FORMATION and EARLY EVOLUTION of VERY LOW MASS STARS and BROWN DWARFS

11–14 October 2011
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ABSTRACT BOOK

POSTERS

Very Low Mass Stars and Brown Dwarfs

ESO, Garching b. München (Germany), 11-14 October 2011

ABSTRACT BOOK

POSTERS

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ABSTRACT

ADAME, Lucia
University of Michigan (US)

The size of brown dwarf disks: limits to their detectability

We have computed a large model SED library to compare with the published Spitzer spectra of the brown dwarfs with disks in Taurus. Once the mid-infrared continuum emission is fitted for each object, the radial variation of the mass surface density of the inner disk is constrained. Since most of the mid-infrared emission forms inside ~5 AU (this value depends on the dust properties of the disk atmosphere and their depletion, the mass surface density, and the luminosity of the brown dwarf), the size of the disk usually cannot be inferred from its mid-infrared spectrum. This information resides in the millimeter emission from the coldest disk regions, but most of the known brown dwarf disks are yet to be observed in the millimeter wavelength range. Assuming that the outer disk is present, and that its mass surface density follows the same radial dependence of that of the inner disk, we can obtain limits to the size and to the dust mass content, and therefore to its detectability at long wavelengths. With the advent of ALMA, the size of the disks around young brown dwarfs could possibly be constrained, ultimately providing an insight to their formation mechanisms and evolution.

POSTER

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ABSTRACT

ALLERS, Katelyn
Bucknell University (US)

Determining the Ages of Young Field Brown Dwarfs using Near-IR spectra

We present the results of a near infrared spectroscopic study of M6-L8 type field dwarfs. Our survey includes both low (R~150) and moderate (R~1200) spectra. We compare the signatures of youth in the near-IR to those seen in the optical spectra of young field dwarfs and present a new set of age sensitive indices.

POSTER

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ABSTRACT

ANDERSEN, Morten
ESA/RSSD, Noordwijk (NL)

The low-mass Initial Mass Function in the supermassive Galactic Star Cluster Westerlund 1

The Initial Mass Function (IMF) is a crucial component in our understanding of star formation and in the interpretation of the integrated light from stellar populations. In recent years advances have been made on the observational knowledge of the brown dwarf and low-mass stellar IMF both in the field and and in nearby star forming regions. Most nearby clusters only cover a narrow range of cluster masses and metallicities and it is thus important to expand the determination of the IMF to massive star clusters. However, limitations on field of view, spatial resolution and sensitivity has precluded attempt to derive the global IMF in massive star clusters to low masses.

Here we present new HST WFC3/IR observations of the most massive young star cluster known in the Galaxy, Westerlund 1. The observations are capable of detecting brown dwarf cluster members, almost an order of magnitude lower mass than previous studies. We discuss the derived mass function for the cluster and the evidence for mass segregation. The mass of the cluster determined through individual star counts is further compared with the dynamical mass determined from the massive stars in the cluster (Cottaar et al. 2011). The ratio of the dynamical to photometric mass will help determine if the cluster will remain bound and evolve into a low-mass globular cluster of it it will disperse and become a part of the field star population.

POSTER

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ABSTRACT

BARSONY, Mary
Space Science Institute, Sebastopol (US)

A Significant Population of Candidate New Members of the Rho Ophiuchi Cluster

A deep (J=20, H=20, Ks=18.5), wide-field (920 sq. arcmin) imaging survey of the highest extinction core of the Rho Oph star-forming region results in the detection of 1916 sources in all 3 bands, of which 936 turn out to be new candidate members, based on modelling of their spectral energy distributions, including their Spitzer photometry. A large fraction (93%) exhibit infrared excess emission from disks. Spectroscopic follow-up will enable the IMF to be well determined from the planetary to the substellar mass regime.

POSTER

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ABSTRACT

BARSONY, Mary
Space Science Institute, Sebastopol (US)

VLA NH3 & Spitzer Observations of the Candidate Proto-Brown-Dwarf, IRAS 16253-2429

We report on VLA ammonia results of the infall envelope of a likely proto-brown dwarf in the nearby rho Oph cloud core, IRAS 16253-2429, which is also the powering source of the Wasp-Waist Nebula (Barsony et al. 2010). The distinguishing feature leading to the conclusion that this is a proto-brown dwarf is the low-mass of its infall envelope. The low mass of the available mass reservoir for infall is determined from three entirely different methods: the VLA ammonia data, mid-IR absorption of the envelope against the background PAH emission of the cloud observed with Spitzer, and from millimeter dust continuum measurements.

POSTER

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ABSTRACT

BARY, Jeffrey
Colgate University (US)

Spatially Resolved H2 Emission in the GG Tau A Binary System

We present high resolution Near-infrared Integral Field Spectrometer (NIFS) Gemini North images of molecular hydrogen gas in the near environment of the GG Tau A binary system. We find that the molecular gas clearly resides within dynamically unstable cleared inner region of the circumbinary disk. We also find that the location of the strongest H2 emission coincides spatially with a "streamer" of material previously suspected to be falling through the circumbinary gap. We investigate the likelihood that this material is accreting into the near environments of the circumstellar disks producing shock excited H2 emission.

ABSTRACT

BECCARI, Giacomo
ESO-Garching

An HST study of star formation in star-burst clusters

We are attempting a systematic study of Pre-Main Sequence (PMS) objects in star-burst clusters, spanning a wide range of masses (0.5 - 4 Msolar), metallicities (0.1 - 1 Zsolar) and ages (0.5 - 30 Myr). We developed a novel method which allows us to identify bona fide PMS stars through a proper combination of optical imaging in V, I and Halpha bands from cameras on board of the Hubble Space Telescope. In this talk I will briefly demonstrate the strength of the proposed photometric approach in identifying stars with Halpha excess emission, a key observational proof of an object actively undergoing mass accretion from a disc. The results obtained so far allow us to undertake a detailed study of the time-scale of star formation in clusters with possible implication on the definition of initial mass function. Interesting applications of this method to the study of chromospheric activity of Main Sequence stars in Globular Clusters will be also presented.

POSTER

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ABSTRACT

BECKER, Andreas
University of Rostock (DE)

Modeling Brown Dwarfs using ab initio equation of state data for hydrogen

Models of the interior of Giant Planets and Brown Dwarfs rely on the equation of state (EOS) data for hydrogen, helium and - as a representative of all heavier elements - water which have usually considerable uncertainties in the high-pressure domain. We constructed a wide range EOS for hydrogen that applies fluid variational theory data [1] for the low-density molecular range (rho<0.2g/ccm), ab initio EOS data derived from finite-temperature density functional theory molecular dynamics (FT-DFT-MD) [2] for intermediate densities (0.2g/ccm < rho <70 g/ccm) where strong correlations and quantum effects are important, and the Chabrier-Potekhin model for the high-density range (rho>70 g/ccm) [3]. FT-DFT-MD simulations treat exchange and correlation effects in dense systems with high precision as comparison with high-pressure experimental data has shownl, see e.g. [2,4,5]. Using this EOS data we model the interior of Brown Dwarfs in a fully convective one-layer model. We derive the interior structure profiles and the mass-radius relationship and compare our results with those using the Saumon-Chabrier-van Horn chemical model EOS [6].

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POSTER

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ABSTRACT

BERGFORS, Carolina
MPI for Astronomy, Heidelberg (DE)

The NTT/AstraLux Sur M-dwarf multiplicity survey

The multiplicity properties of stars hold keys to their formation and early evolution. Characteristics such as the binary fraction, mass ratio and typical binary separation have been shown to be very different for very-low-mass stars and brown dwarfs compared to Sun-like stars. M dwarfs comprise the mass range in-between these types, and any trends of M dwarf multiplicity properties with mass may thus provide clues to the formation of very-low-mass objects. We present results from the AstraLux binary M dwarfs survey, the largest survey to date probing the multiplicity of M dwarfs. First results indicate that properties such as distributions of mass ratio and binary separation for mid- to late-type M dwarfs differ from those of early M type stars.

POSTER

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ABSTRACT

BIAZZO, Katia
INAF-Osservatorio Astronomico di Capodimonte (IT)

Accretion properties of the Chamaeleon II low-mass star forming region

We present optical spectra obtained with FLAMES of 42 low-mass stars in the Chamaeleon II star forming region. We derived the lithium abundance and the radial velocity with the aim to confirm their membership to the Cha II region and to identify new spectroscopic binaries. We also measured the intensity of the Halpha and Helium emission lines in order to derive the mass accretion level. We estimated the width of optical forbidden lines, such as SII, NII, and OI to derive the efficiency of the accretion-powered winds. Finally, possible correlations between mass accretion rate as a function of the stellar mass and spectral type are also investigated.

POSTER

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ABSTRACT

BRICEÑO, César
University of Michigan/CIDA (US/VE)

News from Orion OB1: new groupings of low-mass young stars

We present optical photometry from CIDA at Venezuela, combined with optical/near-IR ZYJHK from the ESO VISTA Galactic Science Verification dataset, and spectroscopy from Smithsonian Astrophysical Observatory telescopes, showing new overdensities of young low-mass stars in the Orion OB1 off cloud regions, north of the Orion belt stars.

ABSTRACT

BULGER, Joanna
University of Exeter (UK)

The BOSS Survey of Disk of Properties in Tauru

We present the initial results of a study of disks around low mass stars and brown dwarfs, spanning the spectral range M2-L0, as part of the ongoing BOSS (Boundary of Stellar/Substellar) Survey. Combining ground-based submillimeter/millimeter observations with a complete Herschel survey, our sample of 138 targets spans the evolutionary stages of protoplanetary to debris disks, consisting of 67 Class I or II objects and 71 Class III objects. Whilst extensive studies of disks around higher mass stars in the T-Tauri phase have been carried out across some of the nearest star forming regions, our observations provide a large-scale study that probes disk properties across the stellar/substellar boundary. Such observations are necessary in providing insight into the mechanisms required for low mass star formation and can aid in the investigation of independent brown dwarf formation models. Our PACS (70um and 160um), CSO (350um) and IRAM (1.2mm) observations are advantageous as the wavelengths cover the transition from optically thick to optically thin emission, enabling disk parameters such as scale height and flaring to be constrained and provide estimates of the disk mass and maximum grain size; critical parameters in assessing the likelihood of planet formation around low mass stars and brown dwarfs. This comprehensive set of disk properties around the low mass population of Taurus will aid in the comparison for investigations of other environments, ages, and central object masses. In addition to the multi-wavelength observations, we have used the Monte Carlo, radiative transfer code, MCFOST to obtain SED model fits for each of the targets. With chi-squared minimization across a large grid of parameter space we have determined the probability distribution for the disk properties such as; inclination, flaring, scale height, surface density profile, maximum grain size, disk size and disk mass. This single dish survey will provide a key resource for upcoming spatially resolved observations with ALMA.

POSTER

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ABSTRACT

CASEWELL, Sarah
University of Leicester (UK)

Brown dwarfs in Blanco 1 and the Pleiades

We have conducted deep surveys of both the Pleiades and its southern hemisphere analogue Blanco 1 to discover new brown dwarfs. By using a combination of optical and infrared photometry and proper motions we are able select faint, low mass objects that are cluster members, and hence compare and contrast these two similarly aged clusters.

POSTER

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ABSTRACT

CHEN, Xuepeng [in absentia]
Yale University (US)

High Angular Resolution Observations of Protostellar Binary Systems

Binary and higher-order multiple stellar systems represent the preferred outcome of the star formation process, but at present we do not understand well how this occurs. Our current knowledge of binary star formation mostly relies on observations of main sequence and pre-main sequence stars and the constraints they put on the theoretical models. Direct observations of the earliest, embedded phase of binary star formation were long limited by the low angular resolution of single-dish millimeter telescopes. Only the high angular resolution obtained at current large millimeter interferometers can enable us to directly observe the formation phase of binary stars, although the number of known and well-studied systems is still very small. To achieve a comprehensive understanding of binary star formation, we have started a systematic program to observe, at different large millimeter interferometers, a large sample of low-mass prestellar and protostellar cores. The observations were mainly carried out at mm dust continuum and in the N2H+ and CO molecular lines. Based on the interferometric mm continuum observations toward 35 Class 0 protostars in nearby clouds, we could, for the first time, derive a statistically significant binary fraction in the Class 0 phase. Based on the molecular lines data, we derive the velocity fields and the distribution of specific angular momentum of the protobinary systems, and kinematically study the fragmentation process at different collapse phases. In this poster I present the main results of this program.

POSTER

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ABSTRACT

DAEMGEN, Sebastian
ESO-Garching

TTauri Binaries in Orion: evidence for accelerated and synchronized disk evolution

In order to trace the role of binarity for disk evolution and hence planet formation, we started the currently largest spatially resolved near-infrared photometric and spectroscopic study of the inner dust and accretion disks of the individual components of 27 low-mass, 100 -400AU visual binaries in the Orion Nebula Cluster (ONC). We study the frequency of Brackett-gamma (2.165mu) emitters to assess the frequency of accretion-disk bearing stars among the binaries of the ONC: only 34% of the binary components show signs of accretion and hence the presence of gaseous inner disks – less than the fraction of gas accretion disks among single stars of the ONC of ~50%. Additionally, we find a significant difference between binaries above and below 200AU separation: no close systems with only one accreting component are found. The results suggest shortened disk lifetimes as well as synchronized disk evolution.

POSTER

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ABSTRACT

DHITAL, Saurav
Vanderbilt University, Boston (US)

Mapping the Milky Way's Ultracool Dwarfs, Subdwarfs, and White Dwarfs with the Large Synoptic Survey Telescope

The Large Synoptic Survey Telescope (LSST) will be a valuable new resource for low-mass (MLTY and white dwarf) dwarf science, characterizing the photometric and kinematic properties of a large, homogeneous sample of low-mass dwarfs in the extended solar neighborhood. LSST will survey the 30,000 sq. deg. of the Southern sky in six bands (ugrizy) to a single exposure depth of r=24.5 and to a co-added depth of r=28. LSST's temporal coverage will include ~1000 visits over ten years for a typical location in the survey footprint, enabling proper motion and parallax measurements for a remarkable number of objects. The Deep Drilling Fields offer even more opportunity by going deeper and/or providing a higher cadence. Here, we describe three basic low-mass science questions that LSST will be able to study. (1) With its depth LSST will identify and characterize unprecedented numbers of low-mass disk dwarfs, halo subdwarfs, and white dwarfs, enabling the construction of a spatial, kinematic, and chemical map of the Milky Way based on empirical data. (2) With its temporal coverage, LSST will be able to study rotation periods and/or other periodic behavior(s) of field and cluster MLT dwarfs as well as cloud properties in T dwarfs. (3) LSST will identify many low-mass eclipsing binary systems, including more than 20 brown dwarf--brown dwarf systems, providing important constraints for stellar formation and evolutionary models.

POSTER

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ABSTRACT

DHITAL, Saurav
Vanderbilt University, Boston (US)

SLoWPoKES: Exploring Formation of the Ultra-wide Binary Stars

We have compiled a large catalog of wide, low-mass common proper motions pairs based on the SDSS photometric database, with 1300 disk dwarf, halo subdwarf, and white dwarf systems. The projected physical separations for these pairs are 10^3-10^5 AU, making them among the widest and least bound binary systems. In this talk, we will discuss three principal results. (1) There seems to be an indication that our sample consists of two populations: a tightly-bound, young/old population that are stable over the lifetime of the Galaxy and a weakly-bound, young population that dissolve in the timescale of 1-2 Gyr. (2) Wide binary fraction, based on our current sample seems, to decrease as a function of Galactic height. (3) Our follow-up observations of the wide pairs indicate that wide pairs are more likely to be hierarchical systems, perhaps contributing to their stability to dynamical interactions and the resulting longevity.

We will also discuss our efforts to assemble a more-complete sample, with an eye towards constraining the wide binary fraction among low-mass stars and eventually understanding the formation of these ultra-wide systems.

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ABSTRACT

DRASS, Holger [in absentia]
ESO Chile / Astronomisches Institut in Bochum

The total stellar content of the Trapezium Cluster, revealed by HAWKI

The Trapezium Cluster is a nearby, very young and active region of star formation with a wide range of stellar masses. The new detector HAWK-I at the VLT allows to perform the most extensive and deepest wide field infrared study to address the following aspects: What is the detailed shape of the initial mass function from 50 M_sol to substellar masses? Is there evidence for triggered star formation in this region? Who was first? Low-mass or high-mass stars? What is the frequency of circumstellar disks as witnessed by IR excesses? How do these properties change with cluster radius? Particular objects like circumstellar disks, jets and bow-shocks can be investigated with unprecedented sensitivity and spatial resolution.

POSTER

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ABSTRACT

ESPINOZA CONTRERAS, Marcela
Instituto de Astrofísica de Canarias (ES)

New ultracool subdwarfs identified in large-scale suveys

This work consists of a photometric and proper motion search looking for ultracool subdwarfs (metal-poor dwarfs with spectral types later than M5). The results presented here are from candidates identified in a cross-match between the fifth Data Release (DR5) of the UKIRT Infred Deep Sky Survey(UKIDSS) and the seventh Data Release (DR7) of the Sloan Digital Sky Survey (SDSS). These candidates were followed-up spectroscopically using the FORS2 spectrograph mounted in the Very Large Telescope. About 60% of all candidates are confirmed as ultracool subdwarfs via low-resolution optical spectroscopy, while the remaining sources are solar-type M dwarfs. We assigned spectral types to each subdwarf (also for the solar-type M dwarfs) based on the adopted classification for M-type subdwarfs, extreme subdwarfs and ultra-subdwarfs defined in the literature as well as from the direct comparison with known subdwarfs used as templates.

POSTER

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ABSTRACT

HAIKALA, Lauri
University of Helsinki (FI)

Submm observations of the cometary globule 12, CG12.

Cometary Globule 12 is a low- and medium mass star forming region 200 pc above the Galactic plane. It contains two prominent cores with ongoing star formation. We present new molecular line observations of CO (3-2) and its isotopoloques and 230 GHz continuum mapping of the region obtained with the APEX and ASTE telescopes. Combined with the already published SEST molecular line data and NIR imaging (NTT) the new data allows to study the structure of CG 12 and star formation, past and present, in detail.

POSTER

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ABSTRACT

HARVEY, Paul
University of Texas, Boulder (US)

First Results From The Herschel GT Program on Brown Dwarfs

We present early observations from the Herschel GT1 program to characterize the CS disks around brown dwarfs. To date only a handful of our 50 program objects have been observed, but the early data suggest that cool material is common around these objects.

POSTER

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ABSTRACT

HUELAMO, Nuria
CAB (INTA-CSIC), Madrid (ES)

Par-Lup3-4 and LS-RCrA 1: Edge-on disks or accretion-modified evolution?

Par-Lup3-4 and LS-RCrA 1 are two very low-mass objects that belong to the young Lupus 3 and RCrA star forming regions. When placed in the HR diagram, both appear underluminous when compared with coeval low-mass members. Two possible scenarios have been proposed to explain their underluminosity: either they are surrounded by edge-on disks (or envelopes), or their luminosity is affected by accretion processes that are common in young stars and brown dwarfs. In this poster we present a study of the circumstellar environment of these two objects to test if they are surrounded by edge-on disks.

POSTER

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ABSTRACT

JOOS, Marc
Laboratoire de Radioastronomie, ENS LERMA, Paris (FR)

Protostellar disk formation and transport of angular momentum during magnetized core collapse

Previous studies found that magnetic field has a strong impact on prestellar cloud collapse, possibly affecting the formation of disk and fragmentation. As most previous studies were restraint to cases where magnetic field and rotation axis are aligned, we study misaligned configurations for various magnetic intensities. We perform 3D AMR MHD high resolution numerical simulations of magnetically supercritical collapsing dense core using the Ramses MHD code. We study in details transport of angular momentum. We find that magnetic braking remove efficiently angular momentum in the aligned or nearly aligned configuration, but decreases sufficiently enough in the misaligned cases. Enough angular momentum remains to form disk, if the strength of the magnetic field is not too high and if the angle between the rotation axis and the magnetic field is sufficiently large. We form disk with masses from 0.05 to almost 0.4 Msun and with radius from 50 to more than 200 AU.

POSTER

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ABSTRACT

KÖHLER, Rainer
MPI for Astronomy, Heidelberg (DE)

Dynamical masses of the low-mass binary TWA 5A

TWA5 is one of the five original members of the TW Hydrae association. It is composed of a pair of low-mass stars (spectral type M1.5) and a brown dwarf (~M8.5). The short orbital period of the close pair (6 years) makes it an ideal target for a dynamical mass determination. Its semi-major axis of only 60 mas, however, makes it a challenge to spatially resolve the binary, even on large telescopes.

We successfully resolved it with NACO at the VLT and measured its relative positions in January and May 2011. Combined with data from the literature, these positions are used to derive improved orbital elements, including the system mass. We measure the positions relative to the third component, which will allow us to determine individual masses within a few years.

POSTER

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ABSTRACT

KUN, Maria
Konkoly Observatory, Budapest (HU)

Low-mass star formation in small clusters: the case of Lynds 1340

Lynds 1340 is a moderate-mass, isolated molecular cloud in Cassiopeia, at 600 pc from the Sun, in which low and intermediate mass stars are being formed, but high-mass stars are not. Most of its young stellar objects are found in three small, nebulous clusters. The star forming mode of Lynds 1340 is apparently halfway between Taurus and Orion, the well-studied prototypes of isolated and clustered modes of star formation in our galactic neighborhood. Its galactic position (l=130deg,b=+11deg), small area (less than 1 square degree) and closeness to us make L1340 suitable for studying the connection between cloud structure and star formation mode. In order to assess the star forming history of the cloud and find connections between the cloud structure and star forming processes we studied the young stellar population born in L1340 using Spitzer IRAC and MIPS photometry, 2MASS, and WISE preliminary data, as well as optical photometry and spectroscopy. Preliminary results are presented in this poster.

POSTER

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ABSTRACT

LEE, Chang Won
Korea Astronomy and Space Science Institute, Daejeon (KR)

Internal Motions in Starless Dense Cores

We discuss the statistics of internal motions in starless dense cores and the relation of these motions to core density and evolution. Four spectral lines from three molecular species are analyzed from single-pointing and mapped observations of several tens of starless cores. Blue asymmetric profiles are dominant, indicating that inward motions are prevalent in sufficiently dense starless cores. These blue profiles are found to be more abundant, and their asymmetry is bluer, at core positions with stronger N2H+ line emission or higher column density. Thirty-three starless cores are classified into four different types according to the blueshift and redshift of the lines in their molecular line maps. Among these cores, contracting motions dominate: 19 are classified as contracting, 3 as oscillating, 3 as expanding, and 8 as static. Contracting cores have inward motions all over the core with those motions predominating near the region of peak density. Cores with the bluest asymmetry tend to have greater column density than other cores and all five cores with peak column density > 6×10^{21} cm-2 are found to be contracting. This suggests that starless cores are likely to have contracting motions if they are sufficiently condensed. Our classification of the starless cores may indicate a sequence of core evolution in the sense that column density increases from static to contracting cores in the latest stage.

POSTER

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ABSTRACT

LIPPOK, Nils
MPI for Astronomy, Heidelberg (DE)

Pestellar cores: molecular freeze-out in relation to local physical cloud parameters

Low-mass molecular cloud cores are the birthplaces of solar-type stars. Despite significant progress during the past 10-20 years in understanding the initial conditions of the star formation process, some physical key properties of such cloud cores, like their temperature and density structure, remain observationally poorly constrained. Nearby, small and isolated clouds, like Bok globules, are ideal laboratories for studying the physical and chemical properties of such star-forming cores because of their relatively simple structure. We are leading the EPOS Herschel key program aimed at studying a small number of such well-selected cores. We combine the Herschel FIR data with ground-based submm bolometer observations and NIR extinction maps to reconstruct spatially resolved dust temperature and density maps and derive constraints on the local dust properties. These data are complemented by line observations of the key molecules C18O, 13CO, N2H+, HCO+ and CS with the aim of studying the relation between gas phase depletion, physical conditions, and dust properties. In this poster we present first results of our freeze-out study in prestellar cores and quantify the size of the depletion regions and their relation to the local physical parameters of the clouds.

POSTER

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ABSTRACT

LODIEU, Nicolas
Instituto de Astrofísica de Canarias (ES)

The UKIDSS View of the Substellar Initial Mass Function

In this contribution, we present the mass functions in several open clusters and star-forming regions targeted by the UKIRT Infrared Deep Sky Survey (UKIDSS) Galactic Clusters Survey (GCS). We describe the photometric search using the five infrared filters employed by the GCS as well as the astrometric selection using 2MASS as first epoch. We compare the mass functions derived in the Pleiades (125 Myr), the IC4665 pre-main-sequence cluster (27 Myr), the Upper Sco association (5 Myr) and sigma Orionis (3-5 Myr).

POSTER

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ABSTRACT

MÄKELÄ, Minja
University of Helsinki (FI)

Globulettes: birthplaces of free-floating substellar objects?

Globulettes are tiny, optically dark molecular clouds, most likely detached from eroding elephant trunks. They form a class of objects whose shape resembles that of starless globules but their size is considerably smaller with masses ranging from planetary mass to about 100M_Jup. They can survive against photoevaporation long enough to undergo gravitational collapse. We have observed globulettes in the Rosette Nebula with NTT/SOFI and the Onsala 20m radio telescope. We have JHK images, narrow-band 2.12 micron H2 and Br Gamma images and molecular line observations in CO and HCO+. We derive properties such as mass and density for the globulettes. The globulettes seem to be denser than suggested by the optical observations in the original paper (AJ, 133: 1795, 2007) and some of them are opaque in NIR. This suggests that free-floating planetary mass objects and brown dwarfs can be formed in globulettes.

POSTER

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ABSTRACT

MCCAUGHREAN, Mark
ESA/SRE-S, Noordwijk (NL)

Dynamical masses for the Eps Indi Ba,b brown dwarf binary

We will present the current status of our long-term VLT monitoring programme designed to yield the individual masses of the two components of the nearest brown dwarf binary to Earth, Eps Indi Ba,b.

POSTER

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ABSTRACT

MIOTELLO, Anna
Università degli Studi di Milano (IT)

New results on the giant dark silhouette disk dd114-426 in the Orion Nebula

The HST Treasury Program on the Orion Nebula Cluster (Cycle 13, GO 10246, P.I. M. Robberto) has provided us with the most detailed images of the largest (~1000AU diameter) protoplanetary disk seen in silhouette in the region, dd114-426. The new data allow us unveil the complex geometry of the disk, which appears eccentric, warped and photoevaporated. Multicolor photometry allows to reconstruct for the first time the spatial distribution of the dust grain size in the outer disk regions thanks to the analysis of the absorption coefficient. Unlike the other proplyds in the Trapezium cluster core, the disk appears photoevaporated by the diffuse non-ionizing FUV flux of the nebular environment. We estimate the surface temperature and the mass loss rate from the disk surface, and use the current constrains on the disk mass to derive its lifetime.

POSTER

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ABSTRACT

MISHRA, Ritesh Kumar
CRPG-CNRS (FR)

Constraining the Early History of Solar Systems from ^{26}Al-^{26}Mg Isotope Systematics in CAIs

Calcium, Aluminium-rich inclusions (CAIs) with an absolute age of ~4568.2 (± 0.2) Myr are the oldest Solar Sys-tem solids that consist primarily of refractory oxides and silicates of Calcium, Aluminium, Magnesium which are also theoretically predicted to condense from the parcel of gas with solar composition. Studies of fossil records of short lived now-extinct nuclides (SLNs) like ^{26}Al, ^{60}Fe, ^{53}Mn, ^{182}Hf in these early Solar System objects (CAIs, chondrules) provide relative chronology of early Solar System events with greater resolution in time (<Myr). Devel-opment in analytical techniques now allow measurement of bulk samples using MC-ICPMS or in-situ using multi-collector Secondary ion mass spectrometer at unprecendent precision of less than 1/10 of a permil which allows dis-cern early Solar System event occurring in short time scales of ~ 10- 100 Kyrs. High precision Mg isotopes and Al measurement in a suite of pristine CAIs from Vigarano, Efremovka, and Axtell were carried out to address the evo-lutionary stage of early solar sytem by infering sequence, duration, and intensity of high temperature events in early Solar System and their relation with various types of CAIs found in meteorites. The preliminary results from the present study suggest that CAIs forming high temperature event happened over an extended time scale of ~2 Myrs and Solar System was relatively homogeneous.

POSTER

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ABSTRACT

MUGRAUER, Markus
AIU, Jena (DE)

High Contrast Imaging search for sub-stellar companions to young stars in the Lupus star forming region

We started a high contrast imaging search for sub-stellar companions to pre-main sequence stars in the Lupus star forming region, using NACO at ESO/VLT. As targets we selected all known T-Tauri stars in Lupus not observed with NACO so far, which exhibit sufficient brightness to be imaged at high Strehl-Ratio, as well as sufficiently high proper motions, so that companions of these stars can be identified via common proper motion already after one year of epoch difference. We will present first results of our imaging campaign, which is able to detect all brown dwarf companions of our targets at projected separations larger than about 25 AU.

POSTER

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ABSTRACT

NEUHÄUSER, Ralph
AIU Univ. Jena (DE)

Orbital motion and mass determination of brown dwarfs as companions to young stars

There is now about a dozen of brown dwarfs confirmed as companions to young nearby stars - confirmed by common proper motion and spectroscopy. We are following their orbital motion since several years. In some cases, we have now detected orbital motion or even curvature in orbital motion, i.e. acceleration. This can be used to determine the masses of the companions independent of models. We will present new NACO observations, the status of the project, and results.

POSTER

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ABSTRACT

OASA, Yumiko
Saitama University (JP)

Young Brown Dwarfs and Planetary-Mass Objects with Disks in NGC 1333

We present the results of a near-infrared spectroscopy and optical/infrared photometry for young very low-mass objects in NGC1333. The Subaru spectroscopic observations demonstrate that they have low effective temperatures. The spectroscopic temperatures are consistent with those derived from a spectral energy distribution (SED) from our Z, J, H, K, and L-band ground-based photometry and Spitzer/IRAC photometry. Their temperatures, together with their luminosities derived from J-band photometry, indicate that very low-luminosity young objects could be young substellar-mass objects such as brown dwarfs and free-floating planetary-mass objects. In addition, the resulting SED reveals that some young substellar-mass objects exhibit significant infrared excess emission ascribed to the presence of circumsubstellar disks.

POSTER

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ABSTRACT

OJHA, Devendra
Tata Institute of Fundamental Research (TIFR), Mumbay (IN)

Young Brown Dwarfs Search in the Core of Distant Massive Star Forming Regions

So far the young brown dwarf (YBD) search has been limited to the nearby star-forming regions (< 500 pc). With the high sensitivity and high resolution NIR observations, it is now possible to detect and characterize the YBDs in distant massive star-forming regions, which are more typical in the galactic scale. W3 Main and NGC 7538 are well-known distant massive star-forming regions and contain the rich clusters of young stars which have recently been formed. Several different evolutionary stages have been discovered in these complexes with considerable substructures and it is expected that the stellar population in these star-forming regions is primarily composed of low mass pre-main-sequence stars. In this talk, I will describe results from our ongoing investigation of low-mass stellar and substellar populations in W3 Main and NGC 7538, using the deep NIR observations (K ~ 20 mag at 10 sigma) with the Subaru Telescope. There appears to be a substantial substellar population and we expect to reveal the IMFs down to 30 Jupiter mass regime in the W3 Main and NGC 7538 regions, by detecting YBDs based on the NIR colors and luminosities. It is unlikely that the mass functions show the presence of cutoff and turnover at least at the hydrogen-burning limit and likely at the deuterium-burning limit. Our results therefore provide the key clues to a census of very low mass stars and the IMF down to a few Jupiter-mass regime for the first time in distance massive star-forming regions.

POSTER

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ABSTRACT

OLIVEIRA, Isa [in absentia]
Leiden Observatory (NL)

Evolution of Dust Mineralogy in Protoplanetary Disks

Mineralogical studies of silicate features emitted by dust grains in protoplanetary disks and Solar System bodies can shed light on the progress of planet formation. The significant fraction of crystalline material in comets, chondritic meteorites and interplanetary dust particles indicates a modification of the almost completely amorphous interstellar medium (ISM) dust from which they formed. The production of crystalline silicates therefore must happen in protoplanetary disks, where dust evolves to build planets and planetesimals. Different scenarios have been proposed, but it is still unclear how and when this happens. This poster presents the dust grain mineralogy (composition, crystallinity and grain size distribution) of a complete sample of protoplanetary disks in the young Serpens cluster. These results are compared to those in the young Taurus region and to sources that have retained their protoplanetary disks in the older Upper Scorpius and Eta Chamaeleontis stellar clusters, using the same analysis technique for all samples. The mean cluster ages and disk fractions are used as indicators of the evolutionary stage of the different populations. The results are discussed in the context of planet formation, in comparison with mineralogical results from small bodies in our own Solar System. Our results show that the disks in the different regions have similar distributions of mean grain sizes and crystallinity fractions (~10%-20%) despite the spread in mean ages. Furthermore, there is no evidence of preferential grain sizes for any given disk geometry nor for the mean cluster crystallinity fraction to increase with mean age in the 1-8 Myr range. The main implication is that a modest level of crystallinity is established in the disk surface early on (<=1 Myr), reaching an equilibrium that is independent of what may be happening in the disk midplane (Oliveira et al. 2010, 2011).

As part of these studies, we have have also characterized newly found young stellar objects in Serpens and Lupus with optical spectroscopy, determining their spectral types and luminosities. Together with literature data, the distribution of spectral types in Lupus is found to be similar to that in Chamaeleon I and IC348 (Mortier et al. 2011, ApJ in press; Oliveira et al. 2009).

I. Oliveira (Leiden Observatory, Univ. of Texas), J. Olofsson (MPIA Heidelberg), K.M. Pontoppidan (StScI), E.F. van Dishoeck (Leiden Observatory/MPE), J.C. Augereau (Grenoble), B. Merin (ESAC Madrid)

POSTER

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ABSTRACT

PEKRUHL, Stephanie
Universitäts-Sternwarte München (DE)

The Clump Mass Function in the Carina Nebula Complex

In the Carina Nebula the feedback of numerous hot stars disperses the parental Giant Molecular Cloud but also triggers the formation of new generations of stars. We obtained wide-field maps with the LABOCA camera at the APEX telescope and with Herschel, which provides the first spatially complete survey of the dust clouds in the Carina Nebula Complex and sample the Clump Mass Function in this region down to sub-solar masses. These data are used to study the Clump Mass Function in different parts of the Carina Nebula, in order to see how the stellar feedback affects the low-mass end of the Clump Mass Function.

POSTER

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ABSTRACT

POLINOVSKYI, Grygorii
Main Astronomical Observatory National Academy of Sciences of Ukraine (UA)

New ammonia line list and its applications in astrophysics

We present the compiled astrophysical database of the NH3 molecule using the BYTe line-list data. The features of the NH3 molecule can appear in the spectra of the low-temperature astrophysical objects, such as atmospheres of the extrasolar planets, late-type cold stars and other objects. As yet it is the most completed and full database of the NH3 molecule properties that can be applied widely in astrophysics. In order to create our astrophysical database we have used the data from the BYTe line-list. The data were recompiled; the oscillator strengths and transition wavelengths were calculated. The newly compiled molecular database was tested by making model spectra and comparing them with observed ones. Our NH3 molecule database is opened for access and can be used in the wide field tasks in astrophysics.

POSTER

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ABSTRACT

POTEET, Charles
The University of Toledo, OH (US)

A Spitzer Infrared Spectrograph Survey of Protostars in the Orion Molecular Cloud Complex

We present a Spitzer Infrared Spectrograph (IRS) study of 278 Spitzer-identified protostellar candidates in the Orion Molecular Cloud complex, the most active region of star formation within 500 pc. Spanning luminosities from 0.1 to 300 solar luminosities, these sources trace the emergence of the mass spectrum from intermediate- to very low-mass stars. These data are an integral part of the Herschel Orion Protostar Survey, an Open Time Key Project to study protostars in Orion with the PACS instrument. Using the IRS spectra, we employ an extinction-independent spectral index method, and re-classify the sample to distinguish between highly reddened pre-main sequence stars with disk and protostars with infalling envelopes. In the remaining sample of protostars, we perform an inventory of silicates and ices being delivered to the nascent stellar systems. We find clear evidence in the envelopes of low-mass protostars for silicates and ices that have undergone thermal processing. Unlike the circumstellar material in massive stars, where dust and ices are subject to processing by direct stellar irradiation, thermally processed materials in low-mass protostellar envelopes may be the consequence of accretion-driven outbursts, shocks in protostellar outflows, and/or transport of materials from the inner disk to the envelope by jets and winds. Towards one unusual, relatively low-luminosity (1.3 solar luminosity) protostar, HOPS-68, we find evidence for thermally processed ices and silicates; the first unambiguous detection of crystalline silicate absorption at 11.1, 16.1, 18.8, 23.6, 27.9, and 33.6 microns in a cold, infalling, protostellar envelope, with crystalline mass fractions of 0.14 and 0.17. Such crystalline material may have been annealed within the hot inner disk and/or envelope regions and subsequently transported outward into the envelope by a protostellar outflow. In addition, the spectrum reveals that the total solid carbon dioxide column density is largely dominated by the presence of pure, crystalline carbon dioxide ice; possibly a consequence from moderate (20-80 K) thermal processing of ice mixtures. Performing a spectral decomposition of the 15 micron carbon dioxide bending mode, we search for evidence of thermally processed material in the envelopes of other low-mass protostars; these may provide evidence of heating by thermal events, such as accretion outbursts.

POSTER

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ABSTRACT

RAJPUROHIT, Arvind Singh
Observatoire de Besançon (FR)

The very low mass multiple system LHS 1070 - a testbed of model atmosphere for the lower end of the main sequence

We present the comparison of the observed spectra in the optical and near-IR with synthetic spectra computed from the recent BT-Settl'' Model (Allard et al. 2011) and MARCS model for the low-mass triple system LHS1070 located at a distance of 7.72+-0.15 pc from the sun (Seifahrt et al. 2008). We also compared the observed photometry in the range of 0.9-6 micron and found good agreement with the synthetic spectra. Using a chi-square minimization technique we determine the effective temperature, log g, metallicity and radius for each of the component and found in good agreement with the evolutionary model (Baraffe et al. 1998). LHS1070 is an important system in order to understand the faint red corner of the H-R diagram for calibrating the temperature which helps to determine the dynamical mass of the lower end of the main-sequence.

POSTER

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ABSTRACT

RATZKA, Thorsten
Universitäts-Sternwarte München (DE)

LHS 1070 - Individual masses of two very low-mass companions

The only way to determine model-independent masses of stars is the astrometric monitoring of binary systems. If there is an astrometric reference point (e.g., the third component in a triple system), then it is possible to measure not just the total system mass, but also the individual masses. PARAGRAPH Discovered in 1993, the triple system LHS 1070 is harbouring an M8.5V and an M9-9.5V component that revolve around each other in an orbit with a semi-major axis of about 0.5" and around the primary, an M5.5-6 dwarf currently about 1.5" away. Its small separation and the correspondingly short period of about 17 years makes the close binary an ideal target for an orbit determination. PARAGRAPH We combined new NACO measurements of the triple system LHS 1070 with data from the literature to refine the orbital elements and the masses of the two low-mass companions. The data now well sample almost a full period of the close orbit.

POSTER

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ABSTRACT

RICCI, Luca
ESO-Garching / Caltech, Pasadena (US)

Sub-mm observations of young brown dwarf disks to contrain the initial steps toward planet formation

The core accretion scenario for the formation of planetary systems in disks predicts that the initial phases of this process are characterized by the grain growth process. In this view, the solid components of disks grow to larger sizes to produce planetesimals and rocky cores of planets before accreting gas from the disk. The models for grain evolution in disks have now reached a sufficient level of sophistication that can make testable predictions. In this poster I show how sub-mm observations of young disks around very low-mass stars and brown dwarfs are ideal systems to test these models. Future observations with ALMA and existing facilities will soon perform this test and shed light on the early phases of solid growth and planetesimal formation.

POSTER

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ABSTRACT

RUDOLF, Natascha
Hamburger Sternwarte (DE)

Classical T Tauri stars with XShooter

We observed a sample of 20 Classical T Tauri stars (CTTS) covering a wide range of ages and evolutionary stages with VLT/XShooter. Its wide wavelength coverage allows to simultaneously observe HI lines in the Balmer, Paschen and Brackett series which supposedly originate from the accretion funnels. These lines can be used to determine temperature and density in the emission region. HI lines with common upper level whose flux ratio is independent of the physical conditions in the gas can also be used to probe the reddening due to the dust in the stellar environment. Additionally, several tracers of winds and accretion can be compared. We present information on the sample and the data as well as first results.

POSTER

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ABSTRACT

SOAM, Archana
Aryabhatta Research Institute of Observational Sciences (ARIES) (India)

Magnetic Field geometry of the three cores that harbour VeLLOs using R band and V band Polarimetry

The relative role played by the magnetic field and the turbulence in cloud formation and evolution and in different stages of star formation is a matter of serious study. By using linear polarization measurements in optical wavelengths of stars that are located behind the clouds, one can map the plane-of-sky component of magnetic field. Here we present the preliminary results of the linear polarimetry (in R-band) of background stars projected on three clouds, namely, IRAM 04191+1522, L1521F and L1014. These clouds, previously classified as starless, are found to harbour very low luminosity objects (VeLLOs, L <=0.1L) detected during observations with Spitzer telescope. A protostar located on the stellar/substellar boundary (M <= 0.08M) would have an accretion luminosity of L ~ 1.6L , assuming a spherical mass accretion predicted by the standard model onto a protostellar object of typical radius R ~3R . VeLLOs, with luminosities more than an order of magnitude lower than this, are difficult to understand in the context of standard model of star formation.

POSTER

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ABSTRACT

STELZER, Beate
INAF-Osservatorio Astronomico di Palermo (IT)

Accretion and activity on the brown dwarf FU Tau A, a testbed for stellar evolutionary models

FU Tau belongs to a class of rare wide brown dwarf binaries. While the secondary, FU Tau B, is located close to the 1 Myr isochrone of evolutionary models, the primary is overluminous by more than an order of magnitude. FU Tau A represents the extremest case of a number of similar very low-mass objects that can not be reconciled with current pre-main sequence models, suggesting either extreme youth, or problems with the derived effective temperature (and radius) or bolometric luminosity. These uncertainties have serious implications for the reliability of IMF studies of young very low-mass stars and brown dwarfs. We are investigating possible explanations with multi-wavelength observations of this benchmark brown dwarf. In particular, we aim at constraining the possible influence of excess luminosity from accretion and of stellar activity on the position of FU Tau A in the HR diagram. In our recent Chandra data, FU Tau A appears as an unexpectedly bright and soft X-ray source. It represent the first case of a brown dwarf where X-ray emission may be attributed to accretion shocks rather to a corona, similar to the case of TW Hya. The presence of both hot and cool surface spots is suggested by our photometric optical lightcurves. Detailed broad-band spectroscopy from the UV to the NIR with XShooter yields the mass accretion rate and the physical conditions of the accretion shock, as well as revised values for the stellar parameters.

POSTER

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ABSTRACT

SUENAGA, Takuya
The Graduate University for Advanced Studies (NAOJ), Tokyo (JP)

Multi-Object and Long-slit Spectroscopy of Very Low Mass Brown Dwarfs In Orion Nebuler Cluster

We present near-infrared multi-object and long-slit spectra of new low-mass brown dwarf candidates in the Orion Nebular Cluster. The multi-object spectra were obtained using MOIRCS on the 8.2-m SUBARU telescope with HK grism, while the long-slit data were observed in H and K bands by using ISLE on the 1.88-m telescope of Okayama Astronomical Observatory. We determined the effective temperatures for the 14 candidates from chi-square fit to synthetic spectra and 9 objects show strong water absorption with the effective temperatures < 3000 (SpT > M6). We plot our sources on HR diagram overlaid with theoretical isochones of low-mass objects and find that the latest objects have very low masses (~0.02 Msun) with an assumed age of 1 Myr. We hope to construct the IMF including other candidate young brown dwarfs and even planetary-mass YSOs from our NIR deep imaging after a follow-up spectroscopy.

POSTER

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ABSTRACT

SZEGEDI-ELEK, Elza
Konkoly Observatory, Budapest (HU)

A new H alpha survey in ONC

We present results from a H alpha survey in the Orion Nebula Cluster, obtained with the Wide Field Grism Spectrograph 2 on the University of Hawaii 2.2-meter telescope. We identified 577 stars with H alpha emission and determined the equivalent width of the line. We studied the correlations between equivalent width and other properties of the stars.

POSTER

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ABSTRACT

TOMIASKA, Kohji
National Astronomical Observatory of Japan (JP)

Observational Identification of First Cores: Non-LTE Radiative Transfer Simulation

A first core is a first hydrostatic object formed in the course of dynamical contraction of a molecular cloud core. Since the inflow pattern changes drastically before and after the first core formation, it is regarded as a milestone in the star formation process. In order to identify the first core from a mapping observation, the features expected for the first core are studied for CS rotation transitions at radio wavelengths. The non-LTE radiation transfer is calculated for the results of radiation magnetohydrodynamical simulations of the contraction of the magnetized molecular cloud core in rotation (Tomida et al. 2010a). We use the Monte-Carlo method to solve the non-LTE radiation transfer in a nested grid hierarchy. In the first core phase, an outflow arises from the vicinity of the first core due to the twisted magnetic field amplified by the rotation motion of the contracting gas disk. The disk and outflow system has several characteristic observational features: (i) in the pole-on view, relatively opaque lines indicate asymmetry in the emission lines in which the blue side is stronger than the red side (an infall signature of the envelope); (ii) in the edge-on view, the disk has a signature of simultaneous rotation and infall, i.e., the integrated intensity of the reaching side is brighter than that of the receding side and the gradient in the intensity-weighted velocity is larger in the reaching side; (iii) the observed outflow indicates rotation around the rotation axis. The size of the outflow gives the approximate age after the first core is formed, since the outflow is not expected for the earlier runaway isothermal collapse phase.

POSTER

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ABSTRACT

TOMIASKA, Kohji
National Astronomical Observatory of Japan (JP)

Origin of Molecular Outflow Determined from Thermal Dust Polarization

The observational expectation of polarization measurements of thermal dust radiation is investigated to find information on molecular outflows based on magnetohydrodynamical (MHD) and radiation-transfer simulations. There are two major proposed models for driving of molecular outflows: (1) molecular gas is accelerated by magnetic pressure gradient or magnetocentrifugal wind mechanism before the magnetic field and molecular gas are decoupled, (2) the linear momentum of a highly collimated jet is transferred to the ambient molecular gas. In order to distinguish between these two models, it is crucial to observe the configuration of the magnetic field. An observation of a toroidal magnetic field would be strong evidence that the first model is appropriate. We calculated the polarization distribution of thermal dust radiation due to the alignment of dust grains along the magnetic field using molecular outflow data obtained from two-dimensional axisymmetric MHD simulations. An asymmetric distribution around the z-axis is characteristic for magnetic fields composed of both poloidal and toroidal components. We found that the outflow has a low polarization degree compared with the envelope and that the envelope and outflow have different polarization directions (B-vector); i.e., the magnetic field within the envelope is parallel to the global magnetic field lines while the magnetic field of the outflow is perpendicular to it. We, then, demonstrated that the point-symmetric (rather than axisymmetric) distributions of low polarization regions indicate that molecular outflows are likely to be magnetically driven. Observations of this polarization distribution with tools such as ALMA would confirm the origin of the molecular outflow.

POSTER

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ABSTRACT

WHELAN, Emma
Dublin Institute for Advanced Studies (IE)

Outflow Activity in the Brown Dwarf Mass Regime

Brown Dwarfs are now known to drive both molecular outflows and optical jets reminiscent of what has been observed for low mass stars. In the last number of years we have been leading a study of brown dwarf outflows with the aim of making a comparison with the T Tauri stars. Here we will summarise our results to date and outline the future direction of our work.

POSTER

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ABSTRACT

WINSTON, Elaine
ESA/RSSD, Noordwijk (NL)

Clusters within clusters: Spitzer & Chandra view of RCW38

The majority of young stars are believed to form in clustered environments. The effect this has on their circumstellar environments will depend on the star formation history and structure of the cluster itself. In this talk I will present Spitzer and Chandra observations of the relatively nearby RCW 38 region of massive star formation. At a distance of 1.7kpc, and containing an estimated 20-40 OB stars, RCW 38 is one of the richest nearby star forming regions, after Orion, with an estimated cluster membership in excess of 1000 members. Previous studies have focused on the central core surrounding IRS2, the central O5.5 binary. Here, I will use the mid-IR observations to identify young stellar objects with circumstellar emission in an extended region surrounding the core. I will utilise the elevated X-ray emission of young stars to locate diskless young members in the X-ray observation. Using multi-epoch Spitzer observations I will also present a preliminary study of the variable young stars in the cluster.

Through a study of the spatial distribution of the YSOs I will present evidence of structure and subclustering in the region, particularly among the most massive stars and show how they help shape the circumstellar environments of their lower mass neighbours. I will comment on a new very young core of star formation in the region identified with Spitzer. I will examine the gas to dust ratio relative to that of the ISM and show that they are consistent, and dissimilar to results found in lower mass clusters, indicating that environment can play a role in the processing of dust in these clouds.

POSTER

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ABSTRACT

WISEMAN, Jennifer
NASA Goddard Space Flight CenterGreenbelt, MD

The Circumstellar Envelope of a Potential Proto-Brown Dwarf

What is the environment around extremely low mass stars? How does the mass and nature of a molecular gas core determine whether a star, cluster, or brown dwarf is produced? Is the environment around brown dwarfs and extremely low mass stars conducive and sufficiently massive for planet production? The determining conditions may be set very early in the process of the system formation. IRAS 16253-2429, the source of the Wasp-Waist Nebula seen in Spitzer IRAC images, is an isolated, very low luminosity ("VeLLO") Class 0 protostar in the nearby rho Ophiuchi cloud. We present VLA ammonia mapping observations of the dense gas envelope feeding the central core accreting system. We find a flattened envelope perpendicular to the outflow axis, and gas cavities that appear to cradle the outflow lobes as though carved out by the flow and associated (apparently precessing) jet, indicating environmental disruption. Based on the NH3 (1,1) and (2,2) emission distribution, we derive the mass, velocity fields and temperature distribution for the envelope. We discuss the combined evidence for this source to be one of the youngest and lowest mass sources in formation yet known, and discuss the potential for brown dwarf formation in this extremely low mass system.

POSTER

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ABSTRACT

WITTE, Soeren
Hamburger Sternwarte (DE)

Cloud variability in young brown dwarfs

In atmospheres of effective temperatures below about 2900K, dust clouds begin to form in a balance between grain growth, evaporation, precipitation and element replenishment. Of course, the cloud is feeding back on the chemistry, the thermodynamic properties and the radiation field of the atmosphere. We are developing the DRIFT-PHOENIX atmosphere code to study the cloud properties as function of the stellar parameters. According to our models, detached convection zones start to form at the bottom of clouds in mid-L and later type objects. We discuss their effects on the dust clouds, how they can cause local cloud variability and the implications for young objects.