Tracing the time-variable asymmetric disk structure in the inner disk of a Herbig Be star: results and perspectives

Lucas Labadie[*,1], Valerio Ganci , Karine Perraut , and Gravity Collaboration

[1]Institute for Astrophysics of the University of Cologne – Germany

Abstract

The deployment of the second generation VLTI instruments GRAVITY and MATISSE (with CHARA in the northern hemisphere) has permitted us to map with increased accuracy the inner _˜0.1-1au regions of protoplanetary disks around young stars at a milliarcsecond spatial resolution not attainable with other facilities. These inner regions are highly interesting for at least two reasons: they host complex morphological features that can possibly be connected to planet formation; the relatively short orbital timescale at such stellocentric distances allows to follow time variable features within months to years. Hence, monitoring these inner regions with interferometry offers a unique opportunity to probe short timescale aspects of disc evolution.

In this contribution, we address the question of the inner disk's morphological time variability with the case of the _˜0.5Myr Herbig Be stars HD98922. Herbig Be sources are interesting as their disks are found to be rarer, less massive and with a shorter lifetime in comparison to less massive Herbig Ae or T Tauri stars. We have compiled a dataset acquired with PIONIER and GRAVITY to monitor with 33 snapshots over a period of 11 years the variations in the interferometric visibilities and, more importantly, the closure phase signal that traces spatial asymmetries in the brightness distribution. Our analysis reveals a dynamical inner disk that can be modeled by a crescent-like structure – also seen in other Herbig stars – orbiting the central star seemingly slower than Keplerian. In addition, we observe that the compact Br-gamma line emission traced with the high-spectral resolution mode of GRAVITY is off-centered from the star and likely orbits the central star as well. We find a discontinuous radial structure of the dusty disk and discuss these results in the context of a low-mass companion or a disk wind shaping the inner disk.

This result confirms the probable strong morphological variability of the inner disk even around more massive objects. This opens the door to important complementary observing programs that will be discussed in this contribution: this involves the comparison to mid-infrared high-resolution observations with MATISSE, but also extending these studies to earlier phases of Herbig Be stars and for which the level of embeddedness will require the capabilities of Gravity+.

[*]Speaker

sciencesconf.org:gravity-plus-yso2024:525188