FINAL SCHEDULE PSF WORKSHOP 2011 in Boppard am Rhein

Monday 17.10.2011

08:15 find the big bus at the parking lot behind Crowne Plaza
08:30 latest departure time of bus (travel: 156 km, ~2 hours)
10:30 - 11:30 Arrival + check-in
11:30 - 12:30 Welcome + overview: Thomas Henning

12:30 Lunch break

14:00 - 15:30 6 talks (Chair Ralf Launhardt)
SESSION "Disks and Clouds"
- Johan Olofsson: "A second generation of dust around warm debris disks"
- Svitlana Zhukovska: "Modeling of protoplanetary disks with dust evolution"
- Alexander Hubbard: "Turbulence-induced dust collisional velocities"
- Bernhard Sturm: "Crystalline dust in protoplanetary disks with Herschel"
- Tobias Albertsson: "Deuterium Chemistry - Probes of the interstellar medium"
- Benoit Commercon: "Collapse and fragmentation of massive dense cores: initial fragmentation inhibition"

15:30 - 16:00 Coffee break

16:00 - 19:00 Fresh Air (e.g. hike)
19:00 Dinner
>20:30 Free evening

Tuesday 18.10.2011

08:00 - 09:00 Breakfast

09:15 - 10:30 5 talks (Chair: Christoph Mordasini)
SESSION Instrumentation
- Katherine Johnston "Commissioning with ALMA"
- Neil Zimmerman "Spectrally resolved Aperture Mask Interferometry"

SESSION Exoplanets 1
- Beth Biller: "Recent Results from Suveys to Directly Image Exoplanets"
- Yamila Miguel: "Composition of Hot Super-Earth Atmospheres"
- Luigi Mancini: "The 2011 microlensing season: new extrasolar planents detected"

10:30 - 11:15 Coffee Break

11:15 - 12:30 5 talks (Chair Jeroen Bouwman)
SESSION Exoplanets 2
- Siddharth Hedge: "Colors of extreme exoEarth environments"
- Mohler: "HD 96064: a planetary companion in a young triple system?"
- Andras Zsom: "A microphysical cloud model for Earth-like exoplanets"
- Roy van Boekel: "MPIA-based efforts for observational characterization of Exoplanet Atmospheres"

- Chrisoph Mordasini: "Luminosity of Young Jupiters Revisited"

12:45 Lunch break

14:00 - 19:00 Excursion, Boat Trip
19:00 Dinner
>20:30 Free evening

Wednesday 19.10.2011

08:00 - 09:00 Breakfast

09:00 - 10:30 6 talks
SESSION Stars & Brown Dwarfs (Chair: Wolfgang Brandner)
- Norbert Schneider: "Determination of stellar parameters from FEROS spectra"
- Victoria Ledesma: "A unique very low mass pre-main sequence periodic variable"
- Mickael Bonnefoy: "A library of NIR integral field spectra of young M-L dwarfs"
- Elena Manjavacas: "Identification of frequencies and oscillation modes of variable stars in the open clusters sigma-Orionis and NGC 6811"
- Andre Mueller: "HD 135344B: a young star has reached its rotational limit"

SESSION Space Missions
- Roger Lee: "JPL Astrophysics Mission Development"

10:30 - 11:15 Coffee Break

11:15 - 12:30 5 talks (Chair Sarah Ragan)
- JWST folks ("double" slot): "The future of planet and star formation with the JWST MIRI instrument"

SESSION High-mass Star Formation & ISM
- Angela Adamo: "Cluster formation and evolution in starburst environments"
- Arjan Bik: "LBT/LUCIFER multi object spectroscopy of the high-mass star-forming region W3 Main"
- Sarah Kendrew: "Tracing massive star formation through ISM bubbles"

12:30 Lunch break

14:00 - 14:45 3 talks (Chair Hendrik Linz)
- Paul Boley: "Observations and modeling of the embedded MYSO AFGL 4176: From large to small scales"
- Nils Lippok: "Molecular line observations of Bok-globules"
- Ralf Launhardt: "Interstellar dust - can we constrain Beta from Herschel and sub-mm data?"

14:45 - 15:00 Adjourn (Henning)

15:00 - 15:30 Coffee

~15:30 departure from Boppard
~17:00 - 18:00 Arrival in Heidelberg

Abstracts

Cluster formation and evolution in starburst environments

Angela Adamo

Young star clusters are a usual product of the star formation process operating in galaxies. As such, they can be considered tracers of the star formation history of their hosts. In my talk, I will present how general properties of the star cluster populations, e.g. cluster formation efficiency, can be used to constrain the conditions of the host environments which lead to star formation. I will also discuss how studies of resolved newborn clusters, in the Milky Way and Magellanic Clouds, can be used to understand the complex stages of the early cluster evolution in nearby starburst galaxies.

LBT/LUCIFER multi object spectroscopy of high-mass star-forming region W3 Main

Arjan Bik

I will present near-infrared multi-object spectroscopy and JHKs imaging of the massive stellar content of the Galactic star-forming region W3 Main, obtained with LUCI at the Large Binocular Telescope. Fifteen OB stars are identified in W3 Main and spectral types between O5V and B4V are derived from their absorption line spectra. Three massive Young Stellar Objects are identified by their emission line spectra and near-infrared excess. The color-color diagram of the detected sources allows a detailed investigation of the slope of the near-infrared extinction law towards W3 Main. Analysis of the Hertzsprung Russell diagram suggests that the Nishiyama extinction law fits the stellar population of W3 Main best E(J-H)/E(H-Ks) = 1.76 and R_Ks = 1.44). From the spectrophotometric analysis of the massive stars and the nature of their surrounding HII regions we derive the evolutionary sequence of W3 Main and we find evidence of an age spread of at least 2-3 Myr. While the most massive star (IRS2) is already evolved, indications for high-mass pre--main-sequence evolution is found for another star (IRS N1), deeply embedded in an ultra compact HII region, in line with the different evolutionary phases observed in the corresponding HII regions. We derive a stellar mass of W3 Main of (4 +- 1) 10^3 Msun, by extrapolating from the number of OB stars using a Kroupa IMF and correcting for our spectroscopic incompleteness. We have detected the photospheres of OB stars from the more evolved diffuse HII region to the much younger UCHII regions, suggesting that these stars have finished their formation and cleared away their circumstellar disks very fast. Only in the hyper-compact HII region (IRS5), the early type stars seem to be still surrounded by circumstellar material.

Direct Imaging of Exoplanets: Towards Dynamical Masses

Beth Biller

Direct imaging has a great potential for advancing our understanding of extrasolar planets. In combinations with other methods of planet detection, direct imaging and spectroscopy will allow us to eventually: 1) fully map out the architecture of typical planetary systems and 2) study the physical properties of exoplanets (colors, temperatures, and eventually masses) in depth. I will discuss initial results and discoveries from a number of ongoing surveys including NICI Planet-Finding Campaign, SEEDS, and the NACO-LP. I will also discuss ongoing orbital monitoring of some of these objects, with the eventual goal of determining masses for these important benchmarks.

The future of planet and star formation with the JWST MIRI instrument

Jeroen Bouwman, Örs Hunor Detre, Sarah Kendrew, Silvia Scheithauer

The build of the Mid-Infrared Instrument (MIRI) to be flown on the James Webb Space Telescope (JWST) was successfully finished last year, including hardware contributions from MPIA (filter and grating wheels). Since then, the instrument was extensively tested in a cryo test chamber at the Rutherford Appleton Laboratory (RAL) in the UK. The scientific performance was verified with the aid of the MIRI Telescope Simulator (MTS), which imitates the JWST beam for different on-sky observations. MPIA was deeply involved in this Scientific Performance Testing of the instrument. We report on the results of these tests, which are essential for judging the scientific quality of the MIRI instrument and give an outlook of future science with MIRI.

Observations and modeling of the embedded MYSO AFGL 4176: From large to small scales

Paul Boley

Massive stars in the process of formation and at early stages of development are difficult to characterize observationally, owing to the fact that they are generally deeply embedded and at distances of several kiloparsecs. In this talk, I review some of the methods used to observe and model such objects, and present the results of a multi-wavelength study of the massive young stellar object AFGL 4176. The observational data used range from near-infrared to millimeter wavelengths, in addition to mid-infrared interferometric measurements. The source structure is modeled both geometrically, and using a radiative transfer approach, and the results are discussed in the context of the broader study of such objects.

Collapse and fragmentation of massive dense cores: initial fragmentation inhibition

Benoit Commercon

I will present recent results of radiation-magneto-hydrodynamics calculations in the context of high mass star formation, using for the first time a self-consistent model for photon emission (i.e. via thermal emission and in radiative shocks) and with the high resolution necessary to resolve properly magnetic braking effects and radiative shocks on scales <100 AU. In this study, we investigate the combined effects of magnetic field, turbulence, and radiative transfer on the early phases of the collapse and the fragmentation of massive dense cores. We identify a new mechanism that inhibits initial fragmentation of massive dense cores, where magnetic field and radiative transfer interplay. We show that this interplay becomes stronger as the magnetic field strength increases. Magnetic braking is transporting angular momentum outwards and is lowering the rotational support and is thus increasing the infall velocity. This enhances the radiative feedback owing to the accretion shock on the first core. We speculate that highly magnetized massive dense cores are good candidates for isolated massive star formation, while moderately magnetized massive dense cores are more appropriate to form OB associations or small star clusters.

Colors of extreme exoEarth environments
Siddharth Hegde

Different surfaces of rocky planets have characteristic albedos. This makes it possible to distinguish different surface environments on rocky planets in the visible waveband - even if one uses a low resolution color-color diagram. In this talk, we go a step ahead and show that such remotely detectable observables could even be linked to extreme forms of life that such environments could potentially harbor.

Turbulence induced dust collisional velocities
Alexander Hubbard

To understand the earliest stages of planet formation, it is crucial to be able to predict the outcome of dust grains collisions, be it sticking and growth, bouncing, or fragmentation. The outcome of such collisions depends on the collision speed, so we need a solid understanding of the rate and velocity distribution of turbulence induced dust grain collisions. We evolve to motion of dust grains in simu- lated turbulence and find three populations of dust grains: one highly clustered, cold and collisionless, one warm and the third “hot”. Our results can be fit by a simple formula, and predict significantly slower typical collisional velocities for a given turbulent strength than previously considered, easing difficulties associated with bouncing and fragmentation barriers to dust grain growth. Nonetheless, the “hot” population falls off merely exponentially with relative velocity so some mid- or high-velocity collisions will still occur, promising some fragmentation.

Commissioning with ALMA
Katharine Johnston

In this talk I will give a brief overview of what commissioning at ALMA entails and also discuss the project I worked on in the Calibration group while I was there this year, specifically commissioning calibration by phase transfer between different correlator modes and bands.

The 2011 microlensing season: new extrasolar planets detected
Luigi Mancini

I will review the results of the last 2011 microlensing campaign towards the Galactic bulge, carried out with the primary scientific objective to detect new extrasolar planets orbiting the lensing stars of gravitational microlensing events.

Composition of Hot Super-Earth Atmospheres
Yamila Miguel

In this talk we present a simple approach to evaluate the atmospheric composition of hot rocky planets by assuming different types of planetary composition and using corresponding model calculations. To explore hot planetary atmospheres, we model the vaporization of silicate magma and estimate the range of atmospheric compositions according to the planet's radius and semi-major axis. We apply our results to the Kepler February 2011 data release and found that most of the hot rocky Kepler candidates have atmospheres rich in monoatomic Na, O2, monoatomic O and Fe, FeO and SiO in order of abundance. We provide a simple set of parameters which can be used for evaluating current and future planet candidates.

HD 96064 - a planetary companion in a young triple system?

Maren Mohler

We are carrying out a radial velocity monitoring program to search for planets around young stars. The goal of our survey is to find planetary systems with ages up to 600 Myr, which are still rare among the current known planetary systems. In particular, the detection of very young (t= few - 10 Myr) planets is crucial to understand planet formation processes. Radial velocity variations of ~200 stars with ages between 1-600 Myr have been monitored from December 2003 until now with FEROS at the 2.2 m MPG/ESO telescope, located at the ESO La Silla observatory. Additional measurements have been obtained with HARPS at the 3.6 m ESO telescope. I report the detection of a planetary companion around the primary star of the hierarchical triple system HD 96064. Since the system is very young (< 200 Myr), the involvement of stellar activity cannot be neglected. Within my talk I'll present the radial velocity results and the analysis of several stellar activity indicators in order to rule out activity as origin of the radial velocity signal.

Luminosity of Young Jupiters Revisited

Christoph Mordasini

The luminosity of young Jovian planets is obviously of fundamental interest for direct imaging searches. Currently, two different models are being discussed in the literature: First, so called Hot Start models, which are characterized by high luminosities and large radii. These models are in principle based on arbitrary initial conditions, but could be representative for the outcome of the "disk instability" (direct gravitational collapse) mechanism of giant planet formation. Second, so called Cold Start models which are characterized by much lower luminosities and smaller radii. This was at least found by in the pioneering work of Fortney et al. 2007. Such Cold Start models result when the planet is gradually built up, as it is the case in the "core accretion" mechanism of giant planet formation. I will present result obtained with our new combined core accretion planet formation and planet evolution model, which we used to revisit the luminosity of Cold Start models. We can recover the very low luminosities found by Fortney under some conditions. But we also find that planets formed by core accretion, and thus Cold Start models, can under other conditions have luminosities and radii, which are almost as high as in the Hot Start case. We have identified two parameters on which the luminosity and radius are extremely sensitive: The gas accretion rate, and, surprisingly, the core mass. We show that when we vary these two quantities within realistic boundaries, a variation of the initial luminosity of massive giant planets of two order of magnitude (!) can result. I will discuss that in the light of these results, it seems rather difficult to relate observationally measured luminosities of young giant planets with masses. Maybe, combining such measurements with spectra of the planetary atmospheres could help to still distinguish the two proposed formation mechanism.

HD135344B: a young star has reached its rotational limit
Andre Mueller

It is known that Herbig Ae/Be stars exhibit significantly larger projected rotational velocities than T Tauri stars. This indicates that mechanisms of angular momentum dispersal work much less efficient in Herbig stars than in their low-mass counterparts. I will present RV measurements of the 9 Myr young Herbig star HD135344B, which revealed a rotation period of only 3.9 hr. The true equatorial velocity of 430 km/s indicates that this star is rotating at or close to its break-up velocity.

Molecular line observations of Bok-globules
Nils Lippok

Bok globules are ideal laboratories for the study of low-mass star formation, because they are relatively simply structured. A well selected sample containing one or a few prestellar and protostellar cores has therefore been taken as part of the EPOS (Earliest Stages of Star Formation) Herschel GTK project. These data allow deriving local dust properties of the globules and dust temperature and density maps have already been obtained. In my PhD work I focus on complementary molecular line observations. After a first year of data hacking I started to work on two projects a few weeks ago and will present very early results in my talk. 1st a case study of Bok-globule CB130 containing a pre and a protostellar core and 2nd a freezeout study of a subsample of globules containing prestellar cores.

A second generation of dust around warm debris disks
Johan Olofsson

Hundreds of stars harbor debris disks, remnant leftover of planetesimals in planetary systems. Most of them are Kuiper belt-like, but some very rare objects display an excess in the near-IR as well as emission features in the mid-IR, associated with small, warm silicate dust grains. Given the ages of the central stars, the origin and survival of such μm-sized grains is intriguing as they should have been depleted on short timescales. I will present preliminary results from SED and spectral decomposition modeling, with a radiative transfer code dedicated to the optically thin regime of debris disks. Such modeling provides strong constraints on the dust content, and the dust mineralogy provides insights on the origin of the silicate grains.

A unique very low mass pre-main sequence periodic variable
Victoria Rodriguez-Ledesma

I will report the discovery of an interesting pms periodic variable with P=17.8 d (CHS7797). The star has an unusually large amplitude of approximately 1.5 mag in the I band and about 1 mag in the near infrared bands. Color-flux correlations were found only at the near infrared wavelengths. I will discuss two possible scenarios which may explained the observed variability. First, and most plausible, CHS7797 could be the second case of a KH 15D-type binary system. The second and less likely alternative is a single star with an overluminous accretion hot spot.

MPIA-based efforts for observational characterization of Exoplanet Atmospheres
Roy van Boekel

The number of known, confirmed exoplanets will soon enough reach 1000, and we are getting ever better statistics on the distribution of exo-planetary orbits, masses, and sizes. But what are exo-planets made of? Directly observing their atmospheres has become possible during recent years, for the most "favorable" objects. The MPIA is pursuing such observations and I will give a short overview of our efforts thus far.

Spectrally Resolved Aperture Mask Interferometry
Neil Zimmerman

For young, giant exoplanets with host star angular separations near the telescope diffraction limit, aperture mask interferometry promises to become a powerful tool for detection and characterization. Until now, mask fringes have been recorded in the light of a single filter. My former research team has added the wavelength dimension to this form of data for the first time, using the Project 1640 imaging spectrograph at Palomar Observatory. I will describe the advantages and limitations we encountered in our test observation.

Modeling of protoplanetary disks with dust evolution
Svitlana Zhukovska

Accordingly to modern observations at IR and mm-/cm-wavelegths, many disks around young stars of age > 1Myr show depletions of small grains in the inner regions and presence of large, pebble-sized particles in the middleplanes. This indicates the evolution of interstellar grains in the PPD due to coagulation, fragmentation and sedimentation processes. To study the effects of dust evolution on the disk structure we combine the detail computation of radiation field, modeling of disk density, thermal and chemical structure with the advanced models of dust evolution. We relax widely used thermal coupling approximation and calculate the gas temperature by solving thermal balance equations. In this talk I will present results of our 1+1D accretion disk model for a low mass T Tauri star.

A microphysical cloud model for Earth-like exoplanets
Adras Zsom

1D codes that are used to model exoplanet atmospheres are mostly based on the numerical techniques and methods developed for stellar photospheres. One significant difference between the atmospheres of stars and exoplanets is the presence of condensed particles (clouds or hazes) in the atmosphere of the latter. Often the clouds and hazes are treated in an approximate way: the surface albedo is increased to mimic the effects of clouds (Kasting et al., 1993, Pavlov et al., 2000), or the observed cloud properties of Earth are adopted as standard (Kitzmann et al., 2010, Goldblatt et al., 2011).
We present the first microphysical cloud model developed for Earth-like exoplanets which can self-consistently calculate the deck and top of the cloud layer and determine the droplet size distribution as a function of height for a variety of atmospheric compositions, surface temperatures, pressures and relative humidities.