. The configuration of the innermost disk is profoundly influenced by interactions between the star and the disk, necessitating a comprehensive grasp of mass transport mechanisms. We have conducted 3D magnetohydrodynamic (MHD) simulations focused on magnetospheric accretion to delineate the flow patterns surrounding the star. Our simulations reveal a variety of wind types, including stellar winds, magnetospheric ejections, and disk winds. Notably, we identify disk winds as comprising both (intermittent) conical disk winds and turbulent winds. The turbulent winds, unique to three-dimensional settings, are found to play a crucial role in mitigating stellar spin-up. Additionally, our simulations indicate magnetic heating at the base of the magnetospheric accretion flows, potentially contributing to hydrogen Br-gamma emissions. In this talk, we will briefly review recent studies of star-disk interaction and explore the observational implications of our findings.

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