7 years in Chile:
The Accomplishments and Goals of Czech Astronomers at ESO

Programme & Abstracts

Prague, Czech Republic
14 - 16 April 2014

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1 Programme

Monday, 14th April, 2014

08:00	Registration	
09:00	Welcome	
Session: Introduction to ESO		
09:20	Czech Republic in ESO (invited)	Jan Palouš
10:00	The Danish Experience from 47 Years in ESO (invited)	Johannes Andersen
10:40	Coffee break	
11:00	ESO: From a user's perspective (invited)	Adéla Kawka
11:40	Writing successful proposals - how to convert ideas into telescope time at ESO (invited)	Ferdinando Patat
12:20	Lunch break	
14:20	ALMA and the Czech ARC node (invited)	Miroslav Bárta
14:50	ESO Science Outreach Network and its Czech node (invited)	Soňa Ehlerová
15:30	Cerro Paranal Observatory - the cutting edge facility for astronomical research (invited)	Petr Kabath
16:10	Coffee break	
Session: VLT and La Silla spectroscopic & imaging facilities		
16:30	The Danish 1.54-m telescope on La Silla and the NEOSource project	Petr Pravec
16:50	Introducing the Vatican Observatory	Pavel Gabor
17:10	Star planet interaction	Tereza Krejčová
17:30	The early stage of chemically peculiar stars	Martin Netopil
17:50	Studying terminal boundary conditions of stellar evolution: Selected properties of white dwarfs and their environment	Stéphane Vennes

Tuesday, 15th April, 2014

Session: VLT and La Silla spectroscopic & imaging facilities (cont.)		
09:00	The Magellanic Clouds (invited)	Ernst Paunzen
09:40	CP stars in LMC	Miloslav Zejda
10:00	CP stars at La Silla	Jan Janík
10:20	Abundance mapping of HD 114365	Milan Prvák
10:40	Coffee break	
11:00	Galactic Structure projects at ESO (invited)	Birgitta Nordström
11:40	Circumstellar environment and mass-loss history of evolved stars	Michaela Kraus
12:00	Determination of distances in SMC using stellar spectroscopy	Petr Hadrava
12:20	Extended narrow-line regions of Seyfert galaxies and quasars: spatially resolved spectroscopy with VLT/FORS1	Bruno Jungwiert
12:40	Binary quasar candidates mapped with IFU spectrograph VIMOS/VLT	Ivana Orlitová
13:00	Lunch break	
Session: VLTI		
14:40	Near-IR and mm interferometry: Introduction, VLTI, ALMA (invited)	Stanislav Štefl
15:30	Detailed Physical modeling of Be star Beta CMi	Robert Klement
15:50	Coffee break	
Session: VLTI		
16:10	APEX: The Atacama Pathfinder EXperiment (invited)	Palle Møller
16:50	Molecular gas stripping with APEX and prospects for ALMA	Pavel Jáchym
17:10	Molecular fragments in the Carina Flare supershell	Richard Wünsch
17:30	Science with the Arecibo Galaxy Environment Survey	Rhys Taylor
19:30	Conference dinner	

Wednesday, 16th April, 2014

Session: Studying and working at ESO		
09:00	Working at ESO: reaching new heights in Astronomy (invited)	Eric Emsellem
09:40	ESO Studentship Programme – Two years below the Southern Cross (invited)	Lucie Jílková
10:20	Coffee break	
10:40	Discussion with students	
11:40	Discussion about astronomy in the Czech Republic	
12:40	Closing session	Adéla Kawka

Czech Republic in ESO (invited)

Jan Palouš (Astronomical Institute, AS CR)

I will review the history of ESO starting in late 5Oth of the last century and the steps of the Czech Republic in direction to ESO before and after XXVIth General Assembly of the IAU in August 2006. I will also cover the evolution in ESO and in the Czech Republic since 2007 and outline future perspective.

Notes:

The Danish Experience from 47 Years in ESO (invited)

Johannes Andersen (The Niels Bohr Institute)

Danish astronomy before 1967 was a backwater: A couple of theoreticians and a new observatory, but small telescopes and bad weather. Entering ESO was a revolution: Suddenly observational projects could be PLANNED(!).Larger telescopes became available, supplemented by own 0.5 and 1.5m telescopes with lots of observing time, all with modern instruments. Large Galactic and other classical projects were undertaken. But in 1987 disaster struck: ESO decided to build the VLT, but the Danish government refused to participate; the Danish 2danger. Disaster was averted in 1989, but at the cost of drastic budget cuts and a promise to radically reorient Danish astronomy to make competitive use of ESO and the VLT. After 25 years of hard work, we can prove that the commitment has been fully honoured; Danish astronomy is stronger than ever before in history; and our future access to the VLT, ALMA, and VLT is secure.

Notes:

ESO: From a user's perspective (invited)

Adéla Kawka (Astronomical Institute, AS CR)

ESO offers to the astronomical community a wide range of instruments that provide deep and extensive spectral coverage. In order for the observatory to remain at the forefront of astrophysical research ESO requires input from the users about current and future facilities. I will provide an overview of the role played by different committees in helping ESO maintain and develop instrumentation that satisfy the needs of the astronomical community. I will discuss in greater detail the role and objectives of the User's Committee which provides a link between ESO and the user community.

Notes:

Writing successful proposals - how to convert ideas into telescope time at ESO (invited)

Ferdinando Patat (European Southern Observatory)

ESO serves a wide community of astronomers, who submit about 900 proposals per semester, involving about 3000 astronomers worldwide. Because of this, the demand on ESO telescopes is very high, implying that on average only a quarter of the submitted proposals gets time. In my presentation I will review the proposal selection process implemented at ESO, illustrate the criteria that are used by the Observing Programmes Committee and discuss the key aspects one needs to consider when applying for time in such a competitive environment.

Notes:

ALMA and the Czech ARC node (invited)

Miroslav Bárta (Astronomical Institute, AS CR)

M. Karlicky, B. Dabrowski, P. Jáchym

ALMA is the largest contemporary project of observing facility built in a broad international cooperation. In order to exploit its potential entirely, the user support for scientific community is organized world-wide via the three ALMA Regional Centers (ARCs) located in Europe (EU), North America (NA) and East Asia (EA). The European ARC itself is not a compact structure but its activities are distributed among the 'head' located at ESO in Garching and seven 'nodes', one of them having its seat in Ondrejov.

The role of the ARC nodes is namely rooted in providing necessary support to ALMA users. It spans from the help with proposal preparation through the personal support during negotiations between the PI of the project and the ALMA operators up to help with data calibration and reduction. The users are assigned to the nodes based on the match between the project and background expertise of the node with respect to locality. The training for the community represents a significant contribution, too, ranging from the on-line Helpdesk system up to organization of training courses and summer schools.

In addition to the direct user support the ARC nodes also collect the user input to further development of ALMA. In connection with that the Czech ARC node received recently an ESO grant for the project whose aim is to define the technical and scientific requirements for the future observations of the Sun with ALMA.

Notes:

ESO Science Outreach Network and its Czech node (invited)

Soňa Ehlerová (Astronomical Institute, AS CR)

ESO carries out a number of public outreach activities. The most widely known ones are perhaps regular press releases and the Picture of the Week series, but they include more: exhibitions, events-oriented activities, an educational material and others.

On a local level, the ESO public outreach is represented by the ESO Science Outreach Network (ESON), which is established in all ESO member states and in some other countries as well. The most visible part of ESON activities are translations of ESO materials and press releases into local languages, but it is not the only part.

In the talk I will give the summary of ESO outreach activities. I will describe the ESON network and then will concentrate on the Czech ESON group: who are we, what we did in the past and what we do now.

Notes:

Cerro Paranal Observatory the cutting edge facility for astronomical research (invited)

Petr Kabath (European Southern Observatory)

The Cerro Paranal in Chile, is one of the driest places in the world, hosting the forefront astronomical facility of European Southern Observatory. The Paranal Observatory operates the suite of modern instruments covering the spectral range from optical to near/mid infrared. Paranal instrumentation programme is pushing the frontiers of modern astronomy and astrophysics by challenging observations starting at objects in our Solar system and ending at the edge of the Universe. This presentation should explain why Paranal it is one of the best places in the world for astronomy. Furthermore, the instrumentation programme will be introduced providing an overview on the potential and capabilities of present instruments. Finally, the process of observing from the point of view of the Operations Astronomer will be presented. As a result, an insight into day to day (night to night) operations of the worlds leading astronomical observatory shall be unveiled.

Notes:

The Danish 1.54-m telescope on La Silla and the NEOSource project

Petr Pravec (Astronomical Institute, AS CR)

The Danish 1.54-m telescope (DK154) located at the ESO La Silla station is a dedicated photometric telescope. It is operated collaboratively by the Danish group of the Niels Bohr Institute, Copenhagen University, and by four Czech groups since October 2012. The main Danish project at the telescope is the MiNDSTEp project (PI Uffe Jorgensen) that runs from mid-April to mid-October each year; they focus on observing fields near the Galactic Center. During the other half of year (”the Czech season”) our main program is the NEOSource project (PI P. Pravec, Co-PI D. Vokrouhlický) and there are three parallel projects of stellar photometry, focusing on the Magellanic Clouds, being run by the teams of the Stellar department of the AI AS CR (PI P. Koubský), the Astronomical Institute UK Prague (PI M. Wolf) and the Faculty of Sciences of the Masaryk University Brno (PI M. Zejda). During my talk, I will briefly overview the telescope, its performance, remote control, and local circumstances relevant to its operation. Then I will overview our long-term NEOSource project (running till the end 2016), our results for the potentially hazardous asteroid (99942) Apophis (http://dx.doi.org/10.1016/j.icarus.2014.01.026), and our participation in the European project ”ENTNEO” that we have submitted to the call EC Horizon 2020-PROTEC2.

Notes:

Introducing the Vatican Observatory

Pavel Gabor (Vatican Observatory)

The purpose of this talk is to provide a brief overview of the Vatican Observatory, focusing on its activities centered around VATT, its 1.8-meter telescope on Mt Graham in Arizona. VATT is currently undergoing a major upgrade, spearheading the new Arizona Robotic Telescope Network which will allow synoptic observations of transient phenomena as well as multi-instrument characterization of NEOs. The first stage of radial velocity exoplanet followup measurements is imminent in collaboration with AIP in Potsdam, optically linking VATT with PEPSI, a high-resolution echelle spectrograph installed at the LBT, over a distance of 310m.

Notes:

Star-planet interaction

Tereza Krejčová (Hamburg Observatory)

One of the most significant groups of exoplanets are without any doubt hot Jupiters. These Jupiter-like planets orbiting within 0.1 AU from their parent star allow us to study processes which do not have any direct counterparts in our solar system. Close-in giant exoplanets offer an unique opportunity to study effects of mutual interaction between the star and the planet. Effects triggered by the parent star and influencing the exoplanet, like strong irradiation of the planet and its effects on the planetary radius or evaporation of the planet, are widely accepted. The question of possible stellar activity enhancement due to the presence of hot Jupiter (magnetic or tidal interaction) is still a matter of discussion. I want to present the study of changes in the star chromospheric activity connected with the close-in exoplanets. The chromospheric activity was studied in the cores of lines CaII H and K, Ca II IR triplet and H alpha in the data acquired by FEROS spectrograph.

Notes:

The early stage of chemically peculiar stars

Martin Netopil (Masaryk University)

L. Fossati, E. Paunzen, et al.

Chemically peculiar (CP) stars are known to be main-sequence objects, and are characterised by a wide variety of element abundance patterns. They display abundance peculiarities of various chemical elements from helium to mercury in their photospheres. These are explained by diffusion processes driven by the competition between radiative levitation and gravitational settling. Current estimates suggest that about 15 per cent of all stars in the corresponding spectral range (B to F-type) belong to the CP groups. The most populous groups are the metallic line (Am) stars and the magnetic Bp/Ap objects. We still do not know when and why they become peculiar, neither the role of the magnetic field, nor the favoured environmental conditions for their formation are clarified yet. The investigation of very young CP objects can help to shed more light on these issues and to test the diffusion theory. In this talk we want to present one candidate, which is still in the pre main-sequence phase.

Notes:

Studying terminal boundary conditions of stellar evolution: Selected properties of white dwarfs and their environment

Stéphane Vennes (Astronomical Institute, AS CR)

A. Kawka

During the last seven years we have conducted at ESO an extensive survey of the properties of evolved stars: We probed a large sample of faint white dwarfs using the visual and near UV FOcal Reducer and low dispersion Spectrograph (FORS) on the VLT and the ESO Faint Object Spectrograph and Camera on the NTT and conducted detailed follow-up observations of new, intriguing phenomena. I will review class properties (age, luminosity, kinematics, multiplicity ...) and, in particular, I will present our work on the chemical composition of cool white dwarfs and the nature of their circumstellar environment.

Notes:

The Magellanic Clouds (invited)

Ernst Paunzen (Masaryk University)

I will give a short overwiew of our current knowledge about the Magellanic Clouds including the results from the VMC - VISTA survey. In addition, I will present an overwiew of our current project at the DTPA, FSc MU (Brno) about the Magellanic Clouds.

Notes:

CP stars in LMC

Miloslav Zejda (Masaryk University)

E. Paunzen, Z. Mikulášek, et al.

During two years we monitored two selected fields in LMC containing CP stars or candidates. We present the first results.

Notes:

CP stars at La Silla

Jan Janík (Masaryk University)

J. Krtička, Z. Mikulášek, T. Lüftinger, E. Paunzen, J. Skalický, M. Prvák

We used in seasons 2011 and 2012 (7+7 nights) Échelle spectroscop FEROS at La Silla observatory to obtain high dispersion spectra of chemically peculiar stars. The lecture will describe the observed stars, their selection, but also practical experience with the observation of this instrument.

Notes:

Abundance mapping of HD 114365

Milan Prvák (Massaryk University)

T. Lüftinger, J. Krtička, J. Janí, Z. Mikulášek

The variability of the chemically peculiar stars is commonly believed to be a result of inhomogeneous distribution of heavier elements, spectral energy redistribution, and rotation. However, this phenomenon is still not completely understood. HD114365 is a Si-rich chemically peculiar star, which is variable with a period of 1.272 days. We use the technique of Doppler imaging to perform an abundance analysis of the star using spectroscopic observations made with the 2.2m telescope and the FEROS spectrograph at La Silla, Chile. We present abundance maps of HD114365 for several chemical elements.

Notes:

Galactic Structure Projects at ESO (invited)

Birgitta Nordström (The Niels Bohr Institute)

Access to ESO and Danish telescopes at La Silla, later complemented by northern instruments and eventually by Hipparcos, provided the tools for a comprehensive all-sky investigation of the Solar neighbourhood. Uvby-Beta photometry for a complete sample of 15,000 Solar-type stars provided metallicities, ages, distances and reddening values, and multiple CORAVEL radial velocities were combined with proper motions to yield full space velocities and galactic orbits. The detailed abundance evolution of the stars was followed with ESO high-resolution spectra of a representative subsample. The final 2004 paper summarises some 30 years of work. Meanwhile, the new class of extremely metal-poor (EMP) stars had been discovered, and we embarked on an analogous project with the ESO VLT. A couple of follow-up programmes are running while we wait for the precise astrometry from Gaia in a few more years.

Notes:

Circumstellar environment and mass-loss history of evolved massive stars

Michaela Kraus (Astronomical Institute, AS CR)

M. E. Oksala, L. S. Cidale, M. Borges Fernandes, M. F. Muratore

Massive stars ($M > 8M_{\odot}$), though few in number, play a major role in the evolution of their host galaxies. Via their stellar winds, they strongly enrich the interstellar medium with chemically processed material and deposit large amounts of momentum and energy into their surroundings throughout their entire lifetime. Evolved massive stars can undergo phases of strong, often eruptive mass loss. The ejected material can veil the star, significantly hampering its detection and classification. The knowledge of the total number of stars in each evolutionary phase, in combination with the mass-loss history of each individual object, is of vital importance for a better understanding of the dynamical and chemical evolution of galaxies. Hence, it is necessary to resolve the massive star population and to investigate their mass-loss history. Based on combined optical (FEROS) and infrared (SINFONI, CRIRES) spectroscopic observations, we study the kinematics, structure, and chemistry of circumstellar ejecta (shells, disks) of evolved, massive stars. In addition, we have developed classification criteria based on infrared characteristics of stars in different evolutionary phases. Using these criteria, we initiated an observational campaign that will allow us to resolve and investigate the massive star population in the Galaxy and beyond.

Notes:

Determination of distances in SMC using stellar spectroscopy

Petr Hadrava (Astronomical Institute, AS CR)

Classical methods of astrophysics developed on small-size instruments like the Ondrejov 2m telescope enable us to get qualitatively new results when applied to observations using advanced large telescopes of ESO. An example is the determination of depth-structure of Magellanic Clouds from spectroscopy and photometry of eclipsing binaries and Cepheids which constrains the models of kinematics and tidal interactions in the system of Magellanic Clouds and Milky Way.

Notes:

Extended narrow-line regions of Seyfert galaxies and quasars: spatially resolved spectroscopy with VLT/FORS1

Bruno Jungwiert (Astronomical Institute, AS CR)

N. Bennert, S. Oh, J. Woo, M. Haas, C. Leipski, M. Albrecht

We present VLT/FORS1 slit spectroscopy of narrow-line regions (NLR) in a sample of Seyfert 1 a 2 galaxies, as well as in two type-1 quasars. Extended, kiloparsec-scale, emission is detected and radial changes of the gas properties in the NLR (temperature, density, ionization parameter) are tracked.

Notes:

Binary quasar candidates mapped with IFU spectrograph VIMOS/VLT

Ivana Orlitová (Astronomical Institute, AS CR)

B. Jungwiert, T. Skalická, M. Křížek, L. Janeková, I. Ebrová, K. Bartošková, L. Jílková

Binary quasars have been predicted to be an integral part of the hierarchical galaxy formation. However, direct evidence of binary quasars is surprisingly low, and only a handful of such objects are known. Therefore, indirect signatures have been searched for to identify binary candidates. Double-peak spectral profiles of optical emission lines have recently been proposed to be one of such signatures, and lists of double-peak quasars from the SDSS catalogue exist in the literature. Our group has performed follow-up observations of 5 of the SDSS binary quasar candidates with IFU spectroscopy using VIMOS/VLT, under the ESO program 085.B-0669 (PI Stoklasova - Orlitova). We study in detail the spatially resolved kinematics of each object to understand the origin of the double peaks, and to discriminate between the effects of internal dynamics inside a single quasar and those connected to merging galaxies or merging active nuclei. By comparison to theoretical models, we discuss the possibility that the observed quasars host single or double nuclei.

Notes:

Near-IR and mm interferometry: Introduction, VLTI, ALMA (invited)

Stanislav Štefl (ESO/ALMA)

The basic principle of interferometric observations is the same in the IR/visual and mm spectral regions: by combining coherently signals from two or more telescopes we can synthesise the angular resolution of a much larger aperture than would be possible with a single mirror/dish. However, technical solution, place and process of the beam synthesis, place of the signal digitalisation as well as an effect of the atmospheric turbulence are much different in the IR and radio domain. The VLT interferometer (VLTI) equipped with three beam combiners can synthesise beams from up to four 8m telescopes or 1.8m auxiliary movable telescopes at several baseline configurations. Two more instruments will be installed during next two years. All 66 antennas has already been delivered to the ALMA mm/sub-mm array. Although not all observing modes and longer baselines are still implemented, ALMA already produces outstanding science results. Some highlights of VLTI and ALMA studies will be presented.

Notes:

Detailed Physical modeling of Be star Beta CMi

Robert Klement (Charles University)

Alex Cavaliéri Carciofi, Stanislav Štefl

Be stars are rapidly rotating stars with circumstellar envelopes in the form of equatorial disks. We combine spectroscopic, polarimetric and interferometric observations, including observations from ESO facilities VLTI and APEX, to constrain the disk structure of a B8Ve star Beta CMi. As a modeling tool we use a fully 3D, NLTE, Monte Carlo radiative transfer code HDUST. Special focus is put on the outer disk structure and on the possibility to find out the radius of a Be star disk for the first time.

Notes:

APEX, The Atacama Pathfinder EXperiment (invited)

Palle Møller (European Southern Observatory)

APEX is an ALMA prototype modified as a single dish antenna operating in the 200-1400 GHz frequency range. It is a collaboration between three partners and the ESO time is offered to the ESO community. A suite of instruments is available which provides the ESO community with a highly competitive platform to carry out observations in several mm and sub-mm wave bands.

APEX allows proposers to study cold dust and molecular gas, from objects in our solar system out to high-redshift galaxies. Tracing the thermal continuum emission and analyzing spectral lines provide ways of studying the structure and chemistry of planetary atmospheres, dying stars, regions of star formation as well as distant starburst galaxies.

I will review the capabilities of APEX including current and future instrumentation and I will describe the tools available to support the observations from proposal writing to data-analysis.

Notes:

Molecular gas stripping with APEX and prospects for ALMA

Pavel Jáchym (Astronomical Institute, AS CR)

We present results of our current observations with the APEX telescope of the Norma cluster galaxy ESO137-001, an excellent candidate for recent transformation from a blue to a gas-poor type due to violent removal of its interstellar matter by ram pressure stripping. We have revealed large amounts ($> 10^9\ M_\odot$) of cold molecular gas associated with the 80kpc long X-ray bright, star-forming tail of the galaxy. We find a very low star formation efficiency in the stripped gas. We speculate that a ram pressure dwarf galaxy could be forming in the most distant (40kpc) observed position in the tail. We further share our experiences with proposing observations to the ALMA Early Science Cycles.

Notes:

Molecular fragments in the Carina Flare supershell

Richard Wünsch (Astronomical Institute, AS CR)

Using the APEX telescope we observe two clouds in the surface of the Carina Flare supershell (GSH287+04-17) in the 13CO line. We apply our clump-finding algorithm DENDROFIND to identify individual clumps from which the two clouds consist. We determine the clump mass function and we construct the minimum spanning tree connecting clumps positions to estimate the typical distance among clumps. We compare the clump properties to the predictions of theories of the thick shell fragmentation in order to determine whether the observed clouds were formed by the gravitational instability or by some other process.

Notes:

Science with the Arecibo Galaxy Environment Survey

Rhys Taylor (Astronomical Institute, AS CR)

I present an overview of the Arecibo Galaxy Environment Survey, AGES. AGES is an extragalactic neutral hydrogen survey targeting a range of different environments, from the Local Void to rich clusters. When complete the survey will cover a total of 200 square degrees to an rms sensitivity of 0.7 mJy, equivalent to an HI mass of $\sim 10^7$ $M_\odot$ at the distance of the Virgo Cluster. I describe some of the results of the survey so far : 1) We have completed the observations for three isolated galaxies and find they have at most one companion each, far less than expected based on the HI mass function from the larger ALFALFA survey; 2) We found 8 HI detections within the Virgo cluster without obvious optical counterparts, some of which have velocity widths too large to fit the Tully-Fisher relation observed in the field (perhaps indicating they are non-primordial debris, but we do not rule out the prospect that they are so-called "dark galaxies"); 3) Behind the galaxy group associated with NGC 7448, we find a dense filamentary structure of galaxies rich in HI streams, some of which are in excess of 800 kpc in length.

Notes:

Working at ESO: reaching new heights in Astronomy (invited)

Eric Emsellem (European Southern Observatory)

I will provide an overview of what it means to study and/or conduct research at ESO, and a brief introduction to our ESO programmes which allow Master and PhD students, post-doctorates and science visitors to spend from a few weeks to a few years in Garching, Germany or Vitacura, Chile.

Notes:

ESO Studentship Programme – Two years below the Southern Cross (invited)

Lucie Jílková (Leiden Observatory)

ESO studentship provides an opportunity for PhD students to spent up to two years of their graduate studies working at the ESO science office in Garching or Santiago. The students work on their PhD research topic under supervision of an ESO staff astronomer. I was awarded the studentship for years 2010 and 2011 during which I was working at the ESO offices in Santiago with Giovanni Carraro. In this presentation, I would like to introduce the ESO studentship programme to the Czech astronomical community, especially to the students who might be potential applicants. I will describe my experience with ESO, my research done during the studentship, benefits obtained by spending two years of my PhD at the observatory, practical aspects, cons of the studentship, and also the Santiago science offices and observatories from the perspective of a PhD student.

Notes:

Poster Abstracts

Modelling a nuclear star cluster - II. Interaction with a self-gravitating accretion disc

Vladimír Karas (Astronomical Institute, AS CR)

L. Šubr, A. Trova

We model the motion of individual stars and the resulting structure of a central star cluster around a supermassive black hole. The aim of this work is to understand processes that can shape the overall structure of the nuclear star cluster, in particular, we explore the degree of non-sphericity of the cluster that can be expected from the interaction with an embedded accretion disc. This can be compared with observational results in the future. We take the interaction with an accretion disc and the effects of the disc disc self-gravity into account. We show that the cluster properties are then determined predominantly by the radial profile of the disc surface density. We develop a simple steady-state model of the central cluster and we estimate the rate at which stars migrate to the centre.

Galactic Centre Mini-spiral: Interaction modes of neutron stars

Michal Zajaček (Charles University/Astronomical Institute, AS CR)

V. Karas, D. Kunneriath

Streams of gas and dust in the innermost parsec of the Milky Way form a distinct feature known as the Mini-spiral, which has been studied in radio (mm/cm) and infrared wavebands (Kunneriath et al. 2012). A large fraction of the Mini-spiral gas is ionized by ultraviolet radiation of massive OB stars present in the Nuclear Star Cluster (NSC). Based on the inferred dynamic mass in the central parsec ($\sim 10^6\,M_\odot$), it is estimated that at least $\sim 10^4$ neutron stars should move in the sphere of influence of the Sgr A* SMBH. According to our simulations, a fraction of this unexplored population propagates through denser ionized medium concentrated along three arms of the Mini-spiral. Based on the density and the temperature of the gaseous environment inferred from observations, we analyse interaction regimes of neutron stars passing through this medium. Spectral features are expected to develop within the Mini-spiral due to non-thermal emission from bow shocks of strongly magnetized stars, and these could be revealed with the improved resolution of ALMA in the future. The results and the procedure may be applied to other galactic nuclei hosting NSC and the resulting distribution of interaction regimes is expected to be different across various galaxy types.