Examining magnetospheric accretion in Herbig Ae/Be stars through near-infrared spectroscopic signatures

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Abstract

Models of magnetically driven accretion and outflows reproduce many observational properties of T Tauri stars. For the more massive Herbig Ae/Be stars, the corresponding picture is not well established. Nonetheless, it is expected that accretion flows in pre-main sequence stars are guided from the circumstellar disk to stellar regions of high latitude along the magnetic field force lines inside a magnetosphere. Using near-infrared multi-epoch spectroscopic data obtained with ISAAC, CRIRES, and X-shooter on the VLT, we examined magnetospheric accretion in the two Herbig Ae stars HD101412 and HD104237. Spectroscopic signatures in He I 10830 and Paschen gamma, two near-infrared lines that are formed in a Herbig star's accretion region, show temporal modulation. This modulation is for both stars governed by their rotation periods, which we determined from the data. For HD101412 we could show that our spectroscopic observations can be explained within the magnetic geometry that we established earlier from magnetic field measurements. For HD104237 we were able to further constrain the inclination of the star's rotation axis. We intend to apply this method to a larger sample of Herbig Ae/Be stars to learn more about their rotation properties and the accretion mechanisms at work in Herbig stars.

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