Questionnaire

Summary of the main activities of a scientific Organisation of the Slovak Academy of Sciences

Period: January 1, 2003 - December 31, 2006

I. Formal information on the assessed Organisation:

1. Legal name and address

Astronomical Institute of the Slovak Academy of Sciences
SK-059 60 Tatranská Lomnica, The Slovak Republic

2. Executive body of the Organisation and its composition

Directoriat	name	age	years in the position
director	Ján Svoreň	57	2001 -
deputy director	Jozef Žižňovský	60	2001 -
scientific secretary	Ján Rybák	46	2001 -

3. Head of the Scientific Board

Aleš Kučera

4. Basic information about the research personnel

i. **Number of employees with a university degree (PhD students excluded) engaged in research and development and their full time equivalent work capacity (FTE) in 2003, 2004, 2005, 2006 and average number during the assessment period**

ii. Organisation units/departments and their FTE employees with the university degree engaged in research and development

Research staff	2003		2004		2005		2006		average	
	No.	FTE	No.	FTE	No.	FTE	No.	FTE	No.	FTE
organisation in whole	36	32,90	36	32,70	37	33,48	36	32,85	36,25	32,983
Department of interplanetary matter	13	11,53	13	11,18	14	12,46	13	12,33	13,25	11,875
Solar department	11	9,84	12	11,34	12	10,84	12	10,34	11,75	10,590
Stellar department	12	11,53	11	10,18	11	10,18	11	10,18	11,25	10,518

5. Basic information on the funding

i. Total salary budget[1] of the Organisation allocated from the institutional resources of the Slovak Academy of Sciences (SAS) in 2003, 2004, 2005, 2006, and average amount for the assessment period

Salary budget	2003	2004	2005	2006	average
total salary budget (millions of SKK)	11,818	12,168	12,521	13,168	12,419

6. URL of the Organisation's web site

http://www.astro.sk

[1] Sum of the brutto salaries without the fund contributions.

II. General information on the research and development activity of the Organisation:

1. Mission Statement of the Organisation as presented in its Foundation Charter

Astronomical Institute (next, the abbreviation of AI SAS is used) is oriented on observations and basic research in astronomy and astrophysics, namely research of the Sun, interplanetary matter, stars and stellar systems.

AI SAS gives expertise services connected with the main activity of the organisation.

AI SAS organizes the postgraduate (PhD.) study in astronomy and astrophysics and takes a part on lectures and practicum courses at universities.

AI SAS publishes the products of its scientific activity in journals, and nonperiodical prints and also popularises the results in media.

2. Summary of R&D activity pursued by the Organisation during the assessed period, from both national and international aspects and its incorporation in the European Research Area (max. 10 pages)

AI SAS consists of three scientific departments. Relevant results and research activities in 2003-2006 are summarized separately for each department.

2.1. Solar department

RESEARCH AREAS:

- analysis of the quiet and active solar photosphere and chromosphere using spectroscopic observations acquired using the solar telescopes base at the Canary Islands (VTT, SST, DOT),
- study of dynamics and mechanisms of energy transfer in the quiet upper solar atmosphere using space-born satellites (SUMER, CDS, EIT, MDI) and TRACE under own joint observing proposals,
- analysis of coronal holes and their relation to the background and local magnetic fields and a relationship between polarization and intensity of the green line in different coronal structures,
- patrol observations of the 530.3 nm and 637.4 nm emission coronal lines and H alpha solar prominences to study solar cycle,
- preparation of the homogeneous coronal data set for the 530.3 nm coronal line and computation of the coronal index of solar activity for solar cycle and space weather studies,
- study of a time-latitudinal distribution and large-scale development of solar prominences,
- investigation of coupling of a cosmic ray modulation to solar LDE flares, coronal mass ejections, and green corona brightness,
- study of periodicities of different indices of solar activity, flare occurrence, and their north-south asymmetry.

SELECTED RESULTS PUBLISHED IN THE PERIOD 2003-6:

a) solar atmosphere and active events

For the first time, we have documented observational evidence for existence of a shock in the solar photosphere formed on the boundaries of granules. Using high spatial and spectral resolution spectra of the solar photosphere and 2D images of the solar granulation taken with German Vacuum Tower Telescope on Tenerife, we analysed temporal development of such event and its couplings with concentration of magnetic fields. Comparing observational results to results of numerical simulations an important agreement has been found. This is a crucial verification of correctness of numerical simulations of the solar surface convection developed in recent years. **[26]** - ***the reference to the list of selected publications (see section III/1/i)***

Semi-empirical model of a temporal evolution of temperature in a granule and inter-granular space was computed using high spatial resolution spectral observations of the solar photosphere. The semi-empirical evolutionary models have been calculated using an inversion method (SIR inversion code) applied to 4-min time series of Stokes I spectral line profiles. The observed disappearance of the granule is accompanied with overall cooling of the granular photosphere. The temperature changes greater than 100 K have been found in deeper (log tau_5 >=0) and upper layers (log tau_5 <=-2) whereas the intermediate layers are thermally stable. The intergranular space, which is 2 arcsec off the granule, keeps the temperature structure of the layers from log tau_5 =0.5 to log tau_5 =-2 without global evolutionary changes except short-term and spatially confined heating. Finally, the significant temperature changes in the upper layers (log tau_5 <=-2.5) observed during the time interval of 4 min are found to be typical for the granular and intergranular photosphere. **[13]**

A unique 15 min time series of high spatial resolution spectra taken with German Vacuum Tower Telescope on Tenerife was used for determination of temporal evolution of height stratification of temperature and velocities and their fluctuations in the solar photosphere. Adaptive optics for stabilization of solar image in the focal plane of telescope and correction of wave front distortions was used to achieve extremely good spatial resolution and temporal stability of data. Inversion code SIR was applied for interpretation of the time series. We found that the mean temperature stratifications in the non-magnetic region agree well with the classical 1D models and the 3D simulations at all heights. The observed rms temperature is much lower than in the simulations, the observed mean velocities indicate more upflows, and the observed velocity fluctuations are smaller except in the upper layers. The magnetic area shows conspicuous behaviour at large height. We also find evidence of fast low-photosphere downflows in the magnetic area and of enhanced temperature above a small pore. **[14]**

Time series of spectrograms are used to study the influence of the 5-min oscillations on intensity and velocity fields of different layers of the quiet solar photosphere. We study the continuum intensity field along with the intensity and velocity patterns of the mid and upper photosphere, obtained from two Fe lines. Oscillations seem to dominate the intensity and velocity fields of the higher atmospheric layers. Our results confirm the fast decay of the granular intensity structure with height. From correlations of temperature structures at three different photospheric levels we conclude that there are rapid changes of the structures in the lower photosphere, which are valid for the duration of the time series, while for the upper levels changes of the structures are fainter and show significant periodic character. The velocity pattern, on the other hand, shows a periodic propagation through the photosphere. **[19]**

Using extreme ultraviolet spectra of plasma at the supergranular boundaries we analysed dynamics and energy transfer between chromosphere, transition region, and corona. Data for this analysis were acquired using SOHO/CDS instrument during our own observational campaign. We documented existence of magneto-acoustic waves propagated at/above the supergranular boundary from the transition region down to the chromosphere. Propagation of the waves is possible to associate to 300-seconds oscillations of the transition region and chromospheric plasma, which could have an origin in solar corona. This, according to model predictions, could be indirect evidence of heating of the solar corona by nanoflares. **[7]**

b) solar cycle and solar-terrestrial connections **(space wheather)**

Observations of ten solar eclipses (1973-1999) enabled us to describe mutual relations between the white-light corona structures and the coronal magnetic field strength and topology. The finding correspondence strongly suggests a governing role of the field in the evolution of all the coronal features. Therefore, the white-light corona structures as observed over a long period of time can provide valuable information about the physical properties and cyclic variations of the Sun's magnetic field in the epoch long before introducing the direct photospheric magnetic field measurements. **[31]**

Simultaneous observations of the green corona (530.3 nm) at Norikura (Japan) and Lomnický Peak coronal station (Slovakia) with ground-based coronagraphs has been used to study 5 min intensity oscillations of this line. Analysis of observational data, obtained at different places in the world at the same time, has confirmed reality of 5 min intensity oscillations that occur at special regions in the emission solar corona (not anywhere). Some coronal intensity oscillations determined using ground-based coronagraphs have been already observed before, however, it was assumed that they are caused by the earth atmosphere fluctuations. Additionally for the first time we have detected tangential motions in the green coronal line structures with a speed up to 400 km/s. **[16]**

Reexamination of the homogeneous coronal data set has been done for the period 1939-1965, using a close correlation between the coronal index of solar activity (CI) and sunspot number (also the 2800 MHz radio flux and the cosmic ray intensity) valid for the period 1966-2002. New homogeneous coronal data set has been created and a new CI has been recomputed. High correlation between the CI and sunspot number (0.914) has been found. **[25]**

Data on the brightness of the coronal green line, the total number and area of sunspots, and the net magnetic flux were used to study the coronal manifestations of the asymmetry of the solar activity for the last 60 years including the north/south asymmetry, zonal deviations, presence and persistence of the 'active longitudes' on the Sun, cyclicity and periodicity of the solar activity. The characteristic time variations in the four quantities are similar for all asymmetries of the solar activity, on both long and short time scales. Quasi-biennial oscillations (QBOs) can be traced in the asymmetries of all four indices. A detailed study of the QBOs was carried out based on spectral-variation and wavelet analyses. Long-term increases and decreases occur synchronously in the asymmetries of various indices. A substantial diminishing of the QBOs during the mid-1960s, which coincided with an especially strong increase in asymmetry of the solar activity, was found. Our analysis shows that the N-S asymmetry is probably a fundamental property that controls the coupling and degree of coincidence between the magnetic-field-generation mechanisms operating in the northern and southern hemispheres. **[3]**

From sunspot drawings made at the Kanzelhöhe Solar Observatory, Austria, and at the Skalnaté Pleso Observatory, Slovak Republic, we extracted a data catalogue of hemispheric sunspot numbers covering the time span 1945-2004. The validated catalogue includes daily and monthly relative sunspot numbers for the northern and southern hemispheres separately. The catalogue is available for public scientific use. These data we then investigated with respect to north-south asymmetries for almost 6 entire solar cycles (Nos. 18-23). For all the cycles studied, we found that the asymmetry based on the absolute asymmetry index is enhanced near the cycle maximum, which contradicts to previous results that are based on the normalized asymmetry index. Moreover, the weak magnetic interdependence between the two solar hemispheres is confirmed by their self-contained evolution during a cycle. For the time span 1945-2004, we found that the cycle maxima and also the declining and increasing phases are clearly shifted, whereas the minima seem to be in phase for both hemispheres. The asymmetric behavior reveals no obvious connection to either the sunspot cycle period of ~11- or the magnetic cycle of ~22-years. **[32]**

The hybrid solar eclipse of April 8, 2005, provided a good opportunity to observe the white-light solar corona, even though the eclipse lasted just 30 seconds and could be seen only from ships in the Pacific Ocean. During the eclipse, we detected a unique 'cloud' of

particles in the white-light corona above the west limb ~260°-270°. We compared this feature with EUV images from SOHO. The feature's density and temperature seem to be comparable to a coronal condensation, and, like a coronal condensation, it is connected to the emergence of material from the solar surface without a flare. However, the morphology of the feature shows clear differences from a classical coronal condensation. **[20]**

2.2. Department of interplanetary matter

RESEARCH AREAS:

- study of the structure of the outer part of the Oort cloud and the Edgeworth-Kuiper belt,
- theoretical investigation of transfer orbits among different populations of small bodies in the Solar System regarding near-Earth objects, interrelations among the populations of small bodies of the Solar System and their evolution,
- investigation of the activity of selected cometary nuclei and its influence on physical and dynamical evolution of these bodies, photometry and astrometry of asteroids and comets,
- structure and dynamics of meteoroid streams and evolution of their parent bodies, description of the distribution of meteoroid particles in the inner Solar System, search for meteoroid streams of asteroidal origin, search for hyperbolic and interstellar meteoroids, operation of the all-sky photographic cameras within the European Fireball Network,
- dynamics and reflection conditions of cosmic dust particles and understanding of the disintegration processes, investigation of the light scattering of dust particles in the Solar System and the Earth atmosphere, study of meteorite properties.

SELECTED RESULTS PUBLISHED IN THE PERIOD 2003-6:

c) dynamics and physics of comets and asteroids

Using the newly published method by Lynch, we evaluated the statistical significance of the correlation between the observed sequence of the mean heliocentric planetary distances and a power law. It turns out that the observed agreement very probably occurred by chance for 8 known planetary distances (Mercury to Neptune) with the added mean distance of the asteroids. However, the clearly opposite conclusion is true, if the distance of the Earth is omitted in the above mentioned sequence. It indicates a peculiar location of the Earth's orbit.

The structure of the outer part of the Oort cloud was, for the first time, revealed from observations. It appeared that the cloud is less concentrated toward its centre (the index of the semi-major-axis power-law distribution is about -0.65) than supposed in the past (index –2 or -2.5). A depletion of the outer cloud caused by the Galactic tide and nearly passing stars was estimated to be about 19%. **[17]**

We demonstrated that no star passing by the Solar System with a velocity approximately equal or larger than about 5 km/s could cause the observed abrupt decrease of the number density of bodies in the classical Kuiper belt beyond the heliocentric distance 50 AU. **[18]**

A problem of the dynamical stability of extra-solar planets in binary star systems, or the Sun-Jupiter-small body system, was solved by the theory of the special case of the general three-body problem. In our theory the Hamiltonian neglecting short-period terms, using von Zeipel's method, was accepted. A designed analytical method properly describes the movement of extra-solar planets on an astronomical large-scale interval and gives comparable results with a numerical integration of orbital equations.

A study of transfer orbits between the Jupiter family comets (JFC) and Encke-like orbits has shown that some of the model orbits of the JFC will change to the Encke-like orbits. The migration come true on a time scale comparable to the activity period of short-period comets. The main factors for this orbital change are resonances and non-gravitational forces. **[21]**

Infrared images and spectra of comets 2P/Encke, 67P/Churyumov-Gerasimenko, and c/2001 HT50 (LINEAR-NEAT) were received by the Spitzer Space Telescope. Comet Encke

exhibited a smooth continuum, best modeled by carbonaceous grains with a small peak grain size of 0.4 mikrometer. Comet 67P exhibited a significant coma at a heliocentric distance of 5 AU. Comet HT50 displayed significant silicate mineralogy with a silicate-to-carbon submicron mass ratio of 0.6. **[10]**

A combination of the observations in radio, UV, visible and infrared regions, provided us with information about complex chemical composition of the cometary nuclei. This together with detailed thermal models of the interior of comets will enable to separate the primordial differences from the products of aging and evolutionary process. Main sources of knowledge will be activities of very distant comets and of brighter Centaurs and a search for comas of the Kuiper Belt Objects. **[1]**

A photometric program was focused to enable a modelling of asteroidal shapes and to observe the near-Earth objects, asteroids of Hungaria family in an internal region of the main belt, and periodic comets. In a fruitful international collaboration of observational groups from the Czech Republic, the USA, Canada, Italy, Portugal and Ukraine three binary asteroids (1717) Arlon, (2754) Efimov and (9260) Edwardolson were discovered.

d) structure and evolution of meteoroid streams

The positions of 17 filaments found inside the Perseid meteoroid stream by method of indices were compared with those of low-order mean-motion resonances with Jupiter and Saturn. Our integrations of the motion of particles in the Perseid stream have shown that the found filaments are located in close proximity of strong resonances. They represent, with a high probability, increased numbers of particles gravitationally expelled from a resonant gap and (temporary) settled down in its close proximity. **[30]**

The IAU Meteor Data Center database of photographic meteors, which represents the most precise set of heliocentric meteor orbits at all, was completed and additional 461 meteors were added, thus the database contains 4581 meteors. The database was homogenized and a final, corrected version is at disposal in an electronic form at the homepage of our Institute. **[15]**

The mean orbit, shape, size and ephemeris of the Geminid meteor stream radiant was derived and a study of the orbital evolution over 5000 yrs confirms a close association between the Geminids and asteroid Phaethon. The both orbits were closest at about one thousand years ago. **[22]**

The analyses of photographic and radar meteors from the IAU Meteor Data Center and the comparison between our results and the results obtained by cosmic spacecraft detectors and by a high-power radar has shown that the occurrence of interstellar meteoriods is different for masses $m<10^{-15}$ kg, for mass interval $10^{-15}<m<10^{-10}$ kg and for masses $m>10^{-10}$ kg, and the mass index of interstellar meteoroids changes continuously along the mass scale. **[8]**

e) cosmic dust

One important problem of dynamical evolution of micron-sized cosmic dust particles which appeared recently is their interaction with the electromagnetic radiation. Interstellar grains entering the Solar System (SS) are mainly affected by solar gravity, radiation pressure, and electromagnetic effects. The trajectories of sub-micron dust particles in the SS are also strongly influenced by Lorentz force, which, in general, influences the motion of charged dust in the magnetic field. It is usually accepted that the radiation pressure force is directed radially away from the Sun and thus reduces the solar gravitational attraction. Nevertheless, any irregularity of the particle shape generates non-radial momentum components in the particle's frame of reference. Finally, the character of motion may significantly differ from the corresponding motion known for ideally spherical particles. **[11]**

In addition, we have found that the survived non-spherical interstellar dust particles orbiting the Sun are characterized by a quantity analogous to Kepler’s third law. This fact can efficiently be utilized in various astrophysical modelling of interstellar dust particle dynamics in the circumsolar region. We have also shown, that already a weak temperature-variation of the dust refractive index may influence a long-term dynamical behavior of the dust grains.

Here the temperature works as a separation factor for particles having slightly different temperature dependence of the optical constant. **[12]**

In a cooperation with the Geophysical Institute a remanent magnetisms of the Fermo meteorite (H-chondrite) was analysed and a solution of a proposed mathematical model for the penetration of temperature inside has revealed that when the meteoroid becomes hot close to the Curie temperature of taenite, any eventual extraterrestrial magnetization cannot survive and disappears.

2.3. Stellar department

RESEARCH AREAS:

- determination of the absolute parameters of the components of eclipsing binaries (masses, radii and luminosities) combining the photometric elements computed using the light curves taken at the telescopes at AISAS and spectroscopic elements determined from spectroscopic observations obtained at the David Dunlap observatory (Canada),
- analysis and interpretation of the orbital period changes of close binaries: study of the mass transfer and mass loss, tests of the predictions of Applegate mechanism, detection of multiple components using the light time effect,
- discovery of the multiple components of binaries using the spectroscopic observations from DDO, speckle interferometry from CFHT and astrometry from Hipparcos,
- mapping of the surfaces of active binaries, study of cycles of stellar activity and spots,
- study of physical processes in symbiotic binaries during different stages of their activity by the method of reconstruction of spectral energy distribution using the multifrequency ground-based and satellite observations (IUE, FUSE, HST),
- study of the structure of active components in symbiotic stars, ionization, scattering and mass outflow by the stellar wind and jets,
- multifrequency observations of classical novae, determination of their orbital periods, study of the structure of their expanding envelopes using the spectroscopic observations and direct optical and radio images,
- study of the chemical composition and properties of the chemically peculiar stars using spectra from ESO, Mt.Stromlo, Nauchnyj, Ondřejov, Rozhen and Zelenchuk,
- search for possible relations between the orbital parameters of binaries with Am components.

SELECTED RESULTS PUBLISHED IN THE PERIOD 2003-6:

f) interacting binaries and multiple systems

In collaboration with J. Kreiner from Poland, a catalogue of 361 contact binaries from all available sources was compiled. The catalogue contains new ephemerides, maximum and minimum brightness and equatorial coordinates of all systems. If available, the photometric and spectroscopic elements, parallaxes and magnitude of the O'Connell effect were also given. Selected statistical relations between the parameters and period changes of individual systems were discussed.

The analysis of new BVR light curves for the active star SV Cam performed with Serbian astronomer G. Djurasevic showed, that the Roche model with spotted areas on the hotter primary component fits satisfactorily all filter observations yielding two spots in intermediate latitudes and covering about 1.5% each of the stellar surface. Both are ~ 1000 K cooler than surrounding photosphere. **[33]**

In collaboration with the American astronomers M. Richards and B. Miller, we have calculated synthetic Hα spectra of TT Hya, which is an Algol-type eclipsing binary with an accretion disc. Both the primary and secondary stars were considered in the calculations as well as a disc surrounding the primary. The influence of various effects and free parameters of the disc on the emerging spectrum was studied. This enabled to put some constraints on the geometry, temperature, density and velocity fields within the disc. Differences found between the observed and synthetic spectra unravel the existence of a gas stream as well as

a hotter disc-gas interaction region. An additional cooler circumstellar region between the C1 and C2 Roche surfaces was suggested to account for various observed effects. A new computer code called Shellspec was created for this purpose, which solves simple radiative transfer along the line of sight in 3D moving media. **[5]**

In collaboration with the Canadian astronomer S. Rucinski, it was found that almost 2/3 of contact binary stars are members of multiple systems. This supports a hypothesis that interaction with a third body is crucial for the formation of close binary stars. This result was obtained by an analysis of all available archive and new observations enabling detection of multiple components to contact binary stars: spectroscopic observations from David Dunlap Observatory (Canada) led to the direct detection of six multiple systems in broadening functions, adaptive optics observations on 3.6m CFHT led to the visual detection of a companion to 9 contact binaries. Presence of a third body was also studied using Hipparcos astrometric observations indicating several systems showing either stochastic astrometric motion or acceleration term in the astrometric solution. Times of the minimum light were used as an indirect indicator in systems showing period changes of the orbital period. In 20 systems stable orbit was found. Several systems manifest large ratio of the X-ray and bolometric flux indicating presence of an active late-type dwarf companion. Reality of a possible multiplicity of a system was assessed using all the above-mentioned techniques after proper weighting. Sample of 151 contact binary stars brighter than V=10 in maximum was found to contain 64 multiple systems. In case of better-observed Northern hemisphere we have 52 multiple systems among 88 objects, i.e., 59$\pm$8%. This supports a hypothesis that interaction with a third body is crucial for the formation of close binary stars. **[23]**

Spectroscopic elements for 10 close binary stars: DU Boo, ET Boo, TX Cnc, V1073 Cyg, HL Dra, AK Her, VW LMi, V566 Oph, TV UMi, and AG Vir were computed using the radial velocities determined by refined method of the double rotational-profile fitting to broadening functions. Three systems ET Boo, VW LMi and TV UMi were found to be spectroscopic quadruples while AG Vir is a spectroscopis triple. New observations enabled us to determine spectroscopic orbits of non-eclipsing binaries in ET Boo and VW LMi. System of VW LMi was found to be extraordinary interesting with two binaries revolving in tight, 355-days orbit. **[24]**

A quantitative method of modeling of the spectral energy distribution (SED) for symbiotic binaries was elaborated. In a review on investigation of symbiotic stars a process of ionization in these systems has been discussed. It was found, by modeling the SED during quiescent phases of symbiotic stars, that total emission from the nebula agrees with that of a simple ionization model and it is responsible for the observed periodic variation in the light curves, which led to a different view on the nature of the symbiotic phenomenon. **[2]**

Application of the method to 21 symbiotic systems during their quiescent as well as active phases led to the determination of accurate physical parameters of individual components of radiation. Independently, the spectral types of cool giants in symbiotic binaries were confirmed. New distances and quantities of the interstellar reddening were refined for some objects. The mass-loss rate for cool components was determined to 10^{-7} solar masses per year. The solution for the apparent problem of directly and indirectly determined temperature of the hot objects as a consequence of a disk-like structured accretion material was suggested. The effect is extreme during active phases. The presence of a high-temperature nebula in active systems was revealed. On the basis of the properties of individual sources a basic structure of the active object in symbiotic binaries was reconstructed, which represents the major result in the field. **[28]**

The key problem of the research of symbiotic stars is nature of their outburst. Observations indicate that the active objects reached 10000 luminosities of the Sun, decrease of temperature from 200 000 K to 20 000 K, while the spectra indicate presence of a hot body, which ionizes hydrogen and helium. The analysis of the spectroscopy, obtained in a wide international collaboration with Italian, Czech, Russian and Japan astronomers, multi-colour photometry from our observatories and ultraviolet FUSE spectroscopy enable to elaborate the structure of the hot object in Z And. It was found that the active object consists of optically thick slowly expanded (100-200 km/s) disc-like envelope in the plane of the orbital

motion and a fast (2 500 km/s) optically thin stellar wind escaping from the rest of the accretor. **[29]**

The coordination of the international european photometric campaign for the symbiotic star YY Her enable to cover its light curve, to find the secondary minimum and to improve the orbital period to 587.54 days. The brightness changes is possible to explain by an eclipsing model, in which the hot component is surrounded by a disk-like envelope with the thickness of 27 R_s and temperature of 4000 K**. [9]**

Analysis of the long-term photometry of the symbiotic nova HM Sge obtained in collaboration with S. Shugarov from Russia and P. Kroll from Germany in 1975-2003, revealed that the maximum of brightness caused by the outburst in 1975 was followed by two brightness minima with the duration of 750 and 2100 days explained by the eclipses of the hot component and the hot shocked region formed by colliding winds of the components by a Mira type giant.

The multicolour CCD photometry and spectroscopy of the classical nova V475 Sct, obtained in collaboration with Czech, Italian, German and Russian astronomers, was used to determine its basic parameters and classify the object as a slow Fe II nova. Formation of the dust in its expanding envelope accelerated by a stellar wind was detected. The 13-day periodicity of brightness increases was explained either by pulsations of the hot component or by a mass transfer from the red to the white dwarf caused by a third body moving around the binary at eccentric orbit. The nebular emission line profiles suggest a nonspherical ejection of the shell. **[6]**

g) chemically peculiar stars

In collaboration with I. Iliev from Bulgaria, a search for abundance anomalies in Am binaries driven by tidal interactions was performed. It was suggested that the tidally induced meridional circulation existing in binary star systems might successfully compete with diffusion processes and rotationally induced meridional circulation. This could affect the chemical composition of an Am binary component. Three stars were analysed. Basic stellar properties, atmospheric parameters and abundance patterns were derived. A new spectroscopic Ab component of HD 178449 was discovered. **[4]**

The analysis of spectra of 6 Am binaries was performed with the aim to investigate possible influence of the companion to a chemical composition of an Am star. The temperatures, masses, age, rotation and abundances of some elements were determined. It was found that HD 861, 29479 a 108651 are typical Am stars, while HD 20320 a 96528 are mild Am stars. HD18778 is not an Am star. In a wide collaboration with astronomers from Ukraine, Belgium, Italy and Switzerland, a detailed analysis of spectra of the unique roAp star HD 101065 (Przybylski's star) near the resonance doublet Li I 6708 Å was perfomed, using a most complete line list including all possible transitions between REE levels of the NIST database. It was proved that the Li lines are present in the range 6707.72-6708.02 Å. The overabundance of lithium amounts to 3.1 dex, the isotopic ratio ^{6}Li/ ^{7}Li is 0.3. **[27]**

In collaboration with V.R. Khalack from Ukraine, the complex magnetic field in the Ap star HD 187474 within the frame of the point field source model, where virtual magnetic charges are distributed in the stellar body, was reconstructed. The best-fit model describes sufficiently well the observed nonsinusoidal variability of the mean magnetic field modulus and the sinusoidal behaviour of the mean longitudinal magnetic field with the phase of stellar rotation. The best fit provides discrepancy on the level of χ^2 = 6.10 for all the analyzed data. We show that in HD 187474 the magnetic dipole is displaced from the centre of the star by 0.055 R_{star}. The dipole has a size ~0.035 R_{star}. The angle between the stellar rotational axis and the magnetic dipole is $\beta = 37^{\circ}$.

3. Concept of R&D activity of the Organisation for the next four years (max. 5 pages)

i. Present state of knowledge and status of ongoing research related to the subject of the Concept, from both international and national perspective

a) solar research of AI SAS is aimed at investigation of physics and dynamics of the solar photosphere and chromosphere **[a1]**; solar activity manifestations in the solar corona together with investigation of solar activity cycle and solar-terrestrial connections **[a2]**; and it is extending interest also to dynamics and heating of the outer solar atmosphere **[a3].**

[a1, a3] Understanding processes that take place in our Sun is important due to two very different aspects. Firstly, there are several basic astrophysical questions with a lot of stellar connections which have to be still solved - the Sun is the only place where we can study in very detail interaction of plasma and the magnetic fields. Secondly, the Sun is sustaining life on Earth. Solar variability and many different solar eruptive phenomena have dramatic consequences for heliosphere and Earth including its climate. Recent solar observations taken by different ground-based telescopes and space-born satellites, grow up a new insight to solar structures and their dynamics - no "purely quiet solar atmosphere" exists. Traditional layers of solar atmosphere consists in fact from coupled dynamic systems of fine structures where complex magnetic fields play dominant role. The main challenge in solar physics nowadays is to combine new observational results to results of advanced numerical simulations to improve our understanding of solar convention, emergence and motion of the magnetic fields, and their role in heating of outer parts of solar atmosphere and acceleration of the solar wind.

[a2] On the other hand, solar variability displayed in the solar activity cycles take place on a wide range of spatial and temporal scales including very important energetic phenomena. So far we do not fully understand several aspects of solar activity and variability and so we cannot predict even very basic aspects accurately. Understanding of these aspects is crucial for our understanding of the solar activity and its effects on Earth.

b) research of interplanetary matter in the AI SAS will be devoted to the study of dynamics and physics of comets and asteroids **[b1, b2]**, structure and evolution of meteoroid streams **[b3]** and cosmic dust **[b4]**.

[b1] There have been worked out partial theories of the origin of giant planets, Kuiper belt and Oort cloud. A confrontation of the details provided by these theories revealed some inconsistencies. At present, researchers attempt to work out a unified, self-consistent theory of a common origin.

[b2] A study of the long-term dynamical evolution of peculiar objects as SOHO comets and trans-Neptunian objects indicates that at least some of them can migrate all over the Solar System. Astronomers pay their attention to activity of cometary nuclei at large heliocentric distances, to the near-Earth asteroids and characteristics of asteroidal families.

[b3] The problematics of possibly genetic related complexes of small bodies of the Solar System is still only partially solved. A prototype is the Taurid meteor complex. At present, there are indication of the existence of several similar complexes, as the Quadrantid complex consisting probably of two comets and two asteroids. A study of a fine structure of the Perseid meteoroid stream showed that using a sufficient separating and sorting statistical method (method of indices) and mathematic simulation (SWIFT package) simultaneously, enables identification of unknown structures. Study of other streams is necessary.

[b4] The quantities like morphology, composition, or structural inhomogeneity were recognized as very essential parameters affecting the optical behavior of irregular and composite dust particles resulted in a quite dramatic evolution of this research field in the last few years. It was experimentally confirmed that illuminated non-spherical particles move in a different way than spherical grains.

c) stellar research in the AI SAS is mainly devoted to the study of **[c1]** interacting binaries with standard stellar components, **[c2]** interacting binaries with a white dwarf component and **[c3]** chemically peculiar stars. Interacting binaries are systems with orbital periods from a few hours to tens of years. The components of the binaries are stars in

different evolutionary stages, from pre-main-sequence objects, through the main sequence stars, subgiants, giants, supergiants up to the stars in the late stage of evolution: white dwarfs, neutron stars and black holes.

[c1] The aim of our research is determination of basic stellar parameters and study of physical processes in these systems. Significant results in research of close binary and multiple systems of stars can be attained nowadays by large (2-10m) telescopes. Typical observational techniques are high dispersion spectroscopy, aperture interferometry, high-resolution imaging using adaptive optics systems and satellite multifrequency observations.

[c2] The field of our research are symbiotic stars (SS) and classical novae (CN). In the former case the donor star is a red giant losing its mass via a stellar wind, whereas in the latter case a cool dwarf transfers matter via Roche-lobe overflow. Pronounced common features of their activity are outbursts but both the groups differ significantly. SS are long-period detached binaries (orbital periods of a few years), but CN are short-period semidetached systems (orbital periods less than 2 days). Outbursts of SS commence with a 2-3 magnitudes rise in the optical and can last from weeks to years with a recurrence of decades. To the contrary, CN increase their brightness by more than 10 magnitudes during a few days of their outbursts. They are not repeatable. Both types of outburst produce a large mass-outflow from system at very high velocities of a few times 1000 km/s. These interacting binaries are therefore important for our understanding of fundamental astrophysical topics like accretion onto compact objects, outbursts, mass outflows and stages of star evolution.

[c3] About 20% of stars of the spectral classes B-F, at the upper main sequence, known as chemically peculiar (CP) stars, exhibit spectral peculiarities, anomalous chemical composition, spectral flux distribution and rotation that differ from the rest of main sequence stars. Part of them is characterized by a global dipole magnetic field. Photometric, spectroscopic and magnetic variability on a time-scale of days and years is observed, consistent with the rotation of the star. Some of them exhibit short-term variability on a time-scale 5-15 minutes due to non-radial oscillations. Photometry is used for determination of rotational or orbital periods, for mapping of spots on the surface, study of non-radial oscillations. Spectroscopy is used for detection of anomalies in abundances of the elements and comparison with synthetic spectra from the models of CP stars atmospheres.

ii. Organisation's role or significance in the overall research effort within the field of the Concept on both the national and international scales

a) solar research

[a1] Due to our results and quality of our proposals we have almost regular access to the best solar observing facilities (Canary Islands). Data of several campaigns are at our disposal. Modelling of solar photosphere using inversion techniques of radiative transfer to high-resolution solar spectra is applied thanks to young scientists in the department. Observations as well as interpretation are on the world competitive level, e.g. inverse granulation photosphere via shocks, models of photosphere.

[a2] Coronal station of the Solar department placed at the Lomnický Peak (2632 m) is one of only few such facilities in the world regularly providing coronagraphic emission line measurements. Department is responsible for homogenisation of all such measurements taken at different instruments (USA, Russia, Japan) providing a homogeneous data set of green emission line intensities and derived coronal index of solar activity – the second longest directly measured dataset of the solar activity. Different data sets including that ones prepared in the department are used for solar cycle studies focused at the solar activity in the solar corona and for the solar-terrestrial studies.

[a3] Recently, using the coordinated campaigns of the ground-based and space-born instruments dynamics and energy transfer is studied with aim to address heating of upper layers of solar atmosphere – one of the enigmatic problems of the solar and stellar physics. Proposed applications for the observing time were very successful so far.

The whole above mentioned research is performed in close collaboration with Germany, Austria, Spain, the Netherlands, the USA, Japan, Russia, UK, the Czech republic and Croatia. Access to observing facilities of the best available level is regularly managed.

b) research of interplanetary matter

[b1] We work within an international collaboration (Poznan Univ., Poland; Astroph. Obs. Catania, Italy). The researchers of our institute represent a core of the group and play a decisive role in the project. Our whole international group appears to be one of only three groups in the world, which try to comprehend the entire problem and have both necessary requirements: astronomical knowledge and computational equipment and skills.

[b2] AI SAS plays significant role in the contribution to the enlargement of knowledge of interplanetary bodies, which come to the vicinity of the Sun, in terms of their dynamical and physical trends in the past and in the future. Improving observational technique at AI SAS allows us to obtain observational data on comets at large heliocentric distances and the brightest Centaurs. We participate in the project of P. Pravec from the Astronomical Institute at Ondřejov (Czech Republic), aimed at a search for the Near Earth binary Asteroids.

[b3] AI SAS ranks among the institutions with high credibility in the field of meteor research and cometary - asteroidal research. Further, we are coordinating the IAU Meteor Data Center, which is a central depository and database summarizing all available basic parameters of photographic, radio and TV meteors and their orbits. We have published a new version of the photographic database as a key source for orbital studies of meteoroids. Skalnaté Pleso is one of the European Photographic Meteor Network stations.

[b4] We are well established in light scattering community and have co-leading position in modeling the dynamical evolution of irregularly shaped cosmic dust particles in the space. As one of the first we have developed an operational model for simulation of real trajectories of irregularly shaped particles in the Solar System. We have very valuable cooperation over the world (NASA, US Army Res. Lab, St. Petersburg Univ., Vienna Univ.).

c) stellar research

[c1-c3] Important part of the observational material has been carried out by the small telescopes of the AI SAS at the Skalnaté Pleso and Stará Lesná Observatories (long-term multicolour photoelectric and CCD photometry). We obtain the orbital light curves of interacting binaries and phase light curves of CP stars. Important targets in active stages are monitored regularly. For better coverage of the light curves of symbiotic stars, international campaigns have been organized. Results of the campaigns are regularly published in the CAOSP journal. Spectroscopic observations, radio observations and direct images are undertaken within our international collaboration and/or complemented with those available from the satellite archives (e.g. IUE, HST, FUSE, ISO). Analysis of the observing material is done in major part using our own software as well as standard packages of codes. Most of the important papers used spectroscopic observations taken in an international collaboration.

iii. Objectives of the Concept

a) solar research

[a1] Investigations of open problems of physics and dynamics of the solar photosphere and chromosphere using inversion of the high spectral and spatial resolution spectra and comparing these observational results to the predictions of the advanced numerical simulations of the convection in the solar atmosphere.

[a2] Continuation in the patrol measurements of the solar coronal emission lines and H alpha prominences using them for study of the solar activity cycle and solar-terrestrial relations. New physical measurements of solar corona (polarimetry) are planned to be introduced at the Lomnický Peak coronal station.

[a3] Dynamics and mechanisms of the energy transfer to upper layers of the solar atmosphere will be addressed using data of observing campaigns performed at ground-based telescopes (e.g. DOT) and space-born satellites (SOHO, TRACE, RHESSI, HINODE). Wave and nanoflare heating mechanisms are planned to be observationally verified.

b) research of interplanetary matter

[b1] We want to create an unified theory of the origin of giant planets, the Kuiper belt and Oort cloud. Reaching this goal will significantly improve our knowledge of the cosmogony of the Solar System and will make partial aspects of the theory of its formation more reliable known than are known at the present.

[b2] We want to clarify a space migration of the interplanetary bodies, which come to the vicinity of the Sun and as well as transitional phases among individual populations. We can obtain possible close approaches of these bodies to the planets. We will pay particular attention to their close approach to the Earth and determination of the physical properties of the medium-size main-belt asteroids and sufficiently bright Near-Earth asteroids. From the best quality and long-term data series to create 3-D models of asteroids.

[b3] We shall study mechanisms of generation of the complexes of meteoroids, asteroids and comets, dynamical evolution of the individual members of the complexes, mechanisms of generation of the meteoroid streams up to their contribution to stability of the zodiacal cloud. Within the foreign partnership, we have an intention to model initial conditions of the particle release (ejection velocity distribution and spatial angle) from the parent comet 109P/Swift-Tuttle. We will separate the main meteoroid showers from the updated database of the precise photographic meteor orbits and search for minor showers and associations.

[b4] Despite the complexity of existent theories, we are able to simulate the dynamical behavior of dust populations consisting of arbitrarily shaped grains. The interaction of the irregular particles with an incident electromagnetic radiation is solved with light scattering tools (DDA and T-matrix) that represent extensions of the conventional Mie theory. An attention will be paid to optical effects by fluffy particles, which typically occur in the space.

c) stellar research

[c1] The aim is determination of the absolute parameters of the components of interacting binaries, to study interactions in binaries with emphasise to systems with eccentric orbits, to study evolution and origin of binaries, to detect binaries in stellar clusters, to detect and study gravitational interaction in multiple systems.

[c2] The aim is to get a more reliable picture of the physical processes acting in classical novae and symbiotic stars and achieve a better understanding of the nature of these objects from a theoretical modelling of spectro-photometric variations in both the continuum and the line spectrum. In the study of outburst stages we will focus on mass transfer processes, the nature of the accreting star and physical reasons of the outbursts. We will use observed activity as a tool for deeper understanding of studied binary systems properties as well as particular physical mechanisms, their mutual connections and finally deeper understanding of internal structure of studied binary systems.

[c3] The aim of our research in hot stars with emphasis on chemically peculiar stars will be a theoretical study of the models of atmospheres with dipole magnetic field, determination of relative abundances of chemical elements using the detailed analysis with synthetic spectra, photometry of CP stars to get periods and shapes of the light curves, photometry and spectroscopy of binaries with CP components to get their parameters.

iv. Proposed strategies and methods to be applied, and time schedule

a) solar research

[a1] We would like to keep our position in high-resolution observations of the solar photosphere by playing an active role in new projects, e.g. 1.6 m solar telescope GREGOR and especially EAST initiative for building the European Solar Telescope – EST, being member of its consortium. Polarimetric observational data are planned to be acquired and analysed in future for the solar photosphere using inversion techniques (SIR) for their analysis. Results on different numerical simulations are at our disposal due to close international collaboration.

[a2] The main method applied is coronagraphic observations of the coronal emission lines and solar Hα prominences preparing the homogenised data sets of the green line intensities (including the coronal index of solar activity) using all data available worldwide. Modernisation of the observational techniques at the Lomnický Peak Coronal Station from 2005-2006 will be continued. In solar-terrestrial connections we suppose to compare our observations with other geo-effective indices.

[a3] New observational campaigns are in preparation for available space-born and ground-based instruments including the newly launched HINODE satellite. Careful co-alignment of data is solved with sufficient precision allowing unprecedented combination of

different observational data related to eruptive phenomena (explosive events, blinkers, microflares) and oscillatory phenomena in different solar structures.

b) research of interplanetary matter

[b1] We shall proceed in several steps, each represented by a huge numerical simulation of a dynamical evolution of test particles representing the planetesimals in once existing protoplanetary disc. The computational technique at the current frontiers is available within a project of the 6FP EU through collaboration with the Institute of Informatics of SAS. We intend to perform at least three simulations, each will last approximately a half-year.

[b2] The dynamical behaviour of comets and asteroids will be modeled by numerical integration of their equations of motion, using a dynamical model of the Solar System consisting of all planets and nongravitational forces. We shall study Near-Earth asteroids photometrically with the 0.61-m telescope and CCD camera at the Skalnaté Pleso. The acquired lightcurves will be used to determine rotational periods.

[b3] We will verify the so far known complexes of the small bodies of the Solar System and search for the new ones. This will be connected with a steady complementation of databases of the NEOs and meteor orbits obtained by all techniques. Next, we shall analyse orbital evolution of individual members of the complexes and search for their common origin in the past. We shall study the Geminid and Taurid meteor streams. The streams are interesting due to their potentional parent bodies – asteroid Phaethon and comet 2P/Encke. We will solve the problem of the particles ejected from the parent comet of the Perseid stream during the repeated perihelion passages. We are going to install a full-automatic camera for observations of bolides on the Lomnický Peak, in the cooperation with the Astronomical Institute, Ondřejov, Czech Republic – leading institution of this research.

[b4] The methodology is a combination of analysis of available experimental data, theoretical analyses and numerical modelling to link simulated particle properties with the existing measurements. Dust particles will be considered to be agglomerates of small homogeneous pieces and these aggregates may be internally mixed with other type of particles. We have great computational capabilities at disposal (120-node cluster at University of Vienna), so real-time numerical runs are possible.

c) stellar research

[c1] We will continue in our photoelectric and CCD photometry to obtain light-curves of close binaries and the high-dispersion spectroscopy in DDO to get their radial velocity curves. We will analyse light curves using our own software ROCHE and determine the basic parameters of the components. We will continue in determination of minima times of eclipsing binaries from the photometric observations by the telescopes of the AI SAS and interpret their orbital period changes. For the determination of the light-time orbits we will use our own software MULTIPLE. We will determine the positions of spots on the surfaces of components of active binaries using simultaneous photometric and spectroscopic observations. We will apply for observing time on larger telescopes and analyse different types of observations obtained in the frame of international collaboration.

[c2] To understand the physical nature of symbiotic and cataclysmic binaries, we will use long-term photometry as well as high-resolution spectroscopy for studying details in their electromagnetic spectrum. We plan to elaborate a model of the energy distribution in the composite spectra of symbiotic and cataclysmic binaries as a tool to determine their fundamental parameters and to diagnose their photometric behaviour. The structure of active objects during outbursts and mass-outflows will be studied with the aid of the multifrequency (from X-ray to IR) observations and modelling processes of ionization, Raman and Rayleigh scattering, acting in these binaries. Our own software will be applied.

[c3] We will continue in photometry of CP stars to get periods and shapes of their phase light curves and in spectroscopy in international collaboration to study the chemical composition and stratification of elements on their surfaces. Photometry and spectroscopy of binaries with CP components will enable to determine their physical parameters.

III. Partial indicators of the main activities:

1. Research output

i. List of the selected publications documenting the most important results of basic research. Total number of publications in the whole assessed period should not exceed the average number of the research employees

Chapters in monographs pubished abroad

1. MEECH, K.J. – SVOREŇ, J.: Using Cometary Activity to Trace the Physical and Chemical Evolution of Cometary Nuclei. In: FESTOU, M.C., KELLER, H.U., WEAVER, H.A. *Comets II.* Tucson, University of Arizona Press, 2004, ISBN 0-8165-2450-5, p. 317-335.

2. SKOPAL, A.: The role of ionization in symbiotic binaries. In PANDALAI, S.G. *Recent Research Developments in Astronomy and Astrophysics*. Trivandrum: Research Signpost, 2003, ISBN: 81-271-0002-1, p. 111-135.

Scientific papers published in journals covered by the ISI database Current Contents

3. BADALYAN, O.G. – OBRIDKO, V.N. – RYBÁK, J. – SÝKORA, J.: Quasibiennial oscillations of the north-south assymetry. In *Astronomy Reports* (IF = 0.649). Vol. 49, 2005, p. 659-670.

4. BUDAJ, J. – ILIEV, I.KH. Abundance analysis of Am binaries and search for tidally driven abundance anomalies -I. HD 33254, HD 178449, HD 198391. In *Monthly Notices of the Royal Astronomical Society* (IF = 4.671). Vol. 346, 2003, p. 27-36.

5. BUDAJ, J. – RICHARDS, M.T. – MILLER, B.: A Study of Synthetic and Observed H_alpha Spectra of TT Hydrae. In *Astrophysical Journal* (IF = 6.308), Vol. 623, 2005, p. 411 - 424.

6. CHOCHOL, D. – KATYSHEVA, N.A. – PRIBULLA, T. – SCHMIDTOBREIK, L. – SHUGAROV, S. Yu. – ŠKODA, P. – ŠLECHTA, M. – VITTONE, A.A. – VOLKOV, I.M.: Photometric and spectroscopic variability of the slow nova V475 Sct (Nova Scuti 2003). In *Contributions of the Astronomical Observatory Skalnaté Pleso*. Vol. 35, 2005, p. 107-129.

7. GÖMÖRY, P. – RYBÁK, J. – KUČERA, A. – CURDT, W. – WÖHL, H.: SOHO/CDS observations of waves above the network. In *Astronomy and Astrophysics* (IF = 4.223), Vol. 448, 2006, p. 1169–1175.

8. HAJDUKOVÁ, M. Jr. – HAJDUK A.: Mass distribution of interstellar and interplanetary particles. In *Contributions of the Astronomical Observatory Skalnaté Pleso,* Vol. 36, 2006, p. 15–25.

9. HRIC, L. – GÁLIS, R. – NIARCHOS, P. – DOBROTKA, A. – ŠIMON, V. – ŠMELCER, L. – VELIČ, Z. – HÁJEK, P. – GAZEAS, K. – SOBOTKA, P. – KOSS, K.: Photometric study of the symbiotic binary YY Her. The eclipsing model. In *Contributions of the Astronomical Observatory Skalnaté Pleso*, Vol. 36, 2006, p. 26–46.

10. KELLEY, M.S. – WOODWARD, C.E. – HARKER, D.E. – WOODEN, D.H. – GEHRZ, R.D. – CAMPINS, H. – HANNER, M.S. – LEDERER, S.M. – OSIP, D.J. – PITTICHOVÁ, J. – POLOMSKI, E. A.: Spitzer study of comets 2/P Encke, 67P/Churyumov–Gerasimenko, and C/2001 HT50 (LINEAR–NEAT). In *The Astrophysical Journal* (IF = 6.308), Vol. 651, 2006, p. 1256–1271.

11. KOCIFAJ, M. – KLAČKA, J.: The capture of interstellar dust: The pure electromagnetic radiation case, In *Planetary and Space Science* (IF = 1.634), Vol. 51, 2003, p. 617-626.

12. KOCIFAJ, M. – KLAČKA, J. – HORVATH, H.: Temperature influenced dynamics of small dust particles. In *Monthly Notices of the Royal Astronomical Society* (IF = 5.352), Vol. 370, 2006, p. 1876–1884.

13. KOZA, J. – BELLOT RUBIO, L.R. – KUČERA, A. – HANSLMEIER, A. – RYBÁK, J. – WÖHL, H.: Evolution of temperature in granule and intergranular space. In *Astronomische Nachrichten* (IF = 0.786), Vol. 324, 2003, p. 349-351.

14. KOZA, J. – KUČERA, A. – RYBÁK, J. – WÖHL, H.: Photospheric modeling through spectral line inversion: Temperature and radial velocity stratifications and fluctuations. In *Astronomy and Astrophysics* (IF = 4.223), Vol. 458, 2006, p. 941–951.

15. LINDBLAD, B.A. – NESLUŠAN, L. – PORUBČAN, V. – SVOREŇ, J.: IAU meteor database of photobraphic orbits - version 2003. In *Earth, Moon and Planets* (IF = 0.770), Vol. 93, 2005, p. 249-260.

16. MINAROVJECH, M. – RUŠIN, V. – RYBANSKÝ, M. – SAKURAI, T. – ICHIMOTO, K.: Oscillations in the Coronal Green-Line Intensity Observed at Lomnický Štít and Norikura Nearly Simultaneously. In *Solar Physics* (IF = 1.875), Vol. 213, 2003, p. 269-290.

17. NESLUŠAN, L. – JAKUBÍK, M.: Some characteristics of the outer Oort cloud as inferred from observations of new comets. In *Astronomy and Astrophysics* (IF = 3.694), Vol. 437, 2005, p. 1093-1108.

18. NESLUŠAN, L. – PAULECH, T.: The study of a gravitational influence of a nearly passing star on the primordial Kuiper belt. In *Contributions of the Astronomical Observatory Skalnaté Pleso,* Vol. 36, 2006, p. 158–170.

19. ODERT, P. – HANSLMEIER, A. – RYBÁK, J. – KUČERA, A. – WÖHL, H.: Influence of the 5–min oscillations on solar photospheric layers. I.Quiet region. In *Astronomy and Astrophysics* (IF = 4.223), Vol. 444, 2005, p. 257–264.

20. PASACHOFF, J.M. – KIMMEL, S.B. – DRUCKMÜLLER, M. – RUŠIN, V. – SANIGA, M.: The April 8, 2005, eclipse white–light corona. In *Solar Physics* (IF = 1.892), Vol. 238, 2006, p. 261–270.

21. PITTICH, E.M. – D'ABRAMO, G. – VALSECCHI, G.B.: From Jupiter-family to Encke-like orbits. The role of non-gravitational forces and resonances. In *Astronomy and Astrophysics* (IF = 3.843), Vol. 422, 2004, p. 369-375.

22. PORUBČAN, V. – KORNOŠ, L. – CEVOLANI, G. – PUPILLO, G.: The orbit and evolution of the Geminid meteoroid stream. In *Il Nuovo Cimento* (IF = 0.272), Vol. 27C, 2004, p. 395-400.

23. PRIBULLA, T. – RUCINSKI, S.M.: Contact binaries with additional components. I. The extant data. In *Astronomical Journal* (IF = 5.377), Vol. 131, 2006, p. 2986–3307.

24. PRIBULLA, T. – RUCINSKI, S.M. – LU, W. – MOCHNACKI, S.W. – CONIDIS, G. – BLAKE, R.M. – DEBOND, H.– THOMSON, J.R. – PYCH, V. – OGLOZA, W. – SIWAK, M.: Radial velocity studies of close binary stars. XI. In *Astronomical Journal* (IF = 5.377), Vol. 132, 2006, p. 769–780.

25. RYBANSKÝ, M. – RUŠIN, V. – MINAROVJECH, M. – KLOCOK, Ľ. – CLIVER, E.W.: Reexamination of the coronal index of solar activity. In *Journal of Geophysical Research* (IF = 2.839), Vol. 110, 2005, A08106, p. 1-9.

26. RYBÁK, J. – WOHL, H. – KUČERA, A. – HANSLMEIER, A. – STEINER, O.: Indications of shock waves in the solar photosphere. In *Astronomy and Astrophysics* (IF = 3.843), Vol. 420, 2004, p. 1141-1152.

27. SHAVRINA, A.V. – POLOSUKHINA, N.S. – PAVLENKO, YA.V. – YUSHCHENKO, A.V. – QUINET, P. – HACK, M. – NORTH, P. – GOPKA, V. F. – ZVERKO, J. – ZHIZNOVSKÝ, J. – VELES, A.: The spectrum of the roAp star HD 101065 (Przybylski's star) in the Li I 6708 Å spectral region. In *Astronomy and Astrophysics* (IF= 3.781), Vol. 409, 2003, p. 707-713.

28. SKOPAL, A.: Disentanagling the composite continuum of symbiotic binaries: I. S-type systems. In *Astronomy and Astrophysics* (IF= 3.694), Vol. 440, 2005, p. 995-1031.

29. SKOPAL, A. – VITTONE, A.A. – ERRICO, L. – OTSUKA, M. – TAMURA, S. – WOLF, M. – ELKIN, V.G.: Structure of the hot object in the symbiotic prototype Z Andromedae during its 2000–03 active phase. In *Astronomy and Astrophysics* (IF = 4.223), Vol. 453, 2006, p. 279–293.

30. SVOREŇ, J. – KAŇUCHOVÁ, Z. – JAKUBÍK, M.: Filaments within the Perseid meteoroid stream and their coincidence with the location of mean–motion resonances. In *Icarus* (IF = 3.244), Vol. 183, 2006, p. 115–121.

31. SÝKORA, J. – BADALYAN, O.G. – OBRIDKO, V.N.: Connections between the white-light eclipse corona and magnetic field, In *Solar Physics* (IF = 1.875), Vol. 212, 2003, p. 301-318.

32. TEMMER, M. – RYBÁK, J. – BENDÍK, P. – VERONIG, A. – VOGLER, F. – OTRUBA, W. – PÖTZI, W. – HANSLMEIER, A.: Hemispheric sunspot numbers Rn and Rs from 1945–2004: catalogue and N–S asymmetry analysis for solar cycles 18–23. In *Astronomy and Astrophysics* (IF = 4.223), Vol. 447, 2006, p.735–743.

33. ZBORIL, M. – DJURASEVIC, G.: SV Cam spot activity in February 2001 – March 2003. In *Astronomy and Astrophysics* (IF = 3.781), Vol. 406, 2003, p. 193-201.

ii. List of monographs/books published abroad

Chapters in monographs published abroad

[1] BUCCHERI, R. – JAROSZKIEWICZ, G. – SANIGA, M.: Endophysics, the fabric of time and the self-evolving universe. In: *Recent Research Developments in Astronomy and Astrophysics, Vol. 2.* Trivandrum: Research Signpost, 2003, ISBN: 81-271-0002-1, p. 609-623.

[2] MEECH, K.J. – SVOREŇ, J.: Using Cometary Activity to Trace the Physical and Chemical Evolution of Cometary Nuclei. In: FESTOU, M.C., KELLER, H.U., WEAVER, H.A. *Comets II.* Tucson, University of Arizona Press, 2004, ISBN 0-8165-2450-5, p. 317-335.

[3] SKOPAL, A.: The role of ionization in symbiotic binaries. In PANDALAI, S.G. *Recent Research Developments in Astronomy and Astrophysics, Vol. 1*. Trivandrum: Research Signpost, 2003, ISBN: 81-271-0002-1, p. 111-135.

iii. List of monographs/books published in Slovakia

[1] Astronomical Handbook for 2004 (in Slovak), Editor E. Pittich, Slovak Central Observatory Hurbanovo, 2003, KASICO, Bratislava, pp. 294, ISBN 80-85221-44-6. 9 chapters in the handbook have authors from AI SAS.

[2] Astronomical Handbook for 2005 (in Slovak), Editor E. Pittich, Slovak Central Observatory Hurbanovo, 2004, KASICO, Bratislava, pp. 304, ISBN 80-85221-46-2. 8 chapters in the handbook have authors from AI SAS.

[3] Astronomical Handbook for 2006 (in Slovak), Editor E. Pittich, Slovak Central Observatory Hurbanovo, 2005, KASICO, Bratislava, pp. 272, ISBN 80-85221-50-0. 9 chapters in the handbook have authors from AI SAS.

[4] Rušin, V.; Slnko – naša najbližšia hviezda. Bratislava, VEDA, 2005, pp. 283, ISBN 80-224-0864-6.

[5] Astronomical Handbook for 2007 (in Slovak), Editor E. Pittich, Slovak Central Observatory Hurbanovo, 2006, KASICO, Bratislava, pp. 272, ISBN 80-85221-51-9. 9 chapters in the handbook have authors from AI SAS.

iv. List of other scientific outputs specifically important for the Organisation

[1]

v. Table of research outputs

*Table **Research outputs** shows research outputs in number of specified entries; these entries are then divided by FTE employees with a university degree (from Tab. Research staff) for all Organisation at the respective year; finally these entries are divided by the total salary budget (from Tab. Salary budget).*

Research outputs	2003			2004			2005			2006			total			
	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	averaged number per year	av. No. / FTE	av. No. / salary budget
chapters in monographs, books published abroad	2	0,06	0,17	1	0,03	0,08	0	0,00	0,00	0	0,00	0,00	3	0,8	0,02	0,06
chapters in monographs, books published in Slovakia	11	0,33	0,93	9	0,28	0,74	10	0,30	0,80	10	0,30	0,76	40	10,0	0,30	0,81
CC publications	27	0,82	2,28	31	0,95	2,55	38	1,14	3,03	40	1,22	3,04	136	34,0	1,03	2,74
scientific publications indexed by other databases (NASA ADS)	42	1,28	3,55	27	0,83	2,22	44	1,31	3,51	10	0,30	0,76	123	30,8	0,93	2,48
scientific publications in other journals	12	0,36	1,02	12	0,37	0,99	6	0,18	0,48	12	0,37	0,91	42	10,5	0,32	0,85
publications in proc. of international scientific conferences	5	0,15	0,42	0	0,00	0,00	2	0,06	0,16	2	0,06	0,15	9	2,3	0,07	0,18
publications in proc. of nat. scientific conferences	5	0,15	0,42	4	0,12	0,33	12	0,36	0,96	2	0,06	0,15	23	5,8	0,17	0,46
active participations at international conferences	70	2,13	5,92	87	2,66	7,15	58	1,73	4,63	55	1,67	4,18	270	67,5	2,05	5,44
active participations at national conferences	6	0,18	0,51	17	0,52	1,40	11	0,33	0,88	18	0,55	1,37	52	13,0	0,39	1,05

vi. List of patents and patent applications

[1] AI SAS is the organisation exclusively aimed at a basic research and it has neither patent nor patent application.

vii. Supplementary information and/or comments on the scientific output of the Organisation

2. Responses to the scientific output

*Table **Citations** shows specified responses to the scientific outputs; these entries are then divided by the FTE employees with a university degree (from Tab. Research staff) for all Organisation at the respective year; finally these entries are divided by the total salary budget (from Tab. Salary budget).*

Citations	2002			2003			2004			2005			total			
	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	averaged number per year	av. No. / FTE	av. No. / salary budget
Web of Science	154	4,7	13,0	145	4,4	11,9	144	4,3	11,8	188	5,7	14,3	631	157,8	4,8	12,7
NASA Astrophysical Data Service Database	30	0,9	2,5	47	1,4	3,9	40	1,2	3,2	25	0,8	1,9	142	35,5	1,1	2,9
SCOPUS Database	0	0,0	0,0	0	0,0	0,0	4	0,1	0,3	11	0,3	0,8	15	3,8	0,1	0,3
in monographs, conf. proceedings and other publications abroad	35	1,1	3,0	52	1,6	4,3	25	0,7	2,0	33	1,0	2,5	145	36,3	1,1	2,9
in monographs, conf. proceedings and other publications in Slovakia	15	0,5	1,3	5	0,2	0,4	4	0,1	0,3	15	0,5	1,1	39	9,8	0,3	0,8

i. List of 10 top-cited publications and number of their citations in the assessment period

1. CEPLECHA, Z. – BOROVIČKA, J. – ELFORD, W.G. – REVELLE, D.O. – HAWKES, R.L. – PORUBČAN, V. – ŠIMEK, M.: Meteor Phenomena and Bodies. In *Space Science Reviews*. Vol. 84, (1998), p. 327-471.
   Citations: 73

2. PRIBULLA, T. – VAŇKO, M. – PARIMUCHA, Š. – CHOCHOL, D.: New photoelectric minima and updated ephemerides of selected eclipsing binaries. In *Information Bulletin on Variable Stars*. No. 5056, (2001), p. 1-4.
   Citations: 17

3. KUDELA, K. – RYBÁK, J. – ANTALOVÁ, A. – STORINI, M.: Time Evolution of Low Frequency Periodicities in Cosmic Ray Intensity. In *Solar Physics.* Vol. 205 (2002), p. 165-175.
   Citations: 14

4. CROCKER, M.M. – DAVIS, R.J. – EYRES, S.P.S. – BODE, M.F. – TAYLOR, A.R. – SKOPAL, A. – KENNY, H.T.: The symbiotic star CH Cygni: I. Non-thermal bipolar jets. In *Monthly Notices of the Royal Astronomical Society.* Vol. 326, (2001), p. 781-787.
   Citations: 12

5. PRIBULLA, T. – CHOCHOL, D. – ROVITHIS-LIVANIOU, H. – ROVITHIS, P.: The contact binary AW Ursae Majoris as a member of a multiple system. In *Astronomy and Astrophysics*. Vol. 345, (1999), p. 137-148.
   Citations: 12

6. PRIBULLA, T. – VAŇKO, M. – PARIMUCHA, Š. – CHOCHOL, D.: New Photoelectric and CCD Minima and Updated Ephemerides of Selected Eclipsing Binaries. In *Information Bulletin on Variable Stars.* No. 5341 (2002), p. 1-4.
   Citations: 12

7. STORINI, M. – PASE, S. – SÝKORA, J. - PARISI, M.: Two components of cosmic ray modulation. In *Solar Physics.* Vol. 172, (1997), p. 317-325.
   Citations: 11

8. PRIBULLA, T. – VAŇKO, M.: Photoelectric photometry of eclipsing contact binaries: U Peg, YY CrB, OU Ser and EQ Tau. In *Contributions of the Astronomical Observatory Skalnaté Pleso.* Vol. 32, no. 1 (2002), p. 79-98.
   Citations: 10

9. ZBORIL, M. – BYRNE, P.B.: Metallicity and photospheric abundances in field K and M dwarfs. In *Monthly Notices of the Royal Astronomical Society*. Vol. 299, (1998), p. 753-758.
   Citations: 10

10. SKOPAL, A. – VAŇKO, M. – PRIBULLA, T. – WOLF, M. – SEMKOV, E. – JONES, A.: Photometry of symbiotic stars. In *Contribution of the Astronomical Observatory Skalnaté Pleso.* Vol. 32, (2002), p. 62-78.
    Citations: 9

ii. List of top-cited authors from the Organisation (at most 10 % of the research employees) and their number of citations in the assessment period

[1] Theodor Pribulla – 157 citations

[2] Drahomír Chochol – 149 citations

[3] Vladimír Porubčan – 136 citations

iii. Supplementary information and/or comments on responses to the scientific output of the Organisation

3. Research status of the Organisation in the international and national context

- **International/European position of the Organisation**

i. List of the most important research activities documenting international importance of the research performed by the Organisation, incl. major projects (details of projects should be supplied under Indicator 4). Collective membership in the international research organisations, in particular within the European Research Area

[1] In the assessment period AI SAS obtained 10 grants in the frame of 5FP and 6FP EU.

[2] AI SAS organized the *IAU Symposium No. 224 The A-star Puzzle*, held in Poprad on July 8-13, 2004.

[3] AI SAS has organized the 3rd school of the ESMN (European Solar Magnetic Network) entitled *Solar Magnetometer and Solar Magnetism*. The event took place at Tatranská Lomnica from November 3-10, 2004. It was an extensive and intensive introduction into the methodology and results of the current solar physics research, with the focus on solar magnetism. Eleven courses were given on the most important topics of solar physics. About 60 participants attended the school, mainly PhD students and graduate students from the European Union.

[4] V. Porubčan served as a president of the Commission 22 of the International Astronomical Union (IAU) and 24 scientists of AI SAS are members of the IAU.

[5] In the assessment period scientists of AI SAS have been asked for 232 referee reports of manuscripts of articles proposed for publication in scientific journals and proceedings or reports about grant proposals applied both in Slovakia and abroad.

[6] Asteroid number 26390 was named Rušin by the International Astronomical Union.

[7] J. Zverko served as a consultant of *The Inamori Foundation* for *The Kyoto Prize.*

[8] J. Svoreň have served as a member of the Attestation Commision for scientists of the Astronomical Institute of the Academy of Sciences of the Czech Republic in Ondřejov.

[9] M. Kocifaj was invited for the post of guest professor at the University of Vienna with a course *Light Scattering by Small Particles: Atmospheric Optics and Astrophysical Applications.*

[10] A. Kučera serves as a member of associations for preparation of the EST project (European Solar Telescope).

[11] D. Chochol and A. Skopal serve as members of committee for preparation the European Widefield Telescope in South Africa.

[12] Permanently, 3-5 employees of AI SAS are accepted for long-time stays (longer than 60 days) at prominent astronomical institutions (The Netherlands, Spain, Germany, Austria, the USA, Canada, France).

ii. List of international conferences (co-) organised by the Organisation

[1] AI SAS organized ***Conference on Achievments of Stellar Astronomy*** -May 30-June 1, 2003, Bezovec (Slovakia).

[2] AI SAS hosted and co-sponsored the International ***Solar Cycle Study Symposium Solar Variability as an Input to the Earth's Environment*** which was held on June 23-28, 2003 at AI SAS and adjacent hotels' area. There were 27 invited reviews, 34 contributed oral presentations and 114 posters. The conference was a very successful professional forum for 146 participants from 34 countries worldwide. Proceedings of the Symposium were published by the European Space Agency.

[3] AI SAS co-organized ***Czech and Slovak Workshop on Interplanetary Matter***, April 26-30, 2004, Modra (Slovakia).

[4] AI SAS organized ***Conference on Achievments of Stellar Astronomy*** -May 28-30, 2004, Bezovec (Slovakia).

[5] AI SAS organized the ***IAU Symposium No. 224 The A-star Puzzle***, held in Poprad on July 8-13, 2004. The symposium was devoted to normal and peculiar stars of the A spectral type. Altogether 31 invited lectures and 20 contributed talks, as well as 86 posters, were presented. The symposium was a very successful professional forum for 124 participants from 26 countries worldwide. The proceedings of the Symposium were published by the Cambridge University Press Publishing House.

[6] AI SAS co-organized a ZiF-funded interdisciplinary research workshop ***Endo-physics, Time, Quantum and the Subjective***, on January 17 - 22, 2005 in Bielefeld (Germany).

[7] AI SAS organized ***Conference on Achievments of Stellar Astronomy*** -May 27-29, 2005, Bezovec (Slovakia).

[8] AI SAS co-organized ***Czech and Slovak Workshop on Interplanetary Matter***, May 9-13, 2006, Modra (Slovakia).

[9] AI SAS organized ***Conference on Achievments of Stellar Astronomy*** -May 26-28, 2006, Bezovec (Slovakia).

[10] AI SAS organized ***Workshop on Solar Flares and Initialisation of CMEs*** on September 13-15, 2006 at Tatranská Lomnica. 37 participants from 7 countries (USA and Central European countries) took a part at this very successful workshop.

iii. List of international journals edited/published by the Organisation

[1] Scientific journal ***Contributions of the Astronomical Observatory Skalnaté Pleso*** (CAOSP) is edited and published by AI SAS. CAOSP is a scientific astronomical journal in English language published three times a year. CAOSP has international identifiers as follows: ISSN - 1336-0337 (online edition), ISSN - 1335-1842 (printed edition), CODEN - CAOPF8.

CAOSP journal has been covered by ISI continuously since its volume 22 (year 1992). However, it is covered in *CC/Physical, Chemical & Earth Sciences / Current Book Contents.* Due to the fact CAOSP is published three times a year, it can be found among books, not journals within the ISI service.

Editorial board: Bernhard Fleck (USA), Marian Karlický (Czech Republic), Richard Komžík (executive editor), Aleš Kučera, Vladimír Porubčan, Tanya Ryabchikova (Russia), Ján Svoreň (scientific editor), Július Sýkora, Giovanni Battista Valsecchi (Italy), Jan Vondrák (Czech Republic) and Juraj Zverko.

Electronic version of CAOSP is available at AI SAS homepage. The full text version (6 months delay from a printed version) is available as well within the ADS article service (<http://adsabs.harvard.edu/article_service.html>).

In the assessment period the CAOSP appeared in 12 regular issues of the volumes 33-36.

iv. List of edited proceedings from international scientific conferences and other proceedings

[1] The Nature of Time: Geometry, Physics & Perception: proceedings of the NATO Advanced Research Workshop, May 21 – 24, 2002, Tatranská Lomnica. Eds. R. Buccheri – M. Saniga – W.M. Stuckey. Dordrecht – Boston – London: Kluwer Academic Publishers, 2003. ISBN 1-4020-1200-4. 464 pp.

[2] The A-star Puzzle: Proceedings of the 224th Symposium of International Astronomical Union held in Poprad, Slovak Republic, July 8-13, 2004. Eds. J. Zverko – J. Žižňovský – S.J. Adelman – W.W. Weiss. Cambridge: Cambridge University Press, 2005. ISBN 0521850185, 524 pp.

[3] Endophysics, Time, Quantum and the Subjective: proceedings of a ZIF Advanced Interdisciplinary Workshop. Eds. R. Buccheri – A. Elitzur – M. Saniga. Singapore: World Scientific Publishing Co., ISBN 981-256-509-4, 2005. 629 pp. Issued also at CD-ROM.

• National position of the Organisation

i. List of selected most important national projects (Centres of Excellence, National Reference Laboratories, Agency for the Promotion of Research and Development (APVV/APVT), National Research Programmes, Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA), and others)

[1] In the assessment period AI SAS obtained 3 grants from the Agency for the Promotion of Research and Development for scientific projects and also 3 grants for popularisation of science in the frame of a special call (start of these projects was November 2006).

[2] In the assessment period AI SAS solved 21 projects granted by the Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA) majority of them in a category “A”.

[3] AI SAS organized a lecture course on the Solar Magnetohydrodynamics on October 4-7, 2005. PhD as well as undergraduate students of the Slovak universities have taken part, including some staff members of AI SAS.

[4] AI SAS served as a national coordination centre of the international project Venus Transit in 2004.

[5] AI SAS is a real center of the astronomical life in Slovakia – seat of the Slovak National Committee for the IAU, Slovak Astronomical Society, place for practicum courses and diploma works of students of both the Slovak universities with astronomical departments.

[6] In collaborations with Humenné Observatory, Faculty of Science of Pavol Jozef Šafárik University in Košice and Odessa University (Ukraine) AI SAS is responsible for the scientific programme of the 1-meter telescope at the Kolonica observatory.

ii. List of national scientific conferences (co)-organised by the Organisation

[1] AI SAS organized workshop as a national coordination centre of the project ***VENUS-TRANSIT-2004*** in Slovak language for 58 teachers of physics, May 21-22, 2004, Tatranská Lomnica.

[2] AI SAS organized a lecture course given by Prof. Dr. Juergen Staude from the Astrophysical Institute (Potsdam, Germany) on the topic of the ***Solar Magnetohydro-***

dynamics on October 4-7, 2005. PhD as well as undergraduate students of Slovak universities have taken part, including some staff members of AI SAS.

[3] AI SAS co-organized ***Slovak astronomical workshop for observers of variable stars Winter Roztoky (ZIRO) 2004***. Vyšná Písaná, April 22-24, 2004.

[4] AI SAS co-organized ***Slovak astronomical workshop for observers of variable stars Winter Roztoky (ZIRO) 2005***. Roztoky, November 24-26, 2005.

iii. List of national journals published by the Organisation

[1] 3 scientists of AI SAS are members of the editorial board of the popular astronomical journal Kozmos.

iv. List of edited proceedings of national scientific conferences/events

[1] VENUS TRANSIT 2004: Proceedings from the workshop for teachers, Tatranská Lomnica, May 21-22, 2004, Eds. J. Koza and A. Kučera, AI SAS, 2004, 70 pp.

• International/European position of the individual researchers

i. List of invited/keynote presentations at international conferences, documented by an invitation letter or programme

[1] Porubčan, V., Kornoš, L., Williams, I.P.: Associations between asteroids and Meteoroid streams. *Meteoroids 2004,* London, Canada, August 16-20, 2004.

[2] Planat M., Saniga, M.: Abstract Algebra, Projective Geometry and Time Encoding of Quantum Information. In: *ZiF Interdisciplinary Research Workshop on Endophysics, Time, Quantum and the Subjective*, Bielefeld, Germany, January 17–221.2005.

[3] Skopal, A., Otsuka, M., Tamura, S., Vittone, A., Errico, L., Wolf, M.: Broad H-alpha wings in active symbiotic stars. The case of Z Andromedae. In: *7th Pacific Rim Conference on Stellar Astrophysics,* Soul, Korea, November 1-5, 2005.

[4] Neslušan, L.: The Formation and Evolution of Meteoroid Streams. In: *British/Czech and Slovak INYS workshop Many Faces of the Universe: From Solar System to Cosmology*, Slaný, Czech Republic, January 30 – February 2, 2005.

[5] Kocifaj, M.**:** Light scattering and absorption by non-spherical particles and applications. In: *Conference on Visibility, Aerosols, and Atmospheric Optics*, Vienna, September 3 - 6, 2006.

ii. List of employees who served as members of the organising and/or programme committees for international conferences

[1] V. Porubčan – SOC member, Physical Proporties and Morphology of Small Solar System Bodies, Sydney, January 12, 2003

[2] L. Hric – LOC chair, Conference on Achievments of Stellar Astronomy, Bezovec, May 30-June 1, 2003

[3] J. Sýkora – SOC member and LOC chair, International Solar Cycle Studies 2003 Symposium, Tatranská Lomnica, June 23-28, 2003 (next ISCS 2003)

[4] J. Ambróz, A. Antalová, P. Bendík, A. Kučera, M. Minarovjech, D. Novocký, V. Rušin, J. Rybák – LOC members, ISCS 2003

[5] M. Saniga – SOC member, Symmetry Festival: Where Science Meets Art, Budapest (Hungary), August 16–22, 2003

[6] A. Kučera – SOC member, Workshop Solar Magnetic Phenomena, Kanzelhohe (Austria), August 25 - September 5, 2003

[7] A. Kučera – SOC member, The First Central European Solar Physics Meeting, Bairisch Kölldorf (Austria), October 23 - 25, 2003

[8] A. Skopal – SOC member, Zdeněk Kopal's Binary Star Legacy, Litomyšl, March 31 – April 4, 2004

[9] V. Porubčan – LOC chair, Czech and Slovak Workshop on Interplanetary Matter, Modra, April 26- 30, 2004

[10] L. Hric – LOC chair, Conference on Achievments of Stellar Astronomy, Bezovec, May 28-30, 2004

[11] J. Zverko – SOC co-chair, IAU Symposium 224 The A-star puzzle, Poprad, July 8-13, 2004 (next IAUS 2004)

[12] J. Žižňovský – LOC chair, IAUS 2004

[13] L. Hric, L. Klocok, R. Komžík, L. Neslušan, D. Novocký, V. Rušin, M. Vaňko – LOC members, IAUS 2004

[14] V. Porubčan – SOC member, Meteoroids 2004, London (CND), August 16-20, 2004

[15] V. Porubčan – SOC member, Dynamics of Population of Planetary Systems, Beograd, August 31- September 4, 2004

[16] A. Kučera and J. Rybák – SOC and LOC members, 3rd ESMN School: Solar Magnetometry and Solar Magnetism, Tatranská Lomnica, October 3-10, 2004 (next ESMN 2004)

[17] J. Ambróz, J. Koza, D. Novocký – LOC members, ESMN 2004

[18] M. Saniga – SOC and LOC chair, Endophysics, Time, Quantum and the Subjective, Bielefeld (Germany), January 17–22, 2005

[19] A. Kučera – SOC member, The Second Central European Solar Physics Meeting, Bairisch Kölldorf (Austria), May 19 - 21, 2005

[20] L. Hric – LOC chair, Conference on Achievments of Stellar Astronomy, Bezovec, May 27-29, 2005

[21] V. Porubčan – LOC chair, Czech and Slovak Workshop on Interplanetary Matter, Modra, May 9- 12, 2006

[22] L. Hric – LOC chair, Conference on Achievments of Stellar Astronomy, Bezovec, May 26-28, 2006

[23] M. Saniga – SOC member, Symmetry Festival: Symmetry in Art and Science Education, Budapest (Hungary), August 12–18, 2006

[24] A. Kučera and J. Rybák – SOC and LOC members, Workshop on Solar Flares and Initialisation of CMEs, Tatranská Lomnica, September 13-15, 2006 (next CME 2006)

[25] J. Ambróz, P. Gömöry, D. Novocký, O. Štrbák, F. Tomasz – LOC members, CME 2006

[26] A. Kučera – SOC member, VIII-th Hvar Astrophysical Colloquium, Hvar (Croatia), September 17 - 22, 2006

[27] J. Svoreň and J. Zverko – SOC members, XXVI. European Symposium on Occulatation Projects, Tatranská Lomnica, August 24-26, 2007 (next ESOP 2007)

[28] L. Hric, Z. Kaňuchová, J. Žižňovský – LOC members, ESOP 2007

iii. List of employees who served as members of important international scientific bodies (e.g. boards, committees, editorial boards of scientific journals)

[1] V. Porubčan – president of the IAU Commission 22 “Meteors, meteorites and interplanetary dust”

[2] J. Rybák – member of the working group WG2 “Observing techniques” of JOSO

[3] J. Zverko and A. Skopal – members of editorial board of the journal Astronomy and Astrophysics

[4] D. Chochol – member of editorial board of the journal Astronomical and Astrophysical Transacions

[5] V. Porubčan – member of editorial board of the journal Earth, Moon, Planets

[6] A. Kučera – member of editorial board of the journal Central European Astrophysical Bulletin

[7] V. Rušin – member of editorial board of the journal Pokroky matematiky, fyziky a astronómie

[8] M. Saniga – member of editorial board of the journal Frontier Perspectives

[9] M. Saniga – members of editorial board of the journal Symmetry: Culture and Science

iv. List of international scientific awards and distinctions

[1] Another asteroid (number 26390), was named ***Rušin*** by the International Astronomical Union in 2003. Previously, 3 asteroids were named after living employees of AI SAS (Pittich, Porubčan and Svoreň).

- **National position of the individual researchers**

i. List of invited/keynote presentations at national conferences documented by an invitation letter or programme

[1] Presentations at national conferences were out of evidence.

ii. List of employees who served as members of organising and programme committees of national conferences

[1] J. Koza, A. Kučera, J. Rybák – LOC members, workshop VENUS-TRANSIT-2004, Tatranská Lomnica, May 21-22, 2004

[2] A. Kučera, J. Rybák – SOC and LOC members, Solar Magnetohydrodynamics, Tatranská Lomnica, October 4-7, 2005

[3] M. Vaňko – LOC member, Winter Roztoky (ZIRO) 2005, Roztoky, November 24-26, 2005

iii. List of employees serving in important national scientific bodies (e.g. boards, committees, editorial boards of scientific journals)

[1] D. Chochol – *a single point of contact* (national coordinator) for the International Year of Astronomy 2009

[2] J. Sýkora – a national representative in the Scientific Committee on solar-Terrestrial Physics of ISCU (SCOSTEP)

[3] A. Kučera – a national representative in the Joint Organization for Solar Observations (JOSO)

[4] J. Zverko and J. Žižňovský – chairs of the Slovak National Committee for IAU

[5] J. Sýkora and V. Porubčan – vicechairs of the Slovak National Committee for IAU

[6] J. Rybák – secretary of the Slovak National Committee for IAU

[7] A. Hajduk, L. Neslušan, E. Pittich, V. Porubčan, V. Rušin, A. Skopal, J. Svoreň – members of the Slovak National Committee for IAU

[8] J. Sýkora – vicechair of the Slovak National Committee for SCOSTEP

[9] J. Rybák – member of the Slovak National Committee for SCOSTEP

[10] J. Rybák – member of of the Slovak National Committee for COSPAR

[11] M. Minarovjech, E. Pittich and J. Rybák – members of the Commission for research and peaceful exploating of the space

[12] V. Rušin – member of presidency of the Slovak Academy of Sciences

[13] J. Svoreň – chair of the Scientific College of the Slovak Academy of Sciences for Earth and Space Sciences

[14] J. Sýkora – member of the Scientific College of the Slovak Academy of Sciences for Earth and Space Sciences

[15] A. Kučera – member of presidency of the Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)

[16] J. Žižňovský, J. Rybák, D. Chochol – members of the Commission 3 of VEGA

[17] J. Zverko, A. Kučera – members of a commission of the Agency for the Promotion of Research and Development (APVV/APVT)

[18] J. Svoreň – scientific editor of the journal Contributions of the Astronomical Observatory Skalnaté Pleso (CAOSP)

[19] R. Komžík – executive editor of CAOSP

[20] A. Kučera, V. Porubčan, J. Sýkora, J. Zverko – members of editorial board of CAOSP

[21] V. Porubčan, J. Svoreň - members of editorial board of the journal Acta Astronomica et Geophysica Universitatis Comenianae

[22] V. Porubčan – scientific editor of the journal Meteor News (in Slovak)

[23] A. Hajduk, J. Svoreň, L. Neslušan – members of editorial board of the Meteor News

[24] M. Rybanský – chair of the editorial board of a popular journal Kozmos

[25] A. Hric, D. Chochol, J. Svoreň, J. Zverko – members of the editorial board of Kozmos

[26] E. Pittich – executive editor of Astronomical handbooks (in Slovak)

[27] M. Husárik – editor of Astronomical Circulars of the Slovak Astronomical Society

[28] V. Rušin – deputy of the Slovak Academy of Sciences in the SAIA Agency

iv. List of national awards and distinctions

[1] T. Pribulla – winner of competition (in the frame of Scientific College of the Slovak Academy of Sciences for Earth and Space Sciences) of young scientiscts to 50th anniversary of the SAS, 2003

[2] V. Rušin – Prize of ZSVTS "Propagandist of science and engineering", 2003

[3] T. Pribulla – Prize of the Slovak Academy of Sciences for young scientists, 2004

[4] T. Pribulla – Prize of Minister of Education for young scientists under 35 years, 2004

[5] J. Sýkora – Dionýz Štúr's honorary plaque for natural sciences

[6] J. Koza, A. Kučera, J. Rybák, V. Rušin, J. Ambróz, R. Komžík, D. Novocký - Prize of the Slovak Academy of Sciences for public relations

[7] E. Pittich – Prize of Academy of Education for 3rd position in public relations

[8] V. Rušin – Premium of the Literary fund for scientific publications in 2005 for the book The Sun – our nearest star.

Supplementary information and/or comments documenting international and national status of the Organisation

Activity in the Slovak Astronomical Society

[1] V. Porubčan and J. Zverko – chairs

[2] L. Hric – scientific secretary and chair of the stellar section

[3] J. Žižňovský and L. Neslušan – economists

[4] L. Klocok, V. Porubčan, V. Rušin – members of the Central Committe

[5] J. Rybák – chair of the solar section

[6] T. Pribulla – chair of the local group at Tatranská Lomnica

[7] E. Pittich – chair of the terminological commission

4. Project structure, research grants and other funding resources

- **International projects and funding**

i. List of major projects within the European Research Area – 5th and 6th Framework Programme of the EU, European Science Foundation, NATO, COST, INTAS, CERN, etc. (here and in items below please specify: type of project, title, grant number, duration, funding, responsible person in the Organisation and his/her status in the project, e.g. coordinator, principal investigator, investigator)

[1] Project HPRN-CT-2002-00313 (5FP EU)
EUROPEAN SOLAR MAGNETIC NETWORK
Responsible person in the AI SAS: A. Kučera
AI SAS was co-investigator of the project
Duration of the project: 11/2002-11/2006
Funding: 5FP EU – 882 000.- Sk,
State budget (SAS) – 269 000.- Sk.
Coinvestigating institutions: 11 (1 Czech rep., 2 France, 1 Netherlands, 1 Hungary, 1 Germany, 1 Norway, 1 Slovakia, 1 Spain, 1 Sweden, 1 Italy)

[2] Project HPMT-CT-2000-0013 - Marie Curie fellowship (6FP EU)
MODELING OF THE TIME EVOLUTION OF THE SOLAR PHOTOSPHERE
Responsible person in the AI SAS: J. Koza
AI SAS was coordinator of the project
Duration of the project: 02/2003 - 05/2003
Funding: 6FP EU – 246 000.- Sk.
Coinvestigating institutions: 1 (Spain)

[3] Project NSF DGE-0312144 USA NSF-NATO fellowship
DOPPLER TOMOGRAPHY AND RADIATIVE TRANSFER IN ALGOL TYPE BINARIES
Responsible person in the AI SAS: J. Budaj
AI SAS was co-investigator of the project
Duration of the project: 07/2003 - 06/2004
Funding: USA NSF – 998 300.- Sk.
Coinvestigating institutions: 1 (USA)

[4] Project 508 963 (6FP EU)
VENUS TRANSIT 2004
Responsible person in the AI SAS: J. Koza
AI SAS was co-investigator of the project
Duration of the project: 03/2004 – 07/2004
Funding: 6FP EU – 120 000.- Sk.
Coinvestigating institutions: 25 European and 17 other countries

[5] NATO Science Programme, Sub-Programme: EXPERT VISIT
UNDERSTANDING THE OUTBURST STAGE OF THE SYMBIOTIC BINARY Z And –
Responsible person in the AI SAS: A. Skopal
AI SAS was coordinator of the project
Duration of the project: 04/2004 – 05/2004
Funding: NATO Scientific Affairs Division – 65 400.- Sk.
Coinvestigating institutions: 1 (Italy)

[6] Project OPTICON 2004/030 – DOT (6FP EU)
DYNAMICS OF THE SOLAR PHOTOSPHERE
Responsible person in the AI SAS: A. Kučera
AI SAS was co-investigator of the project
Duration of the project: 06/2004 - 08/2004
Funding: 6FP EU – 27 600.- Sk.
Coinvestigating institutions: 2 (1 Netherlands, 1 Spain)

[7] Project HPMT-CT-2001-00245 Marie Curie fellowship (6FP EU)
MHD WAVES IN THE SOLAR OUTER ATMOSPHERE
Responsible person in the AI SAS: P. Gőmőry
AI SAS was co-investigator of the project
Duration of the project: 11/2004 – 08/2005
Funding: 6FP EU – 583 200.- Sk.
Coinvestigating institutions: 1 (Netherlands)

[8] Project FP6-2002-Mobility-5 N° 011379-MULTIDOT (6FP EU)
SOLAR FIBRILS AND SPICULES AT HIGH RESOLUTION
Responsible person in the AI SAS: J. Koza
AI SAS is co-investigator of the project
Duration of the project: 07/2005 – 06/2007
Funding: 6FP EU – 1 746 000.- Sk.

[9] OPTICON Trans-national Access Programme 7E1404/2005/028+029 (6FP EU)
SPECTROSCOPY AND IMAGING TOMOGRAPHY OF THE SOLAR FIBRILS: PHOTOSPHERIC DRIVERS AND CORONAL CONSEQUENCES
Responsible person in the AI SAS: J. Rybák
AI SAS was co-investigator of the project
Duration of the project: 10/2005 – 11/2005
Funding: 6FP EU – 105 000.- Sk.
Results: observational campaign at the Swedish Solar Telescope and Dutch Open Telescope (observatory Rogue de Los Muchachos, La Palma, Spain) and satelites SOHO and TRACE.

[10] OPTICON Trans-national Access Programme 7E1404/2005/028 (6FP EU)
SPECTROSCOPY AND IMAGING TOMOGRAPHY OF THE SOLAR FIBRILS: PHOTOSPHERIC DRIVERS AND CORONAL CONSEQUENCES – SWEDISH SOLAR TELESCOPE
Responsible person in the AI SAS: J. Rybák
AI SAS was co-investigator of the project
Duration of the project: 04/2006
Funding: 6FP EU – 1 454 000.- Sk.
Results: observational campaign at the Swedish Solar Telescope (observatory Rogue de Los Muchachos, La Palma, Spain), collaboration with the Dutch Open Telescope and satelites SOHO and TRACE

[11] OPTICON Trans-national Access Programme 7E1404/2005/029 (6RP EÚ)
SPECTROSCOPY AND IMAGING TOMOGRAPHY OF THE SOLAR FIBRILS: PHOTOSPHERIC DRIVERS AND CORONAL CONSEQUENCES – DUTCH OPEN TELESCOPE
Responsible person in the AI SAS: J. Rybák
AI SAS was co-investigator of the project
Duration of the project: 04/2006
Funding: 6RP EÚ – 1 288 000.- Sk.

Results: observational campaign at the Dutch Open Telescope (observatory Rogue de Los Muchachos, La Palma, Spain), collaboration with the Swedish Solar Telescope and satelites SOHO and TRACE

[12] OPTICON Trans-national Access Programme 7E1404/2005/028+029 (6FP EU)
SPECTROSCOPY OF THE QUIET PHOTOSPHERE: PROPERTIES OF THE SHOCKS AND LOCATION OF ACOUSTIC FLUX GENERATION
Responsible person in the AI SAS: A. Kučera
AI SAS was co-investigator of the project
Duration of the project: 11/2006-11/2006
Funding: 6FP EU – 1 187 000.- Sk.
Results: observational campaign at the Vacuum Tower Telescope (observatory Izaňa, Tenerife, Spain)

ii. List of other international projects incl. funding

[13] Project DFG (Germany) 436 SLK113/7/0-1
SOLAR GRANULATION
Responsible person in the AI SAS: A. Kučera
AI SAS was coordinator of the project
Duration of the project: 01/2001 - 12/2004
Funding: Deutsche Forschung Gemeinschaft – 80 000.- Sk.
Coinvestigating institutions: 2 (1 Germany, 1 Austria)

[14] Collaborative inter-government project (Czech rep. - Slovakia) 054/131
COMPLEX INVESTIGATION OF COOL CHEMICALLY PECULIAR STARS
Principal investigator: J. Žižňovský
AI SAS was coordinator of the project
Duration of the project: 01/2001 – 12/2003
Funding: State budget (Ministry of Education) – 25 000.- Sk.
Coinvestigating institutions: 1 (Czech rep.)

[15] Project EOARD SPC 01-WE048
COMPARISON AND CROSS-CALIBRATION OF GREEN LINE CORONAL DATA FROM THE ASTRONOMICAL INSTITUTE OF THE SLOVAK ACADEMY OF SCIENCES WITH MEASUREMENTS FROM CORONAL STATION AT SACRAMENTO PEAK OBSERVATORY (USA), AND MT. NORIKURA (JAPAN).
Principal investigator: V. Rušin
AI SAS was coordinator of the project
Duration of the project: 10/2001 – 09/2003
Funding: EOARD – 107 000.- Sk.
Coinvestigating institutions: 2 (1 – USA, 1 – Japan)

[16] Collaborative inter-government project (China - Slovakia), 2-3-15
STUDY OF MAGNETIC FIELDS, CORONA AND PROMINENCES IN THE SOLAR CORONA OVER A SOLAR CYCLE
Principal investigator: V. Rušin
AI SAS was coordinator of the project
Duration of the project: 01/2003 - 12/2005
Funding: State budget (Ministry of Education) – 136 000.- Sk.
Coinvestigating institutions: 1 (Čína)

[17] Collaborative inter-government project (Czech rep. - Slovakia) 128/2004-12-20

THE VARIABILITY OF COOL MAGNETIC STARS AND ITS ORIGIN
Principal investigator: J. Zverko
AI SAS was coordinator of the project
Duration of the project: 01/2004 – 12/2005
Funding: State budget (Ministry of Education) – 60 000.- Sk.
Coinvestigating institutions: 1 (Czech rep.)

[18] Collaborative inter-government project NSF USA 0407375
SPACE WEATHER: NUMERICAL MHD STUDY OF CMES: INICIALIZATION AND PROPAGATION
Principal investigator: J. Rybák
AI SAS is coordinator of the project
Duration of the project: 04/2004 - 03/2007
Funding: National Science Foundation USA – 1 804 200.- Sk,
State budget (SAS) – 511 000.- Sk,
State budget (Ministry of Educational) – 192 000.- Sk.
Coinvestigating institutions: 2 (1 USA, 1 Slovakia)

[19] Collaborative inter-government project (Greece - Slovakia) MVTS 2005/1
INTERNATIONAL GREEK-SLOVAK ON-LINE NETWORK OF SELECTED ASTRONOMICAL OBSERVATORIES
Principal investigator: L. Hric
AI SAS is coordinator of the project
Duration of the project: 01/2005 –12/2007
Funding: State budget (Ministry of Education) – 143 000.- Sk.
Coinvestigating institutions: 6 (2 Greece, 4 Slovakia)

[20] Collaborative inter-government project (Austria - Slovakia) SK-AT-00706
SOLAR FLARES: TRIGERRING MECHANISM AND CONSEQUENCES FOR SPACE WEATHER
Principal investigator: J. Rybák
AI SAS is coordinator of the project
Duration of the project: 01/2006-12/2007
Funding: Östereichische Akademie der Wissenschaften – 52 000.- Sk,
State budget (APVV) – 28 000.- Sk.
Coinvestigating institutions: 2 (1 Austria, 1 Slovakia)

[21] Collaborative inter-government project (Slovakia - Czech rep.) 01506
THE VARIABILITY OF CHEMICALLY PECULIAR STARS OF THE MAIN SEQUENCE
Principal investigator: J. Zverko
AI SAS is coordinator of the project
Duration of the project: 01/2006 – 12/2007
Funding: State budget (APVV) – 24 000.- Sk.
Coinvestigating institutions: 1 (Czech rep.)

[22] Project DFG 436 SLK 13/70-1
TEMPORAL EVOLUTION OF THE PHOTOSPHERE AND CHROMOSPHERE IN A QUIET AND ACTIVE REGIONS
Responsible person in the AI SAS: A. Kučera
AI SAS is co-investigator of the project
Duration of the project: 5/2006 - 12/2009
Funding: Deutsche Forschungsgemeinschaft, Germany – 77 000.- Sk.
Coinvestigating institutions: 2 (1 Germany, 1 Slovakia)

iii. List of other important projects and collaborations without direct funding

[23] Collaborative inter-academy project (Ukraine – Slovakia)
LITHIUM ON THE SURFACE OF THE COLD MAGNETIC CP STARS
Principal investigator: J. Zverko
AI SAS was coordinator of the project
Duration of the project: 05/2000 – 04/2003
Funding: only institucional budgets
Coinvestigating institutions: 1 (Ukraine)

[24] Collaborative inter-academy project (CNR, Italy - SAS, Slovakia)
EFFECTS OF NONGRAVITATIONAL FORCES ON THE ORBITAL ENERGY OF COMETS
Principal investigator: E. Pittich
AI SAS was coordinator of the project
Duration of the project: 01/2001 – 12/2003
Funding: CNR, Italy – 49 800.- Sk.
Coinvestigating institutions: 1 (Italy)

[25] Collaborative inter-academy project (CNR, Italy - SAS, Slovakia)
POPULATION OF METEOROIDS NEAR THE EARTH ORBIT AND THEIR INTEREACTION WITH THE ATMOSPHERE
Principal investigator: V. Porubčan
AI SAS was coordinator of the project
Duration of the project: 01/2001 – 12/2003
Funding: CNR, Italy – 48 000.- Sk.
Coinvestigating institutions: 1 (Italy)

[26] Collaborative inter-academy project (CNR, Italy - SAS, Slovakia)
LA STRUTTURA MATEMATICA DEL TEMPO SOGGETIVO
Principal investigator: M. Saniga
Duration of the project: 01/2001 – 12/2003
AI SAS was coordinator of the project
Funding: CNR, Italy – 50 800.- Sk.
Coinvestigating institutions: 1 (Italy)

[27] Collaborative inter-institute project (United Kingdom – Slovakia)
PROCESSES OF INTERACTION IN CLASSICAL NOVAE AND SYMBIOTIC STARS
Principal investigator: A. Skopal
AI SAS was coordinator of the project
Duration of the project: 06/2002 - 05/2005
Funding: The Royal Society – 69 000.- Sk.
Coinvestigating institutions: 1 (UK)

[28] Collaborative inter-academy project (Czech rep. - Slovakia) Integral
RESEARCH OF CATACLYSMIC VARIABLES – PROJECT INTEGRAL
Principal investigator: L. Hric
AI SAS was co-investigator of the project
Duration of the project: 01/2003 - 12/2005
Funding: Academy of Sciences, Czech republic – 12 000.- Sk.
Coinvestigating institutions: 1 (Czech rep.)

[29] Project MENRT – No. 05 M 5010, CNRS SPM Grant (Pilote 20) –Notification 200191 a ACI Programme Nanosciences -- Subventions Colloques
SQUEEZED STATES AND UNCERTAINTY RELATIONS

Responsible person in the AI SAS: M. Saniga
AI SAS was co-investigator of the project
Duration of the project: 05/2003 – 12/2005
Funding: CNRS France – 61 000.- Sk.
Coinvestigating institutions: 1 (France)

[30] Collaborative inter-academy project (CNR, Italy - SAS, Slovakia)
PHYSICAL PROCESSES IN ACTIVE STARS AND SEARCH FOR THEIR STAR AND PLANETARY COMPANIONS
Principal investigator: D. Chochol
AI SAS was coordinator of the project
Duration of the project: 1/2004 – 12/2006
Funding: CNR, Italy – 157 000.- Sk
Coinvestigating institutions: 2 (1 Slovakia, 1 Italy)

[31] Collaborative inter-academy project (CNR, Italy - SAS, Slovakia)
PHYSICAL AND DYNAMICAL ASPECTS OF THE EVOLUTION OF SHORT-PERIOD COMETS
Principal investigator: E. Pittich
AI SAS was coordinator of the project
Duration of the project: 01/2004 – 12/2006
Funding: CNR, Italy – 158 800.- Sk.
Coinvestigating institutions: 1 (Italy)

[32] Collaborative inter-academy project (CNR, Italy - SAS, Slovakia)
INTERPLANETARY BODIES AND ATMOSPHERIC PHENOMENA
Principal investigator: V. Porubčan
AI SAS was coordinator of the project
Duration of the project: 01/2004 – 12/2006
Funding: CNR, Italy – 144 000.- Sk.
Coinvestigating institutions: 1 (Italy)

[33] Collaborative inter-institute project (Slovakia - Croatia)
SOLAR ACTIVE PHENOMENA
Principal investigator: A. Kučera
AI SAS was coordinator of the project
Duration of the project: 01/2004 – 12/2006
Funding: only institucional budgets
Coinvestigating institutions: 2 (1 Croatia, 1 Slovakia)

[34] Collaborative inter-institute project (Slovakia - Romania)
CCD OBSERVATIONS OF ASTEROIDS AND ECLIPSING BINARIES
Principal investigator: J. Svoreň and D. Chochol
AI SAS is coordinator of the project
Duration of the project: 01/2004– 12/2009
Funding: only institucional budgets
Coinvestigating institutions: 1 (Romania)

[35] Project ZiF (AG)205-2/2005
ENDOPHYSICS, TIME, QUANTUM AND THE SUBJECTIVE
Responsible person in the AI SAS: M. Saniga
AI SAS was coordinator of the project
Duration of the project: 04/2004 – 10/2005
Funding: Bielefeld University – 1 333 000.- Sk,
Sky Europe Airlines – 20 000.- Sk.

Coinvestigating institutions: 2 (1 Israel, 1 Italy)

[36] France: Project EGIDE 411867G/P392152B Sejour Scietifique de Haut Niveau Fellowship
APPLICATIONS OF FINITE GEOMETRIES IN PHYSICS
Principal investigator: M. Saniga
AI SAS was co-investigator of the project
Duration of the project: 09/2004 – 12/2004
Funding: MJENR, France – 350 000.- Sk.
Coinvestigating institutions: 1 (France)

[37] Project School of Mathematics and Systems Engineering
MATHEMATICAL MODELING IN PHYSICS, BIOLOGY, ECONOMY AND COGNITIVE SCIENCES
Responsible person in the AI SAS: M. Saniga
AI SAS is co-investigator of the project
Duration of the project: 01/2005 – 12/2007
Funding: Växjö University, Sweden – 87 000.- Sk.
Coinvestigating institutions: 1 (Sweden)

[38] Collaborative inter-institute project (Slovakia - Poland)
PHOTOMETRIC INVESTIGATION OF CONTACT BINARIES AND SHORT-PERIOD ECLIPSING BINARIES
Principal investigator: T. Pribulla
AI SAS is coordinator of the project
Duration of the project: 01/2005 – 12/2007
Funding: only institucional budgets
Coinvestigating institutions: 1 (Poland)

[39] Slovakia - Czech - France international project ECO-NET No. 12651NJ
GEOMETRIES OVER FINITE RINGS AND THE PROPERTIES OF MUTUALLY UNBIASED BASES
Responsible person in the AI SAS: M. Saniga
AI SAS is co-investigator of the project
Duration of the project: 01/2006 – 12/2007
Funding: French Ministry of Foreign Affairs – 250 000.- Sk.
Coinvestigating institutions: 3 (1 France, 1 Czech rep., 1 Slovakia)

[40] Collaborative inter-institute project (Slovakia - Bulgaria)
ABUNDANCE ANOMALIES IN SINGLE AND BINARY STARS
Principal investigator: J. Žižňovský
AI SAS is coordinator of the project
Duration of the project: 01/2006– 12/2008
Funding: only institucional budgets
Coinvestigating institutions: 1 (Bulgaria)

[41] Collaborative inter-institute project (Slovakia - Egypt)
BINARY STARS AND PHYSICAL AND DYNAMICAL STUDIES OF SMALL BODIES
Principal investigator: D. Chochol and J. Svoreň
AI SAS is coordinator of the project
Duration of the project: 06/2006– 05/2011
Funding: only institucional budgets
Coinvestigating institutions: 1 (Egypt)

- **National projects and funding**

i. **List of projects supported by the Agency for the Promotion of Research and Development (APVV/APVT), National Research Programmes, and their funding**

[42] Project APVT-20-014402
PHOTOMETRY OF INTERACTING BINARIES
Principal investigator: D.Chochol
AI SAS was coordinator of the project
Duration of the project: 07/2002 - 11/2005
Funding: State budget (APVT) – 1 277 000.- Sk.
Coinvestigating institutions: 11 (3 – Slovakia, 1 – Belgium, 2 – Czech rep., 1 – Chile, 1 – Greece, 1 – Poland, 1 – Russia, 1 – Italy)

[43] Project APVT-51-000802
SLOVAK PHOTOMETRIC TELESCOPES NETWORK FOR STUDIES OF SELECTED PHYSICAL PROCESSES IN VARIABLE STARS
Principal investigator: L. Hric
AI SAS was coordinator of the project
Duration of the project: 08/2002 – 12/2005
Funding: State budget (APVT) – 671 000.- Sk.
Coinvestigating institutions: 3 (Slovakia)

[44] Project APVT-51-012704
THE SOLAR EMISSION CORONA AND PROMINENCES: SOLAR ACTIVITY AND SPACE WEATHER INDICATORS
Principal investigator: V. Rušin
AI SAS is coordinator of the project
Duration of the project: 01/2005 – 12/2007
Funding: State budget (APVV) – 2 139 000.- Sk

[45] Project APVV LPP-0172-06
ASTRONOMICAL OLYMPIAD FOR SCHOLARS
Principal investigator: L. Hric
AI SAS is co-investigator of the project
Duration of the project: 10/2006 – 10/2010
Funding: no funding in 2006 for AI SAS
Coinvestigating institutions: 1 (Slovakia)

ii. **Number of projects supported by the Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA) for each year, and their funding**

VEGA	2003	2004	2005	2006
number	11	9	9	10
funding (millions of SKK)	0,782	0,710	0,884	0,979

- **Summary of funding from external resources**

External resources	2003	2004	2005	2006	total	average
external resources (millions of SKK)	2,245	1,891	2,986	3,291	10,413	2,603
external resources transfered to coooperating research organisations (millions of SKK)	0,000	0,000	0,000	0,000	0,000	0,000
ratio between external resources and total salary budget	0,190	0,155	0,238	0,250	--	0,208
overall expenditures from external as well as institutional resources(millions of SKK)	23,181	26,156	24,382	25,588	99,307	24,827

supplementary information and/or comments on research projects and funding resources

In the recent years AI SAS has been very successful at applying for observational time at the world-class solar telescopes located at the Canary Islands through the Opticon Trans-national Access Program of the 6FP EU. All financial expenses related to operation of these telescopes during our campaignes have been covered by this program.

Telescope	Day charge (EUR)	Duration (days)	Obtained funding (Sk)
2004 year:			
DOT	2 213	7	573 000
2005 year:			
DOT	2 213	16	1 257 000
SST	2 498	16	1 419 000
2006 year:			
DOT	2 213	15	1 243 000
		16	1 288 000
SST	2 498	16	1 454 000
VTT	3 341	10	1 187 000
Sum total		**96**	**8 421 000**

5. Organisation of PhD studies, other pedagogical activities

i. List of accredited programmes of doctoral studies (as stipulated in the previously effective legislation as well as in the recently amended Act on the Universities)

b) in the previously effective legislation

AI SAS is accredited for 2 programmes of doctoral studies **11- 40-9 Astronomy** and **11- 41-9 Astrophysics.**

c) in the recently amended Act on the Universities

AI SAS is accredited for 2 programmes of doctoral studies **4.1.7. Astronomy** and **4.1.8. Astrophysics.** Study is organised in collaboration with the Faculty of mathematics, physics, and informatics of Comenius University in Bratislava.

ii. Summary table on doctoral studies (number of internal/external PhD students; number of students who completed their study by a successful thesis defence; number of PhD students who quitted the programme)

PhD study	31.12.2003			31.12.2004			31.12.2005			31.12.2006		
number of potential PhD supervisors	21			21			21			20		
PhD students	number	defended thesis	students quitted	number	defended thesis	students quitted	number	defended thesis	students quitted	number	defended thesis	students quitted
internal	3	1	0	3	3	0	2	2	1	3	0	0
external	5	0	0	5	1	1	7	0	1	5	1	1
supervised at external institution by the research employees of the assessed organisation										1		

iii. Postdoctoral positions supported by

a) external funding (specify the source)

No

b) internal funding - the Slovak Academy of Sciences Supporting Fund of Stefan Schwarz

Július Koza – 2004

iv. Summary table on pedagogical activities in undergraduate programmes for each year

Teaching	2003	2004	2005	2006
lectures (hours/year)	**170**	**220**	**154**	**213**
practicum courses (hours/year)	**218**	**194**	**182**	**303**
supervised diploma works (in total)	**8**	**10**	**10**	**8**
members in PhD committees (in total)	**8**	**8**	**11**	**9**
members in DrSc. committees (in total)	**4**	**4**	**6**	**6**
members in university/faculty councils (in total)	**1**	**1**	**0**	**0**
members in habilitation/inauguration committees (in total)	**0**	**3**	**2**	**1**

v. List of published university textbooks

No

vi. Number of published academic course books

No

vii. List of joint research laboratories/facilities with the universities

[1] AI SAS has located a receiving station of the forward scatter meteor radar at the Astronomical and Geophysical Observatory of Comenius University in Modra. The instrument is used by both the institutions for a research of the activity and structure of the meteoroid population in the near-Earth surroundings.

viii. Supplementary information and/or comments on doctoral studies and pedagogical activities

In the assessment period the AI SAS has collaborated with following universities:

[1] Faculty of Mathematics, Physics and Informatics of Comenius University in Bratislava

[2] Faculty of Science of Pavel Jozef Šafárik University in Košice

[3] Faculty of Natural Sciences of Masaryk University in Brno, Czech Republic

[4] Pedagogical Faculty of Trnava University in Trnava

[5] Faculty of Mathematics and Physics of Charles University in Prague, Czech Republic

[6] Faculty of Natural Sciences of Saint Cyril and Metod University in Trnava

[7] Claude Bernard University in Lyon, France

[8] University de Franche-Comté in Besançon, France

- V. Rušin serves as an external member of the Scientific Council of University in Žilina
- J. Svoreň, J. Žižňovský – members of commissions for the state examinations at the Faculty of Mathematics, Physics and Informatics of Comenius University in Bratislava
- A. Kučera, J. Svoreň, J. Zverko – members of commissions for the state examinations at the Faculty of Science of Pavel Jozef Šafárik University in Košice

6. Direct output to the society
(applications of results, popularisation and outreach activities)

i. List of the most important results of applied research projects

[1] AI SAS is the organisation exclusively aimed at a basic research and it has not any applied research project.

ii. List of the most important studies commissioned for the decision-making authorities, the government and NGOs, international and foreign organisations

[1] Reports (one of each year) of Juraj Zverko, expert of the Slovak Republic in the Global Science Forum, for Slovak government (2003, 2004, 2005).

[2] The expertise of Vojtech Rušin, number of commision of the Ministry of Education, in the process of preparation of a new law on PhD studies (2003).

[3] The expertise of Juraj Zverko in the process of preparation of a new law on the Agency for the Promotion of Research and Development (2003).

[4] The expertise of Július Sýkora for Insurance system at Stará Lubovňa concerning a solar activity and its influence on a human behaviour (2004).

iii. List of the most important popularisation activities

[1] Open door activities during the partial solar eclipses, nights of a high meteor activity, transits of Venus and Mercury across the Sun's disk and so on (August 16-17 and 23-24, 2003; June 8, 2004; November 12-14, 2004; October 22, 2005; March 29, 2006; November 8, 10 and 18, 2006). Since 2004 open door activities are connected with the European week of science and technology.

[2] AI SAS has been the Slovak coordinator of the project *Venus-Transit 2004*. We organized a two-day meeting for teachers to inform them how to run the project. During the transit we transfered images of the Sun from a web-camera to internet on-line. More than 60 schools across the country were involved in the project.

[3] Presentations of astronomical news for public at the AI SAS web-homepage – continuously about 15-20 items per year.

[4] A special number of the popular journal Kozmos 05/2003 devoted to the 60th anniversary of the Skalnaté Pleso Observatory and the 50th anniversary of the AI SAS and supplement of the popular journal Kozmos 05/2006 presented the results of the Stellar department of the AI SAS.

[5] Activity in the project Encyclopedia Beliana – more than 300 items covering astronomy and astrophysics.

[6] Press meetings devoted to interesting astronomical phenomena – 2-3 a year.

[7] Series of 7 astronomical public lectures held in Bratislava from November 2005 to June 2006.

iv. List of patents issued abroad, incl. revenues

[1] AI SAS is the organisation exclusively aimed at a basic research and it has not any patent.

v. List of the patents issued in Slovakia, incl. revenues

[1] No, see iv.

vi. List of licences sold abroad, incl. revenues

[1] No, see iv.

vii. List of licences sold in Slovakia, incl. revenues

[1] No, see iv.

viii. List of contracts with industrial partners, incl. revenues

[1] No, see iv.

ix. List of research projects with industrial partners, incl. revenues

[1] No, see iv.

x. Summary of outreach activities

Outreach activities	2003	2004	2005	2006	total
studies for the decision sphere, government and NGOs, international and foreign organisations	3	2	1	0	6
articles in press media/internet popularising results of science, in particular those achieved by the Organization	129	73	93	110	405
appearances in telecommunication media popularising results of science, in particular those achieved by the Organization	8	56	67	80	211
public popularisation lectures	24	19	38	109	190

xi. Supplementary information and/or comments on applications and popularisation activities

7. Background and management. Staffing policy and implementation of findings from previous assessments

i. Summary table of personnel

Personnel	2003	2004	2005	2006
all personel	55	55	55	55
research employees from Tab. Research staff	36	36	37	36
FTE from Tab. Research staff	32,90	32,70	33,48	32,85
averaged age of research employees with university degree	47,30	46,84	47,06	48,22

ii. Professional qualification structure

Number of	2003	2004	2005	2006
DrSc.	8	10	9	9
PhD / CSc.	15	19	22	23
Prof.	1	2	2	1
Doc./Assoc. Prof.	1	1	1	1

iii. Status and development of research infrastructure incl. experimental, computing and technical base (description of the present infrastructure, premises, and material and technical resources. Infrastructure, instrumentation and major technical equipment necessary for the achievement of the objectives specified in the research Concept)

[1] Observational facilities:

Solar department

Stará Lesná Observatory - horizontal solar spectrograph (d = 50 cm), photospheric refractor,
Lomnický Peak Coronal Station - double 20 cm coronagraph (f = 4 m) with a spectrograph.

Department of interplanetary matter

Skalnaté Pleso Observatory - 61 cm photometric and astrometric reflector with CCD camera, all sky fireball fish-eye camera,
Modra Observatory - receiver of a forward scatter meteor radar.

Stellar department

Skalnaté Pleso Observatory - 60 cm photometric reflector,
Stará Lesná Observatory - 50 cm and 60 cm photometric reflectors.

The department shared in the designing of satellite programmes for stellar astrophysics - the HIPPARCOS and TYCHO databases are frequently used.

[2] During the last four years we have succeeded in substantial improvement of our observational and working facilities:

- A new powerful internet server was put into operation,
- the 0.61-cm comet and asteroid reflector together with the dome were rebuilt for automatic regime at the Skalnaté Pleso Observatory,
- the 0.5-m reflector for CCD photometry of stars at Stará Lesná was rebuilt for automatic regime and connected to the internal net by fiber optics to the main institute's building at Stará Lesná,
- a new ST-10XME CCD camera produced by SBIG, Santa Barbara, USA was purchased - it enables photometry of bright Centaurs and comets at large heliocentric distances,
- we have also upgraded a few computers and modernized the internal net at the Bratislava's branch of the AI SAS,
- our conference hall at the AI SAS headquarters was equipped with a modern computer projector, and wireless (WIFI) net connection,
- intranet connection to the Skalnaté Pleso and Lomnický Peak observatories was increased to 11 Mbps,
- in 2006 IP telephony was instaled at all the working places of AI SAS,
- speed of the connection of the local gateway of the SANET academic internet network at Stará Lesná to its backbone in Poprad was increased to 34 Mbps,
- a complex reconstruction of windows and outer doors at the mountain Skalnaté Pleso Observatory and a new generator of electric power installed at the Lomnický Peak Coronal Station, made better working conditions for our observers and scientists,
- a complex reconstruction of the central heating at the mountain Skalnaté Pleso Observatory and new central heating at the Stara Lesna Headquarters substantially improved the working conditions.

[3] GRID computing

Our research group studying the origin of the reservoirs of small bodies of the Solar System uses the huge European computational capacity, so-called GRID computing, which belongs to the most powerful computational tools in the world at present. An important support of an efficient usage of the GRID is provided by the experts from the collaborating Institute of Informatics of the Slovak Academy of Sciences within the project *Enabling Grids for E-sciencE II*.

[4] New homepage of AI SAS

In 2006, we completely redesigned the WWW homepage of AI SAS - http://www.ta3.sk. We required a higher level of lucidity and simple way of managing. This goal was made good using the latest tools in developing the websites. In the concrete, instead of HTML 4.0 we used XHTML 1.0 language, Cascading Style Sheets (CSS2) for creating a new layout and PHP5 language as a functional base of our WWW homepage, as well.

[5] Plans of AI SAS in spectroscopy

We would like to use Structural Funds of the European Union for the purchase of the 1.5 – 2.0 m telescope equipped by spectrographs for a high-resolution (R = 45 000) and medium-resolution (R= 20 000) spectroscopy, to acquire spectra of interacting binaries especially novae and symbiotic stars during their outbursts. Activity of these objects is monitored by the CCD and photoelectric photometry using the 0.5m and 0.6m telescopes of

the AISAS. The great advantage of the telescope will be the immediate access to spectroscopy of these objects during their active stages.

iv. Status and development of bibliographic resources, activities of the Organisation's library and/or information centre

Our collections include 9208 books and 139 CD ROMs. On 1 January 2003 our library had 8567 books and 110 CD ROM in possession. During the years 2003-2006 we got 779 new acquisitions. We received 592 books and 20 CD ROMs as donations, 17 books by exchange and we bought 32 books and 9 CD ROM. The library subscribed to 6 journals, 19 got by exchange and 5 as donation.

Our library mainly offered services in the form of both the local and interlibrary (totaling 28) loans; our catalougue of the books and electronic media is also accessible on-line.

We distributed worldwide 2766 issues of our journal Contributions of the Astronomical Observatory Skalnaté Pleso (Vol.33, No. 1 – Vol 36, No. 3). The executive editor of our journal made accessible on-line (as postscript or pdf files) all the issues; these can be downloaded from the address: http://www.astro.sk/library.html. The electronic version of the journal is also accessible from the ADS database (Harvard, U.S.A.) at the URL http://adsabs.harvard.edu_service.html.

Thanks to the membership of our librarian in the worldwide web-based discussion list PAMnet (worldwide net of special libraries – physical, astronomical and mathematical) we acquired free of charge 24 books and 22 journals from the Space Telescope Science Institute, Baltimore, 11 books from the Carnegie Institution, Washington, 4 proceedings of the ASP Conference Series from the Canada-France-Hawai Telescope Institute and 6 volumes of Annual Review of Astronomy and Astrophysics from the Copenhagen University.

v. Describe how the results and suggestions of the previous assessment were taken into account

AI SAS has taken into account all the results and suggestions of the previous assessment held on December 5, 2003:

AI SAS obtained 93.97 points and it has been classified in the "A" degree.

Five suggestions of the previous assessment were fulfilled as follows:

1. The group of young postdocs and PhD students is very well counterbalanced. Gömöry, Jakubík and Koza are orientated more theoretically, Husárik, Kaňuchová and Vaňko are able to carry out also most complex observations.

2. AI SAS has elaborated in 2006 the research concept up to 2016. Funding of the science is at such insufficient level that more perspective groups cannot be sufficiently supported. The whole budget of the AI SAS is used as Institute's services and all the scientific expenses are paid exclusively from grants' funding as well.

3. AI SAS was a number of the European Solar Magnetic Network (project 5FP EU finished on November 2006) and three young scientists obtained Maria Curie Fellowships for 3 months stay in Spain and 24 and 10 months in the Netherlands.

4. Contributions of the Astronomical Observatory Skalnaté Pleso journal (CAOSP) is an important supplementary possibility for publication of scientific results of the AI SAS. Articles in the CAOSP are only a small part of our publication activity. In 2006 28% of

CC articles were published in the CAOSP and the rest in the CC journals abroad, some of them in periodicals with very high impact factors (Astronomy and Astrophysics, Astronomical Journal, Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, Icarus and so on). Since January 2007 the CAOSP is indexed in the SCOPUS database. Large amount of citations in the best ranking journals is a proof of an international acceptance of CAOSP.

5. During the last four years 3 chapters in scientific monographs published abroad were written – Skopal and Saniga in *Recent Research Developments in Astronomy and Astrophysics (*Trivandrum: Research Signpost), Svoreň in *Comets II* (University Arizona Press). Also one monography (Rušin: The Sun – our nearest star (in Slovak)) was published in Slovakia (VEDA Publishing).

vi. Supplementary information and/or comments on management, research infrastructure, and trends in personnel development

[1] In 2006 the Scientific Council of the AI SAS encouraged the research groups to formulate the Research Concept of the AI SAS for the years 2007-2016. All the employees with the university degree engaged in research were obliged to lead or to take part at a research group. Totally, 11 research projects having comprised the current state of the research, a role and significance of the group in the field, and objectives and methods for 10 years were prepared and presented. The Scientific Council has ranked these studies into three categories – the perspective (clearly defined and real goals), the time-limited (problematic long-time continuation due to either the age of the leader or structure of the group) and unaccepted. The research groups with perspective projects will be preferred in obtaining new positions of the internal PhD students. The Scientific Council will repeat the process each 5 years with the aim to set new perspective concepts for studies in the next 10 years.

vii. Other information relevant to the assessment