Slovak Academy of Sciences

# Astronomical Institute

# ANNUAL REPORT 2002

Astronomical Institute, Tatranská Lomnica, Slovakia

# Contents

# 1 Foreword

This is the first issue of the English version of the Annual Report of the Astronomical Institute of the Slovak Academy of Sciences. 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-scientic" 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 2002 and comparing our professional activities and results achieved during it with those of the previous years, we can be quite satisfied. Let me just briefly summarise major accomplishments. We have published 54 papers in internationally distinguished refereed journals and 55 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 14 well-established international projects and a number of informal collaborations. Our institute hosted and co-sponsored the NATO Advanced Research Workshop "The Nature of Time: Geometry, Physics and Perception," which turned out to be a very successful professional forum for 48 participants from 20 countries worldwide. We have also succeeded in substantially improving our observational facilities. A new 50-cm telescope for CCD photometry of variable stars was put into operation and a repair of the dome of the coronal station at Lomnický Peak has been completed. We have upgraded a few computers and bought a new, five-user licence of the Interactive Data language (IDL).

Yet, there were also a number of problems we had to face. The main, and most pressing one, is our meager 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 Skalnaté Pleso (CAOSP). The last volume of the CAOSP (number 32) appeared in two 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,
- photometry and astrometry of 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,
- determination of the composition and physical properties of cosmic dust particles provided by NASA,
- description of the distribution of meteoroid particles in the inner Solar System,
- study of the structure of selected meteor showers,
- study of the structure and dynamics of meteoroid streams and evolution of their parent bodies,
- theoretical investigation of meteor head echoes from the Springhill high-power meteor radar,
- 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.

## 2.2 Solar physics

**Observational facilities:**
Stará Lesná Observatory - a horizontal solar telescope with spectrograph, photospheric and chromospheric refractors; 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 - 60 cm photometric reflectors.

**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 Ap/CP (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 difussion 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, V. Porubčan, N.A. Solovaya
Staff in the High Tatras: G. Červák (technician), M. Husárik, M. Jakubík (postgraduate student), M. Kamenický (postgraduate student), L. Neslušan, P. Rychtarčík (technician), J. Svoreň

### 3.4 Department of Solar Physics

Head: A. Kučera
Staff: P. Bendík (technician), K. Brčeková (postgraduate student), P. Gömöry (postgraduate student, since September 1), Ľ. Klocok, J. Koza (postgraduate student), R. Mačura (technician), K. Maník (technician), M. Minarovjech, V. Rušin, M. Rybanský, J. Rybák, M. Saniga (NATO AR Fellowship in physics, International Solvay Institutes for Physics & Chemistry, Brussels, Belgium, until October 31), L. Scheirich (technician), J. Sýkora, F. Tomasz (postgraduate student, since September 1)

### 3.5 Stellar Department

Head: J. Žižňovský
Staff: J. Budaj, A. Dobrotka (postgraduate student, since September 1), L. Hric, D. Chochol, R. Komžík, K. Kuziel (technician), T. Pribulla, P. Schalling (technician), A. Skopal, P. Schwartz (technician, since November 1), J. Tremko, M. Vaňko (postgraduate student), M. Zboril (currently a post-doctoral scientist at the AIP, Potsdam, Germany), J. Zverko

### 3.6 Administration and Maintenance

Head: M. Alman
Staff: J. Ambroz, F. Buzák, T. Drzewiecka, T. Griešová, Ľ. Hanigovský, T. Jukl, D. Novocký, A. Sanigová, M. Šoltýsová, P. Zimmermann

## 4 Guests

In 2002, the following scholars visited our institute: P. Ambrož (Astronomical Institute, Ondřejov, Czech Republic), P. Bochníček (Geophysical Institute, Prague, Czech Republic), A. V. Borovik (Baikal Astrophysical Observatory, Institute of Solar-Terrestrial Physics, Irkutsk, Russia), L. Buccheri (Istituto di Astrofisica Spaziale e Fisica Cosmica – Sezione di Palermo, CNR, Palermo, Italy), C. Castro (Center for Theoretical Studies of Physical Systems, Clark Atlanta University, Atlanta, USA), G. Eichhorn (Smithsonian Astrophysical Observatory, Cambridge, USA), E. Hiei (National Astronomical Observatory, Tokyo & Meisei University, Tokyo, Japan), V. R. Khalack (National Astronomical Observatory, Kiev, Ukraine), E. L. Martin (Institute for Astronomy, University of Hawaii, USA & Laboratoire d'Astrophysique, Observatoire de Grenoble, France) Z. Mikulášek (Institute of Theoretical Physics and Astrophysics, Masaryk University, Brno, Czech Republic), G. Pupillo (ISAC (FISBAT) CNR, Bologna, Italy), T.

Sakurai (National Astronomical Observatory, Mitaka, Japan), S. Shugarov (Sternberg Astronomical Institute, Moscow State University, Moscow, Russia), S. Štefl (Astronomical Institute, Ondřejov, Czech Republic).

## 5 Results

The main results published by the staff of the Astronomical Institute in the year 2002 are briefly described below. Information about the grant(s) supporting the particular research as well as the reference to the published paper in the list of publications are given in brackets.

1/ Long-term photoelectric photometry of the symbiotic nova V1016 Cygni in the visible and infrared region allowed to determine 15 years period of the light variability. Spectroscopic observations in the ultraviolet region taken by the IUE satellite and the space Hopkins ultraviolet telescope showed that the continuum and emission line fluxes exhibit changes with the same period, but their maxima are shifted by 410 days. The periodic changes of activity of the hot component in the system are caused by an increase of the mass transfer rate from the red giant Mira type variable to the white dwarf and can be triggered by an orbital motion in the system (paper No. 29).

2/ Our calculations of radiative accelerations on Neon in the atmospheres of B stars revealed that they are lower than gravity and Ne should sink. This explains our recent observations of apparent Ne underabundances in HgMn stars (paper No. 5).

3/ A study of the space distribution of meteoroids within young dense filaments of the Leonids 1969 and 1999 has revealed that meteoroids in some parts of these young streams are distributed non-randomly. The observations are indicative of a progressive fragmentation of meteoroids after their release from their parent body.Similarly, a dense filament of the Lyrids 1982, observed in the orbit 120 years beyond the parent comet, is explained by a disintegration of a secondary larger chunk (paper No. 31).

4/ Within the project to obtain precise astrometrical positions of the selected comets and asteroids, there were reduced 664 precise positions of 42 comets and 273 precise positions of minor planets (papers Nos. 26, 45).

5/ The third part of the computer catalogue of brightness of long-period comets was completed and published. The catalogue, accessible from the author www homepage, gives 10 000 magnitude values for long-period comets observed in the years 1861-1976. Together with the apparent brightness of comets, the geometrical conditions of the observations, the diameters of objectives and the light-gathering powers of the telescopes used, the types of instruments, the methods, as well as references to original literature are included in the list (paper No. 46).

6/ A solution of differential equations of the perturbed motion for a particular case of the general problem of three-bodies was found, and possible Earth-crossers were identified as a source of possible local or global catastrophic events on the Earth (papers Nos. 44, 94).

7/ The next part of the Catalogue of short-period comets was done with the collaboration with Russia and its electronic version was published (http://astro. savba.sk/cat).

8/ Potential parent bodies probably associated with the Taurid meteor complex were searched for among the Earth approaching asteroids known till September 2002. There were found 14 objects approaching the orbit of the Earth by 0.1 AU and their theoretical meteor radiants were calculated. As the most promising candidates for an association with the Taurid complex are the asteroids 1993 KA 2, 1889 VD 31, 1999 VK 12 and 2002 MX (paper No. 22).

9/ Within the cooperation concerning the interpretation of meteor observations of hyperbolic-orbit meteors, performed by the AMOR radar in New Zealand, the seazonally variable orbital parameters of a whole variety of theoretical meteor streams were predicted (paper No. 4).

10/ A synodic period of 4.8439 hours for the asteroid 107 Camilla was found on the basis of CCD photometry (paper No. 48).

11/ Spreading of cosmic dust particles in the interplanetary space was determined by analysing ejections of micron-sized particles from comet the Encke. An optical thickness of the Earth's atmosphere was found when solving the problem of interaction of the solar radiation with dust particles (papers Nos. 25, 67).

12/ It was convincingly shown that the results of the broadly published very high velocity meteors (100 - 500 km/s) from the high-power New Zealand AMOR system are untenable (paper No. 66).

13/ Photoelectric measurements obtained during the observations of bright comets were used to derive both extinction characteristics of atmosphere at the Skalnaté Pleso Observatory and the basic mechanism causing the extinction (paper No. 105).

14/ A new, original method for a reduction of solar spectra acquired by large CCD detectors was developed. An application of this method has allowed us to make more precise the physical parameters of the solar photosphere, in some cases by 15% (paper No. 52).

15/ By comparing both the limb green-line intensities and photospheric magnetograms we found a relation between the strength of magnetic field and coronal intensities. Behavior for the green corona intensities is different between high-latitude and mid-latitude regions, and this break occurs at the heliographic latitude of 45 deg. This relation enables us to extend the values of solar surface magnetic fields since 1976 back to 1939. From 1947 to 1992 the total magnetic flux grew at the cycle maxima by a factor of 1.5 – 2 (paper No. 35).

16/ Comparison of the Fourier and wavelet analysis results of the flare index has confirmed importance of different periodicities. It was found that periods 35, 116, and 276 days are real periods of the index and that the 68 a 198 days periods are just harmonic periods of the basic ones. A temporal distribution of the period appearance was determined also. The wavelet analysis has shown that the most pronounced period is concentrated to 35 days (in epochs 1998.3, 1999.9, and 2000.5 years), period 116 days (interval 1999.7-2000.4 years) and 276 days (interval approximatively from 1999.5) (paper No. 28).

17/ A temporal variability of the coronal index of the green coronal line for the epoch of almost 5 solar cycles was determined for all periods including 150 days, 1 year and 28 days in relation with the phase of the solar cycles. Enhancement of the period of 150 days was dominant before and after the maximum of the solar cycle during 4 out of 5 solar cycles under study. On the other hand, no such period was found during the maxima of solar activity. Significant variations of the periodicities around the rotational period up to 5 days were found to take place over short temporal intervals (paper No. 36).

18/ Long time series of daily values of the cosmic rays intensity, acquired by the neutron monitors of different rigidity (Calgary, Climax, Lomnický Štít and Huncayo/Haleakala) were analysed using the wavelets in the interval of periods between 60 and 1000 days. While 1.7 years period, which was the most pronounced in the temporal interval under study, strongly affects the profile of the cosmic rays intensity in the cycle 21 (especially in year 1982), 1.3 years period was significant mostly on the descending phases of cycles 20 and 22. The results support differences between solar activity in odd an even solar cycles (paper No. 24).

19/ We state an almost absolute identity of the global form of the solar corona and of its discrete large-scale coronal structures (coronal holes, condensations, streamers) with the strength and topology of the magnetic field which gives evidence for a dominant role of magnetic fields in the active processes in the Sun (paper No. 49).

20/ Different aspects of the large-scale distribution of the coronal Fe XIV 530.3 nm emission line brightness are presented. Evolution of this line intensity over the solar cycle is demonstrated and the relevance of the solar middle-latitude zones in variability and cyclicity of solar activity is emphasized (paper No. 50).

21/ A new model of spacetime has been put forward. The cornerstone of the model is the configurations of so-called fundamental elements associated with Cremona transformations generated by homaloidal webs of quadrics in a three-dimensional projective space. The model not only offers a unique explantion of the observed dimensionality (4) and signature (3+1) of the universe at large scales, but it also points to a possible link between the number of space coordinates and the intrinsic structure of the time dimension (papers Nos. 40,41 and 101).

22/ Ground based spectroscopic and radio observations as well as our original HST imaging of CH Cygni during its active phases showed the presence of the high-velocity mass outflow from the system up to 4000 km/s. A new quantitative method was elaborated, based on which we determined the mass loss rate from the system to 2-4$\times10^{-6}$ mass of the Sun/year. An application of this method to other eruptive symbiotic stars will allow us to understand better the nature of their outbursts (paper No. 42).

23/ On the CCD photometry observations basis in the BVRI colours of the symbiotic star YY Her the primary minimum was covered in detail, and at the same time the minimum was interpreted by an eclipsing effect. The preliminary results were published together with a challenge to the international photometry campaign. In the frame of the campaign a great deal of observation material was gathered at observatories in Czech Republic, Greece and Slovakia (papers Nos. 70, 71).

24/ Photoelectric photometry, acquired on a long-term basis at the Skalnate Pleso and Stara Lesna observatories, was used for a quantitative and qualitative description of the flickering activity of the recurrent nova T CrB. There was studied a process of mass transfer from the red giant to the white dwarf through an accretion disc. On the basis of the energy balance of flickering, the latter was located in the internal parts of the accrection disc and on the surface of the white dwarf, whose presence in the system we resolved in the previous years. A constant size/area of the turbulent regions in the accretion disc was, with respect to the primary model, replaced by several free parameters, which shifts high-energy flickering effects of a long duration into the external regions of the accretion disc. Further observational support of this scenario was also found in the literature (paper No. 68).

25/ Brightness variation orbital modulations study results of the cataclysmic star V Sge in intensity scale in high, medial and low activity states of system were published. A brightness variation amplitude increases when the system goes from the low to high activity states. Photometry behaviour of the object is possible to explain provided that the radiation comes also from the warmed side of the secondary element. Its sequential eclipse by an accretion disc is shown by secondary minimum existence (papers Nos. 51, 102).

26/ Our photoelectric observations of four contact binaries U Peg, YY CrB, OU Ser and EQ Tau were used to find photometric elements from their light curves. The 13 degrees migration of the cool spot on the surface of the primary component of U Peg in the direction of the orbital motion was detected. The photometric elements of YY CrB and OU Ser, determined for the first time, were used together with published spectroscopic elements to find the masses of the components. An analysis of all published minima times of EQ Tau support the presence of the third body in the system (paper No. 33).

27/ The first ground-based photoelectric light curves of the contact systems FN Cam and EX Leo were obtained and used for the determination of their photometric elements. The masses of the components were determined using the known mass-ratio, semi-major axis and inclination of the orbit (paper No. 32).

28/ The photoelectric and CCD observations of 35 eclipsing binaries obtained at the observatories Skalnaté Pleso, Stará Lesná and Roztoky led to the determination of 90 minima times. New epehemerides of these binaries were determined using all available minima times (paper No. 34).

29/ Detailed spectroscopic and photometric investigation of the eclipsing binary V505 Mon showed that the more massive component is surrounded by a disk, which prevents its spectroscopic detection. The CII line profiles in UV region enabled to determine the rotational velocity of the disk. The masses of the components determined from the radial velocities of the primary component and dimensions of the disk are 1 and 6.1 solar masses. It was shown that V 505 Mon is a prototype of the group of similar binaries of early spectral type: V742 Cas, V1362 Cyg, V2174 Cyg, V447 Sct and FY Vel (paper No. 72).

30/ Imaging of the symbiotic star CH Cyg obtained by the Hubble Space Telescope and the radio telescope showed the presence of an extended bipolarly shaped nebula around the system. Time sequence of the radio maps revealed a precession of the main axis of the high-velocity jets. Photometric observations indicated an eclipse of the active component by the cool giant on the long 14.5-year period orbit of the triple-star system (paper No. 6).

31/ New photometric observations of long-term monitored symbiotic stars were presented. A majority of the observations were carried out at the Skalnaté Pleso and Stará Lesná observatories. The most important result is a monitoring of the prototype of symbiotic stars Z And during its recent activity (paper No. 43).

32/ Analysis of the spectral energy distribution in symbiotic stars confirmed the basic three-component model of their radiation. Only in the case of AR Pav it was possible to explain its combined radiation by a model of a large accretion disk around a mean-sequence star (paper No. 103).

33/ The remarkable spectral feature at 670.8 nm in HD101065 was considered in two ways: (i) as a blend of the Li I and REE lines and, (ii) as a blend of REE lines alone. It was shown by model calculations that the Li I lines absorb significantly in the range 670.772 - 670.802 nm, and the resulting abundance of lithium is log N(Li/H) = -8.7 what is near to the primordial value (paper No. 109).

# 6 Grants/Projects

## 6.1 International grants

- Since 1997, Humboldt project - Spectroscopic and photometric investigation of the circumstellar matter in symbiotic stars - principal investigators: A. Skopal, H. Drechsel
- 2000-2002, Slovak-Japanese project - Observational studies of solar activity using coronagraphs - principal investigator: V. Rušin
- 2000-2002, NATO Collaborative Linkage Grant - Structure of time and quantum computing: pregeometric/discrete space-time approach - principal investigator: M. Saniga
- 2001-2002, Projekt NATO ARF - Algebraic geometrical structure of space-time - principal investigator: M. Saniga
- 2001-2003, Project CNR-SAV - La struttura matematica del tempo soggetivo - principal investigators: R. Buccheri, M. Saniga
- 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
- 2001-2003, Projekt 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
- 2002-2005, Slovak-UK project - Processes of interaction in classical novae and symbiotic stars - principal investigators: A. Skopal, M.F. Bode

- 2002-2006, Project EU HPRN-CT - European solar magnetism network - principal investigators: R. Rutten, A. Kučera

### 6.2 Grants of the Slovak Grant Agencies VEGA and APVT

- 2000-2002 - Physical processes of the origin and development of the chemical peculiarity of early stars - principal investigator: J. Žižňovský
- 2000-2002 - Physics and dynamics of meteoroids and micrometeoroids in the interplanetary environment and on encounter with the Earth - principal investigator: A. Hajduk
- 2000-2002 - Magnetism, dynamics and variability of the solar atmosphere - principal investigator: A. Kučera
- 2001-2003 - Source regions of sungrazers - principal investigator: E. Pittich
- 2001-2003 - Acretion, 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
- 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
- Cataclizmic 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 Refereed publications


1. AMADO, Pedro - ZBORIL, Milan: Photometric and TiO modeling of the starspots on AG Dor and HU Vir. In: Astronomy and Astrophysics, 2002, vol. 381, p. 517-523.
2. BADALYAN, Olga G. - OBRIDKO, Vladimir N. - SÝKORA, Július: Direction of the coronal green line polarization as derived from the eclipse measurements. In: Contributions of the Astronomical Observatory Skalnaté Pleso, 2002, vol. 32, p. 49-61.
3. BADALYAN, Olga G. - OBRIDKO, Vladimir N. - SÝKORA, Július: Polarization in the 530.3 nm emission line and coronal magnetic field structure. In: Contributions of the Astronomical Observatory Skalnaté Pleso, 2002, vol. 32, p. 175-189.
4. BAGGALEY, Jack W. - NESLUŠAN, Luboš: A model of the heliocentric orbits of a stream of Earth-impacting interstellar meteoroids. In: Astronomy and Astrophysics, 2002, vol. 382, p. 1118-1124.
5. BUDAJ, Ján - DWORETSKY, Michael: Radiative accelerations on Ne in the atmospheres of late B stars. In: Monthly Notices of the Royal Astronomical Society, 2002, vol. 337, p. 1340-1348.
6. CROCKER, Matthew - DAVIS, Richard, J. - SPENCER, Robert E. - EYRES, Stewart - BODE, Michael, F. - SKOPAL, Augustin: The symbiotic star CH Cygni. III. A precessing radio jet. In: Monthly Notices of the Royal Astronomical Society, 2002, vol. 335, p. 1100-1108.
7. EYRES, Stewardt - BODE, Michael F. - SKOPAL, Augustin - CROCKER, Matthew - DAVIS, Richard - TAYLOR, Arny - TEODORANI, Massimo - ERRICO, Luidi - VITTONE, Alberto - ELKIN, Vladimir, G.: The symbiotic star CH Cygni. II. The ejecta from the 1998-2000 active phase. In: Monthly Notices of the Royal Astronomical Society, 2002, vol. 335, p. 526-538.
8. HAJDUK, Anton: The Anthropic cosmological principle and the Omega Point. In: Ultimate Reality and Meaning Journal, - Interdisciplinary Studies in the Philosophy and Understanding, 2002, vol. 25, p. 26-35.
9. HAJDUKOVÁ jr., Mária: Pseudohyperbolické meteory v meteorických rojoch. In: Meteorické správy, 2002, vol. 23, s. 89-92.
10. HUSÁRIK, Marek: Modelovanie tvaru asteroidov. In: Meteorické správy, 2002, vol. 23, s. 68-73.

11. CHOCHOL, Drahomír - VITTONE, Alberto: Multifrequency behaviour of symbiotic novae. In: Memorie of the Societá Astronomica Italiana, 2002, vol. 73, p. 232-241.

12. JAKUBÍK, Marián - NESLUŠAN, Luboš: Poznámka k ejekcii komét do Oortovho oblaku. In: Meteorické správy, 2002, vol. 23, s. 101-110.

13. KAMENICKÝ, Milan: Vplyv slnečnej aktivity na jasnosť komét. In: Meteorické správy, 2002, vol. 23, s. 28-33.

14. KOCIFAJ, Miroslav: Analytical solution of the extended single-body problem and its applications. In: Contributions of the Astronomical Observatory Skalnaté Pleso, 2002, vol. 32, p. 25-38.

15. KOCIFAJ, Miroslav: On uncertainty of determination of particle optical thickness in atmospheric environment. In: Contributions of the Astronomical Observatory Skalnaté Pleso, 2002, vol. 32, p. 5-24.

16. KOCIFAJ, Miroslav: Dynamické efekty tlaku žiarenia u poréznych kozmických častíc. In: Jemná optika a mechanika, 2002, vol. 11/12, s. 352-358.

17. KOCIFAJ, Miroslav: Medzihviezdna extinkcia kozmickými časticami nesférického tvaru. In: Meteorické správy, 2002, vol. 23, s. 34-46.

18. KOCIFAJ, Miroslav: O rozpoznávaní mimozemských častíc v strednej atmosfére Zeme. In: Meteorické správy, 2002, vol. 23, s. 47-56.

19. KOCIFAJ, Miroslav - DARULA, Stanislav: ModelSky - jednoduchý nástroj pre modelovanie rozloženia jasu na oblohe. In: Meteorologické zprávy, 2002, vol. 55, s. 110-118.

20. KOCIFAJ, Miroslav - KOHÚT, Igor: Prehodnotenie informačného obsahu optickej hustoty polotieňa Zeme. In: Meteorické správy, 2002, vol. 23, s. 57-67.

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# 8 How to reach us

## 8.1 Headquarters and facilities in the High Tatras


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|---|---|
| Postal address: | Astronomical Institute, Slovak Academy of Sciences,<br>SK-05960 Tatranská Lomnica, Slovakia |
| Telephone | 421 52 4467866-8 (headquarters – secretary)<br>421 52 4467062 (Skalnaté Pleso Observatory)<br>421 52 4467072 (Lomnický Štít Observatory) |
| Fax | 421 52 4467656 |
| E-mail: | astroinst@astro.sk |
| Staff email addresses: | `surnameofperson@astro.sk` |
| World Wide Web: | http://www.astro.sk |
| Anonymous ftp: | ftp.ta3.sk |


## 8.2 Facility in Bratislava


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|---|---|
| Postal address: | Astronomical Institute, Department of Interplanetary Matter,<br>Slovak Academy of Sciences, Dúbravská cesta 9, SK-84504 Bratislava, Slovakia |
| Telephone | 421 2 54775157 (secretary) |
| Fax | 421 2 54775157 |
| E-mail: | admin@astro.savba.sk |
| Staff email addresses: | `surnameofperson@astro.sk` or `surnameofperson@astro.savba.sk` |
| World Wide Web: | http://astro.savba.sk |