Magnetospheric accretions and outflows in young stellar objects

Ryuichi Kurosawa*[1] and Marina Romanova[2]

[1]Max-Planck-Institute for Radio Astronomy – Auf dem Huegel 69, D-53212 Bonn, Germany
[2]Department of Astronomy, Cornell University – Ithaca, NY 14853-6801, United States

Abstract

Recent spectropolarimetric observations suggest that young low-mass stars such as classical T Tauri stars possess relatively strong (~kG) magnetic field. This supports an idea that the final accretion onto the stellar surface is magnetically controlled, and the winds are formed in magnetohydrodynamics (MHD) processes. We examine the formation of outflows from the disk-magnetosphere interaction regions of rotating magnetized stars in the context of numerical simulations. In particular, we focus on the formation the conically shaped magnetically-driven outflow that arises from the disk-magnetosphere boundary when the magnetosphere is compressed into an X-type configurations. We also review recent numerical simulations of magnetospheric accretions through an inclined dipole and a complex magnetic fields. The difference between a stable accretion regime, in which accretion occurs in ordered funnel streams, and an unstable regime, in which gas penetrates through the magnetosphere in several unstable streams due to the magnetic Rayleigh-Taylor instability, will be discussed. Finally, we describe how MHD simulation results can be used in separate radiative transfer (RT) models to predict observable quantiles such as line profiles and light curves. The plausibility of the accretion flows and outflows predicted by MHD simulations (via RT models) can tested against observations.

*Speaker