Optical Interferometry modelling of the TTauri "dipper" star RY Lup protoplanetary disk

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The remarkable diversity of exoplanets originates in the protoplanetary disks that surround young stars during their first few million years. Recent years have seen considerable advances in our understanding of the structure and composition of these disks, driven by instruments like ALMA, VLT/SPHERE and the JWST. Yet, these instruments cannot resolve the innermost regions of protoplanetary disks, a gap that near- and mid-infrared interferometry at the ESO/VLTI (Paranal, Chile) is uniquely positioned to fill.

MATISSE is an imaging spectro-interferometer at the VLTI, that combines the light of four telescopes. It operates in the L, M and N (3 to 12 µm) bands and offers a range of spectral resolutions. When combined with observations from the VLTI/PIONIER and VLTI/GRAVITY instruments, it provides access to measurements spanning 1.6 to 12 µm, and probing spatial scales from approximately 0.1 to several tens of au, corresponding to the regions where most planets, particularly the rocky ones, are supposed to form.

In this talk, we present high-resolution observations of the inner disk of the TTauri "dipper" star RY Lup, obtained with the VLTI instruments MATISSE, GRAVITY, and PIONIER. This system exhibits several intriguing features that currently lack a consistent interpretation. These include a misalignment between the inner and outer disks (Bohn et al. 2022, GRAVITY and ALMA data), a 3.75 day optical variability (up to 3 mag) possibly caused by a warped inner disk modulating the stellar flux along the line of sight, and the presence of a candidate companion recently proposed by Vioque et al. (2026) using GAIA data. Here, we use the "oimodeler" tool to fit the VLTI observations spanning 1.6 to 12 µm, in order to derive unprecedented constraints on the disk structure while assessing the potential presence of companions.