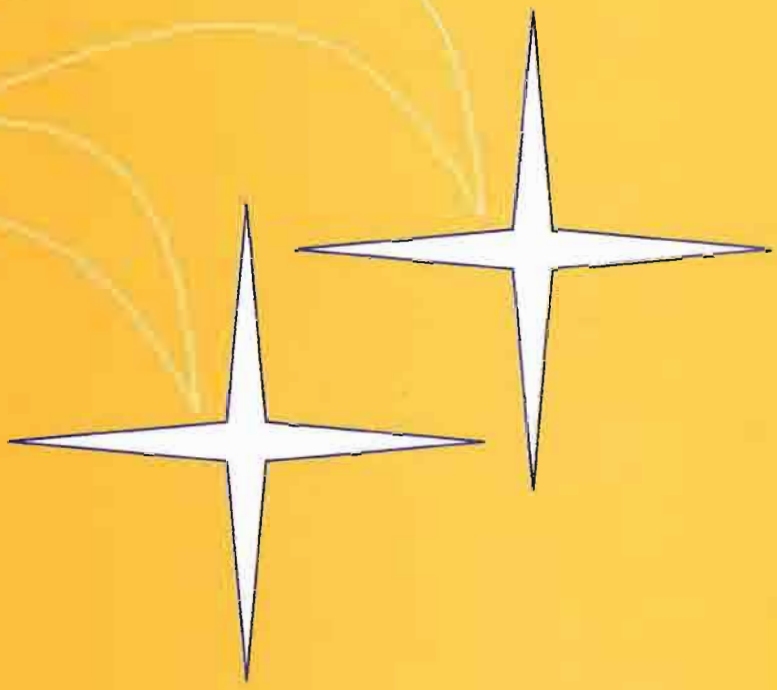


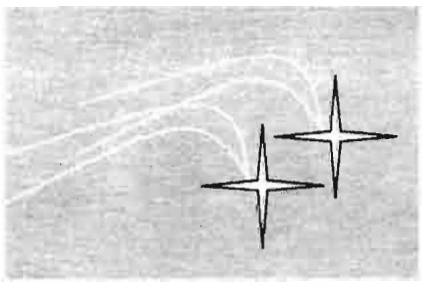
IV SERBIAN BULGARIAN ASTRONOMICAL CONFERENCE BELGRADE 21-24 IV 2004

PROGRAM AND ABSTRACTS

4th Serbian-Bulgarian Astronomical Conference (IV SBGAC)
21-24 April 2004, Belgrade, Serbia

PROGRAM AND ABSTRACTS

ed. M. S. Dimitrijević



Belgrade Astronomical Observatory, Astronomical Society "Rudjer Bošković"
and "Inka", Tikveška 16

Belgrade 2004

Za izdavača
Goran Veličković
"Inka", Tikveška 16, Beograd

Kompjuterski slog
Tatjana Milovanov Milenković

Korice
Zoran Simić

Štampa
Štampariia Veličković

Tiraž
100

4th Serbian-Bulgarian Astronomical Conference (IV SBGAC)
21-24 April 2004, Belgrade, Serbia

Organized by Belgrade Astronomical Observatory and
Astronomical Society "Rudjer Bošković"

Scientific Organizing Committee:

Milan Dimitrijević (Co-chairman, Astronomical Observatory and Astronomical Society "Rudjer Bošković", Belgrade)
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Nataša Stanić (Astronomical Society "Rudjer Bošković", Belgrade)
Tatjana Milovanov-Milenković (Astronomical Observatory, Belgrade)

CONFERENCE PROGRAMME:

April 21, Wednesday

12:00 Opening Ceremony

Chairman: *Milan S. Dimitrijević*
12:30 Peter Getsov: NEW OPPORTUNITIES FOR BULGARIAN SPACE RESEARCH

13:15 COCTAIL

Chairman: *Milcho Tsvetkov*
15:00-15:30 S. Jankov, R. Petrov, F. Vakili, S. Robbe-Dubois, A. Domiciano: HIGH ANGULAR RESOLUTION IN MODERN ASTRONOMY: NEW INSIGHTS INTO THE STELLAR PHYSICS

15:30-16:00 Katya Tsvetkova, Milcho Tsvetkov, Konstantin Stavrev, Ana Borisova: BALKAN COLLABORATION IN THE ARCHIVING OF WIDE-FIELD PHOTOGRAPHIC OBSERVATIONS

16:00-16:30 Milan S. Dimitrijević: FULLERENES AND ASTRONOMY

16:30-17:00 Georgi Ivanov: STAR COMPLEXES IN M33

17:00-17:30 Cofee break

Chairman: *Slobodan Jankov*
17:30-18:00 Rumen Bogdanovski: STARGAZER–WEB BASED SYSTEM FOR STAR FIELD VISUALISATION AND ITS INTEGRATION TO THE WFPDB

18:00-18:30 Dejan Urošević: THEORETICAL SIGMA-D RELATION FOR SUPERNOVA REMNANTS

18:30-19:00 Damyan Kalaglarski: WEB ACCESS AND IMAGE PROCESSING IN ASTROPHYSICAL DATABASES

19:00-19:30 Vladan Čelebonović: TWO SIMPLE PROBLEMS IN SEMICLASSICAL DENSE MATTER PHYSICS

April 22, Thursday

Chairman: *Luka Č. Popović*
9:30-10:00 Gojko Djurašević: INVESTIGATIONS OF ACTIVE CLOSE BINARY SYSTEMS ON BELGRADE ASTRONOMICAL OBSERVATORY

10:00-10:30 Lachezar Filipov: ACRETION DISKS: RESULTS OF SEARCH IN SPACE RESEARCH INSTITUTE – BULGARIA

10:30-11:00 P. Böhm, Th. Becker, M. M. Roth, M. Verheijen: 3D SPECTROPHOTOMETRY WITH PMAS

11:00-11:30 Cofee break

Chairman: *Georgi Ivanov*

11:30-12:00 Luka Č. Popović, Konstantin Y. Stavrev, Katya Tsvetkova, Milcho Tsvetkov, Dragana Ilić, Sebastian F. Sanchez, Gotthard M. Richter, Petra Böhm: OBSERVATIONS OF AGNs WITH THE 2m TELESCOPE OF ROZHEN OBSERVATORY: AIMS AND PRELIMINARY RESULTS

12:00-12:30 Valeri Golev, Ivanka Yankulova: THE STARBURST-AGN CONNECTION FOR THE IR Sy2 GALAXY MARK 534 = NGC 7679

12:30-13:30 Cofee break with snacks

Chairman: *Slobodan Ninković*

13:30-15:30 Poster presentation (First 14 posters) (5-10 min for each poster)

A walk through Belgrade

18:30 Visit of Belgrade Astronomical Observatory

19:30 CONFERENCE DINNER IN THE "BELI BAGREM" RESTAURANT
(850 din for non sponsored participants)

April 23, Friday

8:00-22:00 FULL DAY EXCURSION

Visits of SMEDEREVO with SMEDEREVO FORTERESS ancient capital of medieval Serbia, VRSHAC with Ancient Farmacy from 1784 with the collection of works of famous Serbian painter Paja Jovanovic, Vrshac medieval tower, Ortodox cathedral of St. Nicholas from 1785, Catolic cathedral of St. Gerhard from 1861, Vladika's court from 1757, MESIC Monastery with the church of "St. Jovan Pretecha" from 1225.

April 24, Saturday

Chairman: *Valeri Golev*

9:30-10:00 Slobodan Ninković: GLOBULAR CLUSTERS-INTERESTING STELLAR SYSTEMS

10:00-10:30 Zorica Cvetković: EUROPEAN LONGITUDE NETWORK AND A PROJECT FOR THE BELGRADE INCLUSION

10:30-11:00 Miodrag Dačić: REDUCTION OF ASTROGEODETIC DETERMINATIONS ON THE UNIQUE SYSTEMS

11:00-11:30 Cofee break

Chairman: *Katya Tsvetkova*

11:30-13:30 Poster presentation (Posters from the 15th)

13:30 Closing of the Conference

Official languages of the Conference are Serbian, Bulgarian and English. Proceedings of the IV SBGAC will be published until the end of 2004 and the deadline for manuscripts of invited lectures and contributed papers is 1st June 2004. There is no limitations on the number of pages, but contributions will be reviewed by SOC and if too extensive a shorter version will be requested.

Contributions should be sent to the E-mail address:
mdimitrijevic@aob.bg.ac.yu
or, if dificulties with e-mail connections, to
lpopovic@aip.de
or by mail to
Milan S. Dimitrijević
Astronomical Observatory
Volgina 7
11160 Belgrade
Serbia
tel. +381 11 419357 / 117
fax. +381 11 2419553

TeX macros file for papers may be obtained from Predrag Jovanović
pjovanovic@aob.bg.ac.yu

On Internet address http://www.aob.bg.ac.yu/meetings/4scsls you can also download papers macros.

INVITED LECTURES

Invited lecture

STARGAZER - WEB BASED SYSTEM FOR STAR FIELD VISUALIZATION AND ITS INTEGRATION TO WFPDB

RUMEN BOGDANOVSKI
Institute of Astronomy, Bulgarian Academy of Sciences,
72 Tsarigradsko Chausse Blvd., 1784 Sofia, Bulgaria
E-mail rumen@skyarchive.org

StarGazer is a web based Internet Service for visualization of star fileds. At present it works with several catalogs: GSC-ACT, Tycho, SAO etc. It is capable of working with every stellar catalog since it uses standard database server (PostgreSQL) as a search engine. It is usable by all the Internet users regardless to the operating system and computer architecture. Now StarGazer is developing further to meet the needs of WFPDB and to become a tool for object identification on the scanned wide field plates. There are two mirrors of StarGazer available online at: http://www.astro.bas.bg/stargazer and http://www.skyarchive.org/stargazer.

Invited lecture

3D SPECTROPHOTOMETRY WITH PMAS

P. BÖHM, Th. BECKER, M. M. ROTH, M. VERHEIJEN
Astrophysikalisches Institut Potsdam,
An der Sternwarte 16, D-14482 Potsdam, Germany

Although the method of optical 3D spectroscopy has become more popular in astronomy with the appearance of new integral field unit (IFU) instruments like GIRAFFE and VIMOS for the VLT in Chile (ESO), or CIRPASS for the GEMINI South on Mauna Kea Hawaii (AAO), it is far away from being a common tool. The main reason for the skepticism of the astronomical community is the difficulty of handling the data.

Here we present the integral field unit PMAS (Postdam Multi-Apperture Spectrophotometer) together with the IDL software tool P3d, developed especially for the reduction of PMAS data. However, with some minor adaptions it is also very usefull for the reduction of data taken by other IFUs like VIMOS. We show the capabilities of PMAS with its standard lenslet IFU and its new wide-field IFU module called PPAK, a further development for the observation of low surface brightness objects. Apart from technical details about the instrument and the software, some preliminary scientific results are shown from the observations of Planetary Nebulae.

Invited lecture

TWO SIMPLE PROBLEMS IN SEMICLASSICAL DENSE MATTER PHYSICS

VLADAN ČELEBONOVIĆ
Inst. of Physics, Pregrevica 118, 11080 Zemun-Beograd, Serbia
E-mail vladan@phy.bg.ac.yu

Physics of dense matter is an extremely rich and complex scientific field,mixing laboratory experiments and astronomical observations with complex calculations.The aim of this lecture is to discuss in some detail two simple but important problems which have considerable importance for the developement of theoretical work in semiclassical dense matter physics.

Invited lecture

EUROPEAN LONGITUDE NETWORK AND A PROJECT FOR BELGRADE INCLUSION

ZORICA CVETKOVIĆ
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The first part of this work is devoted to the investigation of mathematical models for smoothing of observations, describing influences of various factors on measurements during the longitude and the longitude difference determinations. Between 12 investigated, it has been accepted the model showing the statistically best agreement with the measurement data. The second part is devoted to the examination of the influence of stellar positions on such determinations during the use of two celestial reference frames: the dynamical one, determined by the FK5 catalogue and the kinematical one, determined by the HIPPARCOS catalogue. It has been determined the systematic difference of two mentioned bases for the longitude determination, which is annulated in the case of longitude differences. In the third part, the functional model, providing the satisfying precision and high reliability for the Belgrade Astronomical Observatory inclusion in the European longitude network, has been investigated. Such point could be a reference point for the determination of the national longitude network and for the geoid determination for our country. By changing the geometry of a part of ELN, it has been found that this could be achieved by the determination of the Belgrade longitude difference related to only two close stations, members of ELN.

Invited lecture

REDUCTION OF ASTROGEODETIC DETERMINATIONS ON THE UNIQUE SYSTEMS

MIODRAG DAČIĆ

Astronomical Observatory, Volgina 7, 11160 Belgrade – 74, Serbia
E-mail mdacic@aob.bg.ac.yu

Determinations in geodetic astronomy, namely, determination of time, longitude, latitude and azimuth from star observations, have been made during a long period by different persons. Positions of observed stars have been taken from different catalogues and in different reference systems. In order that results of such determinations will be mutually comparable, it is necessary to make the reduction of stellar positions on the unique reference system. Consequently, results of astrogeodetic determinations will also be reduced to the same system. Starting from the fact that the position of a point is determined only related to something, it is possible to calculate systematic differences of particular catalogues and catalogues used for the materialisation of the chosen reference system. Obtained stellar positions-, and proper movements - systematic errors, enable the changement from standard epoch on another one (the moment of observation), so that stellar positions are reduced to a single system. The proposed model is checked at three classical methods of geodetic astronomy and applied to results of general Stevan Bošković's astrogeodetic determinations, made in the first decade of the XX century.

Invited lecture

FULLERENES AND ASTRONOMY

MILAN S. DIMITRIJEVIĆ

Astronomical Observatory, Volgina 7, 11160 Belgrade – 74, Serbia
E-mail mdimitrijevic@aob.bg.ac.yu

Carbonaceous dust in the interstellar medium may show strong diversity and might include not only amorphous carbon but also a variety of components like hydrogenated amorphous carbon, soot, quenched-carbonaceous condensate, diamonds and other so that is pointed out the relation of formation of PAHs, bucky tubes and fullerenes to such dust. We note as well that the astrophysically motivated investigations of the chemistry of carbon stars resulted with the discovery of the C_{60} molecule, first and the most interesting representative of such molecules. Here is presented a review of astronomical researches connected with fullerenes as for example the search for interstellar and circumstellar ones or presence of such molecules in meteorites brechias of impact craters on Earth and impact traces on spacecrafts. Also, their connection with the problem of the diffuse interstellar and circumstellar absorption lines will be discussed. Particular attention will be payed to the search for polyynes in interstellar space which resulted in the formulation of investigation of chemistry of carbon stars and in discovery of fullerenes.

Invited lecture

INVESTIGATIONS OF ACTIVE CLOSE BINARY SYSTEMS ON BELGRADE ASTRONOMICAL OBSERVATORY

GOJKO DJURAŠEVIĆ

Astronomical Observatory, Volgina 7, 11160 Belgrade - 74, Serbia and Montenegro
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Computer generated models developed around the year 1970 enabled the synthesis of the light and radial velocity curves which led to large accelerated progress in astrophysics and theory of evolution of close binary systems (CBS). The insight of the CBS evolution and the understanding of the physical processes occurring in CBS are inseparable from the development of the models, involving Roche equipotentials, that provide an efficient analysis of the observations. Since the evolution of CBS is very heterogeneous their morphology is rich in physical models specially designed for the analysis of the observational data of certain system types in different evolutionary phases. If, there is a an appropriate model based in physics for a particular CBS type, then the optimisation of model parameters can provide a good fit of the observations and real, accurate estimates of orbital and physical parameters of the system. In general, the interpretation of observations comprises two key problems in which we have 1) to develop an adequate model for the light and radial velocity curve synthesis (direct problem), and 2) to estimate the parameters with which the model gives the best fit of the observations by employing an appropriate method of optimisation (inverse problem). In the last thirty years these two problems have been the objects of very intense scientific work. Simultaneously with the development of new models intended for generating the synthetic CBS light curves, we have also the efforts in developing of the inverse-problem methods. In essence, the inverse-problem method is the minimisation of the sum of squares of residuals between the real observations and the synthetic ones generated by the model. There is a number of different approaches: differential corrections method, gradient method, Simplex algorithm, Marquardt algorithm, and several forms of iterative minimisation. The high importance of this issue lays in the fact that the observations of eclipse CBS present a unique opportunity to accurately estimate the real orbital and physical parameters. This is a source of precious information on physical characteristics of stars at different evolutionary phases in close binary systems. This paper is an overview of our models and methods used to interpret the observations of active CBS. Also, we presented our more important published results.

Invited lecture

ACCRETION DISKS: RESULTS OF RESEARCH IN SPACE RESEARCH INSTITUTE - BULGARIA

LACHEZAR FILIPOV

"High Energy Astrophysics" Department,
6 Moskovska str.,P.O.Box 799,1000 Sofia, Bulgaria
E-mail lfilipov@space.bas.bg

In this paper we give a short review of our results in the field of Nonlinear evolution of Accretion disks in SRI-BAS for last 20 years. We formulate some basic ideas for future work in this aria. We propose a project for joint research in the theory of Accretion disks.

Invited lecture

NEW OPPORTUNITIES FOR BULGARIAN SPACE RESEARCH

PETER GETSOV

Space Research Institute, Bulgarian Academy of Sciences,
Moskovska, str. 6, 1000 Sofia, Bulgaria

In the paper the successes of Bulgaria in space research area, the science programmes of the two Bulgarian astronauts, the space physics experiments, remote sensing, also space biology and medicine are given. The projects developed in the last years are also presented. Are defined the basic directions in the future development of new space technologies and their applications.

Invited lecture

THE STARBURST-AGN CONNECTION FOR THE IR Sy2 GALAXY MARK 534 = NGC 7679

VALERI GOLEV, IVANKA YANKULOVA

Department of Astronomy, University of Sofia,
P.O.Box 36, BG-1504 Sofia, Bulgaria

The Composite Seyfert/Starburst Galaxy NGC 7679 (Mark 534) was observed with the 2m Zeiss Telescope of the Ukraine National Astronomical Observatory at peak Terskol, Northern Caucasus. The two-channel focal reducer of the MPAe in tunable Fabry-Perot mode was used. The high-luminous IR galaxy Mark is a low-redshift nearly face-on SB0 galaxy in which starburst and AGN activities co-exist. NGC 7679 is physically associated by a common stream of ionized gas with the Sy2 galaxy NGC 7682. There are also signs of tidal distortions due to the interaction with a faint compagnion located at 50" in east direction. Together with the existence of a double nucleus in Mark 534 this could enhance the gas towards the nuclear regions and possibly trigger the starburst processes. The multiwavelength studies reveal the complex physical picture of NGC 7679. Its high FIR luminosity and IR colors are typical for a classical starburst galaxy. The Hα images show double nucleus and extended envelope with bright knots which resembles a starforming ring at 5 kpc from the center of NGC 7679. The high Hα/Hβ ratio of 17:4 infers that the ionization structure in the inner central region (about 3 kpc) is maintained by the AGN continuum whereas outside this region the source of ionization has a clear starburst origin. The SED from IR to X-rays is typical for classical Sy2 galaxies. Our imaging observations of NGC 7679 with a tunable Fabry-Perot interferometer revealed additional complexity of the circumnuclear region in NGC 7679, namely: (i) The maximum of ionization of the starburst region is displaced by 10-12 arcsec east from the nucleus. (ii) The infered ionization anisotropy of the radiation field and the photon deficiency of ionizing photons N(X-ray)/N(opt)=0.1 - 0.5, where N(opt) is the number of ionizing photons needed to maintain the observed ionization structure, and N(X-ray) is the number of those provided in soft X-rays by the central AGN, are suggestive that the central AGN source is observed through dense dust-gas clouds. Such 'dusty' warm absorbers have already been invoked to explain the discrepancy between the amount of X-ray cold absorption and the optical reddening in some SyGs. We note that NGC 7679 is included in a small sample of unabsorbed (i.e having low X-ray column density) for which the simple formulation of the Unified Model for SyGs is not applicable.

Invited lecture

STAR COMLEXES IN M33

GEORGI R. IVANOV

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P.O.Box 36, BG-1504 Sofia, Bulgaria

The present study is based on observations of massive objects in the galaxy M33. The star complexes have a hierarchical structure in both space and time. A method for identification of star complexes is applied. The average size of star clusters are from 11 to 20 pc, while the size of OB associations are ranged 60 - 100 pc. Several OB association form a star complex with a mean dimension of 0.3 - 1 kpc. In this paper we apply correlation technique in order to compare different stellar populations in M33. Our results confirm the existence a strong correlation between OB stars, HII regions,cepheids, red supergiants (RSGs) and WR stars which indicate the regions of massive star formation. There was confirm a good correlation between RSGs and WR stars. This can be expected that the progenitors of WR stars are massive OB stars or RSGs which masses $M \geq 20M_{\odot}$. The massive RSGs as well WR stars probably originate from nearby sites of star formation.We consider this fact as a basis for selecting star complexes in M33.

Invited lecture

HIGH ANGULAR RESOLUTION IN MODERN ASTRONOMY: NEW INSIGHTS INTO THE STELLAR PHYSICS

S. JANKOV[1,2], R. PETROV[2], F. VAKILI[2], S. ROBBE-DUBOIS[2] and A. DOMICIANO[2,3]

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The new generation of ground-based instruments for high angular resolution from optical interferometry provides a qualitatively new information for improving our understanding of the physics, structure and evolution of stars through the comparison of observational results with the predictions of theoretical models of stellar interiors and atmospheres. Traditionally, the optical interferometry has been considered as a tool for determination of the fundamental properties of stars, namely their effective temperatures, radii, luminosities and masses, by the combination of angular diameters, with complementary photometric, spectrophotometric and spectroscopic measurements, made with conventional telescopes. However, the influence of stellar interferometry extends beyond classical regimes of stellar diameters and binary orbits. In this contribution we review a selection of outstanding problems in stellar physics showing the potential of new methods which combine the classical techniques (as photometry and spectroscopy) and long baseline interferometry, providing informations that cannot be obtained otherwise with each of these techniques taken at once.

Invited lecture

WEB ACCESS AND IMAGE PROCESSING IN ASTROPHYSICAL DATABASES

DAMYAN KALAGLARSKI
Space Research Institute, Bulgarian Academy of Sciences, Moskovska, str. 6, 1000 Sofia, Bulgaria

The digitization of photographic plates done by various automatic plate scanning machines and its transfer over the web at present is unrealistic pointing in view hours needed at a typical user bandwidth rate. Web technology motivate needs for fast access to informative pixel maps, which are more intuitively understandable than the catalogues alone. Numerical image information should be simply coded as an array of intensity values, reproducing the geometry of the scanner used for plate digitization. The object signal will be stored with noise, background variations, and so on. Different methods of wide-filed astroimages compression as Hcompress, FitsPress, Independent JPEG Group (IJG) software including a Haar transform generalized to two dimensions and different wavelet transforms is discussed. Some basic on-line image processing like noise-filtering, brightness/contrast correction should be also applied. The Wide-Field Plate Database (WFPDB) users f.e. have to be able to see an image at a desired resolution, as well as to get just a part of the image. Thus they can get high level resolution image of a specified region of the plate without having to transfer the whole amount of data.

Invited lecture

GLOBULAR CLUSTERS - INTERESTING STELLAR SYSTEMS

SLOBODAN NINKOVIĆ
Astronomical Observatory, Volgina 7, 11160 Belgrade – 74, Serbia

Fo a long time, globular clusters excite interest of the astronomical comunity. Here is presented a review, concerning first of all of an ansamble of around 150, belonging to the Milky Way. These systems may exist sufficiently long (in comparison with Hubble time), but however, traces of relaxation should be noticeable. It is possible that some of them survived the colapse of the central part.

Invited lecture

OBSERVATIONS OF AGNs WITH THE 2 m TELESCOPE OF ROZHEN OBSERVATORY: AIMS AND PRELIMINARY RESULTS

LUKA Č. POPOVIĆ[1,2], KONSTANTIN Y. STAVREV[3], KATYA TSVETKOVA[3], MILCHO TSVETKOV[3], DRAGANA ILIC[4], SEBASTIAN. F. SANCHEZ[2], GOTTHARD M. RICHTER[2], PETRA BÖHM[2]

[1] *Astronomical Observatory, Volgina 7, 11160 Belgrade – 74, Serbia*
[2] *Astrophysikalisches Institut Potsdam, An der Sternwarte 16, D-14482 Potsdam, Germany*
[3] *Institute of Astronomy, Bulgarian Academy of Sciences, 72 Tsarigradsko Shosse Blvd., BG-1784 Sofia, Bulgaria*
[4] *Department of Astronomy, Faculty of Mathematics, Studentski trg 16, 11000 Belgrade, Serbia*

Here we present a program for observations of four Active Galactic Nuclei (AGNs) with the 2 m telescope of the National Astronomical Observatory Rozhen (Bulgaria). We intend to observe four objects in different narrow filter bands, as well as in U and I bands. The idea is, for different astrophysical reasons, using the images in different bands to explore an extensive structure of these AGNs. The aims of the observations are given. The preliminary results for Mrk 1040 are presented, where we are searching for any evidence for interaction between Mrk 1040 and a small companion galaxy (LEDA 212995). Our analysis show that the substructures seen in all images are remarkably similar, indicating that: (i) There is a very strong point-like innermost center of Mrk 1040, i.e. AGN. The companion has irregular structure that is expected in the case of star-forming region. (ii) There are different star-forming regions in the disk of Mrk 1040, seen in the western part of the arm. (iii) From our preliminary analysis we can conclude that there is no tidal tail of young stars between Mrk 1040 and LEDA 212995.

Invited lecture

BALKAN COLLABORATION IN THE ARCHIVING OF WIDE-FIELD PHOTOGRAPHIC OBSERVATIONS

KATYA TSVETKOVA, MILCHO TSVETKOV, KONSTANTIN STAVREV, ANA BORISOVA

Institute of Astronomy, Bulgarian Academy of Sciences, 72 Tsarigradsko Shosse Blvd., BG-1784 Sofia, Bulgaria

We consider the collaboration in the archiving of wide-field photographic observations in the astronomical observatories from the Balkan peninsula region. As a result of the collaboration the descriptive information for 58% of all existing wide-field observations in Bulgaria, Serbia and Romania (about 35 000 plates) is already included in the Wide-Field Plate Database (WFPDB). An on-line access to this information is organised in Strasbourg Data Center and in Sofia Sky Archive Data Center. A digitised plate archive is on the way to be created as a part of the WFPDB with the operating high-speed Epson Expression 1640XL flatbed scanner and high- precision PDS1010 microdensitometer in Sofia Sky Archive Data Center, as well as with UMAX Alfa Vista II flatbed scanner in Bucharest, which provide good opportunities for an effective processing of the archived observations. Another aspect of the collabration is the exchange of experience in development and application of astronomical databases (WFPDB and BELDATA) and organization of mirror sites of the databases.

Invited lecture

THEORETICAL SIGMA-D RELATION FOR SUPERNOVA REMNANTS

DEJAN UROŠEVIĆ

Department of Astronomy, Mathematical Faculty, Belgrade, Serbia

This lecture presents a summary of theoretically-derived relations between the radio surface brightness Σ and the diameter D of supernova remnants (SNRs): such relations are commonly known as $\Sigma - D$ relations. We argue that discrepancies between theoretically-derived relations and valid empirical relations derived may be at least partially explained by taking into account thermal emission at radio frequencies from two particular types of SNRs.

POSTER PAPERS

Poster paper

CCD OBSERVATIONS OF SOLAR SYSTEM BODIES FROM BELGRADE ASTRONOMICAL OBSERVATORY

VLADIMIR BENIŠEK, VOJISLAVA PROTIĆ-BENIŠEK
Astronomical Observatory, Volgina 7, 11160 Belgrade - 74, Serbia
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This article is based on our seven years of experience (1997-2004) with CCD observations of minor planets, comets and natural planetary satellites performed mainly with three instruments of Belgrade Observatory: Zeiss Astrograph 16/80 cm, Zeiss Refractor 65/1055 cm and Askania Equatorial 12.5/100 cm, equipped with the ST-6, ST-7 and ST-8 CCD cameras subsequently. The newest detector is Apogee AP-47p CCD camera with high quantum efficiency overall broad spectral range and quite suitable in recording the faint objects. It was shown a good quality of CCD frames and high positional accuracy owing to good instrumental and register parameters.

Poster paper

STARK BROADENING PARAMETERS OF THREE O II LINES

S. BUKVIĆ, A. SREĆKOVIĆ and S. DJENIŽE
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Stark widths and shifts of 3 singly ionized oxygen (O II) spectral lines (327.0856 nm, 327.3434 nm and 327.7561 nm) in the $3p\ ^2F^o - 4s\ ^2D^o$ and $3p\ ^4P^o - 4s\ ^4P$ transitions have been measured in a linear, low-pressure, pulsed arc discharge operated in helium-oxygen mixture (1: 1.1) at a 26 000 K electron temperature and 1.1×10^{23} m^{-3} electron density. The Stark widths of these lines are the first measured values. The Stark shift of the 327.7561 nm is also the first measured value.

Poster paper

PROBLEM OF CROSS-IDENTIFICATION OF POINT SOURCES

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At the Belgrade Astronomical Observatory the original programme for the cross-identification of the stars (as a point sources) of any two catalogues with enough data is developed. The cross-identification between HIPPAROCOS (HIgh Precision PARallax COllecting Satellite) and 2MASS (Two Micron All Sky Survey) catalogues is presented.

Poster paper

KINEMATICS AND EVOLUTION OF TWO ERUPTIVE PROMINENCE

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In this paper we study the kinematics and evolution of two eruptive prominences (Eps), observed on May 8, 1979 and on May 5, 1980 in Astronomical Observatory of Wroclaw University, Poland. The EPs are typical representatives of two basic types of eruption (type I constant velocity and acceleration, type II acceleration, constant velocity and deceleration). Both, velocity and acceleration, are measured in all stages of the eruption. We show that there are essential differences between final stages of these eruptive events. The kinematic differences between EPs are discussed in point of view of the temporal evolution of topological different parts in the erupting huge magnetic system. We suggest that the change of energy of twisting or untwisting of a helical magnetic structure may play important role in the observed eruptions.

Poster paper

INTERACTIVE COMPUTING OF THE EARTH ROTATION MATRIX ACCORDING TO IERS CONVENTION 2003

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The IAU 1976 Precession Model and the IAU 1980 Theory of Nutation are replaced by the precession-nutation model IAU 2000 A (MHB 2000), based on the transfer functions of Mathews et al. (2002) at the beginning of 2003. In the proposed work the basic steps for computing of the rotation matrix of the Earth crust (the International Terrestrial Reference System) with respect to a geocentric set of axes tied to the quasars (the International Celestial Reference System) are described. IERS Conventions 2003 (November 5th, 2003, http://maia.usno.navy.mil/conv2000.html) are used in the basic modules of the interactive program, written using IDL Version 6.0 Win32 (x86). It enables users to obtain the components of the coordinate transformation matrix - the transformation matrices arising from the motion of the celestial pole in the celestial system, from the rotation of the Earth around the axis of the pole, and from polar motion. The program allows taking in account the effect of: 1) The Earth Orientation Parameters, http://hpiers.obspm.fr/eop-pc/ " The celestial pole offsets or ; " The rotation angle around the celestial intermediate pole, UT1-UTC; " The polar motion of the celestial intermediate pole with respect to the terrestrial crust; 2) Tidal gravitational forcing; 3) Oceanic forcing; 4) Atmospheric forcing. The results are compared with the interactive site of IERS EOP Product Center. The final version is available at ftp://aquila.skyarchive.org.

Poster paper

BVR PHOTOMETRY OF STELLAR AND NON-STELLAR OBJECTS IN VICINITY OF STARBURST GALAXY M 82

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We present BVR photometry of stellar and non-stellar objects in the starburst galaxy M82 carried out with IRAF software package. The CCD images were obtained by 2m NAO-Rozhen telescope on May 2003 and cover a 20' × 7' field centered on the galaxy center. Our aim is to study the resolved stellar population and to select possible star cluster candidates. This report is a part of an work dedicated to the basic properties and distribution of stellar clusters.

Poster paper

DECOMPOSITION OF PROFILES OF GALAXIES WITH CONVEX DISK SHAPES

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An improved one-dimensional decomposition technique for galactic profiles is presented. Both, bulge and disk shapes are modeled by the Sersic (1968) formula. The optimal free parameters - central brightness, scale length and exponential number are derived by iterative procedure in the spirit of Kormendy (1977). The method is applied on ¿40 published profiles of nearby galaxies. It is found that the disk shapes of the early type galaxies (S0-Sb) are more convex, with central depression while the disk shapes of later type galaxies (Sc-Sm) are close to exponential form of Freeman (1970).

Poster paper

OBSERVATION Mrk 817 IN SPECTRAL FILTERS: PRELIMINARY RESULTS

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The analysis of the images of Mrk 817 observed with narrow-band filters is presented. The observations were made with the 2 m telescope at the National Astronomical Observatory Rozhen. The extensive structure in the continuum, He II and [OIII] lines was investigated in order to see the sign of the outflow in the extended region.

Poster paper

SOLAR ACTIVITY INFLUENCE TO PRECIPITATIONS, VIII

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As in previous papers, by the same author, the Spectral decomposition theorem has been applied to find the eventual influences of the solar activity, known as the Total sunspot area, to the precipitations, on a spot in Serbia. By means of the cross periodograms, cospectral density, quadrature density, cross amplitude, the correlation has been studied. The cross correlation function proved that there may be a time lag of three years, for maximal precipitations, and a nine year lag for minimal precipitations, following the Solar activity.

Poster paper

HOW MICROLENSING CAN CONTRIBUTE TO QSO VARIABILITY?

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We study the influence of gravitational microlensing on the AGNs X- ray radiation in order to explain the recently observed shape variations of X- ray continuum and Fe Kα line in the high-redshifted lensed quasars MG J0414+0534, QSO 2237+0305 and H1413+117. Assuming that the X-ray radiation is originating in accretion disk, we used the ray tracing method considering both geometries, Schwarzschild and Kerr, to analyze the amplifications of X-ray continuum and the Fe Kα line flux due to microlensing by a caustic microlens. Different sizes of emission region, as well as different emissivity laws and different microlens parameters are used in our study. Our results show that the observed Fe Kα amplification without corresponding amplification of the X-ray continuum can be expected when their emitting regions have different dimensions. Moreover, here we will discuss the optical depth for microlensing of X-ray QSO emitting region by cosmologically distributed gravitational microlenses which could be localized in galaxies (or even in bulge or halo of gravitational macrolenses) or could be distributed in a uniform way.

Poster paper

COSMOLOGICAL CONSTRAINTS ON NEUTRINO OSCILLATIONS FOR INITIALLY NON-ZERO STERILE STATE

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We discuss cosmological constraints on neutrino active-sterile oscillations for the specific case when the sterile neurino is partially- filled initially. We provide numerical analysis of the BBN production of He-4, Y_p, in the presence of electron-to-sterile neutrino oscillations, effective after neutrino decoupling. We account for all known oscillations effects on cosmological nucleosyntesis. We obtain isohelium contours corresponding to different levels of He-4 overproduction, $\delta Y_p/Y_p$, for non-zero initial population of the sterile state δN_s. We present the cosmological constraints on oscillation parameters corresponding to $\delta N_s = 0.0$ and 0.5 and $\delta Y_p/Y_p = 3\%$ and 5%. The cosmological constraints for the cases $\delta N_s \leq 0.5$ are slightly strengthened in comparison to $\delta N_s = 0$ case.

Poster paper

EARLY UNIVERSE BARIOGENESIS

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We discuss the scalar field condensate baryogenesis model, which is among the preferred today baryogenesis scenarios, compatible with inflation. According to that model the baryon excess in the Universe results from the decay of a scalar condensate, carrying a baryon charge, at later stages of Universe evolution ($T << 10^{15}$ GeV). The condensate itself is generated at the inflationary stage.

In this work we update the parameters of the model and analyze numerically the post inflationary evolution of the scalar condensate. We determine the value of the generated baryon asymmetry, after the decay of the condensate.

Our numerical study confirmes the main result of the analytical and numerical estimations, obtained in previous studies, that the observed value of the baryon asymmetry can be obtained in the discussed model of baryogenesis. The dependence of the generated baryon density on the parameters of the model is discussed.

Poster paper

OB ASSOCIATIONS IN SEXTANS A DWARF IRREGULAR GALAXY

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The galaxies of the Local Group serve as our laboratories for understanding star formation and stellar evolution in differing environments. Irregular galaxies provide unique opportunities for studies of star formations triggered by the combined effect of stellar winds and supernova explosions in rich stellar groupings. Sextans A is a dwarf irregular galaxy located just beyond the Local Group. Using the public data from the new wide-field mosaic camera attached to the 4-m KPNO telescope we are producing a catalogue of UBVRI photometry of roughly 100 thousand stars in Sextans A. Using an automatic and objective method (Battinelli's technique) groups of young objects were found. These are the OB associations in the galaxy.

Poster paper

DEVELOPMENT AND PERFORMANCE OF DSP BASED 16-BIT HIGH-RESOLUTION CCD CONTROLLER

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Hyperspectral imaging systems are becoming more and more important concerning a great variety of systems with commercial and military purposes. The valuable fact about hyperspectral sensor of a given spatial resolution or pixel size is that it will give data on the scene that is not obtainable by single band or multi-spectral sensors. Several approaches have been applied to use a single higher spatial resolution band to improve the spatial resolution of the +hyperspectral data. The following items are described in the proposed research work: " the electronic block of the video-spectrometric system; " the used elements' base and scheme solutions; " its alignment with the optic system. Thanks to the usage of digital signal processors (DSP) and high-speed, high resolution ADC an extra flexibility and speed of processing is achieved. According to the task, the number of received channels may be reduced in the spectrometer itself. Schemes of the optic part and of the electronic block are presented.

Poster paper

ION-ATOM COLLISIONS AT INTERMEDIATE IMPACT VELOCITIES AS A NEW SOURCE OF UV AND VUV RADIATION

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The processes of the radiative charge exchange in $H^+ + H(1s)$ collisions at the intermediate ion-atom impact velocities are treated as a source of continuous EM emission in the far UV range. The spectral intensity of this emission is determined, within the semiclassical method developed in previous works, for the ion-atom impact energies (in the center of mass reference frame) from 0.5 keV to 12.5 keV. The results obtained show that the spectral intensity of the examined EM emission increases for several orders of magnitude when passing from the visible to the VUV range of wavelength, and that the position of the maximum of this spectral intesity drifts with increase of collision energy from $\lambda \cong 51$ nm to $\lambda \cong 18$ nm. These results imply that considered radiation processes may be of interest from astrophysical aspect as a new sources of continuous UV and VUV emission.

Poster paper

EXPERIMENTAL TOTAL STARK SHIFT IN Ar I SPECTRUM

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The Stark shift (d) of 4s-5p transitions in the neutral argon (Ar I) have been studied in a linear, low-pressure, optically thin pulsed arc discharge. The line shapes are measured in three different plasmas at about 16 000 K electron temperature (T) and about 7.0x10^{22} m^{-3} electron density (N). The separate electron and ion contributions to the total Stark shift (d_t), i.e. d_e and d_i have also been obtained and represent new experimental data in this field.

On the bases of the observed asymmetry of the Stark broadened line profile we have deduced the ion broadening parameters which describe the influence of the ion static (A) and the ion–dynamical effect (E) on the Stark shift.

Poster paper

IMPROVED KOVAL'SKIJ METHOD AND ITS NEW POSSIBILITIES

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We improved the Koval'skij analytical method for binary star orbital elements determination, in order to enlarge its possibilities. The improved method is applicable to the determination of orbital elements for all cases of observation distributions on the apparent arc of the orbit, and always gives the elliptical solution. Moreover, the method has an additional advantage, since to observations in polar coordinates, radial velocities could be added, which enables a more precise determination of the perihelion longitude.

Poster paper

NEAR-INFRARED SPECTROPHOTOMETRY OF A SAMPLE OF SEYFERT AGNs

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We present an analysis and spectrophotometric parameters of Seyfert AGN spectra in three near-infrared ranges (1.25, 1.54 and 2.2 micrometer), centered at the standard J,H and K bands. The spectra are taken with FSpec - cryogenic, near-infrared, long-slit spectrograph at 2.3m Bok telescope (Steward Observatory) and 6.5m Multi-Mirror Telescope (Mt.Hopkins).

Poster paper

SURFACE PHOTOMETRY OF NGC 5610 – BOX/PEANUT STRUCTURE IN AN ALMOST FACE-ON GALAXY

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About 50 objects forming a basic and a control sample were included in the observational list of the joint project "Surface photometry of BOX/PEANUT galaxies" between the Institute of Astronomy of the Ruhr-University, Bochum, Germany and the Institute of Astronomy of the Bulgarian Academy of Sciences.

The barred spiral NGC 5610, as well as NGC 4442, is seen far from edge-on, so it is not a typical box/peanut galaxy in the sense of the edge-on prototype NGC 128.

The galaxy NGC 5610 was observed with the CCD camera SBIG ST-8 attached to the 60-cm telescope at the Belogradchik Astronomical Observatory in V, R_C and I_C bands and with Photometrics CCD camera attached to the 2-m telescope of Rozhen NAO in U, B, V, R_C and I_C bands. Clear PEANUT structure is shown in all the frames within $20''$ from the centre of the galaxy. This structure is twisted compared to the galaxian bar toward a probable satellite galaxy located $75''$ to the West and $12''$ to the South with respect to the direction of the major axis of the NGC 5610 bar. The calibration coefficients for Rozhen and Belogradchik observations are presented following Mihov's photometric reduction package. The isophotes of the central part of the galaxy are shown. The position angle, ellipticity ($e = 1 - b/a$) and surface brightness profiles are extracted. The total magnitude within the $25\,B\,\mathrm{mag\,arcsec^{-2}}$ isophote is calculated. The bar length is approximately 12 kpc ($H_0 = 75\,\mathrm{km\,s^{-1}\,Mpc^{-1}}$).

Poster paper

THE FLUX RATIO OF [OIII]$\lambda\lambda$4959,5007 LINES IN SY2: COMPARISON WITH THEORETICAL CALCULATIONS

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Here we present the measurements of the [OIII]$\lambda\lambda$4959,5007 line flux ratios for a sample of 10 Sy 2 galaxies. Our measurements are compared with sophisticated calculation given by Storey & Zeippen (2000) and measurements given by Iye et al. (1987) and Leisy & Dennefeld (1996). We found that the ratio of the [OIII] line flux for Sy 2 is slightly smaller and in better agreement with theoretical than previous measurement from emission nebulae.

Poster paper

WATER IN ASTRONOMY AND PLASMA PHYSICS AND A PROJECT FOR RELATED RESEARCH

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The importance of water, the dissolvent without whom our kind of life would be impossible, is obvious and the research of all aspect of this compound is of great interest for many sciences. In astronomy, water is found in comets, Jovian satellites, on the Mars... The first molecule to be detected by radio astronomy methods, was the radical OH in 1963. Some OH sources in interstellar H II regions show strong H_2O emission as well. Their H_2O emission is variable, with intensity changes occuring in periods of months and days. In such regions temperature is around 10000 K and ion density around 5000 ions on m^3. Waters molecules are found and in OH-IR stars, which are probably dust enshrouded Myras having period 600 - 2000 days, and are not visible optically. Recently, water molecules have been detected in the mid-infrared (11-12 microns) spectrum of Arcturus, a K2IIIp giant star (Ryde, N., et al. 2003). Moreover, water at 22,235 MHz (1,35 cm) is one of the well known cosmic masers. Plasma obtained from H_2O is of interest and for investigations of underwater discharges, some aspects of electrolysis research, and for various treatments of water. In this contribution, our project for investigations of plasma-water interaction, plasma containing water molecules, or obtained in the presence of water molecules, of interest for astronomy, laboratory physics and technology, will be discussed.

Poster paper

TEMPORAL VARIABILITY OF THE GRB LIGHT CURVE

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The inner engines of Gamma Ray Bursts (GRBs) are well hidden from direct afterglow observations. However, the variability of GRB light curves at beginning of GRB event can bring us information about the nature of the inner engines. Here, we will present a numerical model which can synthesize light curves in the first phase of GRB in the high density environment. At the beginning we assume that an inner engine creates a lot of small mass shock waves which are spreading isotropically and after short period of time (a couple of seconds) disappearing in the surrounding media. This process causes creation of a massive shock wave which interacts with surrounding media and produces the GRB afterglow. The peaks in the light curve arise in the moment of mutual shocks interaction. We have modeled light curves from a given dynamics, by assuming synchrotron radiation mechanism

Poster paper

ON THE STARK BROADENING OF F III LINES IN WHITE DWARF ATMOSPHERES

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In order to provide the Stark broadening parameters for F III spectral lines, we made first of all a model of F III atom, with symplified energy level structure, facilitating and optimizing our further considerations. We applied full semiclassical perturbation method only to the astrophysically most important, resonance transition, since for other lines there is no enough complete set of atomic data for such calculations. Consequently, for additional ten multiplets, the modified semiempirical method has been applied, and only Stark widths have been calculated. On the basis of obtained results, the influence of Stark broadening mechanism on F III lines in DA white dwarfs has been investigated. The obtained results demonstrate that it is more important than in A-type star atmospheres, and that it should be taken into account for spectrum analysis and synthesis.

Poster paper

ON THE STARK BROADENING OF Cd I LINES

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For the determination of chemical composition and plasma diagnostic of stellar atmospheres, as well as for radiative transfer, plasma modelling and stellar spectra interpretation and synthesis, Stark broadening parameters are of interest, especially for A-type stars and some white dwarfs, or pre dwarfs like PG-1195 type ones. In order to provide the Stark broadening data for neutral cadmium spectral lines, we have calculated within the semiclassical perturbation theory, Stark broadening parameters (width and shift) for 19 Cd I multiplets in UV and V and for 24 multiplets in infra red spectral ranges, for temperatures between 2500 K and 50 000 K, particularly interesting for stellar plasma investigations. Our theoretical values have been compared with existing experimental, and other theoretical values.

Poster paper

ON THE EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF F II STARK BROADENING

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Stark widths (W) and shifts (d) of 5 singly ionized fluorine (F II) spectral lines within the $3s - 3p, 3s' - 3p'$ and $3d - 4f$ transitions have been measured in a linear, low-pressure, pulsed arc discharge created in SF_6 plasma at 30400 – 33600 K electron temperatures and at $(2.75 - 2.80) \times 10^{23}$ m^{-3} electron densities. The widths and shifts have also been calculated using the semiclassical perturbation formalism (SCPF) (taking into account the impurity of energy levels, i.e. that the atomic energy levels are expressed as a mix of different configurations due to the configuration interaction). Calculations have been performed for temperatures between 5 000 K and 100 000 K for the for electrons, protons and helium ions as perturbers. Our measured and theoretical Stark parameters are compared with existing experimental and theoretical data. Tolerable agreement was found among them.

Poster paper

CALIBRATION OF THE DIAMETER TULLY-FISHER RELATION AS TOOL FOR DISTANCE DETERMINATION TO SPIRAL EDGE-ON GALAXIES

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The luminosity - HI line width relation of (Tully and Fisher 1977), hereafter TFR, is a widely used tool in the observational cosmology. Today, with the advent of the CCDs, the application of the TFR becomes more efficient. In this work we present calibrated TFR for the diameters of well studied nearby galaxies in B-band (from Macri et al. 2000) and apply it on the sample of 120 edge-on galaxies Karachentsev et al. (1992). The calibration was made after reducing the linear diameters of the calibrators into edge-on view. Using the derived TFR, the distances to the galaxies from the target sample are calculated and compared with kinematic distances. The distance modulus error, of the derived calibration is about 0.45 mag, and the relative distance error is 21%.

Poster paper

KONKOLY WIDE-FIELD PLATE ARCHIVE

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The wide-field photographic observations in Konkoly Observatory have been performed since 1962 with the 60/90/180 cm Schmidt telescope in Piszkesteto Mountain Station. The archive of the telescope contains more than 13000 observations described in the Konkoly plate catalogue. After the preparation of an enlarged version of the catalogue it has been incorporated in the Wide-Field Plate Database installed in the Sofia Sky Archive Data Center with a possible on-line search at http://www.skyarchive.org/search/. Results from the analysis of the catalogue data characterising the observational activity at Konkoly in the period 1962 - 1996 are presented.

Poster paper

BAMBERG SOUTHERN PHOTOGRAPHIC PATROL SURVEY: INCORPORATION IN THE WFPDB

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The description, cataloging and incorporation into the Wide-Field Plate Database (WFPDB, http://www.skyarchive.org) of the Dr. Remeis-Observatory Bamberg Southern Photographic Patrol Survey (22 000 plates) is presented. The survey was taken with 22 cameras (each with $d = 10$ cm), Zeiss camera ($d = 7$ cm), and the Harvard telescopes - Metcalf (10") and Ross B (3"). The plates stored at present in the observatory stacks were obtained in the period 1963–1976 in Boyden Observatory (South Africa), Mount John University Observatory - Lake Tekapo (New Zealand) and San Miguel Observatory (Argentina). The observational programme supported by the Deutsche Forschungsgemeinschaft (DFG) was under the supervision of Prof. Dr. W. Strohmeier (1965) Director of the Bamberg Observatory that time. Digital CCD preview images of the plates by observational zones are, for first time, included into the WFPDB providing access to them for the worldwide astronomical community. A special attention is paid to the sub-survey in the LMC region. An opportunity for on site plate digitization with Epson Expression 1640XL flatbed scanner is offered in the observatory since May 2003.

Poster paper

ARCHIVING OF THE POTSDAM WIDE-FIELD PHOTOGRAPHIC OBSERVATIONS

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The inventory of the wide-field plate archives stored in the Astrophysical Institute Potsdam since 1879 is presented. The whole Potsdam plate collection consists of 11 wide-field plate archives obtained in the period 1879 - 1970 (see Catalogue of Wide-Field Plate Archives, version 5.0, January 2004, http://www.skyarchive.org) with 8583 plates and films stored not only in Potsdam but in Leiden and Sonneberg, too. The plates contain valuable astronomical information easily to be retrieved. The Potsdam wide-field plate collection reflects also the history and development of the Potsdam observatory.

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