

NIR L' -band polarimetry as a tool of revealing YSOs

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Work focus: Analysis of near infrared polarimetric observations of young stellar object (YSO) candidates in the Milky Way's central stellar cluster

The center of the Milky Way is the closest laboratory for studying nuclear star clusters, star formation under extreme conditions, and the immediate vicinity of a supermassive black hole (SMBH, known as Sgr A*). There is a small but dense cluster of sources (IRS 13N) located $\sim 3''$ (~ 0.12 pc) west of Sgr A*, just $0.5''$ (0.02 pc) north of the bright IRS 13E cluster of Wolf-Rayet and O-type stars. The IRS 13N sources have an extreme infrared excess and their L' - and K -band proper motions show that they are forming a co-moving but dynamically unstable cluster. Therefore, as indicated by their colors and dynamics, they are one of the best examples for very recent $< 10^5$ yrs star formation.

To study the cluster, you will use deep, high-resolution polarimetric observations of IRS 13N obtained using the NACO Wollaston prism on the ESO Very Large Telescope. The L' -band ($3.8 \mu\text{m}$) polarization data is a valuable tool to help reveal their nature: YSOs embedded in a dusty disk are expected to show different polarization than bow-shocks or simple dust concentrations. While for the latter two, a uniform distribution of polarization parameters would be expected, the polarization parameters should exhibit a random distribution in the former case.

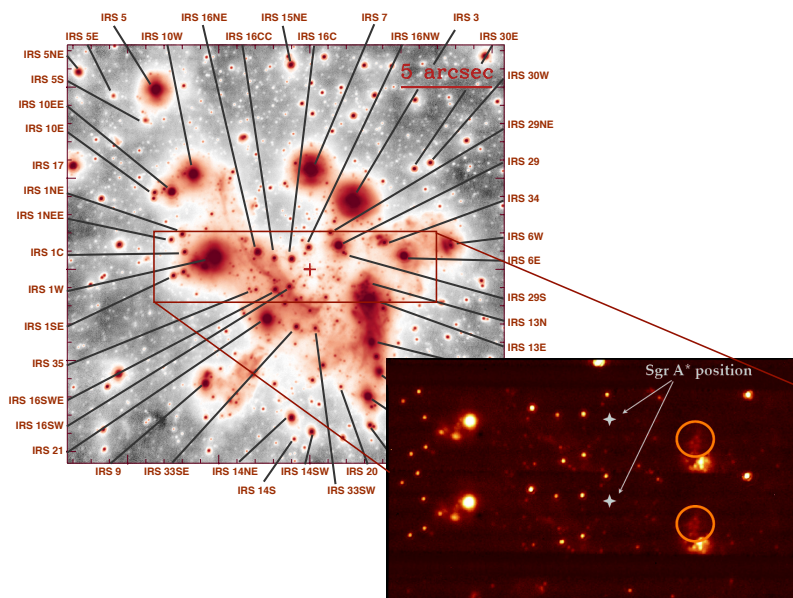


Figure: L' -band ($3.8 \mu\text{m}$) mosaic of the Galactic Center obtained with VLT NACO on the night of 16 May 2012. 1 arcsec translates to ~ 0.04 pc for an 8 kpc distance to the GC. North is up and East is to the left.

Lower right: Reduced image of the Galactic Center in L' polarimetry of two orthogonal channels (0° & 90°) of the electric field vector. The orange circles denote the position of IRS 13N sources in the two polarization channels.

Analysis steps involve: data combination, photometric and astrometric calibration, polarization parameters measurements, interpretation, and writing.

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