

SFB 1601 Student Seminars – Summer 2026

Date & Time: 12th October, 2026 (Monday), 15:00 - 17:00+

Venue: Kosma room, Main Physics building, University of Cologne [[map](#)]

Social event: from 17:00

15:00 - 15:05	Welcome + Introduction	
15:05 - 15:25	Characterizing temperature structures of massive star-forming clumps in ALMAGAL survey	Han-Tsung Lee (PH1)
15:30 - 15:50	A polychromatic analysis of the dissolving stellar association IRS 6 in the center of our galaxy	Lena Großekathöfer (PH1)
15:55 - 16:15	Facilitating the search for 1-amino-2-propanol in space by studying its rotational spectrum	Prachi Misra (PH1)
16:20- 16:40	Can we put a disk in a sink? Post-processing a 1D-protostellar disk model in 3D-MHD simulations of core collapse	Anaïs Pauchet (PH1)
16:40 - 17:00	Open discussion about the Student Council & its activities + Feedback	
17:00 —	Snacks and Social Event	

Coffee and drinks will be provided during the seminar. You can bring your own cup of coffee.

Abstracts on the next pages.

List of Abstracts

Characterizing temperature structures of massive star-forming clumps in ALMAGAL survey

Speaker: Han-Tsung Lee (PH1)

Abstract: The presence of massive stars is expected to have a significant impact on the surrounding environment. Feedback from high-mass (proto)stars plays an important role on affecting the subsequent star formation by creating thermal structures in their natal clouds. ALMAGAL, an ALMA large program observing >1000 massive clumps in the Galaxy provides unprecedented opportunities to study this aspect in star formation process. We derive rotational temperature maps for 419 clumps through excitation analysis using H₂CO line data around 218 GHz with a resolution of $\sim 1.3''$ (~ 4000 au). We found generally higher temperature (25->200 K) from H₂CO than dust temperatures calculated from FIR observations. The measured thermal energies of the clumps range from 10^{43} to 10^{49} ergs and show a correlation with clump luminosity-to mass ratios, indicating feedback becomes more significant as clumps evolve. Radiation and outflow feedback appear to be overall equipartitioned based on the comparison between energy produced by radiative and mechanical outflow heating. We also found a tentative increasing trend between the number of cores and the thermal energies of the clumps, which may be the result of mechanical (outflow) feedback promoting fragmentation.

A polychromatic analysis of the dissolving stellar association IRS 6 in the center of our galaxy

Speaker: Lena Großekathöfer (PH1)

Abstract: ALMA observations of the 343 GHz CO line in the Milky Way's inner parsec revealed enhanced sub-millimeter emission between the stars IRS 6E and IRS 6W, located approximately 0.4 ± 0.2 pc northwest of Sagittarius A*. Through a polychromatic analysis, we cataloged 419 sources in this "IRS 6" region and determined their proper motions, magnitudes, fluxes and velocity dispersion. Keplerian orbit and spectral energy distribution fits to a subset of sources suggest a common origin and two generations of stars. Taking the estimated mass and Hill radius into account, IRS 6 can be classified as a dissolving stellar association that may have formed during the inspiral of a massive molecular cloud.

Facilitating the search for 1-amino-2-propanol in space by studying its rotational spectrum

Speaker: Prachi Misra (PH1)

Abstract: To date, more than 350 molecules have been identified in space, primarily through the interplay of laboratory rotational spectroscopy and radio astronomy. Each molecule has a unique rotational spectrum, or spectral fingerprint, which allows it to be identified in observations obtained with radio telescopes. By analysing these fingerprints, molecular abundances can be determined, providing valuable insights into the chemistry of the interstellar medium. However, astronomical searches rely on accurate laboratory measurements of these fingerprints. This talk will describe how molecules are selected for laboratory investigation and how spectroscopic techniques are chosen to obtain the data required for their detection in space.

The approach will be illustrated using 1-amino-2-propanol (1-a-2-p, $\text{NH}_2\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$) as an example. Its rotational spectrum was recorded using chirped-pulse Fourier-transform microwave spectroscopy in the frequency ranges 12–26.5 GHz and 75–110 GHz using home-built spectrometers. Measurements in the lower-frequency range were performed at approximately 10 K using a supersonic jet expansion, while measurements in the higher-frequency range were performed at approximately 300 K. In addition to the lowest-energy conformer of 1-a-2-p, a second conformer, predicted to lie 4.9 kJ mol^{-1} higher in energy, was observed for the first time by rotational spectroscopy. These high-resolution measurements provide the spectral data needed to search for 1-a-2-p in astrophysical environments.

Can we put a disk in a sink? Post-processing a 1D-protostellar disk model in 3D-MHD simulations of core collapse

Speaker: Anaïs Pauchet (PH1)

Massive star formation is still poorly understood due to their rare occurrences, which together with their embedded nature make this mechanism truly difficult to observe. High-resolution numerical simulations of massive star formation are key to better understanding the massive star formation process. However, numerical simulations are highly demanding as they require high resolution and need to cover a large dynamic range in density and spatial scale. Still, it is basically impossible to resolve individual

stars while following the parental clump, in particular, when a range of initial conditions is studied. Stars are instead described as sink particles (SP), point-like objects accreting mass. Unfortunately, the physics describing the SPs is limited and does not account for the protostellar disk and the formation of binary systems.

I developed a python module, Disk modEl for SInk paRticleS post-procEssing (DESIREE), and analysed the SPs in simulations of massive core collapse from Zimmermann et al. 2025, using the 3D MHD AMR grid code FLASH (Frixell et al. 2000). It uses the alpha-disk description from Shakura & Sunyaev 1973 evolving using the Eulerian method. It includes time evolution of the Keplerian profile due to star growth and the treatment of negative angular momentum accreted on the SP.

The "disk+star" SPs, differently from the "single" SPs, keep storing mass even after star formation ends (i.e. HII region formation). About ~30% of the SP's mass stays in the disk (Pauchet et al. in prep). Thus, considering disks on-the-fly would delay the start of stellar feedback, eventually increasing the Star Formation Efficiency (SFE). Additionally, we found that with negative angular momentum accreted, inner disk's mass seems to fall drastically onto the star. Hence, by only using simple prescriptions we could reproduce episodic accretion events observed in most YSOs, explained by orthogonal accretion with respect to the SP's spin.

In this project we improve the description of SPs in 3D core collapse simulations, by including disk physics, and later on companion stars and disk related outflows.