Academy of Sciences of the Czech Republic
Astronomical Institute, v.v.i.

Activity Report

2009–2010

Ondřejov Observatory
251 65 Ondřejov
Czech Republic

Astronomical Institute
Academy of Sciences of the Czech Republic

2009–2010

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More information on the Astronomical Institute is available at
http://www.asu.cas.cz

I History

The Astronomical Institute of the Academy of Sciences of the Czech Republic is one of the oldest scientific institutions in the country. It is the direct successor of the Observatory of the Jesuit College, located in the tower of the Clementinum in Prague, built in 1722. Later on, the institution of the "Mathematical Tower", which was in fact the observatory, was established in 1752. At that time meteorological observations began.

Since then, the Observatory has undergone a number of changes, many of which have reflected professional, political and even societal reorganization. After Czechoslovakia gained its independence from the Austro-Hungarian Empire, the institute was renamed the 'State Astronomical Observatory'. In 1940, it was moved as such to an undistinguished apartment building in Vinohrady (Budečská Street) in Prague.

Long before that, in 1898, a private observatory owned by J.J. Frič was built in a small village Ondřejov, located 35 km southeast of Prague. This small observatory was donated to the state of Czechoslovakia, more specifically, to Charles University in Prague, in 1928.

The site of the Ondřejov Observatory, at an elevation of 500 m, in the relatively unpolluted environs of Prague (see map on the back cover), proved to be very well chosen. After the Czechoslovak Academy of Sciences was established in 1953, it was merged with the State Astronomical Observatory to create the the Institute, now belonging to the Academy of Sciences of the Czech Republic. At the time of the division of the Federal Czechoslovak Republic into the Czech Republic and Slovak Republic in 1993, the Prague part of the Institute was moved to new premises in Prague-Spořilov. Currently, the Institute participates in ESO and ESA projects, as the Czech republic became a member state of these organisations in 2007 and 2008, respectivelly.

II Events of the Last Two Years

The first information booklet of this series was published at the beginning of 1995. It described the research activities of the Institute during 1993 and 1994. After that, the booklet was published every two years, so this is the eighth issue.

The Institute has actively participated in the International Year of Astronomy 2009, under the auspices of UNESCO. A series of PR activities started in January in Prague, where the European participation in IYA2009 was officially opened by J. Potočnik. In Prague J. Palouš has organized an exterior exhibition of astronomical images, while B. Jungwiert and P. Suchan were the members of the National organizing committee of IYA2009.

At the invitation of the Institute, the visit of NASA astronaut A. Feustel and his family took place in summer 2009. A. Feustel was the crew member of the STS-125 space shuttle mission, the last servicing mission to Hubble Space Telescope. He visited Ondřejov observatory and also several other places in the Czech Republic, where he gave a talk about STS-125.

In 2009, the Izera Dark-Sky Park was established as a result of previous activities of three Czech and three Polish institutions. This project is promoting the protection of dark sky from light pollution and is supported, among others, by our Institute in collaboration with the Institute of the Wroclaw University. For more information see
http://www.izera-darksky.eu

Since 2010 the Institute is involved in new ESA missions like Solar Orbiter, Proba-2 and Proba-3. Hardware and software development of onboard instruments is in progress within the ESA-PRODEX programme in which the Czech Republic participates. Design and

construction of a large space coronagraph ASPIICS onboard of two satellites Proba-3 is a challenging task. F. Fárník and P. Heinzel became Czech delegates in the Science Programme Committee of ESA which decides on future scientific missions.

Following the successful pilot project, the Institute prepares an extensive collaboration with the Niels Bohr Institute of Copenhagen University focused on usage of their 1.54 m telescope on La Silla (ESO). Our main project planned for the telescope will be the NEOSource project, i.e. the study of non-gravitational evolution processes in near-Earth asteroids and their source regions (in collaboration with the Faculty of mathematics and physics of Charles University in Prague).

The Czech Republic is the member of European Association for Solar Telecsopes (EAST), the organization which is building the European Solar Telescope (EST) with main mirror having 4 m diameter. The Institute is resonsible for design of the auxiliary full-disk telescope.

2009 was the year of the 50th anniversary of Příbram meteorite fall - the first instrumentally recorded meteorite fall in history. For that occasion, international conference Bolides and Meteorite Falls was organized by the Institute in Prague and an exhibition for the Czech public was prepared in the main building of the Academy of Sciences.

In 2009 the Institute has organized the PROM meeting in Prague, where around 40 experts on prominence physics from Europe and USA met and discussed the current problems of this exciting discipline.

In 2009 the solar department has undertaken modernization of its large horizontal solar telescope with multichannel spectrograph (HSFA-2), which is dedicated to studies of solar flares and prominences.

In 2010 the Institute has organized international conference „Probing strong gravity near black holes“. It was held in Prague, with 150 participants.

The Ondřejov 0.65-m telescope, which is run in collaboration with the Faculty of Mathematics and Physics of Charles University Prague, was refurbished and its control system was upgraded in 2009. It allows fully automated observations to be carried out, and our project of photometry of binary asteroids was run very efficiently with the new system during 2009-2010.

In 2009, the mirror of the 2-m telescope was sent to Jena for recoating. The Institute has also undertaken an upgrade of robotic control of the spectrographs of the 2-m stellar telescope in 2010.

Center of Theoretical Astrophysics joining the Institute with research groups at Institute of Theoretical Physics at the Charles University in Prague and at the Silesian University in Opava, and Center of the Earth Dynamics Research joining the Institute with the research groups at Czech Technical University, the Institute of Rock Structure and Mechanics, and Research Institute of Geodesy, Topography and Cartography, continued during 2009 and 2010 their research programmes. Their activities have been extended until the end of 2011.

The Marie Curie Research Training Network CONSTELLATION (MCRTN-35890-2006) finished succesfully its activities on 30th November 2010.

In 2009, the Institute has started construction of the new building – the Astronomical pavillion – in Prague-Sporilov academic campus. This building will serve mainly the GPS department and will be opened in summer 2011.

After decision made by ESO, a new European node of the ALMA project (Atacama Large Millimeter/submillimeter Array) started to operate at the Institute in January 1, 2010. A new room was dedicated, for this purpose, equipped with computers, where the scientists will be working, especially those from abroad. The head of this node is Marian Karlický and his team consists of six co-workers. Similarly to other European ALMA nodes, the Czech node

has its own specialization - solar physics, stellar and relativistic astrophysics, and molecular spectroscopy with high spectral resolution. It is proposed that the following topics will be studied in our ALMA node: structure of the chromosphere and the transition region on the Sun, generation of solar flares, filaments and prominences and study of the solar convection (as common project of ALMA with a 1.5 m solar telescope GREGOR under construction at Canary Islands and in which the Institute is also involved), formation of stars in nearby and distant galaxies, or study of the central parts of galaxies. Topics of scientific activities in our node in solar research were presented to the international solar community in Karlický et al.: 2011, Solar Physics, 268, 165. The node will be collaborating with the Institute of Chemical Technology in Prague, Charles University in Prague and Masaryk University in Brno.

Number scientists of the Instutute recieved individual awards in 2009 and 2010:

Zdenek Ceplecha received State Medal of Merit II for research of meteors and meteoroids from the President of the Czech Republic.

Zdenek Ceplecha was awarded the Academy of Sciences De Scientia et Humanitate Optime Meritis for research of meteorids and meteors.

Lubos Perek was awarded the Academy of Sciences De Scientia et Humanitate Optime Meritis a lifelong activity.

Lubos Perek received the Medal of the Learned Society of CR for lifelong activity.

Vladimír Karas received the Kopal lecture granted by the Czech Astronomical Society for the significant results in the field of relativistic astrophysics.

Daniela Korčáková was awarded the Premium of Otto Wichterle from Academy of Sciences of the Czech Republic for solving the equation of radiative transfer.

Adéla Kawka received from the Institute Jan Frič Premium for the research of white dwarfs.

Petr Heinzel recived the Gold Medal of the University of Wroclaw (Poland) for a long-term cooperation and in recognition of his scientific achievements.

Richard Wünsch received the Academy of Sciences Award for young researchers for the modeling of induced star formation.

Viktor Votruba was awarded the Premium of Otto Wichterle by the Academy of Sciences of the Czech Republic for a set of work on the issue of hot stars.

Štěpán Štverák, David Herčík a Pavel Trávníček received awards from the European Space Agency for their participation in the project Proba 2.

Jaroslav Klokočník received award from the IEEE Computer Society as the best technical paper.

Jan Jurčák received Jan Frič Premium for a set of papers on spectropolarimetry fine structure of sunspots and photosphere from the Institute.

III Scientific Profile, Research Activities

The research conducted at the Institute covers a wide range of topics; from the immediate environs of the Earth to distant galaxies and black holes. The research activities are carried out in four scientific departments divided into working groups.

1. **Solar Physics**
   - 1.1. ***Physics of Solar Flares and Prominences*** (numerical simulations of plasma processes and radiation transfer in flares and prominences, optical and UV spectral diagnostics, X-ray and radio observations)
   - 1.2. ***Structure and Dynamics of the Solar Atmosphere*** (quiet and active regions, sunspots, granules and supergranules, interactions between plasma motions and magnetic field)
   - 1.3. ***Heliosphere and Space Weather*** (magnetohydrodynamic numerical simulations of propagation and evolution of coronal mass ejections and other transient disturbances, solar activity monitoring and forecasting; image processing)

2. **Stellar Physics**
   - 2.1. ***Physics of Hot Stars*** (theoretical and observational studies of binaries, early-type stars, Be and B[e] stars, white dwarfs, stellar winds, moving envelopes in general, and stellar pulsations)
   - 2.2. ***Two-meter telescope group*** (operation, maintenance and development of the largest telescope in Czech Republic)
   - 2.3. ***High Energy Astrophysics*** (celestial X-ray and gamma-ray sources, cataclysmic variable stars, analyses of ground-based and satellite data, X-ray optics)

3. **Interplanetary Matter**
   - 3.1. ***Meteor Physics*** (physical properties, chemical composition and spatial distribution of meteoroids, physical processes during meteoroid penetration of the atmosphere, meteor observations in optical region and by radar)
   - 3.2. ***Asteroids*** (rotations, shapes, surface and bulk properties of near-Earth objects, binary asteroids, photometry and astrometry of asteroids)

4. **Galaxies and Planetary Systems**
   - 4.1. ***Astrophysics of Galaxies*** (formation of star clusters and evolution of galaxies; comparison of radio, infrared, optical, and X-ray observations with analytical models and computer simulations of gravitational and hydrodynamic processes, kinematics and physical properties of AGN host galaxies)
   - 4.2. ***Relativistic Astrophysics*** (active galactic nuclei and Galactic black hole candidates; analysis, within the framework of general relativity, of high-energy X-rays; comparison with observations)
   - 4.3. ***Planetary Systems*** (Earth rotation; Earth gravity field; gravity field of the Moon and the planets; resonances and dynamics of the asteroids, Kuiper belt and exoplanetary systems; creation of an astrometric star catalogue, motion of artificial satellites under the influence of gravitational and non-gravitational forces)

More details about the activities and recent results of the working groups are given in Chapter IX. The structure of the Institute is shown in Fig. 1.

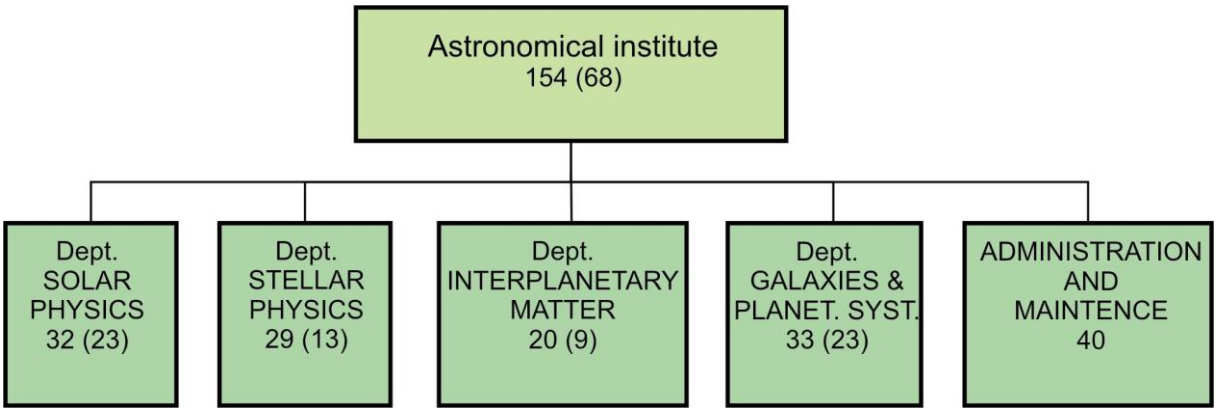

Fig. 1: *The structure of the Institute of the Academy of Sciences of the Czech Republic. The total numbers of staff members in the Institute and in the departments are shown. Numbers of scientists are given in parentheses. Valid for the end of 2010.*

IV Executive Staff, Contact Addresses

Director: Associate Professor Petr Heinzel, DSc
phone: +420-323 620 113
FAX: +420-323 620 117
E-mail: director@asu.cas.cz

Secretary: Daniela Pivová
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Deputy Directors: Dr. Jiří Borovička, CSc
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Associate Professor Vladimír Karas, DSc
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Astronomical Institute of the Academy of Sciences
Ondřejov Observatory
Fričova 298
CZ 25165 Ondřejov
Czech Republic

Internet: http://www.asu.cas.cz/

Fig. 2: *Executives including the heads of departments, the staff of the library, PR and IT (2011). From left to right: P. Spurný, P. Sobotka, V. Karas, P. Suchan, R. Plaček, J. Kubát, P. Heinzel, F. Fárník, D. Pivová, J. Borovička, K. Soldánová, R. Svašková, P. Ryšavý, J. Palouš.*

V Council of the Institution

J. Borovička – Chairman, F. Fárník, P. Hadrava, P. Heinzel, J. Horáček (Charles University, Prague), **B. Jungwiert, J. Krtička** (Masaryk University, Brno)**, J. Kubát, E. Marková** (Úpice Observatory)**, C. Ron – Vice-Chairman, M. Wolf** (Charles University, Prague). **P. Suchan – secretary**

In 2007, the Institute, like the other institutes of the Academy of Sciences, gained new legal status of the so called public research institution. According to the law, the Council of the Institute, consisting of 7 internal and 4 external members, was elected at the beginning of 2007 for a period of 5 years. The Council organized a competition for the position of director of the institute. Other tasks of the Council include the determination of the main directions of research, approval of the budget of the institute, definition of internal rules, and approval of agreements between the institute and other organizations.

VI Infrastructure, Personnel and Funding

The Ondřejov Observatory represents a research campus with its own facilities such as a cafeteria, apartment houses etc. Accomodation for visitors is also available. The Prague part resides in a building belonging to the Geophysical Institute. Most of the Department of Galaxies and Planetary Systems reside in Prague.

The work of the scientific departments is supported by the library (head librarian R. Svašková), computer-system and network managers (M. Jandová, P. Ryšavý), mechanical

workshop (head J. Zeman), and administration and maintenance (head R. Plaček). The administration and maintenance includes a finance section (Z. Ambrožová), personal section (J. Štichová), accounting section (head M. Chytrová), operations and supplies (H. Kalibová), maintenance (head M. Slezák) and cafeteria (head V. Zámyslická).

Fig. 3: *Administration and maintenance staff (2011). From left to right: M. Slezák, R. Plaček, J. Kašpárek, Z. Ambrožová, H. Kalibová, P. Ešner, J. Schindler, I. Smolíková, M. Procházková, J. Štichová, V. Kocourek, S. Hauzar, H. Kyclerová, L. Navrátil, Z. Pácová, V. Zámyslická, J. Bečková, M. Chytrová, H. Hanušková, M. Švandová, J. Nováková, P. Vodrhánková.*

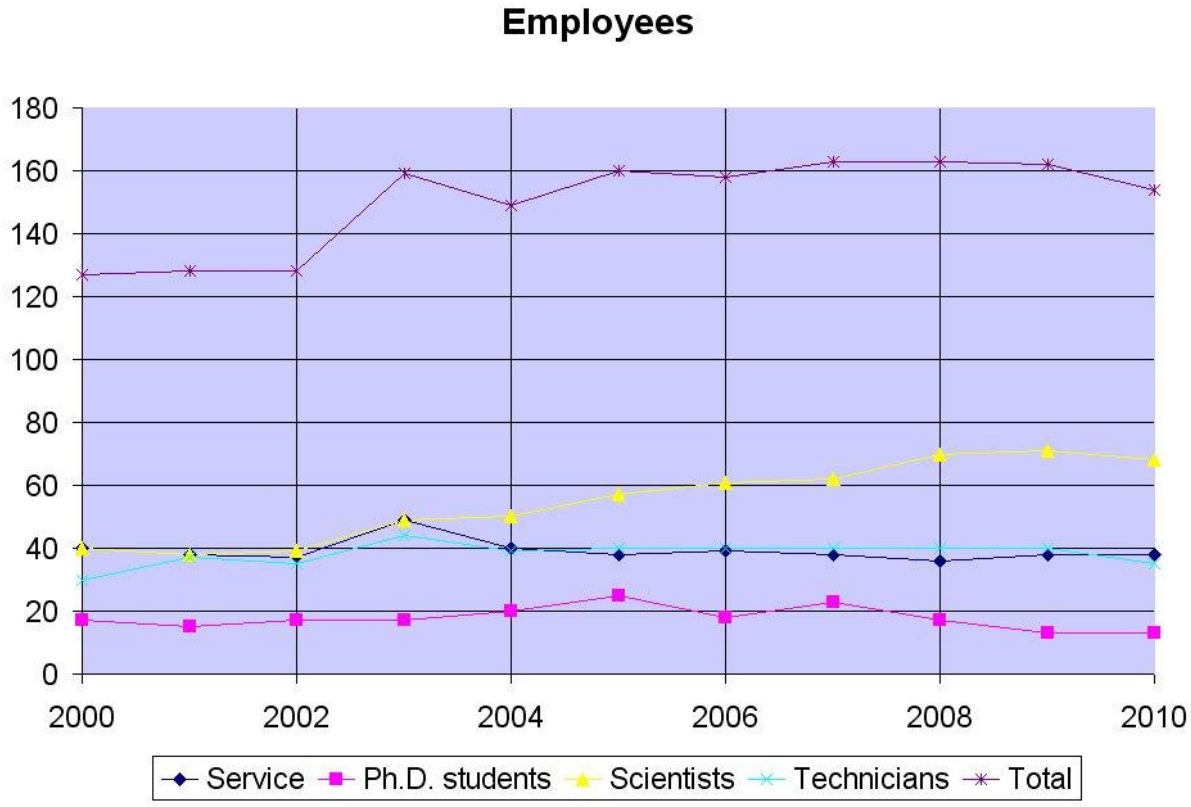

Fig. 4: *Number of employees at the Institute since 2000 (some having part time-position).*

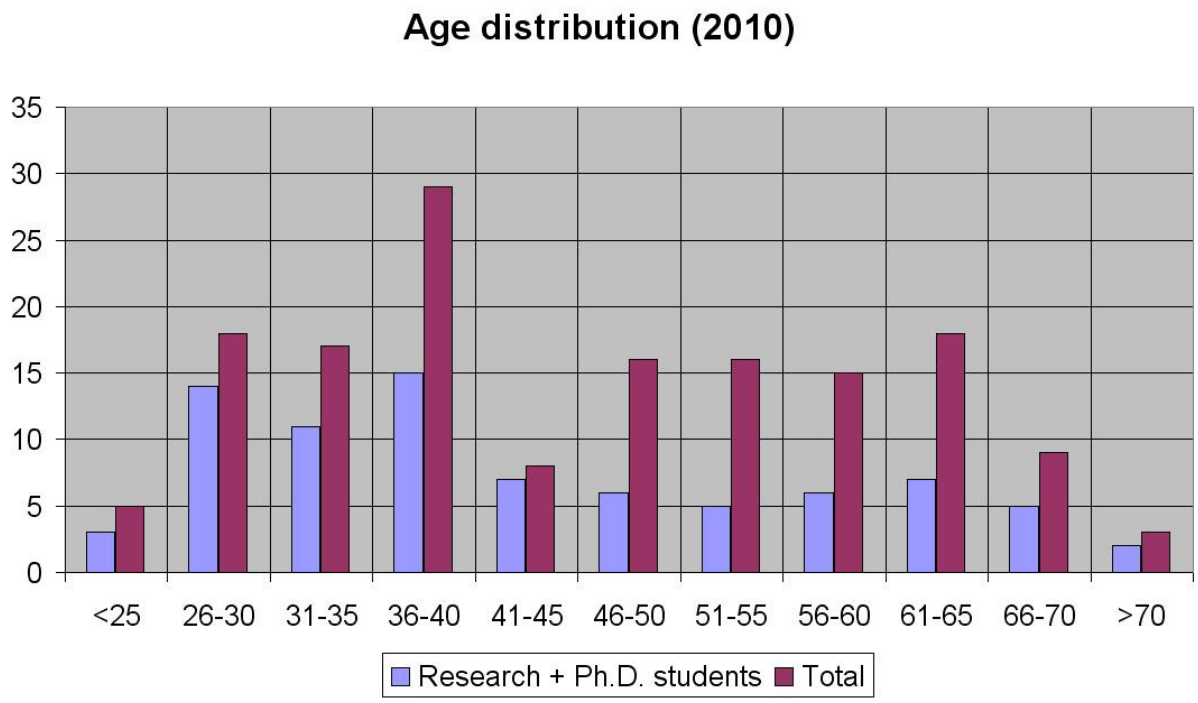

Fig. 5: *Age distribution of all the employees and of those engaged in astronomical research.*

The total number of employees at the end of 2010 was 154, 49 of which were part-time employees. The number of scientists was 68 and there were 13 PhD students. The PhD students are part-time employees. The trend of the number of employees since 2000 is shown in Fig. 4. The decrease in recent years is due to the budget cut by the Czech government for the whole Academy of Sciences. See the age distribution plot in Fig. 5.

Most of the Institute‘s funding comes from the Academy of Sciences. The amount of funding depends on parliament-approved budget for the Academy of Sciences as well as on regular international evaluation of the Institute organized by the Academy. Other sources of funding are grant agencies, ministries and other organizations supporting particular projects, including international ones. The expenditures since 2000 are shown in Fig. 6.

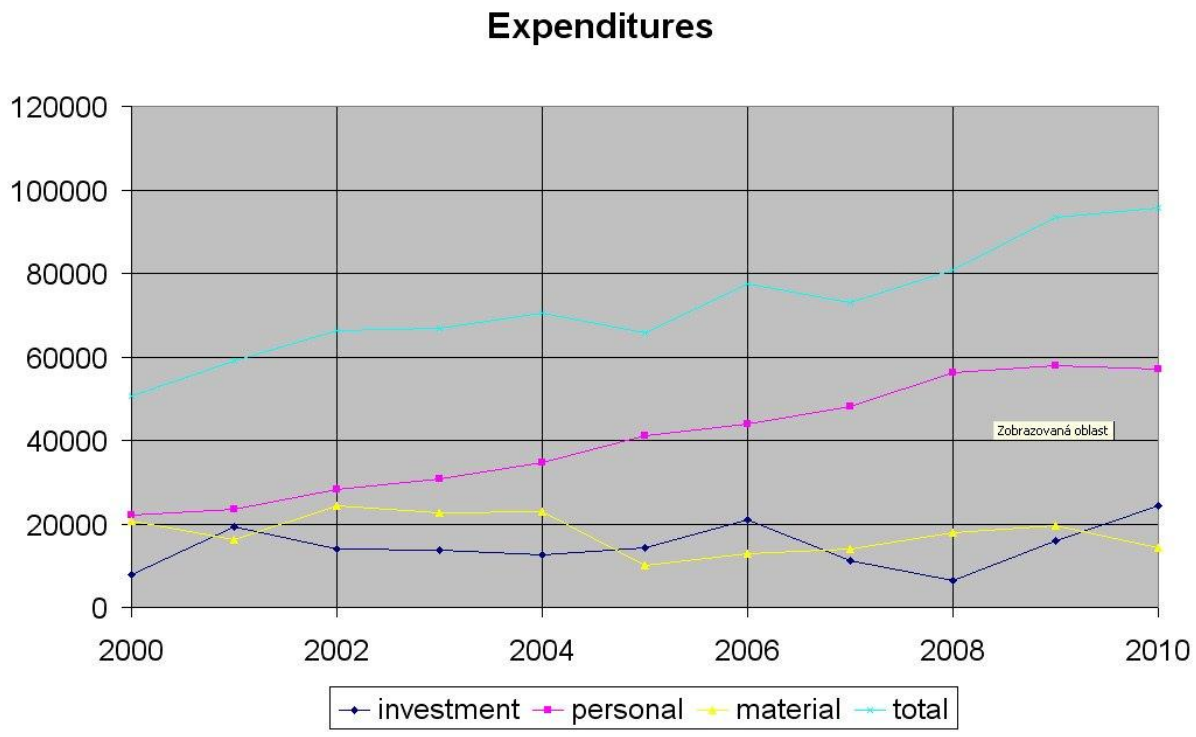

Fig. 6: *Expenditures of the Institute since 2000 (in millions of Czech Crowns). Foreign grants are not included.*

VII Library and Publishing

Head librarian – R. Svašková, Staff – N. Karlická, K. Soldánová

The library's main function consists of providing information resources and making them available to all employees of the Institution and users from other organisations. The library also serves as a center providing information about astronomical and astrophysical literature for the entire Czech Republic. Its history goes back to the 18th century, books from this period are stored in a separate stock and are not only well preserved, but also benefit from special care. The library's historical section contains 253 titles carefully described in a catalogue published in Scripta Astronomica No. 1. (1986) and No. 6. (1994). Twenty-two of the most-at-risk books from this section have already been completely restored.

Scientific literature is in the largest part represented by periodicals; the library has complete series of many fundamental astronomical journals. Some of these journals date from their first edition volumes and are now available online thanks to the Institute's membership of the National Consortium of Springer and Elsevier publishing houses.

The library's monographs are located in a separate building that has been partly renovated in 2006 offering modern technical equipment and a comfortable and calm enviroment for study. All users can access books catalogued in the world reknowned software Aleph compatible with the entire Academy.

Detailed information about services and facilities offerred by the library is available on the website: http://istar.asu.cas.cz/. The library accepts any request from its clients and obtains the requested articles and documents. In most cases the documents are not the originals, but copied or scanned versions.

The library also is in contact with many other Astronomical Observatories all over the world and distributes all documents published by the Institute to 249 different locations as part of an international exchange. The Institute had been publishing the so called Bulletin of the Astronomical Institute of Czechoslovakia until 1992 when this bulletin became part of an European Journal: Astronomy and Astrophysics. This membership and participation now allows czech researchers to publish their results in a top-level scientific journal with a high impact factor. Besides this journal, the Institute published other non-periodical series such as Publications of the Institute and the Scripta Astronomica.

VIII Scientific Departments and Working Groups

This chapter contains detailed information about staff, scientific activities and additional results of individual research departments and groups. The described structure and staff information reflects the situation at the end of 2010 unless otherwise noted.

1. Department of Solar Physics

Head scientist – F. Fárník. Deputy – M. Sobotka.

Computer assistance: A. Heinzelová
Secretary: A. Chytrová, Phone: (+420) 323 620 146, E-mail: alchytr@asu.cas.cz

The Solar Physics Department studies our nearest star, the Sun, and, in particular, active phenomena in the solar atmosphere. This includes solar flares as well as accompanying heliospheric effects. Large-scale solar activity, evolution of solar active regions, the structure and evolution of sunspots and filaments, flare-energy storage, release and transport are all studied. The research of the Solar Department can be characterized as a combination of computer-controlled solar observations in optical, radio and X-ray wavebands, analysis and interpretation of data, and theoretical research with extensive numerical modelling of the processes under study. All these activities are based on a close cooperation with many institutes in Austria, Croatia, France, Germany, Italy, Japan, the Netherlands, Poland, Russia, Slovakia, Spain and the USA. This cooperation includes exchange of various data and their theoretical interpretation, as well as our participation in some ground-based and space projects.

Fig. 7: Solar Physics Department (2011). From left to right: K. Jiřička, U. Anzer, S. Šimberová, J. Leško, S. Gunár, A. Berlicki, M. Karlicky, B. Dabrowski, P. Ambrož, M. Klvaňa, E. Dzifčáková, J. Kuprjakov, H. Meszárošová, P. Heinzel, A. Heinzelová, N. Nishizuko, A. Chytrová, P. Kotrč, F. Fárník, F. Zloch, M. Sobotka, V. Snížek.

1.1 Physics of Solar Flares and Prominences

Head scientist – M. Karlický. Scientists – M. Bárta, A. Berlicki, B. P. Dąbrowski, E. Dzifčáková, F. Fárník, S. Gunár, P. Heinzel, J. Kleczek[1], K. Jiřička, J. Kašparová, P. Kotrč, A. Kulinová, H. Mészárosová, D. Nickeler, P. Schwartz, J. Štěpán, M. Varady. PhD student – T. Prosecký[1], J. Skála[1]. Assistants – A. Heinzelová, A. Chytrová, J. Leško, V. Snížek.

[1] part time

The principal goal of this group is to understand the energetics and dynamics of the very complex plasma processes in flares and prominences, occurring on various spatial and temporal scales. Small-scale processes observed with a high spatial resolution and on sub-second time scales are critical in evaluating the global physical behavior of these phenomena, this being the current trend in solar physics. Two complementary tools are used: (i) optical and UV spectral diagnostics to derive the basic structural and dynamical plasma parameters, and (ii) numerical simulations of plasma processes and radiation transfer. This work is further supplemented by X-ray and radio observations which provide information about hot plasmas.

Observations of the Multichannel Flare Spectrograph (MFS) operating since 1958 have been stopped and the device has been reduced to a one-channel spectrograph. A comprehensive archive of flares and prominences simultaneously registered in three spectral lines: H-alpha, H-beta or He D3 and CaII 854.2 nm and slit-jaw H-alpha pictures is still available. A list of observations since 29. 05. 1998 - 14. 05. 2004, with examples of the data, can be found at the MFS homepage http://www.asu.cas.cz/~pkotrc/index5.html. A large horizontal telescope with a spectrograph (HSFA2) was put into testing operation after extensive modernization. It is fully computer-controlled and replaces the MFS. A new

diffraction grating gives a spectral resolving power of 247 000 in the 1st order. The data acquisition system has been changed and the spectrograph was converted from Czerny-Turner into a multichannel one. It works simultaneously in H-alpha, D3, H-beta, CaII K, resp. CaII H lines. Four out of the 5 CCD cameras are placed at these lines and the fifth one in the new slit-jaw system with H-alpha filter. Auxiliary telescopes with cameras provide information about the position of the solar image in white-light and the full disc in H-alpha line. Latest images and other information about HSFA2 can be found at http://www.asu.cas.cz/~pkotrc/2006.html. Most of the observations performed with the HSFA2 are focused on high temporal resolution of fast processes in solar flares. Compared to the MFS, the HSFA2 has a larger spatial and spectral resolution. It takes part in collaborative campaigns with observatories in France (Meudon, Pic-du-Midi), Poland (Wroclaw), the Canary Islands and elsewhere.

Solar radio emissions are monitored by three radio telescopes. The 0.8-2.0 GHz radio spectrograph with 512 frequency channels was reconstructed in 2006 and now it is used for measuring dynamic spectra with 10 ms time resolution. The 2.0-4.5 GHz radio spectrograph with 512 frequency channels is used with 100 ms time resolution. The 3.0 GHz single frequency radiometer with 10 ms time resolution is used for the monitoring of solar radio activity and studying short-duration phenomena. All instruments are fully automatic, monitoring the solar activity daily, from sunrise to sunset. The goal is the study of fast dynamic phenomena, especially fine structures of solar radio bursts. The list of observed events, as well as pictures of observed radio bursts, are available to interested parties at http://www.asu.cas.cz/~radio/. Information about observed events is also regularly sent to Boulder, Colorado, USA, where it appears monthly in "Solar Geophysical Data".

EUV and X-ray bands represent a fundamental source of information about the state of solar plasma and physical processes taking place in the upper layers of solar atmosphere – the transition region and the corona. In these bands, we use top-quality satellite data obtained in broad international cooperation (missions YOHKOH, SOHO, TRACE, RHESSI, etc.), as well as data from our own instrument (HXRS) launched in March 2000.

The optical and UV spectral data are used for quantitative plasma diagnostics, which are performed by means of sophisticated non-LTE techniques. Non-LTE codes have been developed in close cooperation with the Institut d'Astrophysique Spatiale in Orsay (France) and with the Max Planck Institut für Astrophysik in Garching (Germany). Recently, they have been extended to time-dependent and 2D versions. As a result, we obtain information about the thermodynamic structure of the flaring atmosphere or prominence structures, as well as about dynamical processes (velocity fields). Numerical simulations of plasma processes also predict the X-ray and radio emissivity of flares. A so-called 'hybrid code', which consists of two parts, has been further developed: a simulation of accelerated-particle beams and the hydrodynamic part which solves the equations of 1D radiation hydrodynamics. The radiation part is now being calculated using fast non-LTE techniques based on accelerated lambda iterations. Numerical simulations of flare processes extended into interplanetary space, e.g. flare-shock propagation, are also carried out.

Soft X-ray images are used to study the physics of solar flares (events preceding flares, evolution of hot post-flare loops, etc.) and other active processes in the solar corona (triggering of CMEs, formation of long trans-equatorial loops, etc.). From the diagnostic point of view, the electron temperature and emission measure of hot coronal plasma can be estimated using these measurements. Hard, mostly non-thermal, X-ray emission gives information about high-energy particle beams in the solar corona. Observations of this kind can identify regions of acceleration and thermalization of these beams and could also provide some clue to the still poorly understood physical mechanisms which produce these high-energy particle beams responsible for solar flares.

In 2005 the computer cluster OCAS (Ondrejov Cluster for Astrophysical Simulations, see http://wave.asu.cas.cz/ocas) was built at the Institute consisting of 16 double-processor working nodes (in total 32 AMD Opteron 252@2.6GHz, 64GB RAM) interconnected by the fast InfiniBand network. The cluster is used mainly for the numerical modelling of basic processes in solar flares (magnetic reconnection, plasmoid ejecta) and prominences (relaxation to the MHS equilibria, radiative transfer) using MPI-parallelised MHD and PIC codes (both 2D and 3D). The codes are extended to calculations of the modelled emission in X-rays, radio and Hα, which provides a connection with our observing facilities. The cluster was upgraded in 2007, now having 64 CPU cores.

1.2 Structure and Dynamics of the Solar Atmosphere

Head scientist– M. Sobotka. Scientists – P. Ambrož[1], V. Bumba[1,2], J. Jurčák, M. Klvaňa[1], M. Švanda[3].

[1] part time, [2] emeritus, [3] at a postdoctoral stay in MPS Lindau, Germany

The group studies physical conditions in the solar atmosphere, in active regions, and in sunspots in order to understand interactions between plasma motions and magnetic field. High (0.1" to 0.3") spatial-resolution observations in the optical region are used for this purpose. Global and large-scale dynamic properties of the Sun are studied, and horizontal transport velocities of plasma in the solar atmosphere are analyzed.

Observational data come from large solar telescopes located in the Canary Islands observatories and from solar satellites SOHO and HINODE. The group is collaborating with leading German astrophysical institutes on the project GREGOR, a development and construction of a large solar telescope with a diameter of 1.5 m. The telescope is now in the phase of testing at Observatorio del Teide, Tenerife, Canary Islands, and the first scientific light is planned for 2011. Participation in the project, financed by the Czech Ministry of Education, Youth and Sports, will allow us to share observing time on this unique instrument.

The group has been taking part in the reconstruction of the photographic spectroheliograph of the Astronomical Observatory of the Coimbra University, Portugal. The instrument was adapted for the acquisition of full-disc spectroheliograms using a digital CCD camera. A new original software was implemented in the period 2008 – 2010, which makes it possible to measure full-disc Dopplergrams in the line H-alpha. The daily observed spectroheliograms and Dopplergrams are available in the French solar data base BASS 2000.

Since 2008, the group has been involved in the Design Study of the large European Solar Telescope (EST), promoted by the European Association for Solar Telescopes (EAST) and financed by EU in the FP 7 programme. EST is a 4-meter class solar telescope, to be located in the Canary Islands. It will be optimised for studies of the magnetic coupling between the deep photosphere and upper chromosphere. EST will specialize in high spatial and temporal resolution using instruments that can efficiently produce two-dimensional spectral information. The members of the group participate in the formulation of scientific requirements and are responsible for the complete design of the 15-cm Auxiliary Full-Disc Telescope for EST, including the concepts of the optical, mechanical and control systems.

Sunspots' fine structures (penumbral filaments and grains, umbral dots and light-bridges) result from the complex behaviour of partially ionized dense gas moving in a strong magnetic field. Sunspot umbrae and penumbrae are associated with complex patterns of magnetic fields and velocities. Using high-resolution images and 2D spectra, physical parameters, dynamics, evolution and mutual relations of various types of sunspot fine

structures as well as organized flows around sunspots and pores, are analyzed. Inversion codes are used to derive stratifications of plasma parameters in sunspots and photosphere from spectropolarimetric observations.

Umbral dots can be explained either as a result of convection modified by a strong magnetic field (magnetoconvection) or as a consequence of penetration of hot field-free gas columns into the magnetic umbra. Our observations of umbral dots with extremely high spatial resolution provide parameters (brightness, size, lifetime, motions) necessary for physical models of sunspots. The observed evolutionary characteristics and the detection of substructures in umbral dots verify the correctness of the theory of magnetoconvection and of numerical simulations based on this theory.

Processes in deeper layers of the convection zone, with dominant influence on the dynamo action, manifest themselves partially in large-scale and global flows in the photosphere. We study these flows using surface magnetic fields and supergranules as tracers. Global velocities derived from Doppler features in the full-disc SOHO/MDI Dopplergrams are used to study dynamical behaviour of active regions and their connection with parental magnetic sub-surface structures. The method of local helioseismology is utilized to measure mass flows in the upper convection zone. For this purpose, a new version of the Subtractive Optimally Localised Averaging (SOLA) code was developed in collaboration with the Max-Planck-Institut für Sonnensystemforschung.

Photospheric magnetic fields are extrapolated to the corona to be compared with observed coronal structures. The coincidence of coronal white-light fine structures, observed during total solar eclipses, with the extrapolated field-line positions provides 3D causal relationships between coronal structures and coronal magnetic fields.

1.3 Heliosphere and Space Weather

Head scientist – M. Vandas. Scientists – P. Hellinger[1], S. Šimberová, Š. Štverák[1], P. Trávníček[1]. PhD student - D. Herčík[1]. Assistants – R. Pavelka[1], T. Vaněk[1], F. Zloch.

[1] part time

Space weather research and forecasting involves a complex chain of various dynamic phenomena. Improved understanding of heliospheric disturbances is needed to enhance capabilities to associate, and eventually forecast, solar eruptive phenomena with geomagnetic storms. Essential to this effort are magnetohydrodynamic (MHD) numerical simulations of propagation, evolution, and interaction of transient disturbances on their way to Earth. The group performs these simulations with a special emphasis on coronal mass ejections (CMEs) and their most geo-effective subset, magnetic clouds, which are in fact the interplanetary flux filaments. Apart from MHD simulations, structure and evolution of magnetic clouds are studied theoretically and compared to in situ spacecraft measurements. Kinetic simulations of the interaction of collisionless solar wind plasma with planets and moons are performed. We have developed a global model of a planetary magnetosphere based on the kinetic theory of plasma and applied it to the study of a planet with a magnetosphere comparable to the planet Mercury. This model is used by NASA within the MESSENGER project and for studies of the lunar wake, of the interaction of the water plume near Enceladus with plasma of Saturn, and the environment of the Jovian moon Io. Kinetic simulations are also used to study general processes in the solar wind, e.g., evolution of electron temperature and its anisotropy with the radial distance from the Sun.

Part of the group is a small section of Solar Activity Monitoring and Forecasting. This section observes the Sun in white light and in the Hα line. The observations are used in scientific research conducted by the Solar Department, and contribute to the world net ISES (as station No. 31516) and to SIDC in Brussels. Besides solar observations, the section collects all the accessible data on the actual state of solar activity. The section compiles and publishes a weekly solar-activity forecast (for approximately 90 Czech and international users) and daily solar-activity forecast (for Czech Television). The solar-activity forecasts have been published weekly at Ondřejov since 1978, and this particular section has been doing the forecasting since 1990. Two small refractors are used for monitoring observations of the whole solar disc (in white light - refractor 150/750 mm, in Hα - refractor 50/320 mm + Hα filter Coronado 0.7 Å). For detailed observations of the solar photosphere and chromosphere, two refractors are used (205/2830 mm / A. Clark - 1858/ and 210/3410 mm + Hα filter DayStar 0.6 Å), with CCD-cameras and digitization. A small refractor (63/840 mm) is used for drawings of the whole solar photospheric disk. The latest data can be found on http://www.asu.cas.cz/~sunwatch/.

The group is also involved in image information processing. The art of image processing is a topic with boundaries well beyond astronomy. Astronomical image processing applies a variety of numerical methods to extract scientifically valuable information from the observed data. Applied sciences in this subject cover very broad area including pre-processing (data acquisition from the space and ground-based observation, standard data reduction, removing of noise components and random disturbances, raw and processed data archiving), image reconstruction, analysis, and pattern recognition.

2. Department of Stellar Physics

Head scientist – J. Kubát. Deputy – A. Kawka.

Secretary: E. Hajduová, Phone: (+420) 323 620 226, E-mail: hajduova@sunstel.asu.cas.cz

Fig. 8: Physics of Hot Stars Group and Two-meter Telescope Group (2011). Back row: L. Řezba, J. Kubát, P. Németh, V. Votruba, J. Fuchs, P. Škoda. Middle row: M. Tlamicha, P. Koubský, E. Hajduová, L. Kotková, M. Šlechta, B. Šurlan, A. Aret, V. Pácová. Front row: S. Vennes, A. Kawka. Missing: E. Arazimová, J. Honsa, E. Kortusová, M. Kraus, J. Sloup, K. Šejnová, S. Štefl, A. Tichý.

2.1 Physics of Hot Stars

Head scientist – J. Kubát. Scientists – A. Aret[10], A. Kawka, D. Korčáková[8], P. Koubský[1,2], M. Kraus, P. Németh[9], J. Soldán[6], P. Škoda, S. Štefl[3], S. Vennes, V. Votruba. PhD students – E. Arazimová[1], J. Elner[1,5], M. Netolický[1,4], J. Polster[1,7], K. Šejnová[1,10], B. Šurlan[1], A. Tichý[1,10]. Assistants – E. Hajduová, E. Kortusová.

[1] part time, [2] emeritus of AS CR, [3] on long-term leave at ESO, [4] till February 2009, [5] till May 2009, [6] till December 2009, [7] till September 2010, [8] till October 2010, [9] since August 2010, [10] since October 2010

The research of the group is focused on the theoretical and observational studies of early-type stars, Be and B[e] stars, white dwarfs, subdwarfs, stellar winds, moving envelopes in general, and binaries. The observational programs are based on spectroscopic data from the Ondřejov 2-m telescope, on data obtained at the ESO observatories in Chile, and on data from other facilities abroad – Dominion Astrophysical Observatory (Canada), Observatoire de Haute Provence (France), Rozhen Observatory (Bulgaria), Cerro Tololo Inter-American Observatory (Chile), Kitt Peak National Observatory (U.S.A.), Apache Point Observatory (U.S.A.), and Siding Springs Observatory (Australia). The spectroscopic data are supplemented by photometric measurements obtained at Hvar Observatory (Croatia) and Perth Observatory (Australia). Surveys like SDSS and GALEX are also extensively used. The extensive international collaboration in the framework of ESA Gaia concentrates on the automated stellar classification procedure for Be and other variable stars.

Important results were obtained by combining interferometric and spectroscopic observations for two binary systems. Using the 2m telescope at Ondřejov the binary star upsilon Sgr was spectroscopically monitored over several years. The spectroscopic observations lead to the presentation of two models for this peculiar binary. Combining these data with interferometric observations obtained with ESO VLTI/MIDI at Cerro Paranal, Chile, we confirmed that upsilon Sgr binary is at a very evolved phase. These observations also brought new constraints on the orbital parameters and characteristics of the dust envelope in which the binary is embedded. The binary nature of the Be star omicron Cas was reconfirmed using spectra taken between 1992 and 2008 at the Ondřejov Observatory and the Dominion Astrophysical Observatory. Interferometric observations of this system obtained with the Navy Prototype Optical Interferometer allowed the binary components to be spatially resolved for the first time.

We conducted a spectroscopic study of both components of the slightly overlooked visual binary HR 1847. This study enabled us to determine the system's basic physical and orbital parameters. The component HR 1847A was found to be an eccentric spectroscopic binary, while HR 1847B was shown to be a variable Be star losing its envelope. Further study of the O-type spectroscopic quadruple system SZ Cam was performed. Extensive studies about the behaviour of important representatives of the class of Be stars, namely zeta Tau and BU Tau were published. Studies of Be stars now extend to new class members: with the assistance of summer research students, we have identified new Be stars including
the interesting case of 7 Vul, which is also part of a 69-d binary.

The nature of the disk of the rapidly rotating B[e] supergiant LHA 115-S 65 in the Small Magellanic Cloud was studied using ESO 2.2-m telescope spectra and it was concluded that the Keplerian disk is the more realistic case.

We selected a sample of exceptionally bright hot subdwarfs and white dwarfs candidates from the ultraviolet all-sky survey conducted by the Galaxy Evolution Explorer (GALEX) satellite. Using 4m-class telescopes at La Silla and Kitt Peak National Observatory, we spectroscopically identified 50 new subdwarfs and 6 new white dwarfs. One of the new

white dwarfs (GALEX J193156.8+011745) is a hydrogen-rich white dwarf showing a remarkable heavy-element contamination in its spectrum. Our study of high resolution spectra obtained using the 8m telescope at Paranal revealed a surface abundance pattern bearing the signature of ongoing accretion on to the white dwarf atmosphere. Available infrared photometry also shows an excess most likely caused by the presence of a debris disk around the white dwarf star. We also found that two of the subdwarfs identified in the GALEX survey are in close binary systems. Using high-dispersion spectra obtained using the coudé spectrograph attached to the 2m telescope at Ondřejov, we showed that GALEX J0321+4727 and GALEX J2349+3844 are in close binaries with orbital periods of 0.26584 days and 0.46249 days, respectively. The companion to GALEX J0321+4727 is most likely a cool M dwarf, while the most likely companion to GALEX J2349+3844 is a white dwarf star. Our study confirms that binary interaction determines the fate of a substantial fraction of evolved stellar populations.

Using spectroscopic observations combined with optical and ultraviolet photometry we showed that the white dwarfs LP400-22 and NLTT11748 have a very low mass and that both follow eccentric Galactic orbits with a very high velocity implying that they belong to the Galactic halo. These stars belong to a very small number of white dwarfs with a mass below 0.2 solar masses. Further spectroscopic observations of LP400-22 and NLTT11748 over an extended timeline showed that they are in close binary systems with another degenerate star. They constrain evolutionary scenarios that lead to the formation of cataclysmic variable stars and Type Ia supernovae.

We developed a robust method to unambiguously distinguish between unevolved Herbig Ae/Be and evolved B[e] supergiants and to identify the complete Galactic B[e] supergiant sample. The method is based on an analysis of the amount of chemically processed ^{13}C by ^{13}CO emission from the disks. Subsequently, using infrared VLT/SINFONI spectra, we detected ^{13}C enhancement in two B[e] supergiants in the Large Magellanic Cloud, and we were able to confirm their nature.

We analysed the feasibility of using classical methods to search for periods in chaotic non-linear systems. We found that our period analysis of signals from the chaotic model detected periods that are apparently spurious, which shows that it may be difficult to distinguish between chaotic and quasi-periodic processes using such classical analyses.

In our theoretical work, we significantly improved our NLTE wind models, where we implemented the comoving frame (CMF) radiative transfer equation solution as a generalization of the previously used Sobolev method. We found that without line overlaps and with solely thermal line broadening the pure Sobolev approximation provides a reliable estimate of the radiative force even close to the wind sonic point. However, taking line overlaps into account, the radiative force becomes slightly lower, leading to a decrease in the wind mass-loss rate by roughly 40%. We studied in detail the influence of the X-ray radiation on the stellar wind structure. An X-ray source in the wind changes the ionization structure of the wind, but its influence on global wind parameters (terminal velocity and mass loss rate) is relatively weak.

We used our own NLTE stellar wind models for analysis of dynamical aspects of the circumstellar environment around first stars in the Universe (Population III stars). They were studied both for the zero metallicity case and for the case of first stars with evolutionary enhanced CNO abundance. We showed that in zero metallicity stars, stellar winds are unlikely, and that first stars with low amounts of CNO elements can have very weak winds, which have very little effect on stellar evolution. These results are extremely important for cosmological models.

2.2 Two-meter telescope group

Head scientist – M. Šlechta. Technicians and assistants – J. Fuchs, J. Honsa, L. Kotková, L. Řezba, J. Sloup, M. Tlamicha, F. Žďárský[1].

[1] part time

The principal instrument of the stellar department is the 2-metre reflecting telescope, which has been in operation since 1967. In the past three decades, three major upgrades (1982–87, 1996–98, 2007) were made. The telescope is primarily for high dispersion spectroscopy.

The main camera of the coudé spectrograph is the 700 mm camera equipped with a LN2-cooled CCD chip – SITe ST005A thinned UV-enhanced back illuminated chip 2000 X 800 15μm pixels. Its outstanding performance and low readout noise of less than 7 electrons allows us to obtain high S/N spectra (resolution 10 000 – 20 000) of objects up to 12th magnitude in less than two hours of exposure. A new CCD detector (custom manufactured ITL chip STA0520A based on LORAL wafer, thinned, 2688x512 15μm pixels, cooled by Cryotiger) was installed in the coudé 400mm camera. Another CCD – EEV thinned back illuminated chip 2048 X 2048 13.5 μm pixels is operating at the focus of the Ondřejov echelle spectrograph (OES).

A new interface that controls all the CCD cameras is at the final stage of development. PESO (Python Exposure Script for Ondřejov) is a multi-threaded Python script providing GUI interface for operating the CCD cameras attached to the Ondřejov 2m telescope spectrographs. It can setup the spectrograph configuration, the exposure time and ensures the CCD is readout following an exposure. It also writes the correct FITS header information and saves the FITS frame. It is written in Python calling C wrappers and custom libraries.

The 2007 upgrade of the control system offers a precise and stable performance of the telescope. It also enables remote control of the telescope. The autoguiding system OPSO (OpenGL Pointing System for Ondřejov) was shown to be fully functional and enables automatic control of the telescope position which is based on movements of the stellar image with respect to the slit.

In 2010 the electronics of the spectrographs were upgraded. The standard commercial components replaced the old and unique (hence irreplaceable) components. Moreover, the electronics driving the telescope and the spectrographs were unified. The current setup allows remote control of the telescope and the spectrographs.

2.3 High Energy Astrophysics

Head scientist – R. Hudec. Scientists – C. Polášek[1], R. Gális[1] V. Šimon. PhD students – I. Sujová[1]. Technician – M. Nekola, Assistants – M. Blažek[1], V. Hudcová[1], L. Hudec[1], M. Kocka[1], M. Skulinová[3], J. Štrobl[1].

[1] part time, [3] on long-term leave

Fig. 9: High Energy Astrophysics Group (2011). From left to riht: M. Nekola, M. Blažek, C. Polášek, J. Štrobl, R. Hudec, V. Hudcová, V. Šimon. Missing: R. Gális, M. Kocka, M. Skulinová, I. Sujová.

The group concentrates on multispectral analyses, evolution and emission mechanisms of celestial X-ray and gamma-ray sources (extragalactic - gamma-ray bursts (GRBs), blazars; galactic X-ray binaries and other types of X-ray sources). It participates in satellite projects. Recently, its activity has been focused on the ESA INTEGRAL satellite, namely experiment OMC (Optical Monitoring Camera) and the INTEGRAL Scientific and Data Centre, ISDC. The INTEGRAL satellite continues its smooth operation in space, and the group is involved in related scientific analyses. Since 2007, we are participating in the ESA Gaia project by managing 2 allocated sub-work packages on cataclysmic variables and high-energy sources and participating in the work package on supplementary ground-based observations within Gaia CU7 unit and applications of ultra-low dispersion spectra delivered by Gaia RP/BP photometers in astrophysics.

We investigate the properties of optical afterglows (OAs) of GRBs and their time evolution, including the supernova-GRB relation and the resolution between the synchrotron component and the contribution of the supernova.

Analyses of the long-term X-ray activity of galactic sources are focused on the investigation of transient events like outbursts and high/low state transitions in the systems with the mass-accreting compact object (e.g. neutron star), like the remarkable and unique Rapid Burster (MXB 1730-335), Aql X-1, 4U 1608-52, and ultra-compact systems (e.g. 4U 1820-30). Among others, these analyses make use of the *ASM* data from the *RXTE* satellite. The long-term processes operating in the accretion disc of these systems are the main purpose of these studies.

The group also provides ground-based data and analyses for various satellite projects. The ground-based segment includes several robotic CCD-based detecting systems/telescopes (D50cm, D25cm/BART, and three D30cm telescopes (BOOTES, fully robotic, in collaboration with Spain) with RTS2 control software (P. Kubánek). They provide rapid observations of optical counterparts of GRBs and monitoring of other objects of high-energy astrophysics. D50 has successfully detected OAs of GRBs down to a magnitude 20. The BOOTES collaboration resulted in scientific publications including a collaborative Nature paper in 2008. The GRB analyses are supported by investigations of GRBs by SID ionospheric monitors and optical all-sky monitors (in collaboration).

We also participate in efforts to scientifically use the valuable information recorded on archival astronomical plates (project UDAPAC). Selected known extragalactic (blazars) and galactic (cataclysmic variables and other high-energy sources) sources have been researched on the unique plates partly within a collaborative project DAAD/AV ČR. More recently, we evaluate methods for automated analyses of low-dispersion spectral images recorded on plates related to ESA Gaia with emphasis on studies of spectral type variability.

Studies of astronomical X-ray optics (e.g. related to the ESA/NASA/JAXA IXO project and/or to the NASA Generation X mission) and the design and development of novel wide-field optics of the Lobster-Eye type for astrophysical applications are also being continued, supported by several grants. We organized an international workshop AXRO (Astronomical X-Ray Optics) in Prague in 2010.

3. Department of Interplanetary Matter

Head scientist – P. Spurný. Deputy – P. Pravec.

Secretary: H. Zichová, Phone: (+420) 323 620 160, E-mail: Hana.Zichova@asu.cas.cz

The Department of Interplanetary Matter studies minor bodies of the Solar System, in particular meteoroids and asteroids. Attention is devoted to the study of the interactions of interplanetary bodies of different sizes with the Earth's atmosphere. Photometric studies of Near-Earth Asteroids are also performed. The Department consists of two working groups.

Figure 10: Department of Interplanetary Matter (2011). From left to right: P. Spurný, T. Henych, V.Vojáček, P. Scheirich, H. Zichová, P. Koten, L. Shrbený, P. Pravec, J. Starý, P. Kušnirák, K. Hornoch, L. Smolíková, R. Štork, J. Borovička, P. Pecina, J. Keclíková, J. Boček, D. Čapek. Missing: A. Galád, P. Horálek.

3.1 Meteor Physics

Head scientist – J. Borovička. Scientists – Z. Ceplecha[1], D. Čapek, P. Koten, P. Pecina, P. Spurný, R. Štork. PhD student – L. Shrbený[1], V. Vojáček[1], Assistants – J. Boček, R. Brilová[1], H. Ceplechová, J. Keclíková, P. Horálek, L. Smolíková, J. Starý, R. Šula, H. Zichová.

The group observes meteors in the optical region and performs theoretical interpretations of the observations. The basic observational system is the European Fireball Network (EN) established in former Czechoslovakia in 1963 and now consisting of 10 stations in Czech Republic, where the center of the EN is located, and 14 stations in Germany, 2 in Slovakia and 1 each in Austria, the Netherlands, France and Switzerland. All Czech stations have been equipped with new Autonomous Fireball Observatories (AFO). The efficiency of observations, complexity and quality of recorded data significantly increased after this modernization of the Czech part of EN was finished in 2007. Fireballs brighter than magnitude –4 are observed, including very detailed light curves provided by photoelectric sensors of the AFOs. Additional data on fireballs are obtained from long-focus horizontal cameras placed at Ondřejov Observatory. Also, fireball spectra are simultaneously photographed at the Ondřejov Observatory. Sensitive television cameras are used to observe faint meteors and their spectra during meteor shower activity.

The observational data are used to study physical processes during the penetration of meteoroids into planetary atmospheres, including ablation, deceleration, radiation, and meteoroid fragmentation. The physical properties and chemical composition of different types of meteoroids, their origin and distribution in the solar system and their relation to comets, asteroids and meteorites are being determined. The members of the group have developed a variety of methods for these purposes. Occasionally, we also interpret data on important events which occurred outside the scope of our observations. These events included the formation of the Carancas impact crater in Peru on September 15, 2007 and the atmospheric entry of asteroid 2008 TC_3 over Sudan on October 7, 2008.

In the last four years we substantially participated in a new ambitious project of a new fireball network in Australia. At the end of 2005, the core of the new Desert Fireball Network started its operation in the Nullarbor Plain in Western Australia, a very suitable place for meteorite recoveries. Three new stations were built in December 2005 and equipped with AFOs modified for work in the harsh desert conditions. The fourth station was set up in November 2007. About 50 precise fireball orbits were obtained, including 5 probable meteorite falls. The most promising case belonged to the so called “superbolide” category and was recorded by all three stations on 7th October 2007. Unfortunately no meteorites could be recovered because it terminated far over the Southern Ocean. Nevertheless we were successful in this respect in October 2008, when we found in many ways a unique meteorite Bunburra Rockhole .

The autonomous cameras of the fireball network were upgraded substantially by increasing the time resolution of the brightness detector 10 times, to 5000 measurements per second. It brings unique data and a new insight on processes connected with the meteoroid's atmospheric flight.

3.2 Asteroids

Head scientist – P. Pravec. Scientists – P. Scheirich, A. Galád[1]. PhD student – T. Henych[1], Assistants – P. Kušnirák, K. Hornoch, M. Velen[1].

[1] part time

The main topic of the group is physical studies of asteroids. The focus is on studies of binary systems and paired asteroids and asteroids in excited (non-principal axis) rotation states. An important aspect of the studies is that a part of the asteroid population represents an impact hazard for the earth. We study properties of these, so called Near-Earth Asteroids (NEAs), as well as of NEA source regions. Precise astrometry is an additional task that allows determination of the orbits of NEOs. There is a number of observatories across the world which collaborate with us on the project, see references available on http://www.asu.cas.cz/~ppravec/

The main observational instrument is the 0.65-m telescope located at Ondřejov equipped with a CCD camera. The collaboration with observatories across the world provides us with data from a number of their instruments that allow us to get a much more thorough understanding of the studied objects.

We carried out a pilot project of photometric observations of asteroids with the Danish 1.54-m telescope on La Silla, ESO, Chile in 2009. The telescope turned out to be suitable for photometry of asteroids and we published results from the observations in a letter in Nature (Pravec et al. 2010).

4. Galaxies and Planetary Systems

Head scientist – J. Palouš. Deputy – C. Ron.

Secretary: S. Přádná, Phone: (+420) 267 103 038, E-mail: pradna@ig.cas.cz

The department of Galaxies and Planetary Systems (GPS) studies the evolution of galaxies in groups and clusters, and the formation of stars and starclusters. Radio, infrared, optical, and X-ray observations are compared with analytical models and computer simulations of gravitational and MHD processes. The kinematics and physical properties in central parts of active galaxies are explored and compared with models. Relativistic effects in active galactic nuclei and galactic black hole candidates are analyzed in X-rays observed by satellites. Earth's rotation and its gravity field and the gravity field of other bodies of the solar system are studied. The dynamics of asteroids, Earth satellites and Trans Neptunian Objects (TNO) are examined, and an astrometric star catalogue is being compiled.

Several scientists from the department are also dealing with the history of astronomy. The topics include the role of astronomy in culture, Mesoamerican archeoastronomy, and the study of Jesuit and other astronomical heritage. Members of the department are involved in the care of the Astronomical clock of Prague and historical sundials as well as in editions, translations and interpretation of medieval and early modern astronomical texts.

Fig. 11. Department of Galaxies and Planetary Systems (2011). Back row from left to right: P. Hadrava, B. Picková, P. Jáchym, O. Kopáček, S. Přádná, S. Ehlerová, B. Jungwiert, R. Wünsch, V. Sochora. Middle row from left to right: J. Svoboda, J. Horák, M. Bursa, J. Vondrák, J. Palouš, C. Ron, V. Sidorin, M. Dovčiak. Front row from left to right: M. Křížek, F. Hueyotl Zahuantitla, Z. Šíma.

4.1 Astrophysics of Galaxies

Head scientist – J. Palouš. Scientists – M. Abramowicz[4], T. Bisbas, J. Dale, S. Ehlerová[1], P. Jáchym, B. Jungwiert, A. McLeod, I. Orlitová, L. Perek[1,2], A. Růžička[3], R. Wünsch. PhD students – K. Bartošková[1], I. Ebrová[1], M. Křížek[1], V. Sidorin[1]. Assistants – Z. Dientsbierová, S. Přádná.

[1] part time, [2] emeritus of AS CR, [3] on long-term leave, [4] visiting scientist

Young stars eject energy, mass and metals into the interstellar medium. Star formation drives supersonic turbulence and triggers subsequent star formation at other places. Structures - shells, supershells, filaments and sheets - are formed by the mass and energy feedback of young stars. A cataloque of shells and supershells in the second and third galactic quadrants of the Milky Way was produced by an automatic routine for searching in 3D data cubes. The structures discovered are identified in galactic surveys in other wave-bands. The gravitational fragmentation of expanding shells is studied using the SPH and AMR techniques, which are found to agree very well. Fragmentation is discovered to be strongly influenced by the environment in which the shell expands, with a low-pressure environment leading to supression of low-mass fragments and potentially a top-heavy stellar or cluster mass function.

Hydrodynamical processes occuring during the formation of super star clusters (SSC) are studied with analytical and numerical models and compared to optical and X-ray observations of SSCs. We make numerical models of winds driven by SSCs taking into account radiative cooling. The importance of the cooling for the wind dynamics depends on the properties of the central clusters: the wind of low stellar density clusters behaves almost adiabatically and can be described by the well known semi-analytical solution. As the stellar cluster density grows the cooling of the wind starts to be important and the wind enters the so-called radiative regime in which the wind temperature quickly drops at a certain distance from

the cluster. In the case of the densest clusters, a thermal instability occurs inside the cluster and no stationary wind solution exists. We follow the evolution of the clusters in such a super-critical regime using the hydrodynamic code ZEUS for which the cooling routine was modified to make it suitable for the modelling of extremely rapidly cooling regions. We found that the wind evolves in a bimodal regime in which the densest inner region undergoes strong radiative cooling which results in the accumulation of matter there, while the outer region still sustains a quasi-stationary wind. 2D simulations show that cold dense clumps are formed in the inner cluster region, which may support the secondary star formation. However, a fraction of the clumps formed is accelerated by the surrounding hot wind and ejected from the cluster.

The evolution of galaxies in groups and clusters is analyzed with restricted N-body codes using genetic algorithms. A model of the evolution of the galaxy group including the Milky Way, LMC and SMC was proposed. The high-speed motion of galaxies in the hot and diluted medium in galaxy clusters creates a ram pressure on the interstellar medium, which is stripped away from parent galaxies. The code GADGET using the SPH approach with a gravity tree is used to describe how the ISM gas is removed from spirals, quenching the star formation in galactic discs while triggering it in the tidal arms and at the leading edge of gaseous discs. The above projects are conducted in collaboration with the University of Cardiff, UK; Instituto Nacional de Astrofísica Optica y Electronica in Mexico; Observatoire de Paris, France; and Institut fuer Astronomie der Universitaet Wien, Austria.

We have mapped narrow-line regions (NLRs) of 11 nearby Seyfert 2 galaxies with the optical integral-field spectrograph OASIS mounted at the Canada-France-Hawaii Telescope. We have modelled emission-line profiles of 5 forbidden-line doublets and 2 Balmer lines, correcting for the underlying stellar absorption by reconstructing stellar spectra with synthetic evolutionary stellar population models. For each of the 11 targets, we present 2D maps of surface brightness in the observed emission lines, diagnostic line intensity ratios, gas kinematics (mean line-of-sight velocity and velocity dispersion), electron density, and interstellar reddening, and we plot spatially resolved spectral-diagnostic diagrams. The stellar data are represented by maps of mean line-of-sight (LOS) velocities and of the relative mass fractions of the young stellar populations. The gas velocity fields in 80% of the sample exhibit twisted S-shaped isovelocity contours, which are signatures of non-circular orbits and indicate non-axisymmetric gravitational potentials, gas motions out of the galactic plane, or possible outflows and inflows. Based on the kinematic measurements, we identified a possible nuclear ring or radial gas flow in NGC 262 (Mrk 348), not reported before. Eight of the eleven observed objects exhibit strongly asymmetric or multi-component emission-line profiles, in most cases confined to an elongated region passing through the galactic centre, perpendicular to the major axis of emission. This project was carried out in collaboration with CRAL-Lyon Observatory, France, and Calar Alto Observatory, Spain.

We have presented results from a pilot HST/ACS (Hubble Space Telescope/Advanced Camera for Surveys) deep imaging study in broadband V filter of five low-redshift QSO host galaxies classified in the literature as ellipticals. The aim of our study is to determine whether these early-type hosts formed at high redshift and have since evolved passively, or whether they have undergone relatively recent mergers that may be related to the triggering of nuclear activity. We perform two-dimensional modelling of the light distributions to analyze the host galaxies' morphology. We find that, while each host galaxy is reasonably well fitted by a de Vaucouleurs profile, the majority of them (4/5) reveal significant fine structure such as shells and tidal tails. These structures contribute between ~5% and 10% to the total V-band luminosity of each host galaxy within a region of r~ 3reff and are indicative of merger events that occurred between a few hundred Myr and a Gyr ago. These timescales are comparable to

starburst ages in the QSO hosts previously inferred from Keck spectroscopy. Our results thus support a consistent scenario in which most of the QSO host galaxies suffered mergers with accompanying starbursts that also likely triggered the QSO activity in some way, but we are also left with considerable uncertainty regarding physical mechanisms that might have delayed this triggering for several hundred Myr after the merger. We studied in more detail, using HST/ACS images, Keck spectroscopy and restricted N-body simulations, one of the targets, MC2 1635+119, a QSO hosted by a galaxy previously classified as an undisturbed elliptical galaxy. Our new images reveal dramatic shell structure indicative of a merger event in the relatively recent past. The brightest shells in the central regions of the host are distributed alternately in radius, with at least two distinct shells on one side of the nucleus and three on the other, out to a distance of ~13 kpc. The light within the five shells comprises ~6% of the total galaxy light. Lower surface brightness ripples or tails and other debris extend out to a distance of ~65 kpc. Our N-body model for a merger reproduces the inner shell structure and gives an estimate for the age of the merger of between ~30 Myr and ~1.7 Gyr, depending on a range of reasonable assumptions. While the inner shell structure is suggestive of a minor merger, the total light contribution from the shells and extended structures is more indicative of a major merger. The spectrum of the host galaxy is dominated by a population of intermediate age (~1.4 Gyr), indicating a strong starburst episode that may have occurred at the time of the merger event. We speculate that the current QSO activity may have been triggered in the recent past by either a minor merger, or by debris from an older (~Gyr) major merger that is currently "raining" back into the central regions of the merger remnant. This project was carried out in collaboration with University of California-Riverside, Space Telescope Science Institute, California Institute of Technology, Carnegie Observatories and University of Hawaii.

4.2 Relativistic Astrophysics

Head scientist – V. Karas. Scientists – M. Bursa, M. Dovčiak, P. Hadrava, J. Horák, J. Kovář[4], T. Pecháček, J. Svoboda[1], L. Šubr[1]. PhD students – J. Čechura[1], O. Kopáček[1], V. Sochora[1].

[1] part time, [4] visiting scientist

Members of the Working Group of Relativistic Astrophysics deal with theoretical aspects of strong gravitational fields in cosmic bodies, including the data modelling and interpretation. Additional research funding has been attracted from national granting agencies and through the European Space Agency Plan for European Cooperating States. The group is part of the Centre for Theoretical Astrophysics and is involved in teaching and supervising students at undergraduate and graduate levels. Research and teaching are carried out in fruitful collaboration with collaborators at Charles University in Prague, Silesian University in Opava, and at various institutions abroad.

Research topics and scientific results of the group members include the following:

X-ray spectroscopy of active galaxies: The X-ray reflection features of irradiated accretion discs around black holes enable us to probe the effects of strong gravity and determinate the black-hole properties. We investigate the reflection signs, i.e. the iron K-line and the Comptonized hump, which arise by reprocessing of radiation on the surface of an accretion

disc, and how they are affected by the spin of a rotating black hole. We develop models for the polarization signature of the radiation coming from the vicinity of accreting black holes. In the optical/UV range, polarimetry observations and modelling have already proven to be a very useful tool to investigate active galaxies by tracing geometrical and dynamical properties of structures surrounding their nuclei. Recently we have concentrated our attention on the study of variations in the primary and reprocessed radiation from an orbiting spot around a black hole.

High-frequency quasi-periodic oscillations: Accreting black holes in binary systems often exhibit quasi-periodic oscillations of the observed X-rays. Sometime the frequency of these oscillations is very high (kilohertz) and they occur at two distinct peaks. QPO properties differ between sources. However, it appears that they keep a fixed frequency ratio of small rational numbers. The origin of this phenomenon is currently unknown. We have focused on the resonance scenario of accretion disc oscillations.

Stochastical variability in accretion discs: The short-term variability of active galactic nuclei is often being linked with a presence of hot spots residing on the surface of an accretion disc. We apply the theory of random point processes to model the observed signal from an ensemble of randomly generated spots and to reproduce typical features that are found by Fourier-analysing X-ray lightcurves from galactic centers.

Magnetic fields around black holes: Do extremely rotating black holes power relativistic jets? A compelling answer may be beyond our reach for some time. To be sure, magnetic fields play an important role in astrophysics. Near rotating compact objects, neutron stars and black holes, the field lines are wildly deformed by rapidly moving plasma and strong gravitational fields. Recently we have studied the frame-dragging effects as the origin of magnetic reconnection which could take place in close vicinity of a rotating black hole. We have also examined the properties of the lobes of stable motion which can be formed by off-equatorial orbits of electrically charged particles in strong gravitational fields near magnetized compact objects.

Interaction of stars with their environment: Dense star clusters surround nuclei of galaxies, including the centre of our own Milky Way. Studying the rapid motion of stars within the central arcsecond and their interactions with the surrounding environment provides essential tools to determine the mass of the central supermassive black hole in the Galaxy. We have studied the model of orbital resonances to address the issue of origin of stars close to the Galactic Centre supermassive black hole. We have also collaborated on the model of bright spots and spiral waves to explain the Galactic Centre flares that have been reported in various wavelengths from X-rays to near infrared and sub-millimeter domains.

4.3 Planetary Systems

Head scientist – C. Ron. Scientists – A. Bezděk, M. Burša[1], Ch. Gruber, J. Klokočník, P. Novák[1], R. Peřestý, L. Sehnal[1], M. Šidlichovský, Z. Šíma, J. Vondrák[1,2]. PhD students – J. Sebera[1], V. Štefka. Assistants – M. Páleník[1], B. Picková[1], L. Pospíšilová[1].

[1] part time; [2] emeritus of AS CR

The Zeiss Photographic Zenith Tube (PZT) used at the Ondřejov Observatory to monitor changes of the Earth's orientation in space since 1973 has been renovated radically in 2005–2006. The photographic plate has been replaced by a CCD chip and all the system can be now controlled remotely through the internet. The PZT is used mostly for monitoring of non-polar

and non-tidal deflection of the local vertical and also for determining the positions and proper motions of stars.

We worked on the problem of creating a new, more precise astrometric star catalogue with improved proper motions and quasi-periodic terms reflecting orbital motions of stars in multiple systems by combining space mission results (Hipparcos and Tycho Catalogues) with ground-based optical observations of latitude/universal time variations.

The group, in close cooperation with a group of geodesists from the Czech Technical University, established a Combination Research Centers (CRC) of the International Earth Rotation and Reference Systems Service (IERS). The CRC has been working under the umbrella of the Center for Earth Dynamics Research (established in 2000 as a project of the Ministry of Education, Youth and Sports). We calculate combinations of Earth Orientation Parameters from VLBI and GPS observations, namely of universal time with length-of-day changes and celestial pole offsets with their temporal rates. We use these combinations to test precession-nutation models. In recent years, the activity has been concentrated on geophysical excitation of nutation. Namely the atmospheric and oceanic excitation of free core nutation was studied.

Effects of chaotic dynamics and resonances on the structure of asteroid and Kuiper belts in our planetary system are also studied. We are interested in stability and resonances in multiple exoplanetary systems. The applicability of averaging principle to the secular evolution of systems with two non-resonant exoplanets is studied by comparison of semi-analytical results with numerical integration.

The satellite altimetry data, namely single and dual satellite crossover altimetry for the Earth's gravity field determination and accuracy assessement has been studied and applied. A new method for the Earth's gravity field models accuracy assessement, based on the single satellite cross-over residuals and latitude-lumped coefficients has been developed and applied for various gravity models.

The satellite altimetry data are also used for monitoring the temporal variation in the geopotential W_0 and time variability of the Earth's inertia ellipsoid.

The satellite gradiometry mission GOCE (Gravity and Ocean Circular Experiment) has been launched in March 2009 and is equipped with a gradiometer to directly measure the second derivatives of the geopotential. Our group participated in planning of its orbit (fine orbit tuning) and data processing for gravity field determination and testing. We have grant ESA PECS C 98056 (2007-2011) for this purpose.

We study relationship between density of ground tracks and accuracy of gravity field parameters (namely of monthly solutions for variations of gravity) and we applied the results for the missions GRACE and GOCE and we are extending this study for planetary orbiters.
We were invited to cooperate in a frame of a special study group of IAG on the evaluation of the new gravitational model EGM 08 (which has been issued by US NIMA). Our testing concerns comparison with detailed terrestrial data and verification of known impact craters on the Earth; the accuracy and resolution of EGM 08 is a few miligals on majority of locations on the Earth and about 9 km at the equator. So we are able to confirm the well known (geologically proved) impact structures on the Earth with diameter higher than about 30 km. At this opportunity we identified several new candidates for the impact craters.

We also study the motion of artificial satellites under the influence of non-gravitational forces, like the drag of the atmosphere or the radiative forces with respect to our own models of the thermosphere and of the terrestrial albedo distribution.

IX Principal Results

Analysis of the collision of asteroid 2008 TC3 with the Earth using Meteosat satellite data

Borovička, J. - Charvát, Z.: *Meteosat observation of the atmospheric entry of 2008 TC3 over Sudan and the associated dust cloud*. Astronomy & Astrophysics. Volume 507, no. 2 (2009), pp. 1015–1022

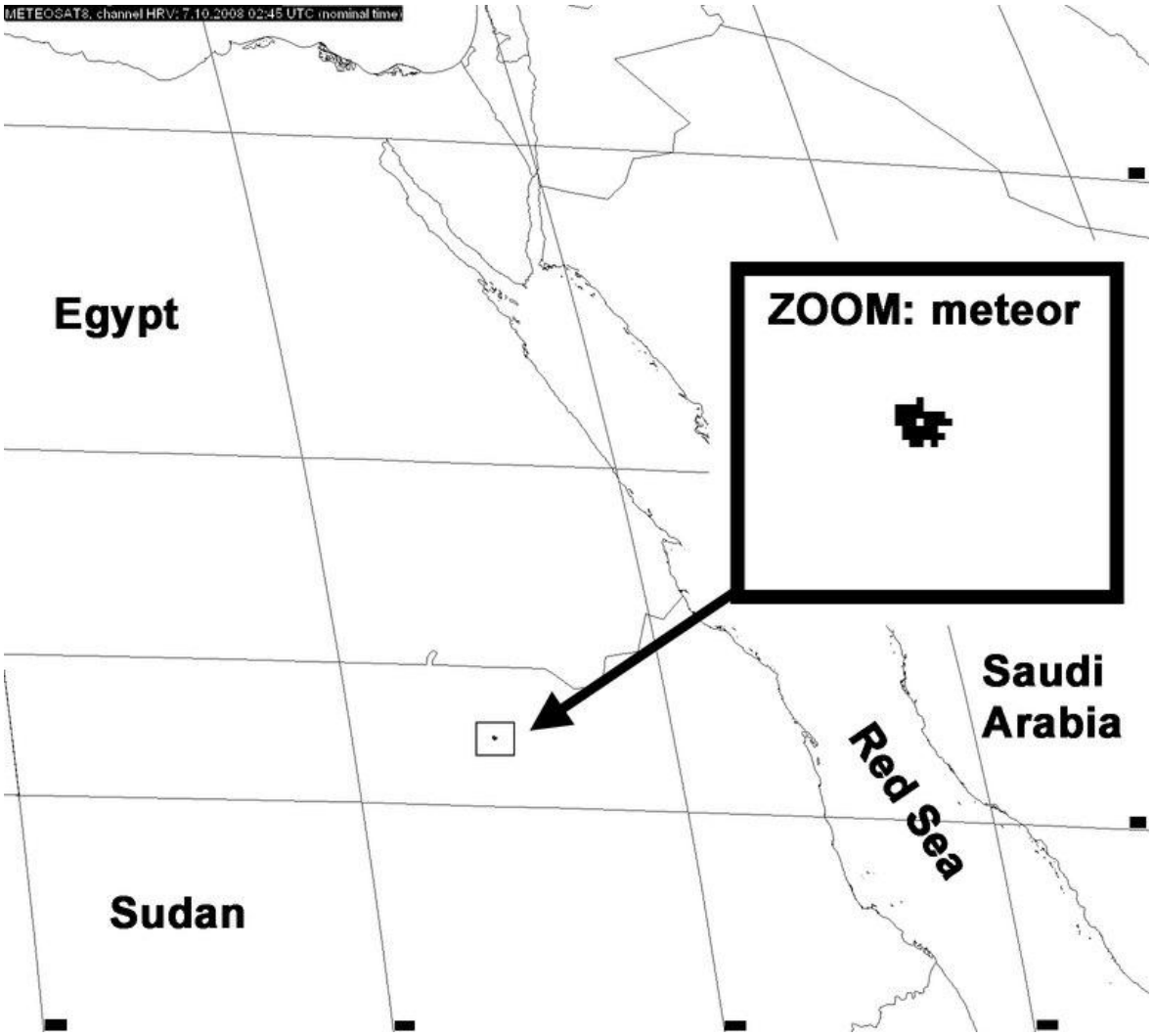

Fig. 12: *Part of Meteosat 8 image showing the fireball over Sudan caused by the entry of asteroid 2008 TC3 into terrestrial atmosphere. The inset shows a detail of the fireball. Image source: Czech Hydrometeorological Institute and EUMETSAT.*

On October 6, 2008, a small asteroid was discovered in the USA. It became soon clear that it is approaching the Earth. Next day, the asteroid entered terrestrial atmosphere over the territory of Sudan. As expected, the asteroid provoked a major luminous effect in the atmosphere (a bolide) but disrupted during the entry. Only small fragments (meteorites) landed, without causing any damage. Such phenomena occur several times a year but this was the first case when the asteroid was discovered before the atmospheric entry and the bolide was predicted. Because of short time, however, it was not possible to prepare any special observations. There are, consequently, only few actual data about the asteroid entry.

Fortunately, Z. Charvát from the CHMI discovered the bolide in the images from the meteorological satellite Meteosat 8.

In our joint paper, we analyzed all available data from Meteosat 8 and 9. They contain not only bolide data but also data on the dust cloud left in the atmosphere after the bolide. We derived the heights of asteroid disruption and absolute bolide brightness at two heights. Multi-channel observation made it possible to find the spectral distribution of the radiation. The bolide color temperature was 3650 ± 100 K. The infrared spectrum of the fresh dust was dominated by the Si-O band at 10 microns. It was caused by recondensed silicates at temperatures exceeding 1000 K. The silicates soon became crystalline. The total mass of silicate smoke was estimated to 3100 ± 600 kg. More mass was probably contained in larger, micron-sized, dust particles originating from incomplete sublimation of asteroidal material. From the height of asteroid disruption we estimated that the bulk porosity of the asteroid was about 50%, i.e. more than the porosity of the recovered meteorites Almahata Sitta (which belong to a rare type, ureilites). Our bolide analysis, together with the data on the asteroid itself and the meteorites, therefore contributed to the understanding of the properties of one type of asteroids crossing the Earth's orbit.

Response of optical hydrogen lines to beam heating. I. Electron beams

Kašparová, J. - Varady, M. - Heinzel, P. - Karlický, M. - Moravec, Z: *Response of optical hydrogen lines to beam heating. I. Electron beams*. Astronomy & Astrophysics, Volume 499, no. 3 (2009), pp. 923 – 934.

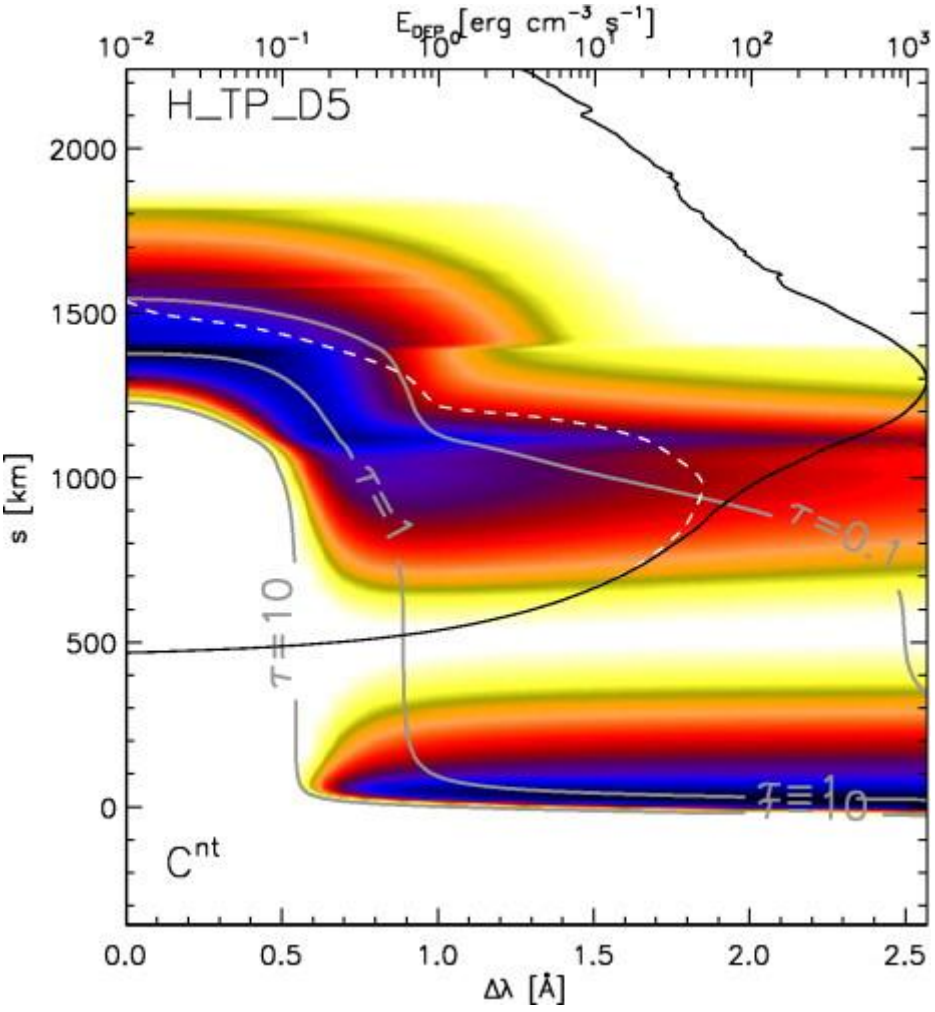

Fig. 13: *Formation layers of Hα line from the line centre (Δλ = 0 Å) to the wing (Δλ ≈ 2.5 Å). Black line indicates total energy deposit of the beam in the atmoshere (i.e. beam heating), white dashed line corresponds to the beam energy deposit on hydrogen related to the non-thermal collisional rates. The region at s ≈ 1000 km is caused mainly by the non-thermal collisional rates. Gray lines display contours of optical depth τ, where τ = 1 roughly corresponds to the height to which we „see" in the corresponding wavelength.*

Observations of hydrogen Balmer lines in solar flares remain an important source of information on flare processes in the chromosphere during the impulsive phase of flares. The intensity profiles of optically thick hydrogen lines are determined by the temperature, density, and ionisation structure of the flaring atmosphere. In the paper we investigated the role of non-thermal electrons in the formation regions of Hα, Hβ, and Hγ lines in order to unfold their influence on the formation of these lines. To model the evolution of the flaring atmosphere and the time-dependent hydrogen excitation and ionisation, we used a 1-D radiative hydrodynamic code combined with a test-particle approach. The code simulates the propagation, scattering, and thermalisation of a power-law electron beam in order to obtain the flare heating and the so-called non-thermal collisional rates, i.e. number of ionisations and excitations, due to the interaction of the beam with the hydrogen atoms. Depending on the beam parameters, both line centres and wings can show pronounced intensity variations. The non-thermal collisional rates generally result in an increased emission from a secondary region formed in the chromosphere. Our simulations also show that fast line intensity variations are well-correlated with the beam flux variations and as such they represent an indirect indication of pulsating beams presence in the flare atmosphere.

False periods in complex chaotic systems

Votruba, V. - Koubský, P. - Korčáková, D. - Hroch, F.: False periods in complex chaotic systems. Astronomy & Astrophysics. Volume.. 496, no. 1 (2009), pp. 217 – 222

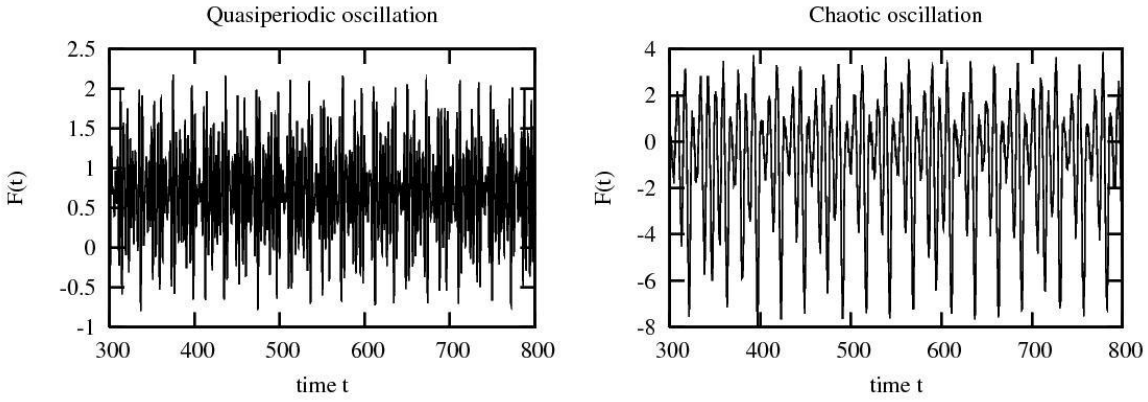

Fig. 14: *Artificial light curves from quasiperiodic and chaotic stellar pulsators. Both light curves are similar and it is impossible to distinguish between them.*

Analysis of the light curves is one of the basic tools of asteroseismology. We focus primarily on stars from the instability strip, where both radial and non-radial pulsations are observed. One of the primary research goals is to determine parameters of stellar pulsations by analyzing their light curves or spectra, focusing on periodic or quasiperiodic behavior. But pulsating stars frequently exhibit some irregularities or complex behavior in their light curves.

One of the explanations is presence of deterministic chaos. It means that a star can pulsate periodically but also chaotically, in dependence of their physical parameters. Question is, whether we are able to distinguish between quasiperiodic or chaotic behavior by using classical methods for period searches and we found that it is impossible by classical methods of period analysis. It also means that chaotic behavior may be more usual in pulsators than we thought before. We also developed a method which can rule out presence of chaos.
Our results can be applied to different classes of astrophysical objects which show some irregularities in their light curves and where deterministic chaos can be expected.

Search for separated asteroid pairs

Pravec, P. - Vokrouhlický, V.: *Significance analysis of asteroid pairs*. Icarus. Volume 204, no. 2 (2009), pp. 580-588

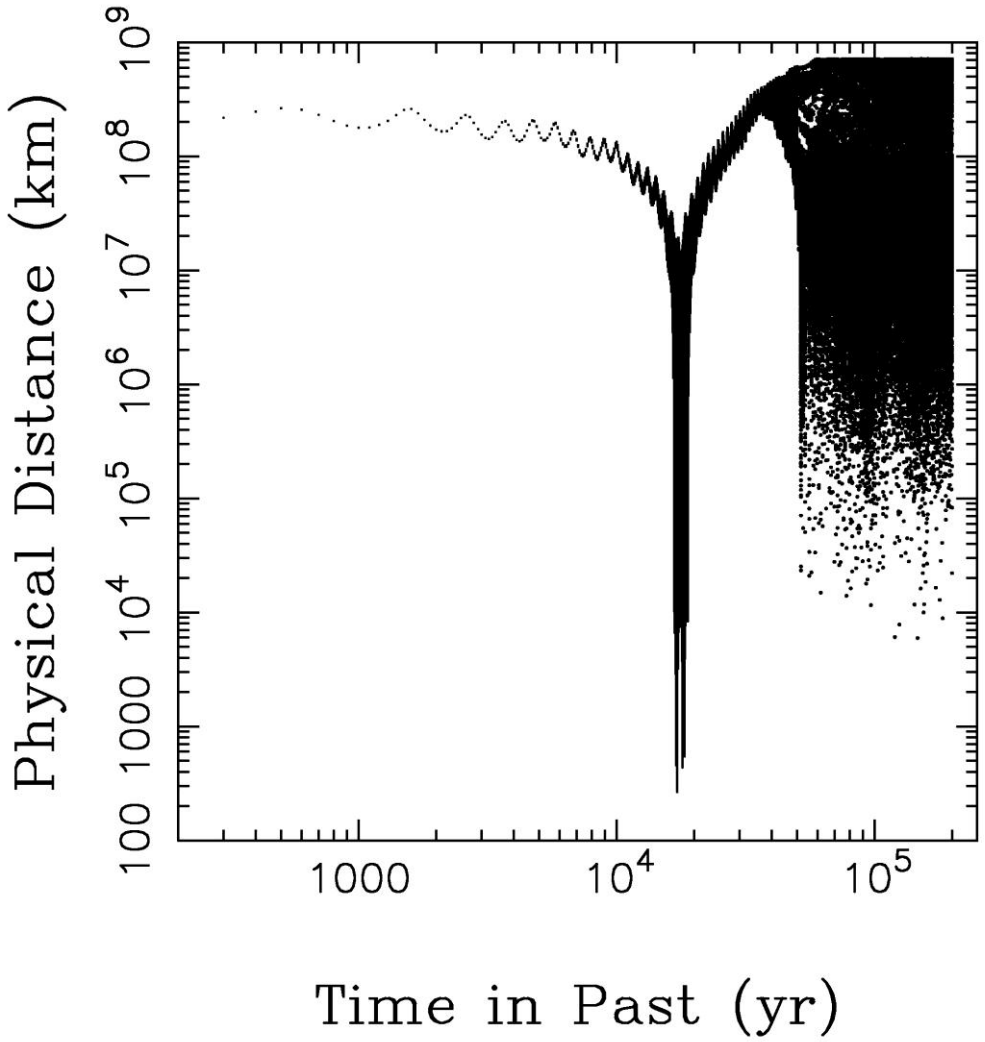

Fig. 15: *Relative distance between a pair of asteroids reached its minimum at a time about 18 thousand years ago, indicating a probable time of separation.*

Small asteroids in the main belt between the orbits of Mars and Jupiter are a source of near-Earth asteroids that represent an impact hazard for the Earth. Our knowledge of their properties and mechanisms is incomplete so far. Further studies are therefore needed for improving our understanding and analysis of their hazardous potential.
A significant number of asteroids are actually binary systems, i.e., they are systems of two bodies orbiting around their common center of mass. Some binaries are unstable and they break up. Reasons and mechanisms of their break up are an important subject of current research, which should contribute to our understanding of properties of asteroids.
Pairs of asteroids formed by break-ups of binary systems are orbiting around the Sun on similar orbits that allows us to identify them. We developed a method of asteroid pairs identification that is based on an analysis of significance of their orbital similarity. We found a few hundred of pairs with distances in the space of orbital elements < 36 m/s (the distance has a dimension and sense of a relative velocity of the bodies). For each pair, we analyzed a density of asteroids in the surrounding population and computed a probability of chance coincidence for a case of unrelated objects. Pairs with low probabilities of chance coincidence were further investigated, we computed their distances in the space of proper elements and finally identified a group of significant pairs. For a few sample pairs, we run backward orbit integrations that showed a convergence of their orbits in the past, i.e., they were close one to the other at a certain time in the past with a relative velocity in the order of a few m/s that suggests that it was the time of pair formation when the two bodies of an original binary system or one body separated.
The identified significant pairs are the subject of our further detailed study using photometric and spectroscopic techniques. Results that we obtain are leading us to developing a theory of their formation and to a thorough understanding of properties of the asteroidal system in the main belt as well as in the vicinity of the Earth.

The circumbinary dusty disk around the hydrogen-deficient binary star ypsilon Sagittarii

Netolický, M.- Bonneau, D.- Chesneau, O.- Harmanec, P.- Koubský, P.- Mourard, D.- Stee, P.: *The circumbinary dusty disk around the hydrogen-deficient binary star upsilon Sagittarii*. Astronomy & Astrophysics. Volume 499, no. 3 (2009), pp. 827 – 833

Ups Sgr is one of the four known binaries with extremely low abundance of hydrogen. This peculiarity is an evolutionary effect, a consequence of multiple mass exchanges between the components in the system. The object has been spectroscopically monitored for several years with the 2 m telescope at Ondřejov and with the 1.2 m telescope of DAO, Canada. A Portuguese amateur astronomer, J. Ribeiro, was involved in the project, too. The spectroscopic observations lead to the improvement of the orbital parameters of the system and to the presentation of two models for this peculiar binary. The test of the models of ups Sgr was the essence of the proposed observations with the world most efficient interferometer – VLTI of European Southern Observatory at Cerro Paranal, Chile. The data obtained with VLTI/MIDI interferometric instrumentation in the mid infrared region during 2007 and 2008 were interpreted in the paper published in the most important European astronomical journal Astronomy and Astrophysics.

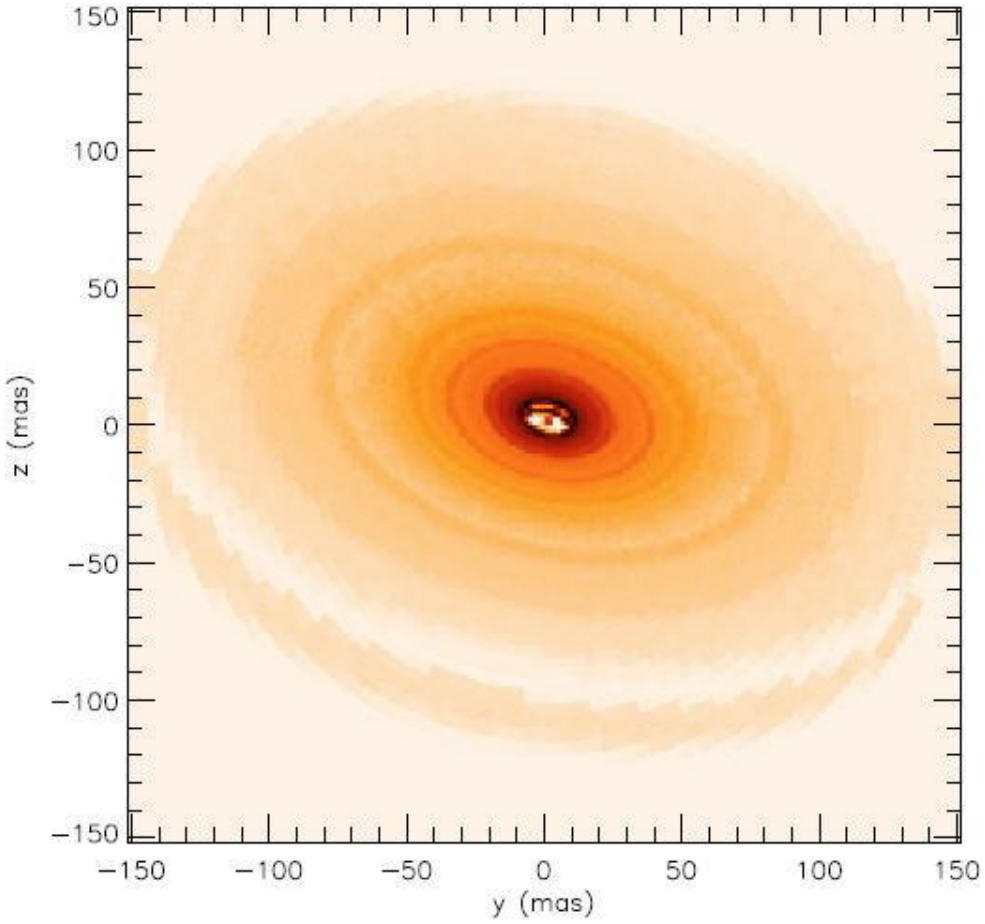

Fig. 16: *The intensity map of the envelope in ups Sgr based on the observations with VLTI/MIDI instrumetation. The angular size of the enevelope is about 3 tenths of an arcsecod. The inherent binary in the middle of the envolope is not resolved at wavelength used by the MIDI/VLTI interefrometer – 10.6 micrometers.*

The results confirm that ups Sgr binary is in the very evolved phase, and bring new constraints of the orbital parameters and characteristics of the dust envelope in which the binary is embedded. The new findings obtained with interferometry and spectroscopy are to be used for the preparations of observational programs to be realized in the visible and near infrared regions with VLTI/AMBER and CHARA/VEGA instrumentation. These instruments can get closer to the core of the ups Sgr binary and bring the answer to the basic question about the mass of particular components and thus test the hypothesis that this peculiar binary would explode as an Ia type supernova..

Disentangling of spectra – theory, practice, and results of the method

[1] Hadrava, P. - Šlechta, M. - Škoda, P.: *Notes on disentangling of spectra. II. Intrinsic line-profile variability due to Cepheid pulsations*, Astronomy and Astrophysics, Volume 507 (2009), pp.397-404
[2] Caballero-Nieves, S. M. - Gies, D. R. - Bolton, C. T. - Hadrava, P. - Herrero, A. - Hillwig, T. C. - Howell, S. B. - Huang, W. - Kaper, L. - Koubský, P. - McSwain, M. V.: *The Ultraviolet Spectrum and Physical Properties*

of the Mass Donor Star in HD 226868 = Cygnus X-1, The Astrophysical Journal, Volume 701 (2009), pp. 1895-1905
[3] Hadrava, P.: *Disentangling of spectra, theory and practice*, Published electronically (2009), 88 pages,
[4] Hadrava, P.: *Notes on the disentangling of spectra. I. Enhancement in precision*, Astronomy and Astrophysics (2009), Volume 494, pp.399-402
[5] Škoda, P. - Hadrava, P.: *Fourier disentangling using the technology of Virtual Observatory, in 'Binaries – Key to Comprehension of the Universe*', eds. A. Prša and M. Zejda, Astronomical Society of the Pacific Conference Series, in press (2010)

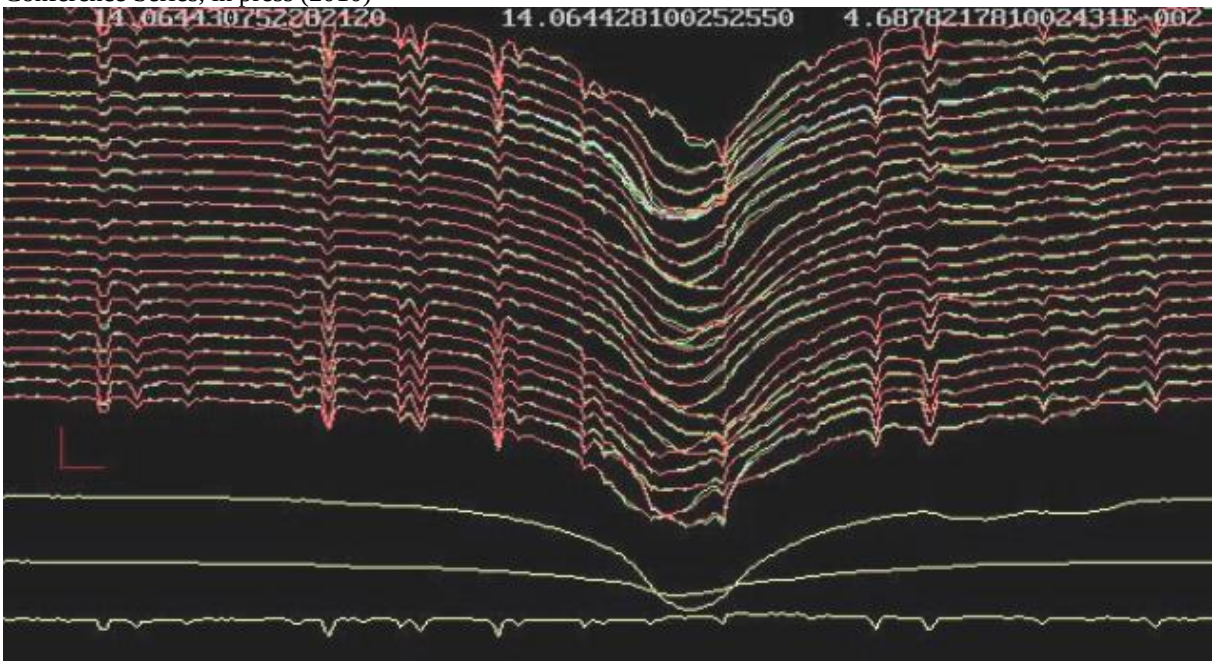

Fig. 17*: Spectrum of the star 68 u Her. Mathematical method of spectra disentangling developed by the author allows to separate spectra of individual components and simultaneously to determine the parameters of the system with an unprecedented accuracy exceeding the possibilities of other approaches.*

The author has developed an original method of spectra disentangling of spectroscopically variable stellar systems. The new technique is based on Fourier transformation in the wavelength domain and it allows to separate spectra of individual components and simultaneously to determine the parameters of the system with an unprecedented accuracy exceeding the possibilities of other approaches. The collection of papers gives an extensive and practical review as well as new improvements and applications of the method which has been propagated by research collaborators and students and is now used worldwide.

Formation of asteroid pairs by rotational fission

P. - Pravec, P., and 25 co-authors: *Formation of asteroid pairs by rotational fission*, Nature 466 (2010), pp. 1085 1088

Asteroids in the main belt between Mars and Jupiter are a source of Near-Earth objects. We study their properties and evolution mechanisms, which can improve an analysis of the impact hazard to Earth.

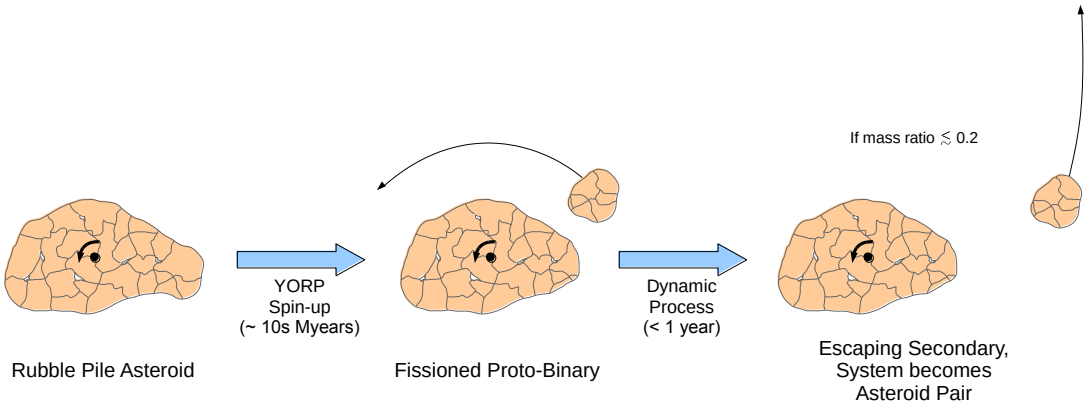

***Fig. 18**: A parent asteroid consisting of small component pieces that can be pulled apart without tensile resistance is spun up to the critical fission frequency by the Yarkovsky-O'Keefe-Radzievskii-Paddack (YORP) effect, forms a proto-binary system which subsequently disrupts under its own internal dynamics and becomes an asteroid pair.*

Asteroids are weak structures, they split and form pairs. Some pairs remain bound in stable binary systems, but many disrupt completely and form pairs of asteroids revolving around the Sun separately. The population of asteroid pairs was found in studies of similarities and evolution of their orbits, but it was not known how they were formed. In our work, we present evidence that asteroid pairs were formed by rotational fission of parent asteroids.

We studied 35 pairs with our technique of time-resolved photometry. Most data were taken with the 1-m telescope at Wise Observatory, Israel, and the 1.54-m Danish telescope at La Silla, Chile. We derived their primary spin rates and mass ratios. We found a strong correlation between the square of primary spin frequency and the mass ratio. We interpreted the data with a theory of rotation fission by D. Scheeres (published in 2007). We have got a perfect match between pairs‘ properties and theory. Specifically, we found that the primaries of pairs with mass ratios much less than 0.2 rotate rapidly, near their critical fission frequency. As the mass ratio approaches 0.2, the primary period grows long. This occurs as the total energy of the system approaches zero, requiring the asteroid pair to extract an increasing fraction of energy from the primary's spin in order to escape. We did not find asteroid pairs with mass ratios larger than 0.2. Rotationally fissioned systems beyond this limit have insufficient energy to disrupt. We concluded that asteroid pairs are formed by the rotational fission of a parent asteroid into a proto-binary system, which subsequently disrupts under its own internal system dynamics soon after formation.

The new findings show that asteroids are not inert giant rocks, but they are changing „little worlds“ that give birth to smaller asteroids. The non-catastrophic evolution mechanism can re-shape the whole asteroid population.

Thermal stress in small meteoroids

Čapek, D. - Vokrouhlický, D.: *Thermal stress in small meteoroids*. Astronomy and Astrophysics, Volume 519, A75 (2010), pp. 1-16

Destruction of boulders by mechanical stress which is caused by non-homogeneous temperature field has been described from Earth's arid areas. The temperature distribution arises due to anisotropic cyclic insolation. Similar temperature and stress fields also exist in meteoroids in the space.

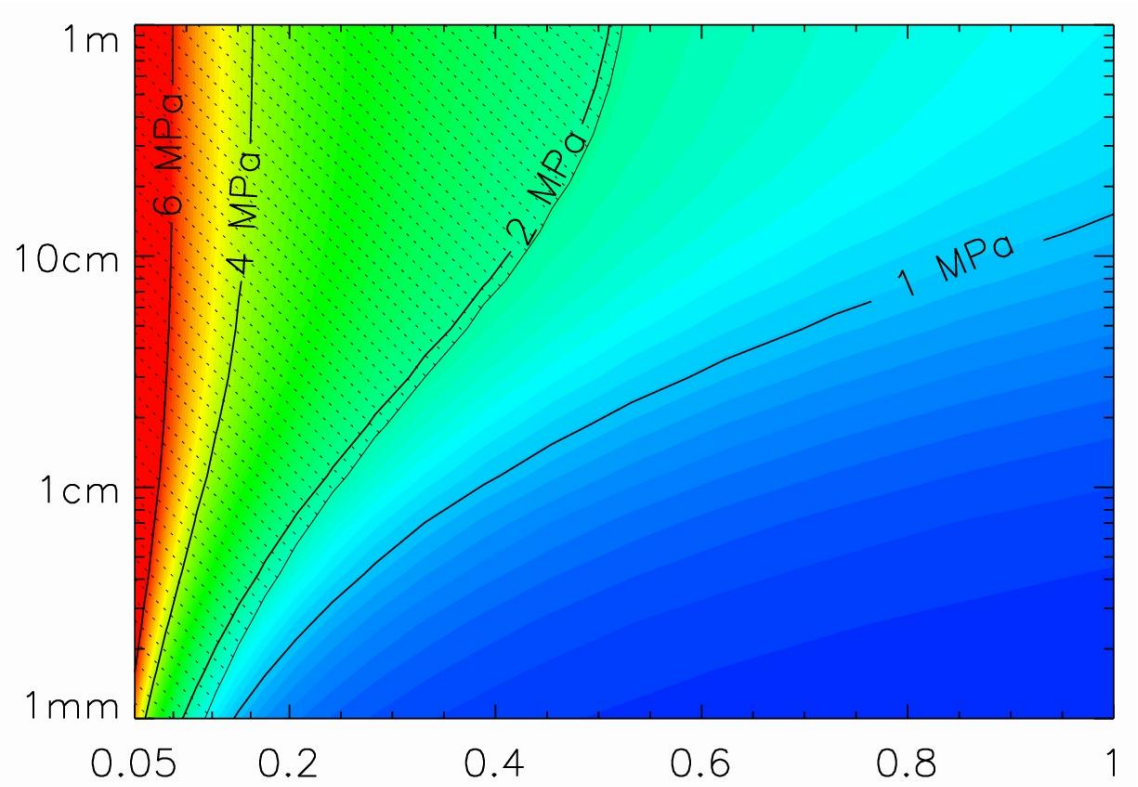

***Fig. 19**: The thermal stress in the center of a meteoroid as a function of its size (y-axis) and the heliocentric distance (x-axis). The isobars are labeled according to their values in megapascals. The shaded zone indicates where the thermal fission occurs. The spin axis is perpendicular to the solar direction and material corresponds to carbonaceous chondrites. The rotation period P is inversely proportional to the size D as: P(s)=3/D(m).*

We derived analytical expressions for thermal stresses in small, spherical, and homogeneous meteoroids with regular rotation. If the thermal stress exceeds the material strength, local material failure or disruption of the entire body may occur. Our results indicate that the onset of thermal failure in the meteoroid depends on a number of parameters including the heliocentric distance, the size, the rotation frequency, and the orientation of the spin axis with respect to the solar direction. In our case, we find large, slowly rotating meteoroids or those with a spin axis pointing towards the Sun or both, are the most susceptible to the thermal bursting. This may have implications for the size distribution of meteoroids in various streams depending on their orbit and the physical characteristics of their parent bodies; and also for orbital distribution of sporadic complexes of meteoroids.

Numerical modeling of Mercury's magnetosphere

[1] Trávníček, P. M. - D. Schriver, D. - Hellinger, P. - Herčík, D. - Anderson, B.J. - Sarantos, M. - Slavin, J.A.: *Mercury's magnetosphere-solar wind interaction for northward and southward interplanetary magnetic field: Hybrid simulation results*, Icarus, 209 (2010), Issue 1, Special Issue SI, pp. 11-22.
[2] Slavin, J. A., B. J. Anderson, D. N. Baker, M. Benna, S. A. Boardsen, G. Gloeckler, R. E. Gold, G. C. Ho, H. Korth, S. M. Krimigis, R. L. McNutt, Jr., L. R. Nittler, J. M. Raines, M. Sarantos, D. Schriver, S. C. Solomon, R. D. Starr, P. M. Travnicek, T. H. Zurbuchen
(2010), *MESSENGER observations of extreme loading and unloading of Mercury's magnetic tail*, Science, 329, Issue 5992, pp. 665-668.

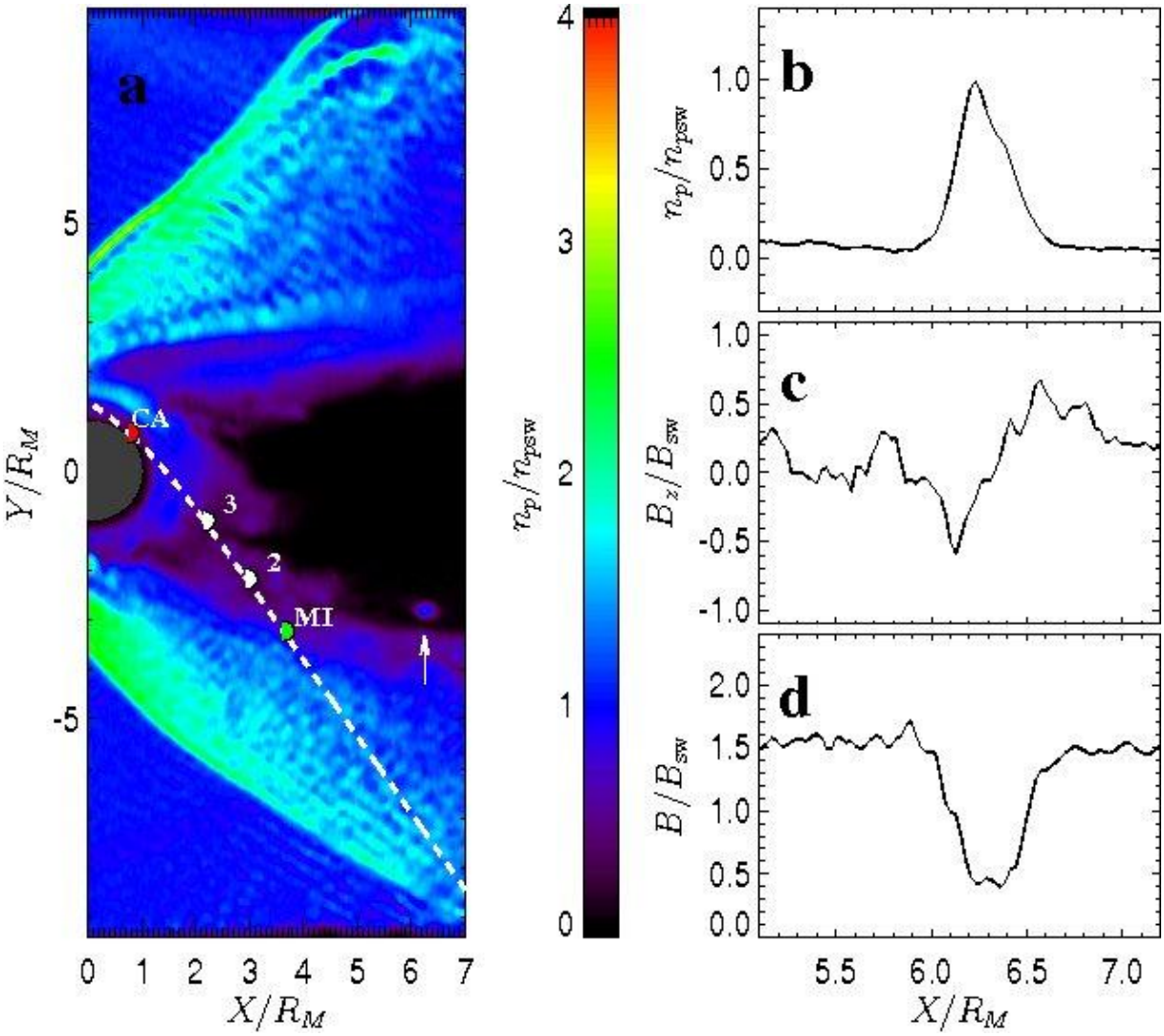

***Fig. 20**: An example of a plasmoid formed in the magnetotail (marked by the white arrow on panel (a), which shows simulated plasma density in the equatorial plane for the case of south-ward oriented interplanetary magnetic field). The plasmoid exhibits typical signatures (profiles of the plasma density and the magnetic field on panels (b) - (d)) and has a diameter roughly half of the Mercury's radius. Its lifetime from the moment of its formation until its absorption in the area of the magnetopause is approximately 10 to 20 proton gyroperiods in the solar wind. Plasmoid moves very slowly.*

We have carried out several numerical simulations of the interaction between the solar wind and Mercury for conditions similar to those of the first and the second flybys of MESSENGER around the planet. During the first flyby the interplanetary magnetic field was oriented northward, during the second one it was oriented southward. This change in orientation has an important influence on the current sheath formed behind the planet. In the second case this region is much thinner. Consequently the magnetic field is reconnecting and so called plasmoids form - closed bubbles in the magnetospheric plasma. Plasmoids are then observed in our simulation results and also in situ by the probe during its flyby around the planet. During both flybys MESSENGER has observed small decreases of the magnetic field close to the planet. Our simulation results show a plasma belt forming around the Mercury. Existence of such a belt can explain observed decreases of the magnetic field, as plasma has the ability "push out" (or decrease) the magnetic field. The density of plasma in the belt observed in our numerical experiment corresponds to the decreases of the magnetic field observed by MESSENGER. We have performed the first spectral analysis of results from a global simulation when we investigated propagation of electromagnetic waves generated in

the magnetosheath. We have observed that downstream of the bow shock two qualitatively different regions exist. Closer to the bow shock so called mirror waves dominate. Cyclotron waves dominate closer to the magnetopause, they form in very narrow layer of magnetosheath in the region of a sub-solar point of the bow shock from where they are convected in the direction of the solar wind flow through the magnetoshetah.

The Earth Orientation Catalog 4: An optical reference frame for monitoring Earth orientation in the 20th century

[1] Vondrák, J -, Štefka, V.: *The Earth Orientation Catalog 4: An optical reference frame for monitoring Earth orientation in the 20th century*, Astronomy and Astrophysics, vol. 509, A3 (2010), doi: 10.1051/0004-6361/200912472
[2] Vondrák, J. – Štefka, V. – Ron, C.: *Improved Optical Reference Frames for determining Earth Orientation Parameters in 20th century*. Proc. 6th Orlov Conference, Akademperiodika, Kiev, 2010, pp. 64-71
[3] Vondrák, J. – Ron, C. – Štefka, V.: *New solution of Earth Orientation Parameters in 20th century. Highlights of Astronomy*, Cambridge Univ. Press, 2010 (Corbett, I.), Vol. 15, p. 211, doi:10.1017/S1743921310008811
[4] Vondrák, J. – Ron, C. – Štefka, V.: *Earth Orientation Parameters based on EOC-4 Astrometric Catalog*, Acta Geodyn. Geomater., Vol. 7, No 3 (2010), pp. 245-251

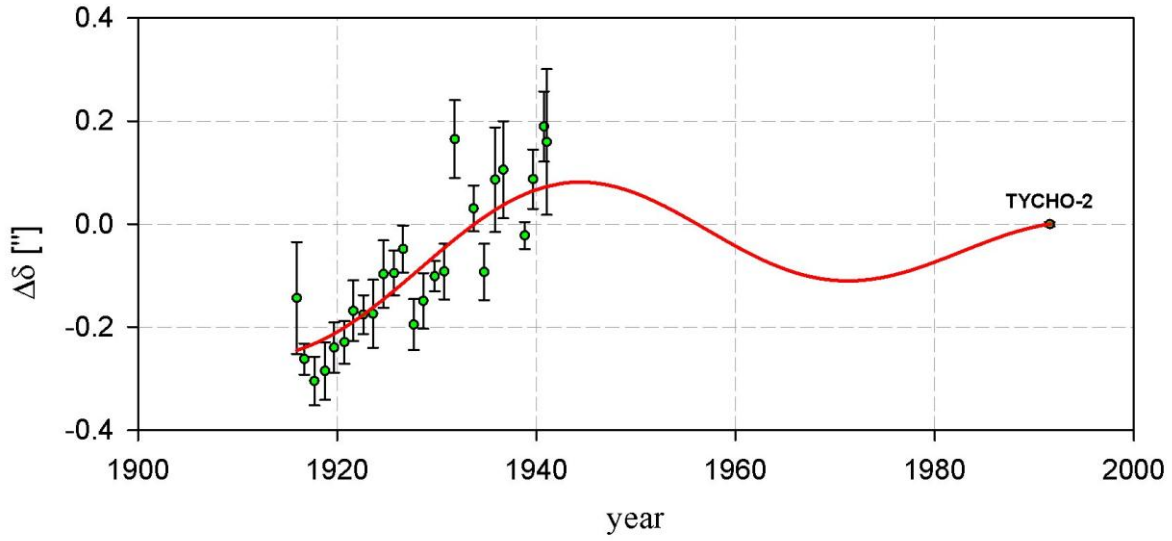

***Fig. 21**: Declination of the star No. 518 whose period, taken from the 6th USNO Catalog, is 106.70y. Position in Tycho-2 is also shown.*

The astrometric ground-based observations of latitude and/or universal time variations, covering the interval 1899.7--2003.0, were used in combination with the positions obtained by ESA Satellite Hipparcos and some older ground-based catalogs to construct a catalog, tailored to long-term Earth-rotation studies. About 4.5 million individual observations at 33 observatories were combined with the catalogs ARIHIP, TYCHO-2, etc. to obtain the catalog Earth Orientation Catalog 4 (EOC-4). Spectral analysis of ground-based data and comparison with the USNO Sixth Catalog of Orbits of Visual Binary Stars was used to discover which of the observed objects display periodic motions. The corresponding amplitudes and phases were then estimated in one-step least-squares solution, together with positions and proper motions. The catalog EOC-4 contains 4418 different objects, out of which 599 have significant orbital motions.

X Supervising PhD and Masters Theses

On the basis of an agreement with the Faculty of Mathematics and Physics of Charles University, Prague, the Institute participates in the undergraduate study programs of Astronomy and Astrophysics and in Plasma Physics. The Institute, along with the Faculty, is also responsible for PhD-study program in Theoretical Physics, Astronomy and Astrophysics. Students of some other universities (including Masaryk University, Brno) are also supervised by researchers from the Institute.

Supervising PhD Theses

E. Dzifčáková: supervisor of PhD Thesis of J. Dudík (Comenius University).
B. Jungwiert: supervisor of PhD Thesis of I. Stoklasová (Charles University).
V. Karas: supervisor of PhD Thesis of J. Svoboda (Charles University).
J. Palouš: supervisor of PhD Thesis of V. Sidorin (Charles University).
P. Spurný: supervisor of PhD Thesis of L. Schrbený (Charles University).

Supervising Masters Theses

P. Hadrava: supervisor of Master Thesis of J. Čechura (Charles University).
V. Karas: supervisor of Master Thesis of V. Sochora (Charles University).
P. Koten: supervisor of Master Thesis of V. Vojáček (Charles University).
J. Borovička: supervisor of Master Thesis of P. Habuda (Charles University).
P. Pravec: supervisor of PhD Thesis of T. Henych (Masaryk University).

XI Participation in Editorial Boards

V. Bumba: Honorary member of the Editorial Board of Solar Physics.
M. Burša: Member of Editorial Board of Earth, Moon, and Planets.
P. Heinzel: Member of the Editorial Board of Solar Physics
M. Karlický: Member of the Editorial Board of Solar Physics and Contributions of the Astronomical Observatory Skalnaté Pleso
J. Kleczek: Honorary member of the Editorial Board of Solar Physics.
P. Kotrč: Member of the Editorial Board of the Central European Astrophysical Bulletin.
L. Perek: Member of Editorial Board of Space Policy
J. Vondrák: Member of Editorial Board of Serbian Astronomical Journal and Contributions of the Astronomical Observatory Skalnaté Pleso

XII Involvement in International Scientific Organizations

European Southern Observatory (ESO)

Examples of approved observing programs for 2010 in which scientists of our institute took part.

Project name	**Telescope**	**Scientist**
Magnetic properties of high proper motion of white dwarfs	VLT/FORS	A. Kawka, S. Vennes
Properties of hot subluminous stars in the GALEX survey	NTT/EFOSC2	S. Vennes, A. Kawka
Abundance analysis and search for debris material around a heavily polluted white dwarf	VLT/UVES	S. Vennes, A. Kawka
CO bandhead emission of the mass-losing B[e] stars: a CRIRES survey	VLT/CRIRES	M. Kraus
What is the ^{13}C footprint of B[e] supergiants?	VLT/SINFONI	M. Kraus
Deriving spin and inclination of the Sgr~A accretion disk from time-resolved polarized sub-flares. Exploiting statistically significant strong gravity features in Sgr~A* light curves*	APEX/LABOCA	V. Karas, M. Dovčiak
Spectroscopy of SDSS Binary Quasar Candidates: Spatially Resolved Kinematics	VLT-VIMOS	I. Stoklasová, B. Jungwiert, I. Ebrová, M. Křížek:
Testing the merger hypothesis for B[e] stars	2.2/FEROS	M. Kraus
Triggered Star Formation in the Carina Flare II	APEX/SHFI	J. Palouš, V. Sidorin, J. Dale, R. Wunsch

European Space Agency (ESA)

The list of the PECS projects at the Institute, till the end of 2010:

Project name	**PI**	**Period**
Czech participation on GAIA project	P. Koubský	2007–2011
Czech participation on INTEGRAL	R. Hudec	2005–2010
SOHO Observations and Data Analysis	P. Heinzel	2005–2010
GOCE – specific tasks on fine gravity field structure of the Earth	J. Klokočník	2007–2011
X-ray Observation XMM: Active galactic nuclei and black holes	V. Karas	2007–2011
BepiColombo: Kinetic processes in the solar wind, Mercury's magnetosheath and magnetosphere	P. Trávníček	2008-2012

Institute's scientists are also members of teams involved in ESA projects. Petr Heinzel is a member of the scientific team, as an associated scientist, of SUMER (*Solar Ultraviolet Measurements of Emitted Radiation*) experiment of SOHO (*Solar & Heliospheric Observatory*) satellite. Petr Hellinger is a member of *Cross-scale Science Study Team* within the *Cosmic Vision ESA program*. Rudolf Gális is a member of the ISDC (*Integral Science Data Center*) team working with the INTEGRAL satellite. René Hudec is a member of the OMC (*Optical Monitoring Camera*) experiment as well as a member of ISDC consortium of the INTEGRAL satellite. Pavel Koubský and René Hudec are leaders of workpackages within section CU7 of future ESA Gaia satellite. Pavel Trávníček is a co-investigator in the PEACE and WHISPER experiments of Cluster II satellite, Co-I in the PEACE experiment, the satellite Double Star, Principal Investigator in DualSegmented Langmuir Probe (DSLP) experiment of the Proba 2 satellite, member of scientific teams of MPPE and SERENA-PICAM experiments on the BepiColombo probe. He is also leading Co-I in the Radio Plasma Waves (RPW) consortium of the Solar Orbiter mission. Jana Kašparová is the Co-I in the STIX consortium on Solar Orbiter (X-ray imager). Petr Heinzel and Stanislav Gunár are members of the consortium for development of the solar coronograph ASPIICS for PROBA-3 mission. Arkadiusz Berlicki and Petr Heinzel are Co-I members in the international consortium of METIS coronagraph onboard the Solar Orbiter ESA mission.

The following scientists employed at the Institute are members of the **International Astronomical Union** (IAU, standing at the end of 2010):

P. Ambrož, M. Bárta, J. Borovička, V. Bumba, M. Burša, M. Dovčiak, S. Ehlerová, F. Fárník, A. Galád, P. Hadrava, P. Harmanec, P. Heinzel, R. Hudec, B. Jungwiert, V. Karas, M. Karlický, J. Kašparová, J. Kleczek, J. Klokočník, M. Klvaňa, D. Korčáková, P. Koten, P. Kotrč, P. Koubský, M. Kraus, J. Kubát, H. Mészárosová, D. Nickeler, J. Palouš, P. Pecina, L. Perek, P. Pravec, C. Ron, P. Schwartz, L. Sehnal, M. Sobotka, P. Spurný, M. Šidlichovský, Z. Šíma, V. Šimon, P. Škoda, S. Štefl, M. Vandas, J. Vondrák, and R. Wünsch.

The official representative of the Czech Republic to the IAU is the **Czech National Committee for Astronomy** (CNCA). The following scientists from the Institute were members of the CNCA at the end of 2010:

J. Borovička, P. Hadrava (chairman), P. Heinzel, M. Karlický, J. Palouš, P. Pravec, C. Ron (secretary), J. Vondrák.

The following IAU members are currently active in the committees of the **IAU bodies** (standing at the end of 2010):

J. Palouš: IAU vice-president, member of the IAU Exective Committee
J. Vondrák: member of the organizing committees of Division I (Fundamental Astronomy) and Commission 4 (Ephemerides)
C. Ron: Member of Finance Sub-Committee
P. Heinzel: member of the organizing committee of Commission 12 (Solar Radiation and Structure)
J. Borovička: member of the organizing committee and secretary of Commission 22 (Meteors, Meteorites and Interplanetary Dust)

The official representative of the Czech Republic to the IUGG (International Union of Geodesy and Geophysics) is the Czech National Committee of IUGG. The following scientist from the Institute is member of the CNC of IUGG at the end of 2010: Z. Šíma.

Involvement of scientists from the Institute in other important international organizations: Committee on Space Research (COSPAR), European Astronomical Society (EAS), American Astronomical Society (AAS), Royal Astronomical Society (RAS), European Geophysical Union (EGU), American Geophysical Union (AGU), International Association of Geodesy (IAG) and the International Union of Geodesy and Geophysics (IUGG), European Association for Solar Telescopes (EAST), Joint Organization for Solar Observations (JOSO), Scientific Committee on Solar-Terrestrial Physics (SCOSTEP) etc. The involvement in these and other organizations is given in the following list:

P. Ambrož: Member of the National Commission of SCOSTEP.
M. Bárta: Member of the National Commission of SCOSTEP.
J. Borovička: Member of EAS.
V. Bumba: Member of EAS.
F. Fárník: Vice-Chairman of the Czech National Board for Space Activities, Member of the Czech Space Office, Member of COSPAR.
P. Hadrava: Member of EAS.
P. Heinzel: Member of EAS.
R. Hudec: Member of AAAS and SPIE.
K. Jiřička: Member of the Committee on Radio Astronomy Frequencies (CRAF) of the European Science Foundation (ESF). Member of the International Union of Radio Science (URSI), commission J (Radio Astronomy).
B. Jungwiert: Member of AAS and EAS.
V. Karas: Member of RAS.
M. Karlický: Member of the Executive committee of WISER (World Institute for Space Environment Research, University of Adelaide). Co-leader of WISER Research Working Group on Sun/Heliosphere.
J. Klokočník: Member of COSPAR, IAG/IUGG, EGU, AGU.
P. Kotrč: Member of the Board of the JOSO and JOSO National Representative.
J. Palouš: EAS vice-president, member of the EAS Council, Member of Royal Society of Edinburgh.
L. Perek: Associate Member of the Royal Astronomical Society since 1970. Member of the Deutsche Akademie der Naturforscher Leopoldina since 1975. Member of the International Institute of Space Law since 1977, member of its Board of Directors 1996-2006. Member of the International Academy of Astronautics since 1977, Advisor to its President 2002-2006. Honorary Member of the Academie Nationale de l'Air et de l'Espace, Toulouse, since 1994. Member of EAS.
P. Pravec: Member of the Division of Planetary Sciences of the AAS. Member of the Spaceguard Foundation.
L. Sehnal: Since 1998 full member of the International Academy of Astronautics. Member of COSPAR Scientific Commissions and COSPAR Finance Committee. Member of IAF and AGU. Member of the Special Study Group of the IAG No. 2.130.
M. Sobotka: National representative in the European Association for Solar Telescopes (EAST) since 2006.
Z. Šíma: Since 1995 member of the International Geoid Service, Special Working Group of the GSFC/DMA. Since 1995 member of Special Commission SC3 – Fundamental Astrogeodetic Constants of the IAG/IUGG; Inter-Commission Committee on Planetary

Geodesy of IAG/IUGG. Member of Scientific Instrument Society. Member of Società Astronomica Italiana.

S. Šimberová: Representative of the Czech and Slovak Republics of TC13 Pattern Recognition in Astronomy and Astrophysics of the International Association for Pattern Recognition (IAPR).

M. Vandas: Member of COSPAR, Since 2002 member of the National Committee of SCOSTEP.

J. Vondrák:. Since 2005 Czech National Representative to ICSU (International Council for Science).

XIII Research Fellows

Marek Abramowicz (Galaxies and Planetary Systems)
Visiting Scientist of the Academy of Sciences of the Czech Republic, Professor of Astrophysics and chair at Göteborg University and Chalmers University of Technology. His interests include a wide variety of issues in astrophysics and general relativity, from accretion discs theory, active galactic nuclei and neutron stars, to black holes, nature of inertial forces and quantum effects in strong gravity.

Pavel Ambrož (*1941, pambroz@asu.cas.cz, Solar Physics, emeritus)

Research fields: Large-scale and global properties of solar magnetic and velocity fields, structure of kinetic energy distribution, solar differential rotation and meridional circulation. Dynamic properties of the solar convection zone and of the solar atmosphere. Structure of the solar corona, models of the coronal magnetic field and their temporal variations. Stationary and dynamic models of the solar corona and coronal radiation related to the observed brightness distribution. 1958-1963 study of physics, graduated from the Natural Sciences Faculty of J. E. Purkyně University, Brno. Since 1964 in the Astronomical Institute. 1972 PhD in astrophysics.1981 graduated in astronomy and astrophysics from the Faculty of Mathematics and Physics of Charles University, Prague. 1977-1990 Deputy Head and Head of the Solar Department. Since 1985 external lecturer on Solar Physics at the Faculty of Mathematics and Physics of Charles University, Prague.

Eva Arazimová (*1984, arazimova@sunstel.asu.cas.cz, Stellar Physics, PhD student)

Research fields: Local sample of white dwarfs, their atmospheric properties and distribution within our Galaxy. In 2008 graduated in Astronomy and Astrophysics from the Faculty of Mathematics and Physics of Charles University, Prague. Since 2008 PhD student at Charles University, PhD thesis “White dwarfs in the Solar Neighbourhood”. Supervisor: A. Kawka

Anna Aret (*1964, aret@sunstel.asu.cas.cz, Stellar Physics)

Research fields: Modelling of physical processes in stellar atmospheres. 1989 graduated from Physics department of Moscow State University. 1993 MSc in astrophysics from University of Tartu. 2009 PhD in astrophysics. Since October 2010 at the Astronomical Institute.

Miroslav Bárta (*1973, barta@asu.cas.cz, Solar Physics)

Research fields: Numerical MHD with applications to the physics of solar flares and prominences (solar-flare reconnection, current-sheet dynamics, energy cascades in magnetic reconnection, MHS equilibria in prominences), Computational Astrophysics (2D/3D MHD simulations, multi-scale/AMR numerical modelling of space-plasma processes), Solar radiophysics (plasma waves, wave dynamics, plasma micro-instabilities, radio emission theory, interpretation of radio bursts), High-Performance Computing (computer clusters, MPI, CUDA, parallel algorithms and their application to MHD numerical modelling). 1996 graduated from the Faculty of Mathematics and Physics of Charles University, Prague. 2003 PhD in Astrophysics at Charles University, 2008-2011 postdoc at Max Planck Institute for Solar System Research in Katlenburg-Lindau, Germany.

Kateřina Bartošková (*1985, bartoskova@ig.cas.cz, Galaxies and Planetary Systems, PhD student)

Research fields: N-body simulations of galaxy mergers, shell galaxies, Local Group galaxies 2007. Bachelor degree obtained in Applied Physics (Spec.: Astrophysics), Faculty of Science, Masaryk University, Brno; 2010 Master degree (Theoretical physics and astrophysics), Faculty of Science, Masaryk University, Brno; since 2010 PhD studies at Faculty of Science, Masaryk University, Brno and works part-time at the Astronomical Institute.

Arkadiusz Berlicki (*1971, berlicki@asu.cas.cz, Solar Physics)

Research field: Solar atmosphere and active events: Flares, prominences, Ellerman bombs, chromospheric structures; NLTE modelling of the solar atmosphere in flares, prominences and other chromospheric structures. Solar spectroscopy: instrumentation and observations. 1995 graduated from the Faculty of Mathematics, Physics and Chemistry of the University of Wrocław (Poland) , 2002 PhD in Astrophysics at University of Wrocław, 2009 habilitation (DrSc) in Astrophysics. 2003-2005 postdoctoral position in the Observatoire de Paris (France), 2006 short postdoctoral position at Utrecht University (The Netherlands). Lecturer at the University of Wrocław. Visiting scientist at Observatoire de Paris (France). Since 2010 Co-I in the ESA Solar Orbiter/METIS consortium. Responsible person for the solar robotic optical telescope SORT. Member of International Astronomical Union (IAU).

Aleš Bezděk (*1970, bezdek@asu.cas.cz, Galaxies and Planetary Systems)

Research Fields: Celestial mechanics, orbital dynamics of low earth artificial satellites, modelling of Earth gravity field, kinematic orbits, orbital resonances, atmospheric drag, models of thermospheric density, use of satellite microaccelerometric data. 1997 graduated from the Faculty of Mathematics and Physics of Charles University in Prague. 2004 PhD in Astronomy, Charles University in Prague.

Thomas G. Bisbas (*1982, tb@star.ucl.ac.uk, Galaxies and Planetary Systems)

Research fields: radiation-hydrodynamics simulations, radiative transfer, self-gravity, smoothed-particle-hydrodynamics codes; interstellar medium, triggered star formation, H_{II} regions; super star cluster formation, thermal instability; astrochemistry. 2004 graduated from the Aristotle University of Thessaloniki, Greece. 2009 PhD in Astrophysics, Cardiff University, Cardiff, U.K. 2009-2010 postdoc stay at the Academy of Sciences Czech Republic. 2010-present postdoc at the University College London, London, U.K. Member of the Hellenic Astronomical Society (Hel.As.Et).

Jiří Borovička (*1964, borovic@asu.cas.cz, Interplanetary Matter)

Research fields: Physics of meteor flight in the atmosphere, meteor spectroscopy, chemical composition, structure and origin of meteoroids, radiation of meteor trains, reduction methods for determination of meteor trajectories and light curves. 1987 graduated in Astronomy from Charles University, Prague. Since 1988 at the Astronomical Institute, 1993 PhD in Astronomy. 2000–2004 Head of the Interplanetary Matter Department, since 2004 Deputy Director of the Astronomical Institute, since 2007 chairman of the Council of the Astronomical Institute. 1998–2001 chairman of the Czech Astronomical Society. 1997 Junior Award from the Learned Society of the Czech Republic, 2002 Otto Wichterle Premium from the Academy of Sciences.

Václav Bumba (*1925, bumba@asu.cas.cz, Solar Physics, emeritus)

Research Fields: Solar magnetic and velocity fields global, as well as local, dynamics of their changes in relation to various solar global and local activity phenomena and their geoactivity. Author or co-author of more than 380 scientific papers, co-author of the Atlas of Solar Magnetic Fields, Carnegie Institute of Washington, Publ. No 626, Washington 1967. Prizes of the Czechoslovak Academy of Sciences (1953, 1967), Czechoslovak State Prize (1961). Medals of various scientific institutions home and abroad. 1949 graduated from Charles University, Prague, 1950 RNDr. degree from Charles University. 1955–1958 PhD study at Crimean Astrophysical Observatory, 1960 PhD from State Univ. Moscow, 1964 Mt. Wilson and Palomar Observatories (UNESCO and Carnegie Institute Scholarships), Pasadena, 1967 DrSc. degree from State Univ. Moscow, 1975 Corresponding member ČSAV. Since 1948 at the Astronomical Institute (State Observatory), 1970–1987 Deputy Chief and head of the Solar Department, 1968–1975 Deputy Director, 1975–1990 Director of the Institute. Chairman and Vice-chairman of the Scientific board of the Czechoslovak Acad. od Sci. for astronomy, geophysics, geodesy and meteorology (1976 - 1990), Scientific secretary (1972 - 1980) and Vice-president (1980 - 1983) of the Czechoslovak Commission Interkosmos,

delegate of the Czechoslovak Republic to the UN Committee on the Peaceful Uses of Outer Space and its Scientific and Technical Subcommittee (1972 - 1979), Chairman of the Czechoslovak National Committee for Astronomy (1976 - 1990). Member of the International Academy of Astronautics (since 1981) and Foreign Member of the Russian Acad. of Sci (since 1988). Vice-president and President of Commission 10 of the IAU (1974 - 1982) and many years its representative in FAGS, MONSEE and IUWDS. Since the foundation in 1967, Member and since 1998 Honorary Member of the Editorial Board of Solar Physics.

Michal Bursa (*1977, bursa@astro.cas.cz, Galaxies and Planetary Systems)

Research fields: Relativistic astrophysics of compact sources, especially effects of strong-gravity lensing near compact objects, short-term variability of accreting black holes. 2006 PhD from Charles University in Prague.

Milan Burša (*1929, bursa@ig.cas.cz, Galaxies and Planetary Systems, emeritus)

Research fields: Figures of the Earth, Moon and Planets, Earth‘s rotation, tidal evolution of the Sun-Earth-Moon system, dynamics of tidal development of satellite systems of selected planets (Mars, Saturn, Uranus, Neptune). Author of 438 scientific papers and 15 books including “Gravity Field and Dynamics of the Earth” (co-author K. Pěč), 1993, Springer-Verlag. 996 references in foreign scientific publications. 1948–1951 study of Geodesy, Czech Technical University in Prague. 1951–1955 study of Astronomy and Geodesy, Moscow Geodetic Institute. 1959 PhD in Geodesy. 1973 DSc. in Astronomy. Since 1974 at the Astronomical Institute, until 1990 as Head of the Department of Dynamics of the Solar System, since 1987 Professor at the Czech Technical University Prague, 1983–1987 vice-president of the IAG, 1983–1987 president of the Special Study Group 5.99 “Tidal Friction and the Earth‘s Rotation” of the IAG. 1987–1991 president of the Special Study Group 5.100 “Parameters of Common Relevance of Astronomy, Geodesy and Geodynamics“ of the IAG. 1991–1995 president of commission SC-3 IAG Fundamental astrogeodetic constants. Since 2003 member of the IAG/IAU inter-union WG on reference systems and rotational elements of the planets and the satellites.

Zdeněk Ceplecha (*1929, +4.12.2009, Interplanetary Matter, emeritus)

Research fields: Minor bodies of the solar system, meteors, meteoroid interaction of interplanetary bodies with the Earth‘s atmosphere. 1952 graduated from Charles University, Prague, 1956 PhD in Astronomy, 1967 DSc in Astrophysics, since 1951 working at the Astronomical Institute. 1977–1993 Head of the Interplanetary Matter Department, 1968–1971 Research Associate to the Smithsonian Institution USA, founder of the European Fireball Network. In 1994 became one of the 35 Founding Members of the newly established Learned Society of the Czech Republic. Published 177 papers on meteors, fireballs, comets and on atmospheric interaction and classification of meteoroids, succeeded in taking double-station rotating-shutter photographs of a meteorite fall in 1959 (Příbram multiple fall), the first scientific photographs of such an event ever made. Awards: 1984 ‘G.P. Merrill Award’ from the National Academy of Sciences of the USA, 1970 ‘Laureate of the State Award’, asteroid No. 2198 named ‘CEPLECHA’, 1989 ‘The Gold Medal for Physical Sciences’ from the Czechoslovak Academy of Sciences, 2004 ‘F.Nušl Award’, 2006 Praemium Bohemiae

Award, 2009 Honor Medal of the Czech Academy of Sciences "De scientia et humanitate optime meritis", 2009 from the President of the Czech Republic State Medal of Merit II for research of meteors and meteoroids.

David Čapek (*1977, capek@sunkl.asu.cas.cz, Interplanetary Matter)

Research fields: Non-gravitational effects on small solar system bodies (Yarkovsky and YORP effect), thermal stress and rotation of meteoroids. 2000 graduated from Faculty of Mathematics and Physics of Charles University, Prague. 2007 graduated from Faculty of Science of Charles University, Prague (specialization Geology). 2007 PhD in Astronomy. Since 2008 at the Astronomical Institute.

Jan Čechura (*1985, cechura@astro.cas.cz, Galaxies and Planetary Systems)

Research fields: Radiation hydrodynamics of the circumstellar matter in the vicinity of binaries and X-ray binaries in particular. 2008 graduated from Faculty of Mathematics and Physics of Charles University, Prague (Bc. General Physics). 2010 graduated from Faculty of Mathematics and Physics of Charles University, Prague (Mgr. Astronomy and Astrophysics). Since 2010 Ph.D. studies in Theoretical physics, Astronomy and Astrophysics. Since 2010 at the Astronomical Institute.

James Dale (*1977, jim@ig.cas.cz, Galaxies and Planetary Systems)

Research fields: Star formation, stellar feedback, numerical modelling of HII regions and stellar winds, gravitational instabilities and fragmenting shells, triggered star formation, stellar collisions and mergers. 1999: BA in Natural Sciences, Cambridge University, 2000: MSc in Experimental and Theoretical Physics, Cambridge University, 2004: PhD in Astrophysics, Cambridge University. 2004--2007: Postdoctoral Researcher, University of Leicester. 2007--2008 Wenner Gren postdoctoral researcher and lecturer in stellar evolution, Lund University. 2008--present: Marie Curie Research Fellow at the Astronomical Institute in Prague.

Bartosz P. Dąbrowski (*1974, bdabrow@asu.cas.cz, Solar Physics)

Research fields: solar radio emission in particular short lived events, like the millisecond radio spikes, hard X-ray emission, plasma physics, processes of the magnetic energy release in observed solar events, investigating the mechanisms of the solar radio emission generation, processes connected with particles propagation in the solar atmosphere, reconnection of magnetic field, solar observations with ALMA, ALMA project, data analysis using CASA (Common Astronomy Software Application) package. 1993 – 1998 studies at the Nicolaus Copernicus University, Toruń at the Physics and Astronomy Department, Poland; September 1998 M.Sc., Astronomy, Nicolaus Copernicus University, Toruń, Poland; 1998 – 2005 Ph.D. studies, Astronomy, Nicolaus Copernicus University, Toruń, Poland; March 2007, defended Ph.D. thesis “Short lived events of solar radio activity”, Nicolaus Copernicus University, Toruń, Poland; November 2007 – September 2008, postdoctoral position at the Institute of Astronomy Swiss Federal Institute of Technology Zürich (ETH Zürich); October 2008 – September 2009, postdoctoral position at the Royal Observatory of Belgium, Brussels.

Michal Dovčiak (*1973, dovciak@astro.cas.cz, Galaxies and Planetary Systems)

Research field: Astrophysical processes around black holes, X-ray spectroscopy of active galactic nuclei and microquasars, development of general relativistic models for XSPEC. Graduated from the Faculty of Mathematics and Physics at Charles University in Prague (theoretical physics) in 1998. 1998-2004 PhD studies at the Faculty of Mathematics and Physics, Charles University, Prague (astrophysics). Since 2003 at the Astronomical Institute of the Academy of Sciences of the Czech Republic.

Elena Dzifčáková (*1956, elena@asu.cas.cz, Solar Physics)

Research fields: Plasma physics, spectroscopic diagnostics, physics of the solar corona, ionization and excitation equilibrium in the solar corona for the non-thermal electron distributions, diagnostics of the non-thermal distributions in corona and transition region, solar flares, analysis of the magnetic topology of solar flares, computation of magnetic field in solar corona from photospheric measurements, coronal emission modeling. 1975-1980 study of physics, graduated from the Faculty of Mathematics and Physics, Comenius University, Bratislava. 1990 PhD in Astrophysics, 2003 Associate Professor in physics at Faculty of Mathematics, Physics and Informatics, Bratislava. 1980-1983 Physical Institute of the Slovak Academy of Science, 1983-1990 Astronomical Institute of the Slovak Academy of Science, 1990-1993 Assistant Professor, Faculty of engineering, Slovak Technical University Košice, 1993 - 2007 Faculty of Mathematics and Physics, Comenius University, 2007-2009 external lecturer at the Comenius University. Since 2007 at the Astronomical Institute Ondřejov. Member of the International Astronomical Union.

Ivana Ebrová (*1982, ivana@ig.cas.cz, Galaxies and Planetary Systems)

Reasearch fields: Minor mergers of galaxies, simulations of creation of shell galaxies, dynamical friction. 2007 graduated from Faculty of Mathematics and Physics of Charles University, Prague. Since 2007 at the Astronomical Institute.

Soňa Ehlerová (*1972, sona@ig.cas.cz, Galaxies and Planetary Systems)

Research fields: Interstellar medium, HI shells and supershells (automatic detection algorithm, statistical studies of shells in the Milky Way, numerical simulations), star formation. 1995 graduated from the Faculty of Mathematics and Physics of Charles University, Prague. 1995 and 1999 scientific stays in Kiel (Germany), 1997 observations with the Effelsberg radiotelescope (Germany). 2000 PhD in Astrophysics. Since 2001 an external lecturer at the Faculty of Mathematics and Physics, Charles University, Prague (Exercises in the Galactic Astronomy). Member of the International Astronomical Union.

Jan Elner (*1982, janelner@centrum.cz, Stellar Physics, PhD sudent)

Research fields: Multiple stars spectra decomposition and data analysis, applications of Fourier disentangling. 2006 graduated in Astronomy and Astrophysics from the Faculty of

Mathematics and Physics of Charles University, Prague. Since 2006 PhD student at Charles University. Supervisor: P. Koubský.

František Fárník (*1946, ffarnik@asu.cas.cz, Solar Physics)

Research fields: X-ray emission of solar flares – instrumental aspects of X-ray detection, analysis of observational data from broad-band detectors and telescopes. In 1970 graduated from the J.E. Purkyně University in Brno (Physics), since graduation a staff member of the Astronomical Institute of the Academy of Sciences of the Czech Republic. 1978 PhD in Astrophysics. Principal investigator of several X-ray instruments onboard Prognoz, Phobos and Coronas spacecrafts. Since 1990 cooperating with scientists from the Space Research Laboratory in Utrecht, Netherlands, the Space Environment Center in Boulder, Colorado, USA, the Institute of Space and Astronautical Sciences in Tokyo, Japan and many others. Principal investigator of the hard X-ray spectrometer launched on March 12, 2000, as a part of the US MTI project. In recent years organizing and supporting participation of the Astronomical Institute in the Science Program of ESA, especially in the Solar Orbiter project.

Adrián Galád (*1970, adriangalad@yahoo.com, Interplanetary Matter)

Research fields: Physical properties of asteroids in the inner part of the Solar System, photometry of asteroids. Graduated in Astronomy from the Faculty of Mathematics, Physics, and Informatics, Comenius University, Bratislava, Slovakia, in 1993. Scientific researcher at Astronomical Observatory in Modra, Slovakia, since 1994, PhD in Astronomy in 2001, at the Astronomical Institute since 2004 (part time), member of the IAU since 2006.

Christian Gruber (*1968, gruber@asu.cas.cz, Galaxies and Planetary Systems)

Research fields: Spherical harmonic expansion via fast Fourier transformation. Gravity field determination from satellite observations. Dynamical satellite geodesy & orbit determination. Satellite resonances and latitude lumped coefficients analysis. 1996 graduation from the University of applied Sciences, Faculty of Surveying and Cartography, Munich. 2003 Dipl.-Ing. from the Faculty of Physical Geodesy of the Technical University, Berlin. In Mai 2007 defense of his doctoral thesis at the Technical University, Berlin. Since May 2009 postdoctoral position at the German Research Centre for Geosciences (GFZ) in Munich.

Stanislav Gunár (*1981, gunar@asu.cas.cz, Solar Physics)

Research fields: Solar prominences: multi-dimensional non-LTE radiative transfer, modeling of synthetical spectra. 2004 graduated from the Faculty of Mathematics, Physics and Informatics of Comenius University, Bratislava. In December 2007 defended a doctoral thesis at the Faculty of Mathematics and Physics of the Charles University, Prague. Since January 2008 postdoctoral position at Astronomical Institute. Since 2010 local instrument manager for the Czech contribution to the ASPIICS coronagraph onboard PROBA-3 mission of ESA.

Rudolf Gális (*1973, rudolf.galis@upjs.sk, Stellar Physics)

Research fields: Interacting binaries, cataclysmic and symbiotic variable stars as well as the near contact binaries with focus on mass transfer, generation and physical mechanisms of active regions and activity of these systems in optical and X-rays. 1996: graduated (M.Sc.) from Faculty of Mathematics and Physics of Comenius University, Bratislava. 1996 - 1999: PhD study at Astronomical Institute of Slovak Academy of Sciences in Tatranská Lomnica. 2001: graduated (Ph.D.) from Faculty of Mathematics, Physics and Informatics, Comenius University in Bratislava. Since 1999 assistant professor at Faculty of Sciences, P. J. Šafárik University in Košice.

Petr Hadrava (*1951, had@sunstel.asu.cas.cz, Galaxies and Planetary Systems)

Research fields: Theory of stellar atmospheres, classical and relativistic radiative transfer, radiation hydrodynamics; binary stars, circumstellar mass, solution of radial-velocity and light-curves (FOTEL code), disentangling of spectra of multiple stars (KOREL code), spectroscopic and photometric observations of stars; relativistic astrophysics, dynamics and appearance of accretion discs; history of medieval and renaissance astronomy. 1974 graduated in Theoretical Physics from the Faculty of Mathematics and Physics of Charles University, Prague. 1980 PhD in Astrophysics, 2001 DrSc in Astrophysics, 2004 Associate Professor of Theoretical Physics at Charles University. 1975–2004 at the Stellar Department of the Astronomical Institute, then at the Department of Galaxies and Planetary Systems. External lecturer and member of the Supervisory Board for PhD studies at the Faculty of Mathematics and Physics of Charles University Prague. 1997–2001 part-time Professor at Trondheim University (NTNU). Member of International Astronomical Union and chair of National Committee for Astronomy.

Petr Heinzel (*1950, pheinzel@asu.cas.cz, Solar Physics)

Research fields: Solar atmosphere: Flares, prominences, coronal loops, chromospheric structure. Non-LTE radiative transfer: numerical methods for multi-level problems, partial frequency redistribution, accelerated lambda iteration techniques, 2D-transfer. Model atmospheres: structure and dynamics of the chromosphere and flares, the physics of isolated plasma structures (loops, prominences, chromospheric network). Radiation-hydrodynamics: time-dependent non-LTE problems, energy balance, heating mechanisms. Spectral diagnostics: analysis of UV, optical and radio spectra, semi-empirical models. 1974 graduated from the Faculty of Mathematics and Physics of Charles University in Prague, 1982 PhD in astrophysics, 1993 DSc in astrophysics, 2005 Associate Professor at Charles University, Director of the Institute since 2004, external lecturer on stellar atmospheres at Charles University, Wroclaw University and Komenský University, member of the Supervisory Boards for PhD students. Supervisor of PhD students at Charles University. Involvement in ESA space projects, namely SOHO, Solar Orbiter and Proba 3. Visiting professor at Université de Paris, Observatoire de Meudon, Wroclaw University and MPA Garching.

Petr Hellinger (*1970, petr.hellinger@ig.cas.cz, Solar Physics)

Research fields: Nonlinear phenomena in space plasmas, collisionless shocks, kinetic instabilities; numerical simulations and theoretical modelling. 1993 graduated in Theoretical physics from Charles University, Prague. 1996 PhD in Space plasma physics at Université de Paris (Orsay), Observatoire de Paris-Meudon, France. Scientific researcher at the Institute of Atmospheric Physics, AS CR, since 1995. Since 2008 member of the Solar Physics Department (part time).

Tomáš Henych (*1984, ftom@physics.muni.cz, Interplanetary Matter, PhD student)

Research fields: Asteroid collisions, impact processes, rotational dynamics, binary asteroid dynamics and tides, asteroid photometry and astrometry. In 2008 graduated in Astrophysics from the Faculty of Science, Masaryk University, Brno. Since 2008 PhD student at Masaryk University. Supervisor: Petr Pravec.

David Herčík (*1983, dh@ig.cas.cz, Solar Physics, PhD student)

Research fields: Data analysis from numerical simulations and in situ observations of space plasma, H/W development for space instrumentation - magnetometers. 2007 graduated in Applied Physics from Czech Technical University, Prague. Since 2004 at the Institute of Atmospheric Physics, AS CR. Since 2010 member of the Solar Physics Department (PhD student). Involved in projects DSLP-Proba2, Solar Orbiter, JGO.

Jiří Horák (*1978, horak@astro.cas.cz, Galaxies and Planetary Systems)

Research fields: Relativistic astrophysics of compact sources, oscillations of relativistic fluid tori, variability and polarization of X-rays from compact objects. 2005 PhD from Charles University in Prague. Since 2006 at the Astronomical Institute.

René Hudec (*1951, rhudec@asu.cas.cz, Stellar Physics)

Research fields: High energy astrophysics with emphasis on multi-spectral analyses and eruptive processes in cosmic plasma. Gamma ray bursts (GRB), galactic and extragalactic X-ray and gamma-ray sources (AGNs, QSOs, blazars). Searches for counterparts at optical wavelength. Analyses of evolution and emission mechanisms. Designer of space and ground-based experiments in these areas. Development and design of X-ray optics and X-ray telescopes for space as well as laboratory applications. 1970 graduated from the Technical Faculty of General Engineering, 1975 graduated from Charles University, Faculty of Mathematics and Physics, 1978 RNDr. degree from Charles University, Prague, 1981 PhD Czechoslovak Academy of Sciences Prague, 2007 habilitation (Assoc. Prof.) at Czech Technical University in Prague. Since 1975 at the Astronomical Institute. Since 1989 Head of Working Group on Interdisciplinary Astrophysics, later Head of the Group of High Energy Astrophysics. Principal Investigator of satellite and ground-based projects (e.g., X-ray telescope TEREK-FOBOS). Since 1992 Principal Investigator of the European Central Initiative Cooperation Project Investigation of GRB. Since 1996 Co-I and consortium member

of the experiment OMC onboard the INTEGRAL ESA, and Co-I and consortium member of the INTEGRAL Science and Data Center ISDC. Since 1996 PI of the Czech participation in the INTEGRAL satellite program, ESA. Since 2005 member of the CU7 Coordination Unit, ESA Gaia. Since 2009 member of the Telescope Working Group of the project ESA IXO (now Athena). Since 2010 Co-I and consortium member, ESA LOFT. Author and co-author of 602 scientific papers and communications (177 in refereed journals).

Pavel Jáchym (*1978, jachym@ig.cas.cz, Galaxies and Planetary Systems)

Research fields: Dynamics and evolution of galaxies in galaxy clusters and groups, numerical simulations (N-body tree/SPH algorithms) of environmental effects in galaxy clusters (ram pressure stripping, galaxy harassment, tidal interactions), millimeter observations of environmentally affected galaxies. 2001: MSc in Astronomy and Astrophysics at Charles University in Prague, 2006: PhD in Astrophysics at Charles University and University Paris 6. 2003-2004: Marie Curie fellowship for graduate students at Paris Observatory, 2009: short term attachment at IRAM Grenoble, 2009-2010: Fulbright-Masaryk Scholarship at Yale University.

Karel Jiřička (*1944, jiricka@asu.cas.cz, Solar Physics)

Research fields: Solar radio flares, instrumentation for radio astronomy (low-noise receivers, data acquisition systems, etc), analysis, processing, and archiving of radioastronomical data. 1967 graduated from the Faculty of Electrical Engineering of the Czech Technical University in Prague. 1973 PhD in Radio Science. Since 1975 at the Astronomical Institute. Member of the CRAF (Committee on Radio Astronomy Frequencies) of the ESF (European Science Foundation), member of the URSI (International Union of Radio Science) Commission J (Radio Astronomy).

Bruno Jungwiert (*1970, bruno@ig.cas.cz, Galaxies and Planetary Systems)

Research fields: Dynamics and evolution of galaxies, N-body simulations, spectroscopy. 1993 Master degree in Physics (Charles University, Prague); 1995 DEA (Diplome d´Etudes Approfondies) in Astrophysics and Space Techniques (Meudon Observatory); 1998 PhD in Astrophysics at Université Paris VII and Charles University. Since 1998 researcher at the Astronomical Institute ASCR. Prize of the Academy of Sciences of the Czech Republic for young researchers (1999). Long-term stays abroad: Meudon Observatory, Paris Observatory, Centre de Recherche Astronomique de Lyon (post-doc, Marie Curie Research Training Network "Euro3D-Promoting 3D Spectroscopy in Europe"), University of California (Los Angeles, Riverside). PI and co-I of observational projects with large and medium size telescopes (VLT, Keck, HST, WHT, Calar Alto 3.5m, Lick Observatory 3m). Lecturer and supervisor of undergraduate and graduate students at the Charles University in Prague and Masaryk University in Brno. Member of the Council of AI ASCR since 2007.

Jan Jurčák (*1978, jurcak@asu.cas.cz, Solar Physics)

Research fields: Magnetic fine structure and velocity fields in sunspots, analyses of high spatial resolution spectroscopy and spectropolarimetry. 2002 graduated from the Charles University, Prague, Master's Degree in astrophysics. Since 2002 at the Astronomical Institute, Solar Department. 2006 PhD in astrophysics, Charles University, Prague. 2004 four-month stay at Instituto de Astrofisica de Canarias (IAC) as an EARA fellow. 2006 - 2008 post-doc position at National Astronomical Observatory of Japan (NAOJ), Mitaka as a JSPS fellow.

Vladimír Karas (*1960, vladimir.karas@cuni.cz, Galaxies and Planetary Systems)

Research fields: Relativistic astrophysics; radiation processes in strong gravity and their applications to active galactic nuclei and Galactic black holes. 1998 Associate Professor, 2001 DrSc in Astrophysics. Since 2004 a research scientist at the Astronomical Institute, Head of the Group of Relativistic Astrophysics, Deputy for Foreign Relations of the Institute and Head of the Prague Section of the Institute. Supervisor of undergraduate and graduate students. Member of professional organizations: International Astronomical Union, Royal Astronomical Society, International Society on General Relativity and Gravitation. Author of research and educational articles. Translator of popular science books.

Marian Karlický (*1949, karlicky@asu.cas.cz, Solar Physics)

Research fields: Solar flare physics: evolution of superthermal particles in flare loops, evaporation, reconnection of magnetic field, hard X-ray emission, polarization of optical chromospheric lines. Solar radioastronomy: radio bursts in metric, decimetric and microwave frequency ranges. Plasma astrophysics: Langmuir waves in current-carrying plasma, tearing and coalescence processes in flare current sheet, solutions of Zakharov equations, electron, proton and neutral beams, return current. Numerical modeling: particle (parallel version), hybrid and MHD codes. 1973 graduated from J. E. Purkyně University in Brno, 1976 RNDr degree from Charles University, Prague, 1981 PhD in Solar Plasma Physics, 1992 DSc in Astrophysics, 2008 Associate Professor. Several stays abroad – Meudon Observatory, Trieste Observatory, Potsdam Observatory, Glasgow University, Birmingham University, Colorado University, Nanjing University, Beijing Astronomical Observatory, INPE Sao Jose dos Campos, Brazil, Nobeyama Observatory, Japan, JAXA/ISAS Japan, New Jersey Istitute of Technology, USA. 1990–1996 Head of the Solar Department, 1996–2004 Deputy Director of the Astronomical Institute, since 2004 Head of Working Group Physics of solar flares and prominences. Since 2002-2009 Member of the Scientific Council of the Academy of Sciences of the Czech Republic. Member of Editorial Board of Solar Physics journal since 2005. Since January 2010 head of the Czech ESO-ALMA ARC node.

Jana Kašparová (*1976, kasparov@asu.cas.cz, Solar Physics)

Research fields: Solar flares: non-LTE radiative transfer, analysis of optical and hard X-ray spectra. 1999 graduated from the Faculty of Mathematics and Physics of Charles University, Prague. 2004 PhD in Theoretical Physics, Astronomy and Astrophysics at Charles University, Prague.

Adela Kawka (*1977, kawka@sunstel.asu.cas.cz, Stellar Physics)

Research fields: Evolution, atmospheric properties of white dwarfs, and their distribution within our Galaxy, close binary systems: their evolution, orbital parameters and atmospheric properties of the components stars. Spectroscopic and photometric observations in the optical and ultraviolet of white dwarfs and close binaries. Obtained a PhD in 2004 at Murdoch University, Perth, Australia. Since 2004 at the Astronomical Institute.

Jaroslav Klokočník (*1948, jklokocn@asu.cas.cz, Galaxies and Planetary Systems)

Research fields: Satellite dynamics, orbit determination from observations, gravity field of the Earth, orbital resonances, navigation for applied satellites, satellite (crossover) altimetry, tests of accuracy of gravity field models, gradiometry, GOCE; archeoastronomy of Mesoamerica and South America. In 1971 graduated in Space Geodesy from the Czech Technical University, Prague. 1979 PhD in Astronomy. 1996 DSc in Astronomy. 2000 Associate Professor of Geodesy, senior lecturer of geodesy, CTU Prague., 2010 Prof. of Geod., CTU Prague. Researcher at the Astronomical Institute. Several stays in Germany, USA, and other countries. Member of several special study groups of IAG/IUGG, member of EGU, AGU, IAU, COSPAR, etc; principal investigator of ESA PECS grant on GOCE gradiometry. About 160 research papers, with at least 165 references in foreign periodicals.

Miroslav Klvaňa (*1943, mklvana@asu.cas.cz, Solar Physics)

Research fields: Magnetic and velocity fields in solar active regions and quiet photosphere (observations, interpretation, and modelling), instrumentation, data processing. 1966 graduated in Physics from Technical University of Leningrad. Since 1968 at the Astronomical Institute, Solar Department. 1978 PhD in Astrophysics. 1969–1972 development of the Ondřejov first scanning photoelectric magnetograph, 1972 first photoelectric measurements of solar magnetic and velocity fields in Czechoslovakia, 1972-1983 systematical magnetographic measurements and their physical interpretation, 1985–1990 development of the Ondřejov second generation scanning photoelectric magnetograph SOLMAG, 1990-2001 coordinator and head of group of magnetographic measurements by SOLMAG. 1997-1998 reconstruction of control system of the solar telescope at Hvar Observatory (Jugoslavia), team member for construction of large solar telescopes at Canary Islands (1,5m GREGOR, 4m Europen Solar Telescope EST). 2003-2006 reconstruction of spectroheliograph in Coimbra, Portugal, 2004-2009 development of Solar Spectra Analyser SOLSPAN at Ondřejov Observatory. Cooperation with Groups of magnetographic measurements (Potsdam-SRN, Irkutsk-Russia, Crimean Astrophysical Observatory, Ukraine). Author and co-author more than 200 publications and holder of 3 patents.

Ondřej Kopáček (*1981, kopacek@ig.cas.cz, Galaxies and Planetary Systems, PhD sudent)

Research fields: Dynamics of charged particles in the vicinity of magnetized compact objects, deterministic chaos in relativistic systems, magnetospheres of accreting black hole systems. Since 2007 PhD student at Charles University. Supervisor: V. Karas.Topic of the Thesis: Transition from regular to chaotic motion in black hole magnetospheres.

Daniela Korčáková (*1975, kor@sunstel.asu.cas.cz, Stellar Physics)

Research fields: Modeling of stellar atmospheres, radiative transfer, stellar winds, observation and analysis of spectra of B[e] stars. 1993-1998 study physics with a specialisation to the astronomy at the faculty of science of the Masaryk University in Brno, diploma thesis "Spectroscopy of the cool star beta UMi", supervisor V. Štefl, 1998-2003 postgraduate study at the faculty of science of the Masaryk University, PhD thesis "NLTE models of the moving stellar atmospheres", supervisor J. Kubát, 1998 part-time research assistant at the Astronomical Institute of the AS CR in Ondřejov, 2002 full-time research assistant at the Institute in Ondřejov. Since 2006 member of the IAU. 2009 full-time scientific position at the Institute. 2009 Otto Wichterle Premium from the Academy of Sciences.

Pavel Koten (*1972, koten@asu.cas.cz, Interplanetary Matter)

Research fields: Photometry, light curves and physical structure of faint video meteors, models of meteoroids, double station observations of meteors, trajectory computation, image processing of video meteors, automation of the observation and data proccesing, meteor streams identification. 1996 MSC, graduated from the Faculty of Mathematics and Physics of Charles University in Prague. Since 1996 at the Astronomical Institute. 2001 PhD in Astronomy from Charles University. Popularization of astronomy. Member of the International Astronomical Union.

Pavel Kotrč (* 1948, pkotrc@asu.cas.cz, Solar Physics)

Research fields: Solar atmosphere, flares, surges, prominences, coronal loops, spectral observation and analysis, diagnostics of solar activity phenomena, solar corona, eclipses of the Sun, instrumentation. PI, Co-PI or Co-I on several solar physics projects. In 1972 graduated from Faculty of Sciences, J. E. Purkyně University (now Masaryk University) in Brno (Mathematics and Physics). Since then working as a staff member at the Solar Department of the Astronomical Institute of the Academy of Sciences of the Czech Republic at Ondřejov. 1980 PhD in Astrophysics (Solar Physics). Responsible person for the solar optical telescope and spectrograph HSFA2. In recent years studied prominences and effects of accelerated particles in solar flare spectra. Longer missions abroad: ISZF Irkutsk, Russia, Hvar Observatory, Croatia, Crimean Astrophysical Observatory, Ukraine, National Solar Observatory Sacramento Peak, USA, Observatoire de Paris, Meudon, France. Member of solar eclipse expeditions to east Siberia (1981 and 1997), Romania & Hungary (1999), Angola (2001 and 2002) and Turkey (2006). Since 1992 external lecturer on spectroscopy at Charles University at Prague. In 2000 external lecturer on solar physics at Masaryk University in Brno, supervisor of 9 Master diploma theses. Member of the International Astronomical Union and a Representative of the Czech Republic in JOSO. Member of Editorial Board of the Central European Astrophysical Bulletin. Author and co-author of about 150 papers.

Pavel Koubský (*1943, koubsky@sunstel.asu.cas.cz, Stellar Physics, emeritus)

Research fields: Early-type stars, close binaries, Be stars, astronomical techniques. In 1965 graduated from the Faculty of Mathematics and Physics of Charles University, Prague.

Since 1966 at Stellar Department of the Astronomical Institute. 1977 PhD in Astrophysics. 1981-1989 Head of the Working Group 2m Telescope, 1990-2000 and 2004-2008 Head of the Stellar Department. Since 1990-2006 member of the Council of Sciences of the Astronomical Institute. In 1972 promoting systematic photoelectric observations at the joint Czech-Yugoslav Observatory, Hvar (now Croatia). Responsible for three upgrades of the 2m telescope (1982-87, 1996-98, and 2007). Observational stays at Observatoire de Haute Provence, France, KPNO USA, Dominion Astrophysical Observatory Victoria and David Dunlap Observatory, Canada. In recent years continued spectroscopic, photometric and interferometric study of Be stars and rapid variability in early type stars. Since 2007 member of the CU7 Coordination Unit, ESA Gaia.

Jiří Kovář (*1977, Jiri.Kovar@fpf.slu.cz, Galaxies and Planetary Systems)

Research field: Relativistic astrophysics, physics of neutron stars, especially processes of accretion in compact binary systems, effects of charge separation in magnetized plasma. Role of cosmological constant in modern cosmology. 2009-2010 member of Center of Theoretical Astrophysics.

Michaela Kraus (*1972, kraus@sunstel.asu.cas.cz, Stellar Physics)

Research fields: Winds and circumstellar disks of hot stars; Be and B[e] stars; ionization structure calculations in non-spherically symmetric and rotationally distorted winds; modeling forbidden emission lines from non-spherically symmetric winds and disks, and the spectral energy distribution of flat, flared and outflowing dusty disks; evolution of massive stars; studies of the evolutionary connections between evolved phases like the classical OB-type supergiants, B[e] supergiants, Luminous Blue Variables, Red Supergiants, and Yellow Hypergiants. 1997 graduated in Physics from the faculty of physics and astronomy of the Rheinische-Friedrich Wilhelms University in Bonn, Germany, 2000 PhD in Astrophysics at the Rheinische-Friedrich Wilhelms University in Bonn, Germany. Until 2001 post-doc at the Max-Planck Institute of Radioastronomy in Bonn, Germany, from 2001 to 2005 post-doc at the Astronomical Institute, Utrecht University, the Netherlands, from 2005 to 2009 post-doc at the Astronomical Institute, since 2010 scientific staff member at the Astronomical Institute.

Miroslav Křížek (*1981, krizek@ig.cas.cz, Galaxies and Planetary Systems, PhD student)

Research fields: structure, dynamics and evolution of galaxies, N-body simulations. 2007 graduated from the Faculty of Mathematics and Physics of Charles University, Prague. Since 2007 PhD student at Charles University. Supervisor: B. Jungwiert.

Jiří Kubát (*1962, kubat@sunstel.asu.cas.cz, Stellar Physics)

Research fields: Radiative transfer, theory of stellar atmospheres, calculation of model stellar atmospheres, line profiles, NLTE physics, dynamics of stellar winds. 1985 graduated in theoretical physics from the Faculty of Mathematics and Physics of Charles University, Prague. 1985-1989 at the Astronomical Institute of the Czechoslovak Academy of Sciences. 1989-1992 worked as a programmer and teacher in a secondary school. Since 1992 at the

Astronomical Institute. 1994 PhD in Astrophysics. Author of the computer code for calculating non-LTE model stellar atmospheres in planar and spherical geometry. Since 1997 member of the IAU, Commision 36 (Theory of stellar atmospheres). Teaches a semestral course „Physics of stellar atmospheres“ at the Masaryk University Brno. 1996-2000 deputy director of the Astronomical Institute. 1996-2000 and 2004-2008 deputy head of the stellar department, 2000-2004 and since 2008 head of the stellar department. Since 2008 head of the working group Physics of hot stars. Since 2007 member of the Council of the Astronomical Institute.

Andrew McLeod (*1985, andrew.mcleod@astro.cf.ac.uk, Galaxies and Planetary Systems)

Research fields: Star formation in the local universe. Triggered star formation from cloud-cloud collisions and pressure-driven implosion. Turbulence in the interstellar medium. Thermodynamics and chemistry in the interstellar medium. Computational hydrodynamics including smoothed particle hydrodynamics. Computational methods and OpenMP and MPI parallelization. 2003 graduated from the Department of Physics and Astronomy of Cardiff University, UK. April-November 2010 Early-Stage Researcher (Marie Curie CONSTELLATION network) at the Astronomical Institute, Academy of Sciences of the Czech Republic. Due to complete Ph.D. at Cardiff University in 2011.

Hana Mészárosová (*1959, hana@asu.cas.cz, Solar Physics)

Research fields: Solar flares, radio radiation, data analysis, statistical methods. Main interest in the impulsively generated magnetoacoustic waves in the solar coronal loops (radio and X-rays data). 1987 graduated from the Faculty of Electrical Engineering, Czech Technical University in Prague (technical cybernetics), since 1990 at the Astronomical Institute in Ondřejov. 2004 PhD in Astrophysics at Charles University, Prague. 2006 year-long stay in INPE, São José dos Campos, Brazil.

Martin Netolický (*1981, netol@physics.muni.cz, Stellar Physics, PhD student)

Research fields: Interferometry in visual and near-IR bands, hot stars, stellar envelopes, spectroscopy. In 2004 graduated from the Faculty of Science of Masaryk University, Brno. Since 2004 till 2009 postgraduate study at the Faculty of Science of the Masaryk University, supervisor P. Koubský

Peter Németh (*1981, nemeth@sunstel.asu.cas.cz, Stellar Physics)

Research field: Spectral modeling of hot stars from X-rays to optical wavelengths. Abundance analysis for subdwarfs, white dwarfs and classical novae with Tlusty. 2004 MSc., University of Szeged, Hungary. 2010 PhD., Florida Institute of Technology, USA.

Dieter Nickeler (*1968, nickeler@asu.cas.cz, Solar Physics)

Research fields: Stationary ideal and non-ideal MHD flows of large scale stellar winds (astrospheres/heliosphere) and solar flows, solutions of nonlinear MHD equations, theory of

magnetic reconnection and magnetic topology. 1998 graduated from faculty of physics and astronomy of the Ruhr-University, Bochum, 2005 PhD in Astrophysics at the University of Utrecht. Since 2006 member of the IAU. From October 2005 to December 2006 scientific guest, 2007 Post-Doc position at the Astronomical Institute Ondrejov. From 2008 until 2010 GAAV postdoctoral fellowship.

Pavel Novák (*1965, pavel.novak@vugtk.cz, Galaxies and Planetary Systems)

Research fields: The figure and gravitational field of the Earth, satellite positioning, adjustment calculus and statistics. Author of 75 peer-reviewed publications (33 at WoS); 175 references at WoS; H-index 7; professor of geodesy, Czech Technical University in Prague (2007); Elected-Fellow of the International Association of Geodesy (IAG, 2007); vice-president of the Inter-Commission Committee on Theory of the IAG (since 2007); member of several IAG study groups; member of the International Editorial Board of the Journal of Geodesy (since 2003); Scientific Secretary of the Research Institute of Geodesy, Topography and Cartography (since 2009); Vice-Dean for Research of the Faculty of Applied Sciences, University of West Bohemia Pilsen (since 2010); chairman of the Czech National Committee for FIG (since 2009).

Ivana Orlitová (Stoklasová) (*1978, ivana@sirrah.troja.mff.cuni.cz, Galaxies and Planetary Systems)

Research fields: Narrow-line regions of active galaxies, kinematics and excitation of gas. 2004-2006 eighteen-month stay at Centre de Recherche Astrophysique de Lyon, fellowship of French government. PhD at Charles University in Prague, Faculty of Mathematics and Physics in 2009. In 2010, two-month training at millimeter interferometry, IRAM (Grenoble, France). At present, a post-doc at Astronomical Institute ASCR, Prague.

Jan Palouš (*1949, palous@ig.cas.cz, Galaxies and Planetary Systems)

Research fields: Evolution of galaxies, two-component systems, interstellar matter and stars, star formation, stellar winds and mass recycling, feedback, chemical evolution, shells, supershells and filaments, gravitational instability, triggered star formation, the initial mass function, galaxies in groups and clusters, tides, merger events, harassment, gas stripping, formation of super-star clusters, intracluster medium. 1972: graduated from the Faculty of Mathematics and Physics of Charles University, Prague. 1977: PhD in Astronomy and Astrophysics, 1993: DSc in Astronomy and Astrophysics, 1994: Assistant Professor, 2001: Professor of Astronomy at Charles University, Prague. 1993–1996: member of the Council of the Academy of Sciences of the Czech Republic. 1996–2004: Director of the Astronomical Institute of the Academy of Sciences of the Czech Republic. Since 2005: President of the Council for International Affairs and member of the Council of the Academy of Sciences of the Czech Republic. Since 2009: member of the Learned Society of the Czech Republic. Member of International Astronomical Union (IAU), 1997–2003: member of the organizing committee of IAU Commission 33. 2004 - 2009 chairman of the Czech National Committee for Astronomy, chairperson of the National Organizing Committee of the General Assembly of IAU 2006 in Prague.

Since 2009 vice-president of the IAU. Member of the European Astronomical Society (EAS), 1992–1996 its secretary, since 2008 its vice-president. Corresponding member of the Royal Socienty of Edinburgh, Honorary Fellow of the Royal Astronomical Society. Supervisor of undergraduate and graduate students in astronomy and astrophysics. Author and co-author of research articles in professional journals, public presentations in newspapers, magazines, radio and TV.

Roman Pavelka (*1988, ChaoticRoman@seznam.cz, Solar Physics, MSc student)

Research fields: Fluxgate magnetometry, data acquisition and processing. Since 2010 at the Astronomical Institute. Development of Dual Segmented Langmuir Probe data quick-look web interface (2010).

Petr Pecina (*1950, ppecina@asu.cas.cz, Interplanetary matter)

Research fields: Radar observations of meteors and their analysis, solving problems of physical theory of meteors and its application to observations, study of mutual interrelations between radar and TV meteors, determination of heliocentric orbital elements of radar meteoroids, study of selected meteor showers (Geminids, Perseids, Leonids). 1973 graduated in Astronomy from Charles University, Prague. Since 1973 working at the Astronomical Institute. 1981 PhD in Astronomy.

Tomáš Pecháček (*1981, pechacek_t@seznam.cz, Galaxies and Planetary Systems)

Research fields: Relativistic astrophysics of compact sources, various effects of strong gravitational field acting on radiation field near compact objects, stochastical models of X-ray variability. Obtained a PhD in 2008 at Charles University, supervisor V. Karas. Since 2008 a postdoc at the Astronomical Institute.

Luboš Perek (*1919, perek@ig.cas.cz, Galaxies and Planetary Systems, emeritus)

Research Fields: Distribution of mass in the galaxy, high-velocity stars, planetary nebulae, definition of outer space, geostationary orbit, space debris, management of outer space. 1946 graduated from Masaryk University, Brno, 1956 PhD in Astronomy at Charles University, Prague, 1961 DSc in Astronomy. 1965 Corresponding Member of the Czechoslovak Academy of Sciences. 1952–1956 Associate Professor, Masaryk University. 1964 Visiting Professor, Northwestern University. 1967–1970 General Secretary of the IAU. 1968–1975 Director of the Astronomical Institute of Czechoslovak Academy of Sciences. 1975–1980 Chief, Outer Space Affairs Division, United Nations, New York. Medals: University of Liège 1969, ADION 1972, T. Hagecius de Hajek 1980, Nagy Ernö 1981, Zagreb Univ. 1982, City of Paris 1982, Collège de France 1986, Prix Janssen de la Societé Astronomique de France 1992, Medal of the Czech Learned Society 2009. Asteroid 2900 named Lubos Perek, Dr. H. C. Masaryk University 1999. 44 papers on stellar dynamics and planetary nebulae, Catalogue of Galactic Planetary Nebulae (jointly with L. Kohoutek) Academia Praha 1967. 100 papers and articles on the geostationary orbit, definition of outer space, space debris, protection of space environment, and space traffic. President of IAU Commission 33 in 1973-1976, Vice-

President of the International Council of Scientific Unions 1968-1970, Associate Member of the Royal Astronomical Society since 1970, Member of the Deutshe Akademie der Naturforscher Leopoldina since 1975, Member of the International Institute of Space Law since 1977, member of its Board of Directors 1996-2006, Member of the International Academy of Astronautics since 1977, President of the International Astronautical Federation 1980-1982, member of its International Program Committee 1990-1992, Advisor to its President 2002-2006, Honorary Member of the Academie Nationale de l'Air et de l'Espace, Toulouse, since 1994, Delegate of the Czech Republic to the UN Committee on the Peaceful Uses of Outer Space and its Scientific and Technical Subcomittee 1992-2003.

Radek Peřestý (*1962, peresty@asu.cas.cz, Galaxies and Planetary Systems)

Research fields: Microgravity environment, accelerometry, non-gravitational forces, artificial satellite dynamics. 1985 graduated in Physics from the J. E. Purkyne University in Brno, since 1985 at the Astronomical Institute. From 1990 lead MACEK accelerometer design and development. Principal Investigator of several space experiments onboard e.g. RESOURCE satellite (Russia) the Spacehab-04 microgravity laboratory (Space Shuttle STS-79) and 6-th Czech satellite MIMOSA. Recently involved in development, manufacture and testing of three accelerometers for SWARM project (ESA).

Cyril Polášek (*1943, polasek@asu.cas.cz, Stellar Physics)

Research fields: High-energy astrophysics, data reductions, optics, testing and development of innovative X-ray and optical CCD telescopes of apertures: 50 cm (1mirror with field corrector). In plans: 63cm (2mirror aplanatic), 64cm and 45 cm Richter/Slevogt's (high speed and wide field). History of astronomy and astrophysics, light pollution. 1967 graduated in Numerical Mathematics from the Faculty of Natural Sciences of Palacký University in Olomouc. 1997 PhD in Astronomy. Since 1970 at the Astronomical Institute. (up to 1989 Computing Center, until 1996 in Near-Earth Physics Department, since 1996 HEA Group in the Interplanetary Matter Department, since 2004 High Energy Astrophysics Group).

Jan Polster (*1982, polster@physics.muni.cz, Stellar Physics, PhD student)

Research fields: Common features of B[e] and Be stars spectra, time variations in spectra. 2006 graduated in Astrophysics from the Faculty of Science of Masaryk University in Brno, since 2006 PhD student at Masaryk University, Supervisor: D. Korčáková

Petr Pravec (*1967, ppravec@asu.cas.cz, Interplanetary Matter)

Research fields: Physical properties of asteroids, photometry and astrometry of asteroids and comets, discoveries, recoveries and follow-up of both new and old poorly observed asteroids; application of CCD technology in astronomy. 1990 graduated from Masaryk University, Brno. Since 1990 in the Interplanetary Matter Department of the Astronomical Institute. 1996 PhD from Charles University, Prague. Author and co-author of papers devoted to studies of near-Earth asteroids, asteroid photometry and astrometry, use of CCD in astronomy. Discoverer of a few hundred asteroids. Currently concentrating on studies of

binary asteroids. Awarded the Premium of Otto Wichterle from Academy of Sciences for his work on asteroids in 2004.

Tomáš Prosecký (*1980, prosecky@asu.cas.cz, Solar Physics, PhD sudent)

Research fields: Spectroscopy of solar flares. 2005 graduated in Astrophysics from the Faculty of Mathematics and Physics of Charles University, Prague. Since 2005 PhD student at Charles University. Supervisor: P. Heinzel.

Cyril Ron (*1957, ron@ig.cas.cz, Galaxies and Planetary Systems)

Research fields: Astrometry, PZT observations and their analysis, Earth orientation parameters (EOP) from optical astrometry and combination of the EOP series derived from different techniques, geophysical excitations of the Earth rotation. 1981 graduated in Geodesy and Cartography from the Faculty of Civil Engineering of the Czech Technical University, Prague. Since 1983 at the Astronomical Institute. 1986 three-month mission to the Zentralinstitut für Physik der Erde in Potsdam, Germany. 1992 PhD in Astronomy. 1997-1998 mission to the Lohrmann Observatory, Technical University Dresden, Germany. Member of the Center for the Earth's Dynamics Research (CEDR) and of the IERS Combination Research Center. Since 2000-2006 member of organizing committee of IAU Commission 19 (Rotation of the Earth). Member of a team awarded the prize of Academy of Sciences of the Czech Republic in 2000. Chairman of local organizing committee of 26th General Assembly of IAU held in Prague 2006. Regular lectures on Space Geodesy at the West Bohemian University in Pilsen since 2005.

Adam Růžička (*1978, adam@ig.cas.cz, Galaxies and Planetary Systems)

Research fields: Galactic dynamics, N-body simulations, evolutionary algorithms, clusters of galaxies. 2001 graduated from the Faculty of Mathematics and Physics of the Charles University, Prague. 2004-2005 Fulbright scholarship at the Astronomy Department, University of Massachusetts, USA. PhD degree received in 2006. Since 2001 a PhD and postdoctoral (since 2006) researcher at the department of Galaxies and Planetary Systems of the Astronomical Institute. 2008-2011 a postdoctoral researcher at the Institute of Astronomy of the University of Vienna, Austria, project "Evolution of the Magellanic Clouds".

Josef Sebera (*1983, josef.sebera@fsv.cvut.cz, Galaxies and Planetary Systems, PhD sudent)

Research fields: Earth's gravity field determination by terrestrial and space techniques (satellite altimetry/gradiometry) - graduated in Geodesy from the Faculty of Civil Engineering of the Czech Technical University, Prague. Since 2008 PhD student. Superviser: Jan Kostelecký.

Ladislav Sehnal (*1931, lsehnal@asu.cas.cz, Dynamics of Satellite Motion, emeritus)

Research fields: Celestial mechanics, orbital and rotational dynamics of artificial satellites, non-gravitational perturbing forces (atmosphere, radiative effects). Theory of satellite motion in the atmosphere, models of the atmosphere and of the terrestrial albedo distribution. Theory of space accelerometric measurements. 1954 graduated in Astronomy from Charles University, Prague. 1959 PhD in Astronomy. 1984 DSc in Astronomy. Since 1954 at the Astronomical Institute, 1990–1996 Director of the Astronomical Institute. 1965–1971 with the Smithsonian Astrophysical Observatory, Cambridge, Mass., USA, 1988, 1989 with the DGFI Munich, Germany. About 118 research papers published.

Lukáš Shrbený (*1981, shrbeny@asu.cas.cz, Interplanetary Matter)

Research fields: Physics of bright photographic meteors, measuring of all-sky images. Also participates in the international project of fireball network in Australia. 2005 graduated from Faculty of Mathematics and Physics of Charles University in Prague. Since 2005 at the Astronomical Institute. 2009 PhD in Astronomy, Charles University in Prague. 2009 - 2010 employee of Imperial College London.

Peter Scheirich (*1979, petr.scheirich@centrum.cz, Interplanetary Matter)

Research fields: Modeling of binary and tumbling asteroids from photometric data. In 2003 graduated from Faculty of Mathematics and Physics of Charles University, Prague. In 2008 obtained PhD in Theoretical Physics, Astronomy and Astrophysics at the Charles University (supervisor: Petr Pravec). Since 2008 at PostDoc position at the Interplanetary Matter Department of the Astronomical Institute of Academy of Sciences of the Czech Republic.

Pavol Schwartz (*1974, schwartz@asu.cas.cz, Solar Physics)

Research fields: Non-LTE study of the solar filaments and prominences, EUV spectroscopy of small-scale chromospheric structures, reduction of the data from SoHO/CDS and SoHO/SUMER spectrographs and from instruments of Hinode satelite. In 1998 graduated from the Faculty of Mathematics, Physics and Informatics of the Comenius University in Bratislava, Slovakia. In 2004 obtained PhD in Astrophysics at the Comenius University. Since 2004 working as a staff member of the Solar Department of the Astronomical Institute of Academy of Sciences of the Czech Republic. In 2005 at IAS Orsay, France participated in planning of the observations of the filaments and prominences using SoHO/CDS and SoHO/SUMER spectrographs during the 15th MEDOC observing campaign. In 2010, one month-long stay in Observatoire de Paris, Meudon, France as an ad-joint scientist.

Vojtěch Sidorin (*1982, vojtech.sidorin@gmail.com, Galaxies and Planetary Systems, PhD sudent)

Research fields: Interstellar matter, star formation, shells, supershells and filaments, gravitational instability, triggered star formation, the initial mass function. 2008: graduated from the Faculty of Mathematics and Physics of Charles University, Prague, diploma thesis:

“IR, optical and X-ray counterparts of HI shells in the Milky Way”, supervisor: Jan Palouš. Since 2008: PhD student at Charles University, Prague, PhD thesis: “Shell-like structures in the ISM: observation versus simulations”, supervisor: Jan Palouš, advisor: Jim Dale.

Jan Skála (*1983, jskala@physics.ujep.cz, Solar Physics)

Research fields: Modelling magnetic field reconnection in the solar flares. 2008 graduated from Faculty of Science of J. E. Purkyne University, Usti nad Labem. Since 2008 PhD studing (Computer modeling) of J. E. Purkyne University.

Michal Sobotka (*1954, msobotka@asu.cas.cz, Solar Physics)

Research fields: Sunspots, fine structure and velocity fields in solar photosphere, high spatial resolution photometry and spectroscopy, image processing, time-series analysis, instrumentation. 1978 graduated from the Charles University, Prague, Master's Degree in astrophysics. 1981–1985 external PhD student at the Leningrad State University and Crimean Astrophysical Observatory. 1985 PhD in astrophysics, Leningrad State University. 2007 DSc in astrophysics, Academy of Sciences of the Czech Republic. 1990–1992 Postdoctoral Fellowship at Instituto de Astrofisica de Canarias (IAC). 1993 three-month European Community Grant at IAC. 1999 Visiting Professor at the Karl-Franzens University, Graz. 1999–2000 one-year sabbatical stay at IAC. 2003 and 2005 Researcher at Observatoire Midi Pyrénées, Tarbes. Since 1979 at the Astronomical Institute, Solar Department, since 1995 Head of the Working Group “Structure and Dynamics of Solar Atmosphere”, since 2004 Deputy Head of the Solar Department. 2002-2008 vice-president of JOSO. Since 2006 national representative in the European Association for Solar Telescopes (EAST). Participation in the projects of the 1.5-m solar telescope GREGOR and of the 4-m European Solar Telescope EST. Cooperation with institutions in Spain, Portugal, Germany, Italy, France, and Austria. Author and co-author of more than 140 astronomical publications.

Vjačeslav Sochora (sochora@ig.cas.cz, Galaxies and Planetary Systems, PhD student)

Research fields: Relativistic astrophysics; radiation processes in strong gravity and their applications to active galactic nuclei and Galactic black holes. 2009: graduated from the Faculty of Mathematics and Physics of Charles University, Prague. Since 2009 PhD student at Charles University, Prague, supervisor: V. Karas.

Jan Soldán (*1957, jsoldan@asu.cas.cz, Stellar Physics)

Research fields: Design and development of instruments and software for ground-based experiments, namely two robotic telescopes: BART (Ondřejov, Czech Republic) and BOOTES (Al Arenosilo, Spain) for follow-up observations of optical counterparts of gamma ray bursts. Software development for driving CCD cameras and telescopes, image data acquisition and processing. Software development of Optical Monitoring Camera (OMC) and Jem-X experiments for INTEGRAL mission (C, C++, CERN's Root). 1982 graduated from the Technical University in Brno, since 1983 at Astronomical Institute. 1994 2-month mission to the University of California, Riverside. 1998 PhD from the Czech Technical University,

Prague. Co-I of numerous space and ground-based grant projects such as the robotic telescope BART and experiment BOOTES. Since 1996 consortium member of the OMC experiment, INTEGRAL satellite project, ESA. Long-term stay in Switzerland 1998-2006, member of software development team of INTEGRAL satellite. Since 2007 in Stellar Physics Department – group of Physics of Hot Stars and since 2010 in High Energy Astrophysics Group.

Pavel Spurný (*1958, spurny@asu.cas.cz, Interplanetary Matter)

Research fields: Physics of meteor flight in the atmosphere, computations of meteor orbits and trajectories, prediction of meteorites impact positions, radiation of meteors at very high altitudes, reduction methods for determination of meteor trajectories, high resolution light curves of fireballs from AFO radiometers, double station television observations of meteors. Principal investigator of the project "Automation of the cameras for fireball observations in the Czech part of the European Fireball Network". Participation in the design and development of the Autonomous Fireball Observatory for photographic detection of fireballs (AFO). Main coordinator of the European Fireball Network (EN) and head of the Czech part of the EN since 1993. Complete modernization of all fireball stations in the Czech Republic (2004-2009). Fundamental participation in the international project of the Desert Fireball Network in SW Australia. 1982 graduated from Charles University, Prague. Since 1982 at the Astronomical Institute. 1992 PhD in Astronomy, 2000–2004 Head of the Group of Meteor Physics, 1993–2000 and since 2004 Head of the Interplanetary Matter Department. 2003 Senior Scientist Award of the Learned Society of the Czech Republic, 2007 Laureate of the Kopal Lecture of the Czech Astronomical Society, 2006-2009 President of the IAU Commission 22 Meteors, Meteorites and Interplanetary Dust.

Ivana Sujová (*1984, caivana@gmail.com, Stellar Physics, PhD sudent)

Research fields: galactic and extragalactic X-ray and gamma-ray sources (AGNs, QSOs, blazars), with emphasis on multispectral analyses of blazars. 2007 graduated from Charles University, Faculty of Mathematics and Physics, in Prague.

J**iří Svoboda** (*1982, svoboda@astro.cas.cz., Galaxies and Planetary Systems, PhD student)

Research fields: Effects of strong gravitational field acting on radiation near compact objects, X-ray spectroscopy. PhD student at Charles University. Supervisor: V. Karas.

Klára Šejnová (*1984, klarka@physics.muni.cz, Stellar Physics)

Research field: Be stars, modelling of Be stars. 2010 graduated from Faculty of Science of Masaryk University (master degree), since 2010 studying for PhD at Faculty of Science of Masaryk University. Since 2010 at the Astronomical Institute.

Miloš Šidlichovský (*1947, sidli@ig.cas.cz, Galaxies and Planetary Systems)

Research fields: Dynamical astronomy, chaos, resonances, structure of the asteroid and Kuiper belts, stability of orbits, multiple exoplanetary systems. 1970 graduated with honors in Theoretical Physics from Charles University, Prague. Since 1970 at the Astronomical Institute, presently in Group of Planetary Systems. 1994–1996 Deputy Director for Foreign Contacts, 2000–2004 Head of the Department of Dynamical Astronomy.

Zdislav Šíma (*1947, sima@ig.cas.cz, Galaxies and Planetary Systems)

Research fields: Scientific interest first focused on binary stars, later more on problems of gravitational fields of planets in the solar system, namely the combination of satellite altimetric measurements and primary constants of the Earth and other planets. A member of Inter-Commision Committee on Planetary Geodesy (ICCPG) of IAG-IUGG. Devoted also to the history of astronomy and astronomical instruments. Responsible for astronomical aspects of the old astronomical clock of Prague. Reconstructed old sundials in Břevnov monastery, Prague, and the ones at Parliament building of the Czech Republic, Prague – Malá Strana. Contributed to several TV films about history of astronomy. A member of Scientific Instrument Society. Since 1999 a member of the Società Astronomica Italiana. 1970 graduated in Astronomy from the Faculty of Mathematics and Physics of Charles University, Prague. 1973–74 11-month study mission at the Astrophysical Observatory at Asiago of the University of Padua. Since 1975 at the Astronomical Institute. 1978 PhD in Astronomy. 1980 the price of Czechoslovak Academy of Sciences for works concerning the gravitational fields. 1994 two-month DAAD scholarship in IPG Technische Universitaet Darmstadt, Germany.

Stanislava Šimberová (ssimbero@asu.cas.cz, Solar Physics)

Research fields: Digital image processing in astronomy and astrophysics; pattern recognition - image fusion, contextual classification, feature selection, classifier performance, filtration. Image enhancement and restoration - multispectral image analysis and reconstruction, texture synthesis, geometric transformation, probabilistic relaxation, multichannel blind deconvolution. 1978 MSc graduate in honours Czech Technical University, Prague, Electronics. 1982 MSc Inst. of Engineering Studies, Prague, Pedagogics. 1990 PhD Czech Technical University, Prague, Cybernetics. Since 1989 researcher at the Astronomical Institute, Solar Department. Since 1998 chairman of the Czech Pattern Recognition Society (CPRS), since 2001 member of the scientific council of the Czech Society for Cybernetics and Informatics. 1996 ISPRS Vienna - Dolezal Award, 2007 Grant Agency CR President Award.

Vojtěch Šimon (*1968, simon@asu.cas.cz, Stellar Physics)

Research fields: High energy astrophysics. Astrophysical sources of high-energy radiation and their optical counterparts. Galactic X-ray sources: study of mass accreting compact objects – cataclysmic variables, supersoft X-ray sources, novae, X-ray binaries (mainly soft X-ray transients), analysis of their long-term activity and eruptive processes in X-ray and optical regions; accretion processes; relations of the character of the orbital modulation to

the current state of the long-term activity; investigation of the dependence of the observed characteristics of X-ray sources on their physical state and parameters. Extragalactic sources: investigation of afterglows of gamma-ray bursts (GRBs), study of their comprehensive properties, supernova - GRB connection, implications for the environment in the host galaxies of GRBs. CCD photometry, data analysis and evaluation. Participation in the international campaigns on high-energy astrophysical sources and their optical counterparts. 1992 graduated from the Faculty of Natural Sciences of Palacky University, Olomouc. Since 1992 at the Astronomical Institute AS CR. 1998 PhD in Astronomy at Charles University. Member of the Czech Astronomical Society and the International Astronomical Union. Popularization of astronomy. 2001 Hlavka Award for Young Scientists of the Hlavka Foundation. 2003 Prize of the Academy of Sciences of the Czech Republic for Young Researchers. Author or co-author of more than 120 papers in international scientific journals and in proceedings of international conferences.

Petr Škoda (* 1964, skoda@sunstel.asu.cas.cz, Stellar Physics)

Research fields: CCD spectroscopy, data acquisition and reduction, telescope instrumentation, computational astrophysics, astronomical databases and archives and the Virtual Observatory . In 1987 graduated in Astrophysics from the Faculty of Mathematics and Physics of Charles University, Prague. 1987–1989 postgraduate student at the Astronomical Institute of the Czechoslovak Academy of Sciences in Ondřejov. Since 1989 a regular staff member of the Stellar Department at the Astronomical Institute. 1996 PhD in Astrophysics (supervisor P. Hadrava). Occasional system administrator of Linux PCs; responsible for maintenance of main astronomical SW packages like IRAF, MIDAS, IDL. Involved in the complex refurbishment of the telescope and spectrograph control systems of Ondřejov observatory 2m telescope. Co-author of CCD detector control and data acquisition program and of the telescope auto-guiding system. Expert in reduction of CCD single-order and mainly echelle spectra. Author of some archives of spectra captured by Ondřejov 2m telescope detectors. Deeply involved in the project of Virtual Observatory. Collaborates with International Virtual Observatory Alliance (IVOA) on new standards and applications. Co-author of two important new standards and applications. Co-author of two important VO standards and of VO-compatible spectra server. Founding member of IVOA Interest Group on Knowledge Discovery in Databases.

Miroslav Šlechta (*1971, slechta@sunstel.asu.cas.cz, Stellar Physics)

Research fields: Observational and computational astronomy, CCD data acquisition and reduction. History of natural sciences and astronomy. 1994 graduated from Charles Univ., Prague. 2001 PhD in Astrophysics at Charles Univ., Prague 1997-1998 employed at the Observatory and Planetarium of M.R.Stefanik, Prague. Since 1998 at the Astronomical Institute of the Academy of Sciences of the Czech Republic, v.v.i., stellar department. Since 2008 head of the technical group in stellar dept.

Vojtěch Štefka (*1980, stefka@ig.cas.cz, Galaxies and Planetary Systems, PhD sudent)

Research fields: Combination of Earth orientation parameters measured by modern space techniques and combined astrometric catalog (EOC-3, EOC-4) based on optical observations

of latitude, universal time or altitude variations. 2005 - graduated in Geodesy from the Faculty of Civil Engineering of the Czech Technical University, Prague. 2010 - PhD in Geodesy (supervisor J. Kostelecký).

Stanislav Štefl (*1955, sstefl@eso.org, Stellar Physics)

Research field: Active early-type stars, stellar oscillations, structure and density oscillations of circumstellar disks, interacting binaries, stellar magnetic fields; echelle spectroscopy, near-IR and visual interferometry, mm/sub-mm astronomy. Graduated in Astronomy from Charles University, Prague. 1986 PhD in Astronomy. 1991-1993 Research Associate at the European Southern Observatory, Garching bei Munchen. Since November 2004 on the long-term leave at the ESO La Silla Paranal Observatory, member of the Sciops VLTI group, supporting VLTI and UT2 observations, 2006-2008 AMBER second instrument scientist, since 2009 ATs instrument scientist. 1996-2006 member and 2000-2003 chairman of the Organizing Committee of the IAU Working Group "Active B Stars". Member of the IAU Commission 54 - "Optical and Infrared Interferometry"

Jiří Štěpán (*1980, stepan@asu.cas.cz, Solar Physics)

Research fields: Non-LTE polarized radiative transfer, atomic processes, chromospheric magnetic fields, solar flares, software development. He graduated summa cum laude in 2004 from the Faculty of Mathematics and Physics of the Charles University in Prague. 2008 Ph.D. in astrophysics from Observatoire de Paris-Meudon (France) and Charles University in Prague (advisors Petr Heinzel and Sylvie Sahal-Bréchot). Since 2008 postdoc position at Instituto de Astrofísica de Canarias (IAC), La Laguna, within the project Solar Magnetism and High-Precision Spectropolarimetry.

Rostislav Štork (*1969, stork@asu.cas.cz, Interplanetary Matter)

Research fields: Research fields: TV observation of faint meteors. 1993 graduated in Physics from Charles University, Prague. Since 1994 at the Astronomical Institute, Interplanetary Matter Department. 1998 PhD in Astrophysics at Charles University. 2000–2007 webmaster www.asu.cas.cz

Jan Štrobl (*1977, strobl@asu.cas.cz, Stellar Physics, PhD student)

Research fields: Cataclysmic variable stars – multispectral analysis, high-energy X-ray & gamma-ray sources data analysis, CCD sky monitors and related data analyses and interpretations. Member of the ESA INTEGRAL CVs working group, of the secondary INTEGRAL Science Data Centre team and of the BART robotic telescope team. 2002 graduated from the Faculty of Mathematics and Physics of Charles University, Prague. Since 2002 PhD student at Charles University, supervisor: R. Hudec

Štěpán Štverák (*1980, stverak@ig.cas.cz, Solar Physics)

Research fields: Non-thermal properties of particle distributions in space plasmas, H/W development of plasma diagnostic tools (Langmuir probes), numerical modelling and data analysis, simulations of collisionless plasmas. 2004 graduated in software engineering from the Czech Technical University, Prague. 2009 PhD in astrophysics at Université Pierre et Marie Curie Paris VI. Since 2001 at Institute of Atmospheric Physics, since 2010 also post-doc at Astronomical Institute of the Academy of Sciences of the Czech Republic. Collaborator on the ISL experiment of the ESA/CNES spacecraft Demeter, and on the DSLP experiment at ESA's Proba 2 spacecraft.

Ladislav Šubr (*1972, subr@nbox.troja.mff.cuni.cz, Galaxies and Planetary Systems)

Research fields: Dynamics of dense stellar systems and Galactic nucleus. Graduated in 1995 at the Faculty of Mathematics and Physics, Charles University in Prague; got PhD in 2001 at the same institute. In 2006 post-doc at the Argelander Institut fuer Astronomie, University of Bonn; in 2007 Alexander von Humboldt fellow at the AIfA, Bonn.

Brankica Šurlan (*1974, surlan@sunstel.asu.cas.cz, Stellar Physics, PhD sudent)

Research fields: Winds of hot stars, radiative transfer in inhomogeneous (clumped) medium. 2002 graduated in Astrophysics from the Mathematical Faculty of University in Belgrade. 2008 completed master study at the Mathematical Faculty of University in Belgrade. Since 2008 PhD student at the Faculty of Mathematics and Physics of Charles University, Prague. Supervisor: J. Kubát

Michal Švanda (*1980, michal@astronomie.cz, Solar Physics)

Research fields: Inversion methods for local helioseismology, travel-time measurements, velocity and magnetic fields in solar photosphere, large-volume data processing. In 2004 graduated from the Faculty of Mathematics and Physics of Charles University, Prague, 2007 finished PhD in astrophysics at the same institute under a supervision of M. Sobotka. In years 2006-2008 collaboration with Solar Oscillation Investigation group, Stanford University, Palo Alto, USA, (repeated mid-term stays), 2006 also Observatoire Midi Pyrénées, France, and Astrophysikalisches Institut Potsdam, Germany. Since 2009 on a postdoctoral stay at Max Planck Institut für Sonnensystemforschung, Katlenburg-Lindau, Germany, in the Max-Planck Research Group for Helio- and Asteroseismology.

Adam Tichý (*1985, adamtichy@sunstel.asu.cas.cz, Stellar Physics)

Research fields: stellar atmosphere modelling, especially radiation in stellar winds. Statistical thermodynamics used in stellar atmospheres. Education: 2007 BSc. at Masaryk University, Brno, specialization astrophysics, 2010 MSc. at Theoretical Physics and Astrophysics, Masaryk University, Brno. Since 2010 Stellar dep., Astronomical Institute and PhD student at Masaryk University.

Pavel Trávníček (*1965, trav@ig.cas.cz, Solar Physics)

Research fields: Kinetic simulations (hybrid/Vlasov codes) of collisionless plasmas, kinetic processes in the interaction between plasma flows and planets and moons, temperature anisotropy driven instabilities in the solar wind and Earth's magnetosheath, shocks in collisionless plasmas. 1990 graduated from Czech Technical University, Prague. Since 1994 at the Institute of Atmospheric Physics, since 2006 also at Astronomical Institute of the Academy of Sciences of the Czech Republic. 1997 PhD in Mathematical Physics. 1998–2004 Deputy-head of Department of Space Physics at IAP, ASCR. 2005-2009 member of the Comission for information technologies ASCR. P.T. is a co-author of over 60 refereed papers, Co-Investigator on two experiments of ESA CLUSTER II (WHISPER and PEACE), Co-Investigator on the ISL experiment of the ESA/CNES spacecraft Demeter, Principal Investigator of the DSLP experiment at ESA's Proba 2 spacecraft, collaborator of two experiments on BepiColombo (MPPE and SERENA-PICAM), P.T. is also an Associate Scientist of the Atmosphere and Magnetosphere Group of NASA MESSENGER mission since 2007, lead Co-I of the Radio Plasma Waves (RPW) team of Solar Orbiter (Milan Maksimovic, LESIA, PI), and served/serves as Principal Investigator of five ESA PRODEX/PECS projects (related to CLUSTER II, Demeter, Proba 2 and BepiColombo missions) and two awards of NASA.

Marek Vandas (*1956, vandas@ig.cas.cz, Solar Physics)

Research fields: Magnetohydrodynamic simulations of interplanetary disturbances, acceleration of electrons by shock waves, magnetic clouds in the solar wind. 1980 graduated in Astronomy from Charles University, Prague. Since 1982 at the Astronomical Institute of the Czechoslovak Academy of Sciences. 1988 PhD in Astronomy, 1997 DSc in Astronomy. 1992-2000 Head of the Near-Earth Space Physics Department. Since 2000 member of the Solar Physics Department and head of the working group “Heliosphere and Space Weather”. 2000-2003 President of the IAU Scientific Commission 49 “Interplanetary Plasma and Heliosphere”. IAU representative to COSPAR Scientific Committee D on Space Plasmas in the Solar System, including Planetary Magnetospheres (since 2000). Secretary of the National Committee of SCOSTEP (since 2008).

Michal Varady (*1965, varady@asu.cas.cz, Solar Physics)

Research fields: Solar flares, EUV and X-ray emission originating from flares, coronal loops. Numerical modelling: hydrodynamics of flare and coronal loops, transfer and dissipation of energy of high energy particle beams in solar atmosphere, hybrid codes – modelling of solar flares combined with radiative transfer. EUV and X-ray observations of solar flares: EUV and soft X-ray plasma diagnostics, high energy particle beams parameters from flare hard X-ray spectra. 1996 graduated in Astronomy and Astrophysics, 2002 PhD in Theoretical Physics, Astronomy and Astrophysics both from the Faculty of Mathematics and Physics of Charles University, Prague. Stays abroad: 1998 Goddard Space Flight Center in Greenbelt, USA, 2000 Max Planck Institute in Garching, Germany.

Stephen Vennes (*1961, vennes@sunstel.asu.cas.cz, Stellar Physics)

Research interests: Stellar evolution, white dwarfs, evolved binaries; Computational astrophysics, radiative transfer and convective transport in stellar atmospheres, diffusion, stellar opacities; Data analysis, spectroscopic and photometric surveys and databases, stellar parameters. 1989 PhD in Physics, Université de Montréal. Since 2009 at the Astronomical Institute.

Vlastimil Vojáček (*1984, vojacek@asu.cas.cz, Interplanetary Matter)

Research field: Photometry, light curves, physical structure, trajectory computation and image processing of faint video meteors. Spectroscopy and physics of meteor flight in atmosphere. 2010 graduated from the Faculty of Mathematics and Physics of Charles University, Prague. Since 2010 PhD student at Charles University. Supervisor J. Borovicka.

Jan Vondrák (*1940, vondrak@ig.cas.cz, Galaxies and Planetary Systems, emeritus)

Research fields: Numerical treatment of the Earth's rotation parameters, theoretical studies of the orbital motion of the Moon and rotational dynamics of the Earth (tidal and rotational deformations, planetary effects in precession-nutation, atmospheric and oceanic excitations of Earth orientation, combination of Earth orientation parameters measured by astrometric and modern space techniques, astrometric catalogs (combination of Hipparcos results with ground-based observations), ephemeris astronomy. 1962 graduated in Geodesy and Geodetic Astronomy from the Faculty of Civil Engineering of the Czech Technical University, Prague. 1973 PhD in Geodetic Astronomy. Since 1977 at the Astronomical Institute. 1983 three-month mission to the Bureau International de l'Heure in Paris. 1985 DSc in Astronomy. 1989 three-month mission to the U.S. Naval Observatory, Washington D.C. (Dept. Of Time Service and Earth Orientation). 1991–1994 Head of the Dept. Of Dynamics of Solar System; 1991–1992 six-month mission to the CNRS URA1125, Observatoire de Paris. 1995-2000 Head of the Dept. of Dynamical Astronomy. 1998–2004 Chairman of the Czech National Committee for Astronomy of the IAU. 2000–2005 Deputy Director of the Astronomical Institute for Foreign Contacts. 2001–2004 Chairman of the Directing Board of the IERS. 2005-2010 Czech National Representative to ICSU (International Council for Science). 2006-2009 President of IAU Division I (Fundamental Astronomy). Since 2010 Chairman of the Czech Astronomical Society.

Viktor Votruba (*1977, votruba@sunstel.asu.cas.cz, Stellar Physics)

Research fields: Radiation hydrodynamics, theory of radiatively driven stellar winds from hot stars, multicomponent stellar wind, numerical simulations, various type of instabilities in stellar wind, nonlinear dynamics. 2000 graduated from the Faculty of Natural Science of Masaryk University, Brno. Author of the computer code for computing Lyapunov's exponent and reconstruction of the phase portrait in chaotic systems and code for simulation of multicomponent stellar wind. 2006 PhD in Theoretical Physics and Astrophysics at Masaryk University.

Richard Wünsch (*1977, richard@wunsch.cz, Galaxies and Planetary Systems)

Research fields: radiation-hydrodynamic simulations, self-gravity, grid-based codes; interstellar matter, star formation, expanding shells and supershells; planet formation, protoplanetary discs, layered discs; super star clusters, thermal instability. 2000 graduated from the Faculty of Mathematics and Physics of Charles University, Prague. 2003 PhD in Theoretical Physics, Astronomy and Astrophysics at Charles University. 2004 - 2005 postdoc stay at Nicolaus Copernicus Astronomical Center, Warsaw, Poland. 2007 - 2008 postdoc stay at Cardiff University, Cardiff, UK. Prize of the Academy of Sciences of the Czech Republic for young researchers (2010). Member of International Astronomical Union.

Alena Zemanová (Kulinová) (*1973, kulinova@sunkl.asu.cas.cz, Solar Physics)

Research fields: Solar flares, spectroscopic diagnostics - soft X-ray spectra, diagnostics of the non-thermal distributions in the corona and the transition region, data processing (satellite and groundbased), participating on the developemnent of Solar Optical Robotic Telescope. In 1997 graduated from the Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava, Slovakia. 2005 PhD in Astrophysics at Comenius University, Bratislava. 1997 – 1999 observer at Slovak Central Observatory, since 2002 teacher and assistant reseacher at FMPhI Comenius University, Bratislava and since 2008 researcher at the Astronomical Institute of the AV CR in Ondřejov.

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Fabian A.	England	5
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Goosmann R.	France	18
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Migliori G.	Italy	4
Milič I.	Serbia	8
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Rudawy P.	Poland	4
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Rozanska A.	Poland	7
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Sadowski A.	Poland	10
Samardžija B.	Serbia	5
Sánchez F.	Spain	7
Savič K.	Serbia	19
Sawant H.	Brazil	4
Schmieder B.	France	20
Schnurr O.	England	4
Schriver D.	USA	5
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