IMPRS-HD 4th generation Workshop 2010, Köln.

Talks schedule and abstracts booklet

For the speakers: please keep your talk duration within 20 min, allowing for sufficient time for questions.

Wednesday 26th March

Time	Speaker	Title
14:00 - 14:30	Xiaoying Pang	Aging problem in young star cluster NGC 3603
14:30 - 15:00	Christian Angrick	Statistics of gravitational potential perturbations: Deriving the X-ray temperature function
15:00 - 15:30	Carolina Bergfors	The AstraLux Binary M Dwarfs Survey: First Results from the Southern Sky
15:30 - 16:00	Mauricio Cisternas	The merger-AGN connection at z<1

16:00 - 16:30 Break

16:30 - 17:00	Mario Gennaro	Westerlund 1, the King of star clusters
17:00 - 17:30	Oliver Porth	From disk winds to relativistic jets
17:30 - 18:00	Roman Follert	Mimicking the atmosphere - The differential piston simulator for LINC-NIRVANA
18:00 - 18:30	Hagen Meyer	Identifying the progenitors of early-type dwarf galaxies in the Virgo galaxy cluster

Evening: Social Dinner

Thursday 27th March

Time	Speaker	Title
09:00 - 09:30	Dading Nugroho	Optical integral field spectroscopy of z$\sim$ 0.1 QSO host galaxies
09:30 - 10:00	Min Fang	Star formation and protoplanetary disk evolution in PISMIS 24
10:00 - 10:30	Kasper Borello Schmidt	Quasar Candidate Selection via Variability
10:30 - 11:00	Anne Bochow	Supernova Remnants in the Gamma-ray sky as seen with H.E.S.S.

11:00 - 11:30 Break

11:30 - 13:00	Invited Speaker: Prof. Dr. J. Wambsganß	Who wants to be(come) an Astronomer ? Career perspectives for young astronomers

Afternoon: visit to the Köln Cathedral

Evening: pub night

Friday 28th March

Time	Speaker	Title
09:00 - 09:30	Ana Valente	Correlating weak lensing and the SZ effect - part one
09:30 - 10:00	Yuan Wang	Different Evolutionary Stages of the Massive Star-Forming Regions
10:00 - 10:30	Alex Hansonn	Galaxy formation from the point of view of a dwarf galaxy

10:30 - 11:00 Break

11:00 - 11:30	Gisella De Rosa	Probing the black hole growth and the chemical evolution of their hosts at z$\sim$6
11:30 - 12:00	Ana Uribe	Planet migration in magnetized turbulent disks
12:00 - 12:30	Sanjaya Paudel	Stellar population of early-type dwarf galaxy in the Virgo cluster and their nuclei
12:30 - 13:00	Julian Merten	An advanced lensing method for mass reconstructions

Aging problem in young star cluster NGC 3603
Speaker: Xiaoying Pang

We present deep Hubble Space Telescope/Wide Field and Planetary Camera 2 photometry of the young star cluster NGC 3603. The data were obtained in 1997 and 2007, ten years apart, permitting us to derive membership based on the relative proper motions of the stars. From the resulting Color-Magnitude Diagram (CMD) for the member stars we derive an age of 1 Myr for main-sequence and pre-main-sequence stars, with a possible age spread of up to 3 Myr for the low-mass stars (Fig.1). A cold, clumpy collapse from a larger initial state may have occurred, which could have merged clumps of different ages to produce the observed age spread of a few Myr in the stars. Significant mass segregation is found in the distribution of stars that are more massive than 40 $M_{\odot}$ using the minimum spanning tree technique (Fig.2). The slope of the incompleteness-corrected mass function for member stars on the PC chip is $\Gamma = 0.94 \pm 0.20$, which is flatter than a Salpeter slope and which agrees well with earlier determinations. According to cold, clumpy model from Allison et al. (2009), the cluster can collapse into a very dense phase within a short time before re-expanding. During this time, only the most massive stars can be dynamically segregated. Thus while primordial segregation cannot be excluded, we believe that the mass segregation may have primarily happened dynamically during the formation process of NGC 3603.

Statistics of gravitational potential perturbations: Deriving the X-ray temperature function
Speaker: Christian Angrik

While halo mass functions based on the Press-Schechter formalism are theoretically very sensitive measures of cosmological models, masses of dark-matter halos are poorly defined, global, and unobservable quantities. To compare them to observations, one has to relate masses to observable quantities like X-ray fluxes or temperatures using empirical results. Since X-ray temperatures of clusters are themselves local quantities, we try to compare them directly to theoretical predictions without invoking masses by deriving the X-ray temperature function from Gaussian random fluctuations in the cosmic gravitational potential.

The AstraLux Binary M Dwarfs Survey: First Results from the Southern Sky

Speaker: Carolina Bergfors

Multiplicity characteristics provide important constraints on star formation and dynamical evolution. For low mass stars, the behaviour of binary properties such as the distributions of mass ratio and separation might provide a way to distinguish whether very low mass stars and brown dwarfs form in the same way as more massive stars do, or by other processes. I will present the first results from the southern part of the AstraLux binary M dwarf survey, a high resolution Lucky Imaging search for low-mass companions to ~ 800 young, active nearby M dwarfs. The first Southern sample consists of 124 stars and is by itself the largest survey of its kind.

The merger-AGN connection at z<1
Speaker: Mauricio Cisternas

What is the relevance of major mergers and interactions as triggering mechanisms for AGN activity? This project tackles this longstanding question as follows: We study a sample of 140 AGN host galaxies over z $\sim$ 0.3 - 1.0 with high-resolution HST/ACS imaging from the COSMOS field. We perform a visual analysis of their morphologies, looking for signatures of interactions and/or mergers that could potentially be related to the AGN fueling/triggering. To establish the significance of any distortions present in our AGN hosts, we compare them with a matched control sample of inactive galaxies from the same dataset. After carrying out this analysis with 10 independent human classifiers, we find no enhanced merger rate for the AGN hosts over the inactive galaxies. Our findings provide direct evidence that, since z $\sim$ 1, secular evolution and minor interactions take the lead over major merging as the primary mechanisms for triggering AGN activity.

Westerlund 1, the King of star clusters
Speaker: Mario Gennaro

Westerlund 1 (Wd1) is the most massive star cluster in the Local Group, comparable in mass to Super Star Cluster in star forming Galaxies. As so, it is, at present, one of the few test cases to study huge events of star formation and, possibly, the stellar dinamics of precursors of Globular Clusters. I'll show a new approach in the study of such cluster, using a 2D treatment of completeness correction, and a new probabilistic technique to obtain better field decontamination when using only photometric data. The clean CMD, together with up-to-date MS and PMS stellar models, is then used to derive the basic properties of the cluster such as distance, extinction and age. In addition, the 2D approach allows to study the spatial dependence of the IMF and the stellar density without assuming a priori the sphericity of the cluster itself. I'll show that Wd1 shows an elongation in the direction parallel to the galacic plane, a hint to the fact that the the internal dynamics of such cluster is probably not triavial.

From disk winds to relativistic jets
Speaker: Oliver Porth

I will show results from axisymmetric relativistic MHD simulations of jet acceleration. The prospective jet fed into the computational domain consits of an inner Poynting dominated component from the rotating black hole and an outer disk wind. Both components accelerate through the slow and fast magnetosonic points in simulations that cover the inner parsec of an active galacitc nuleus. This inner region is within the reach of present VLBI experiments. I will present Synchotron radiation and polarization maps, spectra and rotation measures that can help in the interpretation of observational data from nearby AGN.

Mimicking the atmosphere - The differential piston simulator for LINC-NIRVANA

Speaker: Roman Follert

Every modern, ground based, high spatial resolution observation is in nowadays mainly limited by the effects the atmosphere imposes on the light passing through it. The almost flat wavefront, emitted by the scientific target of the observation, reaching earthís atmosphere is bent and differentially delayed while passing through it on its way toward the detector of the scientific instrument. In the case of the usual imaging system, this results in a variety of distortions of the image. In modern observatories this problem is solved by the use of sophisticated adaptive optics systems. On the other hand, optical/infrared interferometric instruments are mainly affected by a general delay of the wavefront as whole. Since this cannot be detected by AO systems, interferometers have to rely in addition on fringe trackers. At the MPIA, we are currently constructing LINC-NIRVANA, the NIR image plane interferometric unit to be installed at the LBT. Since the fringe tracker unit is one of LINCs most critical subsystems, it is mandatory to test it in detail already in the lab. Thus, we are constructing the atmospheric piston simulator. This device will enable us to create differential piston sequences which resemble the actual situation at the site of the LBT. I will give an introduction on the concept and overview over the current status of the project.

Identifying the progenitors of early-type dwarf galaxies in the Virgo galaxy cluster

Speaker: Hagen Meyer

Dwarf galaxies are the most numerous type of galaxy in the Universe. In galaxy clusters, like the Virgo or Coma cluster, the most commen type of galaxies at small centre cluster radius or high density environment are early-type dwarf galaxies (dE). These dE do not form a homogenous class of galaxies, rather one find dEs with spiral structure, bars or disk features. While in regions with lower density one find gas rich spirals or irregular galaxies (late-type galaxies) with active star formation. Resent studies discussing the evolution of late-type galaxies into early-type dwarf galaxies and the different subclasses e.g. by ram-pressure stripping or harassment, but the physical processes and their influence on the transformation are not well understood at the moment.

To investigated the properties and the future morphological evolution of Virgo cluster late-type galaxies, we derived their structural properties (such as effective radius, magnitude and surface brightness) and color characteristics from SDSS data. I will present the results of this project, thereby showing how the different types of late-type galaxies distribute in the parameter space and how they compare to the Virgo dE population.

Furthermore, I will present the time evolution of the derived colors by means of evolutionary synthesis model GALEV. The model grid contains a variety of star formation histories for different types of late-type galaxies, dust corrections and a chemical consistent treatment of the gas and stellar population of the galaxies. The evolutional tracks of these models will give interesting hints if the derived color space of the population of late-type galaxies will evolve into the color space of dEs.

Optical integral field spectroscopy of z$\sim$ 0.1 QSO host galaxies
Speaker: Dading Nugroho

We present the results of a programme of VLT/VIMOS Integral Field Spectroscopy of a volume limited sample of 19 luminous type 1 QSO hostg alaxies at Mv $\sim$ 23 and redshifts $0.06 < z < 0.2$ aimed at investigating QSO triggering via host galaxy kinematics. Using this data, we produce QSO-subtracted 2D intensity maps and gas velocity fields for the host galaxies in the Halpha and [OIII] emission lines. The observed velocity fields range from perfectly regular to very distorted, indicating that while interaction processes or distortion by inflows or outflows can influence the observed gas kinematics of some sources, for others, the presence of completely undisturbed velocity fields indicates that major merging can not be the dominant fueling mechanism for those QSOs. These results indicate that in this regime, secular mechanisms also can fuel QSO activity.

Star formation and protoplanetary disk evolution in PISMIS 24
Speaker: Min Fang

Pismis 24 is OB association located at Sagittarius spiral arm. It harbors dozens of known O stars with two extremely luminous O3 If*(Pismis 24-1), and O3 III (Pismis 24-17). Recently, a large low-mass and intermediate-mass young population in this region have been revealed by Chandra. We combine the photometric data and spectroscopic data to investigate the properties of these newly discovered young stars. The photometric data are composed of optical photometry in R and I bands with VIMOS/VLT, near-infrared JHK photometry from 2MASS catalog, and mid-infrared photometry at 3.6, 4.5, 5.8, and 8.0 micron with Spitzer IRAC. The photometric data are obtained with VIMOS/VLT. We use these data to study the stellar properties and disk properties of these young low-mass and intermediate-mass stars.

Quasar Candidate Selection via Variability
Speaker: Kasper Borello Schmidt

With upcoming (multi-epoch) surveys like Pan-STARRS1 and LSST a complete and especially pure selection of quasar candidate samples will be crucial. We will present the results from Schmidt et al. 2010 where we have shown how parametrizing the intrinsic single-band variability of quasars by a power-law model for the light-curve structure function can aid in creating such samples. This algorithm performs just as well as the standard SDSS color selection for low redshift quasars, whereas in the redshift range $2.5 < z < 3$, where color selection is known to be problematic, variability can select quasars 5-10 times more efficient than usual color selection methods. This makes variability a powerful tool for establishing complete and pure samples of quasars. Pure and complete quasar samples provide insight into numerous aspects of observational cosmology. One particular case where robust quasar algorithms are needed, is the search for gravitationally lensed quasars. We will furthermore present preliminary results on such a lensing search based on the algorithm from Schmidt et al. 2010.

Supernova Remnants in the Gamma-ray sky as seen with H.E.S.S.
Speaker: Anne Bochow

Recent advances in the instrumentation to observe Very-High Energy (VHE) gamma rays have made the discovery of numerous sources possible. About 100 VHE gamma-ray sources are known at date, many of them discovered in the Galactic Plane survey of H.E.S.S., an array of imaging atmospheric Cherenkov telescopes in Namibia. Of these galactic H.E.S.S. sources, up to 15 show spatial coincidence with supernova remnants (SNRs). For a catalog of SNRs visible in Radio in the central Milky Way, I compare VHE gamma-ray flux predictions, based on SNR parameters, to H.E.S.S. measurements.

Correlating weak lensing and the SZ effect - part one
Speaker: Ana Valente

We try to compute the cross-correlation angular power spectrum of the weak shear and the Sunyaev-Zel'dovich effect based on the large scale structure halo model. Whereas lensing constrains the classical cosmological parameters, the SZ effect will give additional insight on mass-temperature relations, baryon fraction and entropy. From the joint analysis of these complementary probes, we aim to answer questions regarding measurability, constraints on baryonic physics and biasing model.

Different Evolutionary Stages of the Massive Star-Forming Regions
Speaker: Yuan Wang

The massive star-forming region S255IR complex is embraced by the Sharpless regions S255 and S257 which are already evolved HII regions. The SCUBA 850 micron observation shows three main continuum sources: S255IR in the center (a.k.a. IRAS06099+1800), and two additional mm continuum peaks toward the north and south (Klein et al. 2005) which will be labeled S255N and S255S. In a concerted effort from near- infrared to mm wavelengths, we studied the three massive star formation regions S255IR/N/S, with the Submillimeter Array (SMA), the VLT-SINFONI, and Subaru. In this talk, I will show the multi-wavelength study results of these three region with different evolutionary stages. And in S255IR region, I will also show the near infrared spectral study results such as the age of the cluster, to reveal the interactions and relationship between the cluster members. Also, I will show some of our recent interferometry study in W3 main region to reveal the evolution of massive star formation.

Galaxy formation from the point of view of a dwarf galaxy
Speaker: Alex Hansonn

Dwarf galaxies play a key role in galaxy formation and evolution given their participation in the previous and ongoing assembly of more massive galaxies. Due to their low masses and luminosities dwarf galaxies are not as well studied as their giant counterparts. Here we will present results from an observational study of nearby dwarfs using the Sloan Digital Sky Survey. The focus will be twofold: 1) How the properties of dwarf galaxies vary as a function of the environment in which they reside. 2) How the properties of dwarf galaxies compare with those of giants. We will, moreover, discuss what physical mechanisms that may be behind these results.

Probing the black hole growth and the chemical evolution of their hosts at z∼6.
Speaker: Gisella De Rosa

High redshift quasars are the best probes of the early growth of supermassive black holes (BHs) and allow to study the relation betweenearly galaxies and BH formation. Among the most surprising discoveries in this field are the detection of BH masses $> 10^9$ $M_\odot$ and the apparent lack of evolution of the broad line region (BLR) metal enrichment. However until now only extremely luminous objects at high redshift have been studied. We present the first results of our ongoing program for the observations of faint z∼6 quasars. The new VLT/ISAAC observations of three SDSS QSOs ($19.6 < z_{AB} < 20.7$) expand the existing sample towards the faint end of the quasar luminosity function, allowing an unprecedented homogeneous statistical study of the properties of these objects. Preliminary results of a $z_{AB} = 20.9$ quasar reveal the lowest BH mass and one of the highest Eddington ratios ever detected at this redshift.

Planet migration in magnetized turbulent disks
Speaker: Ana Uribe

Planet migration is an important element for understanding how planets form and survive and for developing planet population synthesis models that describe the observed distribution of exoplanets. For typical protoplanetary disk models, the migration timescales are found to be a fraction of the gas disk lifetime and of the time it takes for a planetary core to reach the critical mass needed for runaway gas accretion. Using 3-dimensional magneto-hydrodynamic simulations, we study planet migration and planet-disk interaction in turbulent protoplanetary disks, where the turbulence is generated by the magneto-rotational instability.

An advanced lensing method for mass reconstructions
Speaker: Julian Merten

In my talk I will present a newly developed method to recover dark-matter mass profiles through gravitational lensing. The main focus will be on clusters of galaxies. Galaxy clusters, while representing the high-mass tail of virialised structures in the Universe, are ideal cosmic laboratories to test the predictions of the concordance model. One of the most precise methods to recover their main properties is gravitational lensing and I will present an algorithm, which combines three different lensing constraints on a wide range of scales. After the basic idea of such a method, I will discuss its massively parallel implementation on MPI clusters and GPU systems. Extensive tests with realistic lensing scenarios show the performance of our method and the application to several real clusters closes the summary of my PhD work. In the end several planned projects are presented including the predicted constraints on cosmology from recently accepted HST Treasury project and the comparison with cosmological simulations of clusters.