Slovak Academy of Sciences

Astronomical Institute

ANNUAL REPORT 2003

Astronomical Institute, Tatranská Lomnica, Slovakia

Contents

1 Foreword

The present form of the report of the activities of the Astronomical Institute of the Slovak Academy of Sciences does not differ significantly from the last year's report. Its structure and layout are, however, considerably different from those of the corresponding Slovak version (also available at our web page).

Here, we focus almost uniquely on the scientific activities of the Institute and omit a number of important "non-scientific" issues, like, e.g., financial matters of the institute, teaching commitments at universities, etc.; these can only be found in the Slovak version.

Looking back at the year 2003 let me just briefly summarize major accomplishments. The amount of scientific production is expressed by 52 papers in internationally distinguished refereed journals and 43 articles in conference proceedings. A number of interesting results have been obtained, some of them being highlighted in what follows. Our institute plays a very important role in 12 well-established international projects and a number of informal collaborations.

The institute 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 the Institute 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 was published by the European Space Agency.

We have also succeeded in substantially improving our observational facilities. A new power internet server was put into operation and the dome of the 61-cm comet and asteroid reflector at the Skalnate Pleso Observatory was rebuilt for automatical regime. A complex reconstruction of the central heating at the mountain Skalnate Pleso Observatory and new central heating at the Stara Lesna Headquarters substantially improved working conditions for our observers and scientists. We have also upgraded a few computers and modernized the internal net at the Bratislava's branch of the Institute.

Yet, there were also a number of problems we had to face. The main, and most pressing one, is our meagre budget for purchase of new literature. A majority of journals we keep receiving thanks to an exchange policy for current issues of our journal Contributions of the Astronomical Observatory Skalnate Pleso (CAOSP). The last volume of the CAOSP (number 33) appeared in three regular issues. The journal is covered by the ISI and is electronically available from our web page (http://www.astro.sk) and the ADS database as well.

Ján Svoreň
director of AI SAS

2 Research

2.1 Interplanetary matter

Observational facilities:
Skalnaté Pleso Observatory - a 61 cm reflector with a CCD camera, an all sky fireball fish-eye camera; Modra Observatory - a receiver of a forward scatter meteor radar.

Research activities:

- theoretical investigation of transfer orbits among different populations of small bodies in the Solar System regarding near-Earth objects
- photometry and astrometry of asteroids and comets,
- investigation of the activity of selected cometary nuclei and its influence on the physical and dynamical evolution of these bodies,
- a search for meteoroid streams of an asteroidal origin,
- investigation of the meteoroid population in the vicinity of the Earth's orbit,
- interrelations among the populations of small bodies in the Solar System and their evolution,
- description of the distribution of meteoroid particles in the inner Solar System,
- study of the structure of selected meteor showers,
- identification of the meteor sporadic background activity by a forward scatter radio system,
- detection of ozone in the upper mesosphere with ground based radio observations,
- operation of fireball fish-eye cameras within the framework of the European Fireball Network,
- investigation of the light scattering of dust particles in the Solar System and Earth atmosphere,
- search for hyperbolic and interstellar meteoroids using data from IAU Meteor Data Center and other sources,
- study of meteorite properties.

2.2 Solar physics

Observational facilities:
Stará Lesná Observatory - a horizontal solar telescope with spectrograph, photospheric; Lomnický Peak Coronal Station - a double 20 cm coronagraph with a spectrograph.

Research activities:

- study of rotational characteristics of sunspots and surrounding photospheric plasma based on own measurements,
- spectral analysis of the quiet and active solar photosphere and chromosphere using spectra from Tenerife VTT observations,

- study of the dynamics and energy transfer in the quiet upper solar atmosphere from SOHO (SUMER, CDS, EIT) and TRACE satellites data,
- investigation of the coupling of a cosmic ray modulation and solar LDE flares and also coronal mass ejections,
- derivation of magnetic fields in specific coronal structures using own eclipse observations,
- 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,
- study of a time-latitudinal distribution and large-scale development of solar prominences,
- observations of both the 530.3 nm and 637.4 nm emission coronal lines as well as the white-light corona to study solar cycles,
- preparation of the homogeneous coronal data set for the 530.3 nm coronal line,
- computation of the coronal index of solar activity.

2.3 Stellar astrophysics

Observational facilities:
Skalnaté Pleso Observatory and Stará Lesná Observatory - two 60 cm photometric reflectors, a 50 cm reflector with a CCD camera.

Research activities:

- investigation of interacting binary and multiple systems, symbiotic stars, novae and nova-like objects focused on physical processes during phases of their activity, studies of their origin, structure, evolution and physical conditions in the circumstellar environment,
- photometric detection of various manifestations of both regular and semi-regular stellar variability, models' construction explaining the behaviour of the systems,
- use of the IUE as well as HST databases for the spectroscopy of interacting binaries and direct HST images to study expanding envelopes of novae and symbiotic stars,
- spectroscopic investigation of chemically peculiar star phenomena based on spectra from ESO, Mt. Stromlo, Nauchnyj, Ondřejov, Rozhen and Zelenchuk observatories,
- study of the chemical composition and properties of the atmospheres of CP stars, and the role of radiative diffusion of some species,
- search for possible relations between the orbital parameters of binaries with Am components.

3 Personnel

3.1 Executives

Director : J. Svoreň, deputy director : J. Žižňovský, scientific secretary : J. Rybák

3.2 Scientific Council

J. Grygar, A. Hajduk, D. Chochol, A. Kučera (chairman), L. Neslušan, V. Porubčan, J. Rybák, M. Saniga, A. Skopal, T. Pribulla (vice-chairman)

3.3 Department of Interplanetary Matter

Head: A. Hajduk
Staff in Bratislava: J. Farkašová, M. Hajduková, Jr., I. Kapišinský, M. Kocifaj, J. Pittichová (currently a post-doctoral scientist at the Institute for Astronomy, University of Hawaii, USA), E. Pittich, T. Paulech (postgraduate student), V. Porubčan, N.A. Solovaya
Staff in the High Tatras: G. Červák (technician), M. Husárik (postgraduate student), M. Jakubík (postgraduate student), Z. Kaňuchová (postgraduate student, since 1/9), L. Neslušan, P. Rychtarčík (technician), J. Svoreň

3.4 Department of Solar Physics

Head: A. Kučera
Staff: P. Bendík (technician), K. Brčeková (postgraduate student, till 30/10), P. Gömöry (postgraduate student), Ľ. Klocok, J. Koza (postgraduate student), R. Mačura (technician), K. Maník (technician), M. Minarovjech, V. Rušin, M. Rybanský, J. Rybák, M. Saniga, L. Scheirich (technician), J. Sýkora, F. Tomasz (postgraduate student)

3.5 Stellar Department

Head: J. Žižňovský
Staff: J. Budaj (USA NSF-NATO fellow since 1/7), L. Hric, D. Chochol, R. Komžík, K. Kuziel (technician), T. Pribulla, P. Schalling (technician), A. Skopal, J. Tremko, M. Vaňko (postgraduate student), M. Zboril (post-doctoral scientist at the AIP, Potsdam, Germany, till 15/10), J. Zverko

3.6 Administration and Maintenance

Head: M. Alman
Staff: J. Ambroz, F. Buzák, T. Drzewiecka, T. Griešová, Ľ. Hanigovský, T. Jukl (till 31/5), D. Novocký, Ľ. Pekarčík (27/10-31/12), A. Sanigová, M. Šoltýsová, P. Zimmermann, M. Zummerová (since 1/5).

4 Guests

In 2003, the following guests visited our institute: N. Awadalla (Department of Astronomy, Faculty of Science, Cairo University, Giza, Egypt), P. Ambrož (Astronomical Institute, Ondřejov, Czech Republic), M. Bárta (Astronomical Institute, Ondřejov, Czech Republic), L. Buccheri (Istituto di Astrofisica Spaziale e Fisica Cosmica – Sezione di Palermo, CNR, Palermo, Italy), I.M. Chertok (IZMIRAN, Troitsk, Moscow Region, Russia), A. Hanslmeier (IGAM, University of Graz, Graz, Austria), P. Heinzel (Astronomical Institute, Ondřejov, Czech Republic), I. Iliev (Rozhen Observatory, Bulgarian Academy of Sciences, Sofia, Bulgaria), K. Jiřička (Astronomical Institute, Ondřejov, Czech Republic), P. Kotrč (Astronomical Institute, Ondřejov, Czech Republic), M. Kreiner (Pedagogical University, Cracow, Poland), Z. Mikulášek (Institute of Theoretical Physics and Astrophysics, Masaryk University, Brno, Czech Republic), G. Pupillo (ISAC (FISBAT) CNR, Bologna, Italy), H. Rickman (Astronomical Institute, Uppsala, Sweden), S. Shugarov (Sternberg Astronomical Institute, Moscow State University, Moscow, Russia), J. Střeštík (Geophysical Institute, Prague, Czech Republic), I. Williams (Astronomy Unit, Queen Mary, University of London, London, U.K.).

5 Results

The main results published by the staff of the Astronomical Institute in the year 2003 are briefly described below. Information about the reference to the published paper in the list of publications is given in brackets.

1/ The most significant results of the year 2003: Spectral energy distribution in symbiotic binaries. We have elaborated a quantitative model of the spectral energy distribution for symbiotic binaries. Application of this model to the ultraviolet spectra of the prototypical symbiotic star Z Andromedae confirmed the eclipse effect independently discovered by observations from the Skalnate Pleso and Stará Lesná. Tests of the hot radiaton from the active system AR Pavonis by our model showed the presence of an accretion disk in the system embedded in an extended very hot corona. Reconstruction of the ultraviolet to infrared continuum identified basic source of the energy as an accretion process at a onto a non-degenerate star. This method represents a powerful tool, which allows us to understand better the nature of outbursts in symbiotic stars (papers Nos. 12, 35, 36).

2/ The most significant results obtained within frame of international collaboration: Search for abundance anomalies in Am stars driven by tidal interactions. It is suggested that if the tidally induced meridional circulation existed in binary star systems it might successfully compete with diffusion processes and rotationally induced meridional circulation. This could affect the chemical composition of an Am binary component. We started a systematic abundance analysis of a sample of Am binaries in order to search for possible observable abundance anomalies driven by tidal interaction in these binary systems. First three stars (HD 33254, HD 178449 and HD 198391) were analysed. Basic stellar properties, atmospheric parameters and abundance patterns were derived. We dicovered a new spectroscopic Ab component of HD 178449 (paper No. 15).

3/ 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 found 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 (paper No. 39).

4/ Space-time distribution and mutual correlations among the north/south (N/S) asymmetry in various indices of solar activity have shown that the changes in the N/S asymmetry are consonant in all the activity indices considered. Quasi-biennial variations of the asymmetry index were found. A conclusion is drawn that the N/S asymmetry represents a specifically independent and very promising tool for analysis of variability in different manifestations of the solar activity (papers Nos. 66, 95).

5/ Simultaneous observations of the green corona (530.3 nm) at Norikura (Japan) and Lomnicky stit coronal station (Slovakia) with a 40-cm and 20-cm lens coronagraph has been used to study 5 min oscillations in the intensity of this line. Analysis of observational data, obtained at different places in the world at the same time, has shown reality if 5 min oscillations in the intensity that occur at special regions in the emission solar corona (not anywhere). We have already confirmed both the 47 second and 10 min oscillations in the green coronal line, observed to the present aboard space probe SOHO in the UV region. Some coronal intensity oscillations have been already observed before, however, it was assumed that they are caused with the earth atmosphere fluctuations. Oscillations in the solar corona are supposed to be as a possible source of the corona heating. For the first time we have detected tangential motions in the green coronal line structures with a speed up to 400 km/s (paper No. 27).

6/ Homogenous data of the green coronal 530.3 nm line intensity was updated for the period 1997 - 2002, and the coronal index of solar activity was derived for this period. The green coronal intensity in cycle 23 is about one third lower with the comparison of the green corona intensity in cycle 22, and this green corona intensity decrease is in agreement with the solar magnetic field intensity. The green corona maximum occurred in 2001, and coincided with the 2800 MHz solar radio flux, both 2 years shifted of sunspot number that occurred in 1999 (paper No. 33).

7/ Analysis of the time-latitudinal distribution of the green corona (530.3 nm) local intensity maxima in the period 1939 - 2002 shows regularly poleward migration that begins in mid-latitudes in cycle minina, and reaches solar poles around cycle maxima. Separation of the poleward migration branches (the north and south) has its stable time, and using this relation we forecasted forthcoming minima and maxima of solar cycles to 2050 (paper No. 87).

8/ The dependence been estimated between the both ground based time-latitudinal green 530.3 nm coronal intensity distribution and the UV corona rotational residuals as obtained by the SOHO EIT instrument (paper No. 79).

9/ Analyse of the semiempirical model of the solar granule evolution showed, that the range of photosphere, for which is possible to determine the line-of-sight-velocity, varies in time as a consequence of the evolution of the granule. This range is separated on two parts occupying lower and upper photosphere (paper No. 22).

10/ Statistics and model analysis of high resolution spectra of the solar active photosphere and chromosphere (subflare) have shown that the activity is remarkable in both layers. We found six times higher intensity of the central part of the Ca II K line in the active region comparing to the quiet one. The energy diffusion to the photosphere is straight-lined while the flow of matter follows the magnetic field-lines trajectories (papers Nos. 13, 24).

11/ For the first time shock wave was observationally documented to take place on boundary between the solar photospheric granulum and the neighbouring interganular space (paper No. 53).

12/ Study of temporal variability of the solar flare index over the epoch of almost 4 solar cycles revealed significant variability of the intermediate periods on the northern as well as on the southern solar hemisphere. Utilization of the wavelet transform allowed to determine wich periods are just harminics of the real periods of the flare index (paper No. 31).

13/ 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 are also given. Selected statistical relations between the parameters and period changes of individual systems were discussed (paper No. 32).

14/ First ground-based BV observations of variable star HH UMa were obtained during the test of the new 50cm telescope at Stara Lesna. The type of the variability was not given in the Hipparcos catalogue. New, high-precision CCD photometry revealed that HH UMa is a contact-binary star. The paper gives new ephemeris of the system (paper No. 58).

15/ The first photoelectric light curves (in the Walraven VBLUW filters) of the B spectral type southern eclipsing binaries: GW Car, V685 Cen, V742 Cen and V764 Sco, obtained in the South Africa in the years 1969-1978, were presented. The light curves analysis led to the determination of photometric elements and classification of the binaries. While GW Car is almost semidetached system, other three binaries are detached systems (paper No. 15).

16/ Photometric observations of the prototypical symbiotic star Z And made at the Skalnate Pleso and Stara Lesna observatories revealed the eclipse effect in the system. A high inclination of the orbit was independently confirmed by a quantitative modeling of the spectral energy distribution of symbiotic stars (paper No. 35).

17/ A test of the radiation from the active system AR Pavonis showed the presence of an accretion disk in the system embedded by an extended hot corona. A reconstruction of the UV to IR continuum identified an accretion process at a high accretion rate onto a non-degenerate star as the basic source of the energy. This configuration solves a problem of the eclipse profile as a function of wavelength (paper No. 36).

18/ In a review on investigation of symbiotic stars a process of ionization in these systems has been discussed. By modeling the energy distribution during quiescent phases of symbiotic stars we found 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 (paper No. 12).

19/ It is suggested that if the tidally induced meridional circulation of Tassoul & Tassoul existed in binary stars it might successfully compete with diffusion processes and rotationally induced meridional circulation. This could affect the chemical composition of an Am binary component. We started a systematic abundance analysis of a sample of Am binaries in order to search for possible observable abundance anomalies driven by tidal interaction in these binary systems. First three stars (HD 33254, HD 178449 and HD 198391) were analysed. Basic stellar properties, atmospheric parameters and abundance patterns were derived. We discovered the new spectroscopic Ab component of HD 178449 (paper No. 15).

20/ New ephemeris was determined for the cool CP star HD188041 based on all the available photometric, spectroscopic and magnetic observations. The new value of the rotational period is the same for all the three mentioned kinds of variability, what enables to exclude all earlier published values the rotational period of the star (paper No. 26).

21/ A detailed analysis of spectra of the unique roAp star HD 101065 (Przybylski's star) near the resonance doublet Li I 6708 A was perfomed, using a most complete line list including all possible transitions between REE levels of the NIST database. We proved that the Li line components are present in the range 6707.72-6708.02 A. The overabundance of lithium amounts to 3.1 dex, the isotopic ratio ^{6}Li/^{7}Li is 0.3 (paper No. 34).

22/ We reconstructed 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. 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. It was shown that in HD 187474 the magnetic dipole is displaced from centre of the star by 0.055 $R_{\star}$. The dipole has a size $\sim$0.035 $R_{\star}$. The angle between the stellar rotational axis and the magnetic dipole is $\beta = 37^{\circ}$ (paper No. 19).

23/ The study on systems SV Cam, HU Vir, AG Dor, AR Lac and YZ Cmi revealed the spot sigantures located at medium and high latitudes. The spot are typically cooler than surrounding photosphere and the locations are probably in an agreement with theoretical studies on magnetic flux-tubes. At least two independent method were used to study the spot properties. The chromosphere activity level was estimated on SB2 systems AR Lac, KT Peg and KZ And as based on hydrogen alpha spectral line profile (papers Nos. 41, 42).

24/ The deepest ever in the atmosphere photographed fireball, which terminated at a height of 13.5 km, was recorded by all-sky fireball cameras on November 17, 2001. The calculated place of the fall of meteorites from this fireball (of a total weight of 400 kg) is in Ukraine, only about 15 km from Slovakia. The orbit of the meteoroid is asteroidal one, with aphelion of 1.97 AU. The decisive photographic observation for the calculation of the orbit and the place of the fall of meteorites was obtained at the Skalnate Pleso Observatory (paper No. 92).

25/ The meteorite Fermo who fell on September 25, 1996 in Italy, was analysed in a co-operation with the Geophysical Institute Slocak Academy of Sciences from the viewpoint of its possible remanent magnetism. A simplified model describing a spread of the temperature inside the meteoroid during its flight through the atmosphere was suggested and calculated (paper

No. 18).

26/ The latest version of the photographic catalogue of meteor orbits of the IAU meteor database was analysed from the viewpoint of a search for members of the Taurid meteor complex. 240 members of the complex were found and the mean orbit and radiant ephemeris for the both branches of the complex members were calculated (paper No. 86).

27/ The meteor shower of the Leonids 2002 was observed as by a forward scatter radio system so visually at the Modra Observatory. The both theoretically proposed maxima corresponding to the meteor filaments released from the parent comet 7 and 4 orbital revolutions ago were identified. The zenithal hourly rate of the Leonids at the peak of activity with a number of 3280 meteors per hour reached an activity of a meteor storm (paper No. 56).

28/ The investigation of long-term orbital evolution of asteroids with high inclination and SOHO comets model near-parabolic orbits showed that some of these bodies under the influence of the planetary perturbations return periodically to the inner part of the solar system. They cross orbits of the inner planets, among them the Earth's orbit too. The orbital stability of extrasolar planets were investigated (papers Nos. 84 a 91).

29/ Summarizing the measurements of the size of both long-period and shor-period individual cometary nuclei, a new average size of those was determined: 8.9 km for the long-period and 2.3 km for the short-period cometary nucleus. Using these values, new average masses were inferred. (paper No. 28).

30/ It was demonstrated that the cometary population in the Oort cloud can be about one to two orders lower that estimated before. It was found that the observed distribution of the reciprocal semi-major axes of long-period comets in orbits perturbed by Jupiter can be explained, when there is assumed that 8-12 % observed cometary nuclei split at every revolution around the Sun. (papers Nos. 47, 71)

31/ On the base of own visual observations and the most extensive accessible observation series (IMO and Olivier) the curves of diurnal and annual variation of sporadic meteors were found. Some anomalies in obtained diurnal and annual variations were explained by insufficient separation of known shower meteors (paper No. 48).

32/ Possibilities of a conversion of extensive sets of visual observations to a uniform scale were analysed and discussed. The computer photometric catalogue consisting of 10 000 estimations for 67 long-period comets (`http://www.ta3.sk/~astrsven`) is used as the input source (paper No. 61).

33/ We developed the method based on evaluation of lidar backscattered signal, which enables to identify contaminants in the Earth's atmosphere. Retrieval of size distribution of icy particles in noctilucent clouds was analysed using Rayleigh-Gans approximation (papers Nos. 51 and 52).

34/ The filamentary structure of the Comet Halley meteor stream has been precised from over 100 years of observations, including series from long-base (Lecce-Bologna-Modra) observations (paper No. 69).

35/ We derived mass functions for possible interstellar particles together with their changes along mass scale in 20-orders range (paper No. 70).

36/ The conditions of the interstellar dust capture in the Solar System were formulated theoretically (paper No. 73).

37/ Using CCD images from Modra Observatory we analysed 3 known cases of split comets - 73P/Schwassman-Wachman 3 (3 fragments), 51P/Harrington (2 fragments) and C/1999 S4 (Linear) which suddenly split into dozens of small pieces and disintegrated completely on late July 2000 (paper No. 82).

38/ Within the project to obtain precise astrometrical positions of the selected comets and asteroids, there were reduced 333 precise positions of comets and 127 precise positions of minor planets (papers Nos. 29, 30, 38, 54 and 60).

39/ 75 measurements of bright comets 1P/Halley, 23P/Brorsen-Metcalf and C/1989 X1

(Austin) was used to derive atmospheric extinction at the Skalnate Pleso Observatory. The two-component model of atmospheric extinction was confirmed. The model is a superposition of a more or less constant component of Rayleigh scattering on temporary clumps of molecules of air and a heavily variable component of scattering on dust particles - aerosols (paper No. 25).

6 Grants/Projects

6.1 International grants

- 2001-2003, Project DFG - Solar granulation - principal investigators: H. Wöhl, A. Kučera, J. Rybák
- 2001-2003, Slovak-Czech project - Complex investigation of cool chemically peculiar stars - principal investigator: J. Žižňovský
- 2003-2005, Slovak-Chinese project - Study of magnetic fields, corona and prominences in the solar corona over a solar cycle - principal investigator: V. Rušin
- 2001-2003, Project EOARD - Comparison and cross-calibration of green line coronal data from the Astronomical Institute of the Slovak Academy of Sciences with measurements from coronal stations at Sacramento Peak Observatory (USA), and Mt. Norikura (Japan) - principal investigator: V. Rušin
- 2001-2003, Project CNR-SAV - Effects of nongravitational forces on the orbital energy of comets - principal investigators: E. Pittich
- 2001-2003, Project CNR-SAV - Population of meteoroids near the Earth orbit and their interaction with the atmosphere - principal investigators: V. Porubčan
- 2001-2003, Project CNR-SAV - La struttura matematica del tempo soggetivo - principal investigators: R. Buccheri, M. Saniga
- 2002-2006, Project EU HPRN-CT - European solar magnetism network - principal investigators: R. Rutten, A. Kučera
- 2003-2005, Project AV ČR-SAV - Research of cataclismic variables - project INTEGRAL - principal investigators: L. Hric
- 2003-2003, Marie Curie fellowship - Modelling of the time evolution of the solar photosphere - principal investigators: J. Koza
- 2003-2004, USA NSF-NATO fellowship - Doppler tomography and radiative transfer in Algol type binaries - principal investigators: J. Budaj

6.2 Grants of the Slovak Grant Agencies VEGA and APVT

- 2001-2003 - Source regions of sungrazers - principal investigator: E. Pittich
- 2001-2003 - Accretion, mass transfer and their physical manifestations in cataclysmic binaries and related objects - principal investigator: L. Hric
- 2001-2003 - Magnetic field of the solar corona from emission and polarization of its radiation - principal investigator: J. Sýkora
- 2001-2003 - The dynamics of meteor streams and the evolution of their parent bodies -principal investigator: J. Svoreň

- 2001-2003 - Active atmospheres of solar type stars: spots and their relations to other types of activity - principal investigator: M. Zboril
- 2001-2003 - Asteroidal meteoroid streams and near-Earth meteoroid population - principal investigator: V. Porubčan
- 2001-2003 - Multifrequency analysis of stars in interaction - principal investigator: D. Chochol
- 2001-2003 - Cycle activity in the solar corona - principal investigator: M. Rybanský
- 2003-2005 - Distribution of chemical elements on the surface of the chemically peculiar stars - principal investigator: J. Zverko
- 2003-2005 - Dynamical processes and energy transfer in the solar atmosphere - - principal investigator: A. Kučera
- 2003-2003 - Cosmic dust, interplanetary and interstellar medium and their effects on the Earth and its atmosphere - principal investigator: A. Hajduk
- 2002-2005 - Photometry of interacting binaries - principal investigator: D. Chochol
- 2002-2005 - Slovak photometric telescopes network for studies of selected physical processes in variable stars - principal investigator: L. Hric

6.3 Institute Projects

- Radar studies of the faint component of the interplanetary matter - principal investigator: A. Hajduk
- Structure of meteor streams - principal investigator: V. Porubčan
- Cosmic dust - principal investigator: I. Kapišinský
- Dynamics of comets and asteroids and investigation of cometary dust - principal investigator: E. Pittich
- The astrometry of asteroids and the mutual interaction of interplanetary matter - principal investigator: L. Neslušan
- Photometry of comets and asteroids and cometary astrometry - principal investigator: J. Svoreň
- Study of variable phenomena of early spectral type stars and automatization of their observations - principal investigator: J. Žižňovský
- Chemically peculiar stars - principal investigator: J. Zverko
- Close binaries - principal investigator: D. Chochol
- Cataclismic variable stars - principal investigator: L. Hric
- Symbiotic stars - principal investigator: A. Skopal
- Solar eclipses - principal investigator: V. Rušin
- Solar corona - principal investigator: M. Rybanský
- Solar protuberances and automatization of solar observations - principal investigator: M. Minarovjech
- Dynamics of solar photosphere and chromosphere - principal investigator: A. Kučera
- Solar cycle and Solar-terrestrial relations - principal investigator: J. Sýkora

7 List of publications

7.1 Books and book chapters published in Slovakia

1. ČEMAN, R. - PITTICH, Eduard: Vesmír 2: Hviezdy - Galaxie, Mapa Slovakia, Bratislava, 2003 (in Slovak).
2. HRIC, Ladislav: Premenné hviezdy. In: Astronomická ročenka 2004, ed. E. Pittich, Slovenská ústredná hvezdáreň, Hurbanovo, 2003, p. 178-192 (in Slovak).
3. PITTICH, Eduard: Čas, obloha. In: Astronomická ročenka 2004, ed. E. Pittich, Slovenská ústredná hvezdáreň, Hurbanovo, 2003, p. 3-89 (in Slovak).
4. PITTICH, Eduard: Pohyb planét po oblohe, elongácie a jasnosti, Mesiac krátko po nove. In: Astronomická ročenka 2004, ed. E. Pittich, Slovenská ústredná hvezdáreň, Hurbanovo, 2003, p. 90-103 (in Slovak).
5. PITTICH, Eduard: Galileiho mesiace. In: Astronomická ročenka 2004, ed. E. Pittich, Slovenská ústredná hvezdáreň, Hurbanovo, 2003, p. 153-166 (in Slovak).
6. PITTICH, Eduard: Kométy. In: Astronomická ročenka 2004, ed. E. Pittich, Slovenská ústredná hvezdáreň, Hurbanovo, 2003, p. 106-137 (in Slovak).
7. PITTICHOVÁ, Jana: Kométy roka 2002. In: Astronomická ročenka 2004, ed. E. Pittich, Slovenská ústredná hvezdáreň, Hurbanovo, 2003, p. 204-242 (in Slovak).
8. RYBANSKÝ, Milan: Zatmenia Slnka a Mesiaca. In: Astronomická ročenka 2004, ed. E. Pittich, Slovenská ústredná hvezdáreň, Hurbanovo, 2003, p. 167-170 (in Slovak)
9. SVOREŇ, Ján: Asteroidy ako materské telesá achondritov. In: Astronomická ročenka 2004, ed. E. Pittich, Slovenská ústredná hvezdáreň, Hurbanovo, 2003, p. 138-152 (in Slovak).
10. ZBORIL, Milan: Škvrny na hviezdach podobných Slnku. In: Astronomická ročenka 2004, ed. E. Pittich, Slovenská ústredná hvezdáreň, Hurbanovo, 2003, p. 274-277 (in Slovak).

7.2 Book chapters published abroad

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8 How to reach us

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