PSF Workshop 2018 Abstracts

Ahmadi, Aida

Title: *Core Fragmentation and Disk Stability in High-Mass Star Formation: The link between observations and simulations*

ABSTRACT: In recent years, we have been able to resolve rotating structures surrounding the most luminous cores and find differentially rotating disk-like structures, making a case for high-mass star formation being a scaled-up version of low-mass star formation in this context. However, the fragmentation mode and the properties of these disk-like structures have yet to be comprehensively characterised. Using the IRAM NOrthern Extended Millimeter Array (NOEMA) and the IRAM 30-m telescope, the CORE survey has obtained high-resolution (~0.35", 700 AU at 2 kpc) observations of 20 well-known highly luminous star-forming regions in the 1.37 mm wavelength regime in both line and dust continuum emission. I will present our findings on the disk-scale kinematics of the sample with a focus on the W3(H2O) star-forming region. We find that different fragmentation processes can contribute to the final stellar mass distribution within a single region, with core fragmentation on large scales and disk fragmentation on smaller spatial scales. With temperature information obtained from radiative transfer modelling of the dense-gas tracer CH3CN, we are able to study the Toomre stability of these structures and predict their fate in the disk fragmentation scenario. Furthermore, we use radiation hydrodynamic simulations to test the applied methods and investigate the limits of what current observations can unveil.

Baehr, Hans

Title: *Core and Planetesimal Formation in Self-Gravitating Disks*

ABSTRACT: Recent measurements of Jupiter suggest that gas giant planets have considerable solid cores. Planet formation by gravitational instability, unlike core accretion, is essentially a star formation process resulting in objects which more closely resemble stars in composition. While silicates will evaporate at temperatures around 1300 K, this does not mean solids and heavier elements cannot concentrate through aerodynamic and self-gravitational forces before the core temperature of the fragment becomes too hot. We perform high-resolution simulations of fragmenting disks showing the sedimentation and concentration of particles at the formation of a fragment can lead to the enrichment of the planetary atmosphere if not the development of a core.

Barraza, Marcelo

Title: *Hydrodynamical simulations of dust traps in protoplanetary disks*

ABSTRACT: Resolved ALMA and VLA observations support the existence of two dust traps in the spiral-bearing protoplanetary disk around MWC 758. By means of 2D gas+dust hydrodynamical simulations post-processed with 3D radiative transfer calculations, we show that the spirals in scattered light, the asymmetric ring and the crescent-shaped structure in the (sub)mm can be caused by two giant planets: a Jupiter-mass planet a t ~33au (inside the spirals) and a 5-Jupiter mass planet at ~ 132 au (outside the spirals). The outer planet triggers several spiral arms that can account for some of the observed spirals. The disk hosts a vortex at the inner edge of its gap (at ~ 80 au), where the compact continuum emission reproduces previous ALMA and VLA observations quite well, if assuming moderately fluffy dust particles (with an internal density ~0.1 g cm^-3) up to a cm in size. The inner planet also forms a vortex at the outer edge of its gap (at ~ 47 au) that decays faster than the vortex induced by the outer, more massive planet as a result of the disk's turbulent viscosity.
The loss of azimuthal trapping due to the vortex decay can reproduce the low signal and larger spread observed in VLA observations of this dust trap. Finding the thermal and kinematic signatures of both planets could verify the proposed scenario.

Barth, Patrick

Title: *Coupled Atmosphere-Interior Model for Rocky Exoplanets*

ABSTRACT: During the early stages of their life, rocky exoplanets are likely to have had completely molten mantles, so-called magma oceans. These magma oceans can play an important role in the evolution of volatiles in the planets' atmospheres, i.e. the amount of water and oxygen left after the solidification of the magma ocean, and, therefore, have an influence on the habitability of those planets. During my year at the University of Washington, I worked together with Rory Barnes to write a code that models the evolution of magma oceans as a part of the Virtual Planet Code and I will continue with this work as a master student with Ludmila Carone and Thomas Henning at the MPIA.

Bertrang, Gesa

Title: *Magnetic fields in Bok globules: Multi-wavelength polarimetry as tracer across large spatial scales*

ABSTRACT: he role of magnetic fields in the process of star formation is a matter of continuous debate. Clear observational proof of the general influence of magnetic fields on the early phase of cloud collapse is still pending. I will present our results obtained with multi-wavelength polarimetry (optical - mm) as tracer for magnetic fields on scales of 10^3-10^6au in 6 Bok globules (Bertrang+2014, Jorquera & Bertrang 2018). We find a strong polarization signal and strongly aligned polarization vectors on large scales (10^4-10^6au) for all 6 globules. This indicates dominant magnetic fields across Bok globules with simple as well as complex density structures. To reconcile our findings in globules, the lowest mass clouds known, and the results on intermediate (e.g., Taurus) and more massive (e.g., Orion) clouds, we postulate a mass dependent role of magnetic

fields, whereby magnetic fields appear to be dominant on low and high mass but rather sub-dominant on intermediate mass clouds.

Bopp, Eduard

Title: *Young accreting planets*

ABSTRACT: With a new generation of instruments we expect to observe accretion onto young planets within disks. Such observations may allow us to put stronger constraints on the processes governing this phase of planet formation. To derive properties of planets and accretion processes from such observations, we need detailed models of the circumplanetary disk structure. We are creating radiation hydrodynamical models of improving detail of the planet-disk interaction to enable comparisons to future observations.

Bitsch, Bertram

Title: *Conditions for giant planet formation*

ABSTRACT: The exact formation mechanism of giant planets is still a mystery. The only thing certain is that giant planets have to form during the gas-disc phase, as they accrete their gas from the protoplanetary disc. In the core accretion scenario, a planetary core forms first, which can then accrete gas from the protoplanetary disc. Forming cores only via planetesimal (100km sized objects) accretion can take longer than the gas disc lifetime. However, the recently developed theory of pebble accretion allowed a dramatic reduction in the core formation time-scale. This reduction of the growth time-scale depends on the amount of pebbles (mm-cm sized objects) available in the protoplanetary disc. During the growth, the planet also migrates through the protoplanetary disc, where type-I migration can lead to dramatic loses of semi-major axis of the growing planet. Even if the planet forms at several AU, it might migrate all the way to the inner disc. I will discuss in this talk the interplay between the growth time-scale via pebble accretion and planet migration on the formation of gas giants exterior to 1 AU.

Chuang, Ko-Ju

Title: *The formation of complex organic molecules in dense clouds*

ABSTRACT: Large areas of space are filled by molecular clouds that consist of gas and (sub)-micron sized silicate and carbonaceous dust grains that are the remnants of dead stars. When these clouds start gravitationally collapsing, the decreasing temperature and increasing density cause gas particles to start accreting onto dust grain surfaces that act as highly effective cryopumps. This results in layered geometries of partially mixed ices on top of the grains that act as molecule reservoirs and cryogenic catalysts on which both simple and complex molecules form in surface reactions, triggered by impacting atoms, electrons and cosmic rays or irradiation by vacuum UV light. These grains form the material from which celestial bodies –comets and planets and their moons –form. A good understanding of the elementary processes taking place in dark interstellar clouds, therefore, is necessary to understand the chemical inventory of stellar systems, like our own Solar system. The work* focuses on laboratory studies investigating the surface chemistry of CO-rich ices on dust grains at temperatures as low as 10 K. The formation mechanisms of complex organic molecules (COMs) are

investigated by non-energetic processes (e.g., hydrogenation) and energetic processes (e.g., photolysis). Moreover, the net transfer of the newly formed hydrogenated species from grain surfaces into the gas phase through non-thermal desorption is investigated to link the detection of COMs in the gas phase to their formation in the solid state.
*All work described in the talk has been performed in the Sackler Laboratory for Astrophysics at Leiden University.

Deacon, Niall

Title: *Searching for cold giant planets in wide orbits with Spitzer*

ABSTRACT: In the past decade massive giant planets have been directly imaged at very wide separations from their host stars. Currently a handful of planets are know to lie at separations of a few thousand AU from their host stars. Most of the these planets are around young stars and have temperatures similar to field brown dwarfs. By the time these planets reach field ages they will have cooled to temperatures of 200-300K. I am leading a Spitzer programme to image areas around stars in the solar neighbourhood to search for these cold field-age planets. I will present the ongoing survey and the efforts we are making to characterise the wide orbit population of giant planets.

Gieser, Caroline

Title*: Chemical Complexity of AFGL 2591*

ABSTRACT: Hot cores are ideal laboratories to study the formation of simple and complex organic molecules. Here, we present a detailed observational and modeling study of the chemistry of the prototypical hot core VLA 3 in the high-mass star-forming region AFGL 2591, where it evolves in unique conditions being isolated from other young OB stars with strong UV radiation. This region is part of the NOEMA (NOrthern Extended Millimeter Array) large program CORE targeting 20 of such regions. Observations were carried out with NOEMA from 217 GHz to 221 GHz with a spectral resolution of ~2.7 km/s and to include large-scale emission observations with the IRAM 30 m telescope were complemented. Using the high spatial resolution (0.4", ~1300 AU at 3.3 kpc) we derived the physical structure (density and temperature) of the source using the 1.37 mm continuum, methyl cyanide and formaldehyde emission. In the spectra, we could identify in total 17 different species and 12 isotopologues among ~100 detected lines. Using XCLASS, we derived the rotation temperatures and column densities: AFGL 2591 has a high molecular abundance (e.g., SO2, SO, OCS) and shows a rich diversity in complex molecules (CH3OH, CH3CN, NH2CHO, C2H5CN, C2H3CN, CH3OCHO, CH3COCH3, CH3OCH3). Many species show an asymmetric distribution around the continuum peak which indicates a complex structure on small scales due to disk accretion and the outflow. As hot cores have a rich gas-phase chemistry, we modeled the chemical abundance with MUSCLE. The code includes the time-dependent gas-grain chemical model ALCHEMIC and finds the best-fit physical structure covering several stages of high-mass star formation. With this simplistic 1-D model, we are able to explain the abundance of ~70 % of the species with a chemical age of ~50 000 years and a best-fit physical structure comparable to the observed one.
Thus, in agreement with previous studies of the region, AFGL 2591 VLA 3 seems to be in an early hot core stage. The observed chemical segregation can be partially explained by our model, but more sophisticated modeling is needed in order to explain

the spatial distribution of certain species, e.g., by including shock chemistry and the complex physical structure of the source.

Espinoza, Nestor

Title*: Looking for clear and cloudy skies in transiting extrasolar worlds*

ABSTRACT: The field of exoplanet atmospheres has seen its rise through the years as we learn how instruments behave and tune our models to understand the data they provide. The technique of transmission spectroscopy --- the change in the observed planetary radius of an exoplanet as a function of wavelength due to opacity sources in its atmosphere --- is particularly a very constraining tool to understand what these atmospheres look like, and what they can teach us about planet formation. In this talk, I will mention current efforts at detecting different signatures in exoplanet atmospheres through this technique using different ground-based facilities such as Magellan/IMACS, as well as a new approach for obtaining 2-dimensional information of the atmospheres of these distant worlds directly from transit lightcurves.

Kossakowski, Diana

Title*:* Enigmatic AD Leo: Starspot, Planet, or Both?

ABSTRACT: If our goal is to detect exoplanets, the amplitude of a periodic signal present in Radial Velocity (RV) data should be both time- and wavelength-independent. However, an on-going issue present is our limitation in both time and wavelength space. Essentially, we are not getting the full picture, and stellar activity, especially in M dwarfs, can mimic a planetary signal if a given time-wavelength subspace is not adequate enough. In an attempt to address the wavelength coverage, the instrument CARMENES consists of two separate high-resolution echelle spectrographs, covering the VIS and NIR wavelengths from 520-960 nm and 960-1710 nm, respectively. Therefore, it can aid in determining whether a signal is truly due to a planetary companion or due to activity in the star itself. An additional tool is to look at the ChRomatic IndeX (CRX), where a correlation between the RV and the CRX indicates stellar activity due to the temperature difference between a spot and the star's quiescent photosphere. A stellar target proved to be interesting to study is AD Leo, a M3 dwarf known to be highly active. The literature reports a 23 m/s signal with a period around 2.23 days using HARPS, whose wavelength range is 383-690 nm, and therefore bluer than CARMENES. The amplitude of the signal was claimed to be relatively constant throughout the HARPS wavelength regime, and therefore, a CARMENES campaign for AD Leo was carried out to investigate the wavelength-dependency of the signal. The CARMENES data in the VIS shows the periodicity of 2.23 days with a similar semi-amplitude and phase, even though it is taken 10 years after the HARPS data, which could be consistent with a planetary signal. However, when considering both the VIS and NIR, it is found that the amplitude of this signal is decreasing with wavelength at first, but then plateaus off in the longer wavelength regime. Here, I present RV data that extends all the way to the NIR as well as a discussion considering possible explanations as to why this 2.23 day periodic signal of a highly active early M dwarf star behaves in such a manner.

Klarmann, Lucia

Title*: The inner regions of protoplanetary disks*

ABSTRACT: The inner regions of protoplanetary disks are where terrestrial planets and super-Earths form and/or migrate to. The small spatial extend of this region makes direct observations difficult. But interferometric observations and dust modelling can put constraints on the base material of terrestrial planet formation.
We show that the inner rim position can be very well constrained with NIR interferometry, and that the observed positions can be explained by a power law grain size distribution, but also the presence of highly refractory grains.
Motivated by the low carbon fraction in the Earth, we investigate how to sustain a low fraction of refractory carbon in the inner disk. We find that radial dust transport in the disk must be significantly reduced parent body formation, possibly by a quickly formed giant planet core. Otherwise grains from the outer disk region will replenish refractory carbon very efficiently within the grain drift timescale.

Keppler, Miriam

Title*: ALMA observations of PDS 70*

ABSTRACT: We have recently discovered a planetary mass companion in the gap of the transition disk around PDS 70 using VLT/SPHERE. I will show new ALMA band 7 observations of the system in dust continuum and CO gas and analyse the disk morphology as well as the imprints of PDS 70 b on the disk as seen in the sub-millimeter regime.

Krasnokutski, Serge

Title*: Experimental Characterization of Low-temperature Surface Reactions for Astrochemistry*

ABSTRACT: Low-temperature reactions on the surface of cosmic solid particles (“dust”) are thought to be responsible for the formation of complex organic molecules observed inside “dark” molecular clouds and planet-forming disks. These molecules could later be delivered to planets and facilitate the formation of biopolymers. However, there is a lack of quantitative experimental data on the relevant surface reactions. We describe an experimental technique, which can be used to measure the energy released in reactions of a single pair of reactants. These data can be directly compared with the results of quantum chemical computations leading to unequivocal conclusions regarding the reaction pathways, the presence of energy barriers, and the final reaction products. In the experiment liquid He is used as a third body. Reactions investigated inside superfluid He nanodroplets are analogues to those occurring on chemically inert surfaces, for example, water ice surfaces. The new method was applied to study the reactions of C atoms with H2, CO2, NH3 and C2H2 molecules. The formation of HCH, C2O2, CNH3, and triplet cyclic-C3H2 products has been revealed. The method has applications beyond laboratory astrophysics in studying surface reactions.

Liu, Yao

Title: *The Ring Structure in the MWC 480 Disk Revealed by ALMA*

ABSTRACT: Gap-like structures in protoplanetary disks are likely related to planet formation processes. In this work, we present and analyze high resolution (0.17 arcsec × 0.11 arcsec) 1.3 mm ALMA continuum observations of the protoplanetary disk around the Herbig Ae star MWC 480. Our observation shows a gap centered at ~ 74 au with a width of ~ 23 au, surrounded by a bright ring centered at ~ 98 au from the central star. Detailed radiative transfer modeling of both the ALMA image and the broadband spectral energy distribution is used to constrain the surface density profile and structural parameters of the disk. If the width of the gap corresponds to 4 ~ 8 times the Hill radius of a single forming planet, then the putative planet would have a mass of 0.4~3MJ. We test this prediction by performing global three-dimensional smoothed particle hydrodynamic gas/dust simulations of disks hosting a migrating and accreting planet. We find that the dust emission across the disk is consistent with the presence of an embedded planet with a mass of ~ 2.3 MJ at an orbital radius of ~ 78 au. Given the surface density of the best-fit radiative transfer model, the amount of depleted mass in the gap is sufficient to account for the formation of such a planet.

Manger, Natascha

Title: *Observational Signatures of the Vertical Shear Instability*

ABSTRACT: Basically all protoplanetary disks observed by ALMA show dust concentrations consistent with particle trapping in giant vortices and zonal flows. The formation and survival of vortices is of major importance for planet formation, because vortices act as particle traps and are therefore preferred locations of planetesimal formation. Recent studies showed that the vertical shear instability (VSI) is capable of generating turbulence and small vortices in protoplanetary disks with realistic radial and vertical stratification and cooling properties. We investigate the influence of the azimuthal extent of the disk on the long-term evolution of a protoplanetary disk and the possibility of large vortices forming. To this end, we perform 3- dimensional simulations for up to 1000 local orbits using different values of $\Delta\phi = \pi/2 - 2\pi$ for VSI in disks with a prescribed radial density and temperature gradient cooling on short timescales.
We find the VSI capable of forming large vortices that can exist at least several hundred orbits in simulations covering a disc with $\Delta\varphi \geq \pi$. This suggests the VSI to be capable to form vortices or at least to trigger vortex formation via a secondary instability, e.g. Rossby wave instability or Kelvin–Helmholtz Instability. We also present post-processed images showing the capability of those vortices to trap particles and their signs in observed disks.

Mori, Shoji

Title: *Inefficient Heating by Wind-driven Accretion in Protoplanetary Disks*

ABSTRACT: Gas temperature in protoplanetary disks is determined by a combination of irradiation heating and accretion heating, with the latter conventionally considered to be due to turbulent dissipation. However, recent studies have suggested that the disks' inner region is largely laminar with accretion driven by magnetized disk winds, as a result of non-ideal magnetohydrodynamic (MHD) effects from weakly ionized gas, suggesting the alternative heating mechanism by Joule dissipation. We perform local stratified non-ideal MHD simulations, and investigate the role of Joule heating and the resulting vertical temperature profiles. We find that as the non-ideal MHD effects strongly suppress electrical current around the midplane, Joule heating primarily occurs at several scale heights above the midplane. This makes disk midplane temperature significantly lower than that with the conventional model. Our results suggest that the midplane temperature in disks' inner regions can be largely determined by irradiation heating rather than accretion heating even in the early stage of disk evolution.

Musso Barcucci, Arianna

Title: *A low mass companion in the disk gap around HD 193571*

ABSTRACT: We have discovered a close-in low-mass stellar companion around the debris disk-hosting A0 star HD 193571. The companion was detected in the course of the VLT ISPY coronagraphic survey of young stars with disks, and is only the third known M-type companion discovered within the debris disk of its host star. We confirmed the companionship through second epoch L'-band observations with NACO, as well as H-band observations with GPI. We also attempted to spatially resolved the disk for the first time using polarimetric observations with GPI. The combination of a high-mass ratio (~10:1) binary with a circumbinary debris disk is reminiscent of a planetary system and can inform on the role of companion mass in proposed stirring mechanisms for debris disks.

Riener, Manuel

Title: *Going beyond cloud segmentation: Unveiling the detailed velocity structure of the CO gas in the Galactic plane*

ABSTRACT: For decades, the analysis of molecular gas structures in the Galactic plane has been driven by segmentation into pre-defined physical objects, i.e., approaches based on "cloud-finding" or "clump-finding". While these works have been important for quantifying the mean properties of cloud-like structures, the cloud-based analysis by design washes away important information about the detailed, internal velocity structure of the gas both inside the clouds and at Galactic scales. This velocity structure thus still largely remains unexplored and unknown, also because of the technical challenge of efficiently dealing with hundreds of thousands of velocity components.
We have recently worked on developing an automated Gaussian decomposition scheme that incorporates a machine-learning approach to automatically fit hundreds of thousands of spectra and velocity components. Combined with a Bayesian approach of determining distances to the identified components, this enables us to look for and find systematic trends that are directly linked to the physical processes in the gas (e.g., fluctuation patterns in the velocity field due to instabilities and/or turbulence, shear, Galactic potential, or kinematic effects of spiral arms). Our new analysis focusses in particular on differences in the turbulent velocity structure of molecular clouds across Galactic environments

and may thus give insight to the universality of the turbulent velocity fluctuations that we see in the observations.

Rouille, Gael

Title: *Photodissociation of the 1-ethynylpyrene cation*

ABSTRACT: The gas-phase chemical network that describes the formation and destruction of polycyclic aromatic hydrocarbon (PAH) molecules can be expected to include species carrying an ethynyl group (-CCH). In a previous study, we concluded that ethynyl-substituted PAH molecules were as photostable as regular PAH species in the conditions of H I regions (Rouillé et al. 2015, ApJ, 810, 114). We have studied the photodissociation of the 1-ethynylpyrene cation in more detail by measuring its dissociation for selected values of its internal energy. Thus we can determine the activation energy and the entropy of activation for the dissociation channels we have observed. The preliminary results indicate that the behavior of the 1-ethynylpyrene cation with regard to photodissociation in H I regions is very close to that of the pyrene cation, in agreement with our previous study.
The mid-IR emission spectra that reveal the presence of interstellar PAH molecules do not show any ethynyl-substituted PAH species. As the present study reinforces the idea that photodissociation is not an issue with respect to the survival of these species in H I regions, their low abundance in the interstellar medium has another cause.

Samland, Matthias

Title: *Application of transit light curve methods to direct imaging exoplanet detection*

ABSTRACT: Analogous to a planet transiting in front of a star causing a characteristic dip in the light curve, in angular differential imaging (ADI) commonly used in high-contrast imaging, the planet signal moves azimuthally over stationary pixels causing a characteristic time-dependent rise in the time series of the pixels that can be modeled. Instead of creating a local noise model, a data-driven model of the temporal behavior of the systematics can be created using reference pixels (Schölkopf et al. 2016, Wang et al. 2016) under the condition that there is a causal connection within the data set. This method will extend the toolbox of direct imaging post-processing by introducing a different approach of thinking about the problem of high-contrast imaging and bridging the gap between methods used in the transit and direct imaging community.

Semenov, Dimitry

Title: *Detection of new organic species in protoplanetary disks*

ABSTRACT: In my presentation, I'll provide an update on the newest detection of organic and prebiotic species detected in protoplanetary disks at (sub)millimeter wavelengths, along with the data analysis and modeling.

Ueda, Takahiro

Title: *Dust-pileup at the Dead-zone Inner Boundary and Its Effect on the Disk Structures*

ABSTRACT: The inner region of protoplanetary disks is the birthplace of rocky planetesimals and planets. One preferential site of rocky planetesimal formation is the inner edge of the dead zone. Across the dead-zone inner edge, the turbulent viscosity arising from magneto-rotational instability steeply decreases from inside out, resulting in a local maximum in the radial profile of the gas pressure. The pressure maximum traps solid particles and the local dust-to-gas mass ratio increases, leading to rocky planetesimal formation via the streaming instability.We perform simulations of the dust and gas disk evolution to investigate the observational features of a dust-pileup at the dead-zone inner edge. We show that the total mass of accumulated dust particles is sensitive to the turbulence strength in the dead zone because of the combined effect of turbulence-induced particle fragmentation (which suppresses particle radial drift) and turbulent diffusion. For a typical critical fragmentation velocities of silicate dust particles of 1 m/s, the stress to pressure ratio needs to be lower than 0.0003 for dust trapping to operate.The obtained dust distribution is postprocessed using the radiative transfer code RADMC-3D to simulate infrared scattered-light images of the inner part of protoplanetary disks with a dust pileup. We find that a dust pileup at the dead-zone inner edge, if present, casts a shadow extending out to ~ 10au. In the shadowed region the temperature significantly drops, which in some cases yields even multiple water snow lines. We also find that even without a dust pileup at the dead-zone inner edge, the disk surface can become thermally unstable, and the excited waves can naturally produce shadows and ring-like structures in observed images. This mechanism might account for the ring-like structures seen in the scattered-light images of some disks, such as the TW Hya disk.

Wang, Yuan

Title: *Studying atomic hydrogen during cloud formation by means of HI self absorption*

ABSTRACT: Probability distribution functions (PDFs) of the column density of hydrogen are a common tool to examine molecular clouds. Due to turbulent motion, the initial PDFs have a log-normal shape and evolve into a power-law tail at high column densities due to gravity and collapse. To date, these studies are mostly limited to the molecular content of the clouds. Here, we present a study of the cold atomic content of the giant molecular filament GMF38.1−32.4 (Ragan et al. 2014), presenting column density PDFs and the corresponding kinematics. We extracted a long HI self absorption (HISA) feature, which correlates partly with the CO emission. The peak velocity of the HISA and CO shows a close correlation on one side of the filament, whereas a velocity step is visible on the other side. The column density of the cold absorbing HI is on the

order of 10^20-10^21 cm−2. In contrast to this, the column density of the molecular hydrogen, traced with CO, is an order of magnitude higher.
The shape of the atomic and molecular column density PDF reveal mostly log-normal shapes, indicating turbulent motion as the main driver. We speculate that we observe different evolutionary stages within the filament. The atomic and molecular hydrogen is well mixed on the left side forming a molecular cloud out of the atomic environment, which could indicate an early evolutionary stage, whereas the right sub-region already shows high column density peaks and active star formation. Such studies are an important characterization of the transition between the atomic and molecular phase and influence simulations as well as theoretical studies.

Zhakhozhay, Olga

Title: *Radial Velocity Survey for Planets around Young stars RV-SPY*

ABSTRACT: RV-SPY is a large radial velocity search program for planets around young stars with debris disks. Our sample includes 145 targets that we intent to observe with FEROS. Majority of our stars are included in NaCo- ISPY ESO-GTO direct imaging survey for planets. The synergy of both these surveys will allow us to draw the up-to-date most robust constraints on the occurrence and properties of giant planets in young debris disks. We already have started a first year survey of high-cadence observations to scan our targets for both stellar activity and the presence of hot Jupiters.
In my talk I will give a brief overview of our survey and will present some interesting results that we have got during the first observing semester.

Zhang, Chuan-Peng

Title: *Gas dynamics and NH2D chemistry in massive clumps*

ABSTRACT: In this work, we present NH2D and NH3 observations using PdBI and VLA, respectively, towards eight massive precluster clumps (G18.17, G18.21, G23.97N, G23.98, G23.44, G23.97S, G25.38, and G25.71). The NH2D cores are gravitationally bound, and can potentially form intermediate- or high-mass stars in future. We find that NH2D emissions are not associated with either a dust continuum or NH3 peak position or infrared source, but just surrounding the central continuum cores, suggesting that NH2D has been destroyed by the central young stellar object due to its heating. The NH2D cores are likely prestellar or starless cores. We detect extreme high deuterium fractionation of D_frac ~ 1.0. We find that the correlation between D_frac and T_kin is a positive-correlation from 13 to 16.5K, but anti-correlation from 16.5 to 22K. The most suitable condition for NH2D to take place reaction may be at the temperature of around 16.5K. The detected NH2D lines are very narrow with a median value of around 0.94km/s, which is regulated by turbulent broadening. Using NH3 as a dynamical tracer, we find very complicated dynamical movement towards all the eight clumps, as can be explained by processes such as outflow, rotation, convergent flow, collision, and large velocity gradient. The sample generally exhibit clear signatures of Keplerian disk, suggesting that

accretion is keep going and increasing gradually from prestellar core to evolved source stages.

Zhang, Miaomiao

Title: *Near-infrared extinction mapping in the Galactic plane*

ABSTRACT: We perform a PSF photometry on the archival VVV near-infrared survey data. Based on this deep photometric catalog, we obtain a 30-arcsec resolution extinction map for the 4th quadrant Galactic plane.