A VLTI view of the star/disc interface around Massive Young Stellar Objects.

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Abstract

With steady observational advances, the formation of massive stars is being understood in more detail. Numerical models are converging on a scenario where accretion discs play a key role. Also, binarity appears to be an inevitable outcome. Indeed, the vast majority of massive stars are found in binaries (up to 100%). Our understanding of the geometry and physical properties of the innermost regions of discs around massive stars and their associated binarity is sparse due to the rarity of such objectsand the observational challenges, including the lack of adequate diagnostic lines in the near-IR.

In this talk, I will present the first systematic study towards a sample of Massive Young Stellar Objects (MYSOs) as observed with long-baseline near-infrared K-band interferometry on VLTI (GRAVITY, AMBER). Geometrical models are employed to derive the characteristic size of the 2μm continuum and ionised gas emission towards this sample of MYSOs and investigate binarity. MYSOs are placed in a luminosity-size diagram for the first time, and their location is directly compared to their low and intermediate-mass counterparts. In addition, the investigation on the origin of the ionised gas emission (Brγ) points towards a disc-wind interaction. I will also present the first statistics on young high-mass binarity tracing 2-300 au separations and directly compare them to their pre-main and main sequence equivalents, reporting an increasing fraction with evolution.

Finally, we detect and spatially resolve the Na I doublet and He I transitions at au-scales towards an MYSO for the first time. The new observations in combination with our geometric models allowed us to probe the smallest -au- scales of accretion/ejection around an MYSO. We find that Na I originates in the disc at smaller radii than the dust disc and is more compact than any of the other spatially resolved diagnostics (Brγ, He I, and CO). Our findings suggest that Na I can be a new powerful diagnostic line in tracing the warm star/disc accreting interface of forming (massive) stars, while the similarities between He I and Brγ point towards an accretion/ejection origin of He I.

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