

VII Bulgarian-Serbian Astronomical Conference

1- 4 June, 2010

Chepelare, Bulgaria

Conference Programme

Abstracts

Posters

List of Participants

Monday, May 31st

18:30 - 20:00 Registration and Welcome Cocktail at the Grand Hotel
CHEPELARE

Tuesday, June 1st

8:00 - 12:00 Registration

Morning Session

Chairman: Milcho Tsvetkov

9:00 – 9:30 Official Opening

9:30–10:00: Ognyan Kounchev, Milcho Tsvetkov, Dimo Dimov, Yavor Chapanov, Nikolay Kirov, Katya Tsvetkova, Damyan Kalaglarsky, Svetoslav Christov, Emil Kelevedjiev, Ana Borisova, Yuliana Goranova, Galin Borisov, Rumen Bogdanovski, Alexander Kolev, Orlin Stanchev, Alexander Marinov, Nadezhda Zlateva, Lasko Laskov, Georgi Marinov: ASTROINFORMATICS: SIGNAL PROCESSING AND ANALYSIS OF DIGITIZED ASTRONOMICAL DATA AND WEB-BASED IMPLEMENTATION, 2008-2010 (Invited talk)

10:00–10:30: Milan S. Dimitrijevic, Sylvie Sahal-Brechot: VIRTUAL ATOMIC AND MOLECULAR DATA CENTER (VAMDC) AND STARK-B DATABASE (Invited talk)

10:30-11:00: Emmanuel Bertin, THE ASTROMATIC SOFTWARE SUITE (Invited talk)

Coffee Break 11:00-11:20

Chairman: Milan Dimitrijevic

11:20–11:40: Milcho K. Tsvetkov, Nikolay K. Kirov, Katya P. Tsvetkova, Haralambi S. Markov, Ana P. Borisova, Damyan G. Kalaglarsky, Rumen G. Bogdanovski, Stoianka P. Peneva, Nikola I. Petrov, Svetoslav T. Christov, Assya Tzvetkova, Renate Budell: WIDE-FIELD PLATE DATABASE (WFPDB): DEVELOPMENT AND INTERNET ACCESS: 2008-2010 (Invited talk)

11:40-12:10: Luka C. Popovic: DATABASES AND EXTRAGALACTIC ASTROPHYSICAL SPECTROSCOPY (Invited talk)

12:10-12:30: Valeri Hambaryan: BAYESIAN PROBABILITY THEORY IN ASTRONOMY: TIMING ANALYSIS OF NEUTRON STARS (Invited talk)

Lunch Break 12:30 – 14:00

Afternoon Session

Chairman: Ognyan Kounchev

14:00–14:30 Darko Jevremovic, Milan S. Dimitrijevic, Luka C. Popovic, Miodrag Dacic, Vojislava Protic Benišek, Edi Bon, Nataša Gavrilovic, Jelena Kovacevic, Vladimir Benišek, Andjelka Kovacevic, Dragana Ilic, Sylvie Sahal-Bréchet, Katya Tsvetkova, Zoran Simic. Miodrag Malovic: SERBIAN VIRTUAL OBSERVATORY AND VIRTUAL ATOMIC AND MOLECULAR DATA CENTER (VAMDC) (Invited talk)

14:30–14:50 Dimo Dimov, Milcho Tsvetkov, Yuliana Goranova: CLASSICAL APPROACHES OF INFORMATICS TO ASTRONOMICAL IMAGES PROCESSING (Invited talk)

14:40-15:00 Jan Vondrák, Cyril Ron, Vojtech Štefka: NEW SOLUTION OF EARTH ORIENTATION PARAMETERS 1900-1992 FROM OPTICAL ASTROMETRY, AND ITS LINKING TO ICRF AND ITRF (Invited talk)

Coffee Break (15:00-15:30)

Chairman: Luka Popovic

15:30 – 16:00 Žarko Mijailovic, Nadežda Pejovic: NATIONAL SERBIAN DIGITIZATION PROJECT: ITS ACHIEVEMENTS AND ACTIVITIES (Invited talk)

16:00 – 16:30 Georgi Petrov, Momchil Dechev, Emanouil Atanasov: BULGARIAN GRID, BULGARIAN VIRTUAL OBSERVATORY AND SOME ASTRONOMICAL APPLICATIONS (Invited talk)

16:30 - 17:00 Dejan Urošević, PARTICLE ACCELERATION IN STRONG SHOCKS: INFLUENCE ON THE SUPERNOVA REMNANT EVOLUTION IN RADIO (Invited talk)

17:00 – 17:15 Yavor Chapanov, Jan Vondrák, Cyril Ron, Vojtech Štefka: PROPER MOTION ACCURACY OF WFPDB STARS

Coffee Break (17:15 – 17:30)

Poster Session 17:30 – 18:30 Moderator: Nikola Petrov

Dinner 19:30 Grand Hotel Chepelare

Wednesday, June 2nd

Morning Session

Chairman: Zarko Mijialovic

9:00–9:30 Valery Golev, Nadezhda Kaltcheva, Jens Knude: INTERACTION OF THE MASSIVE OB STARS WITH INTERSTELLAR MATTER IN THE MONOCEROS STAR-FORMING FIELD (Invited talk)

9:30–10:00 Nadežda Pejovic: TEACHING OF ASTRO-INFORMATICS AT THE UNIVERSITY OF BELGRADE (Invited talk)

10:00-10:30 Vasil Kolev: SINGULAR VALUE DECOMPOSITION ON ASTRONOMICAL IMAGES (Invited talk)

10:30-11:00 Dragana Ilic, Jelena Kovacevic, Luka Popovic: THE EMISSION LINE RATIOS: A TOOL FOR INVESTIGATING THE PHYSICS OF THE LINE EMITTING REGIONS IN AGN (Invited talk)

Coffee Break 11:00-11:20

Chairman: Dimo Dimov

11:20–11:40 Ognyan Kounchev, Damyan Kalaglarsky, Milcho Tsvetkov: APPLICATIONS OF WAVELET ANALYSIS AND COMPRESSIVE SENSING TO WIDE FIELD PLATES IN ASTRONOMY

11:40-12:00 Renate Budell, Milcho K. Tsvetkov: PHOTOMETRIC ACCURACY OF FLATBED SCANNERS COMPARED TO PDS MICRODENSITOMETERS

12:00-12:20 Haralambi Markov, Milcho Tsvetkov: WFPDB DEVELOPMENT: RESTORING CHARACTERISTIC CURVE FROM DIGITIZED IMAGES OF SCANNED PHOTOGRAPHIC PLATES

12:20-12:40 Jelena Kovacevic, Luka C. Popovic, Milan S. Dimitrijevic: THE Fe II EMISSION LINES IN AGN SPECTRA

Lunch Break 12:40 – 14:00

Afternoon Session

Chairman: Nadezda Pejovic

14:00–14:30 Andjelka Kovacevic, Luka C. Popovic: SEARCHING FOR PERIODICITIES IN AGN (Invited talk)

14:30–14:50 Nikola Petrov, Assia Tzvetkova, Milcho Tsvetkov: DIGITIZING OF ASTRONOMY PHOTO PLATES IN NATIONAL ASTRONOMICAL OBSERVATORY ROZHEN (Invited talk)

14:50–15:00 Tatjana Jakšic, Žarko Mijajlovic, Predrag Jovanovic: PARALLELIZATION AND CODE IMPLEMENTATION OF AN ALGORITHM FOR SOLVING OF AN ASTRONOMICAL PROBLEM

Coffee Break (15:00-15:20)

Chairman: Yavor Chapanov

15:20–15: 35 Vojislava Protic-Benišek, Vladimir Benišek: KINEMATICS AND DYNAMICS OF SOLAR SYSTEM BODIES: INVESTIGATIONS DURING 2001-2010

15:35–15: 50 Nikolai Kirov, Milcho Tsvetkov, Katya Tsvetkova: BRASHEAR PLATE CATALOGUES IN THE WFPDB

15:50– 16:10 Marko Stalevski, Jacopo Fritz, Maarten Baes, Theodoros Nakos, Luka C. Popovic: MODELING OF THREE-DIMENSIONAL CLUMPY TORI AROUND AGN

16:10– 16:25 Vasil Popov, Dinko Dimitrov: REMOTE GUIDANCE OF THE 60 CM TELESCOPE AT NAO ROZHEN

16:25–16:45 Yavor Chapanov, Katya Tsvetkova, Milcho Tsvetkov, Jan Vondrák, Cyril Ron, Vojtěch Štefka: WIDE-FIELD PLATES OBSERVATIONS OF STARS FROM EARTH ORIENTATION CATALOGS (EOC)

16:45–17:05 Yuliana Goranova¹, Yannick Mellier, Catherine Grenet, Patrick Hudelot, Frédéric Magnard, Henry Joy Mccracken, Mathias Monnerville, Mathias Schultheis, Gregory Sémah, IMAGE PROCESSING AT TERA-SCALES (Invited talk)

Coffee Break (17:05-17:25)

Poster Session 17:25 – 18:45 Moderator: Andjelka Kovacevic

CONFERENCE DINNER: Grand Hotel CHEPELARE 20:00

Thursday, June 3rd

Social programme: Visit of the National Astronomical Observatory "Rozhen", Smolyan, Smolyan Historical Museum, Planetarium of Smolian, Pamporovo resort, etc.

DINNER 20:00 Grand Hotel CHEPELARE

Friday, June 4th

Morning Session

Chairman: Georgi Petrov

09:00-09:20 Saša Simic, Luka C. Popovic: GAMMA RAY BURSTS AND ACTUAL DATABASES
(Invited talk)

09:20-09:35 Rumen G. Bogdanovski: CONCEPTS OF CLOUD COMPUTING

09:35-90:55 Zoran Simic, Milan S. Dimitrijevic: STARK-B DATABASE VIRTUAL ATOMIC AND MOLECULAR DATA CENTER (VAMDC) AND DATA FOR WHITE DWARF ATMOSPHERES ANALYSIS (Invited talk)

09:55-10:15 Ana Borisova, Lasko Laskov, Valeri Hambaryan, BAYESIAN PROBABILITY THEORY IN ASTRONOMY: LOOKING FOR STELLAR ACTIVITY CYCLES IN PHOTOMETRIC DATA-SERIES (Invited talk)

10:15-10:40 Sergei V. Vereshchagin, Natalia V. Chupina, Valery P. Osipenko, Olga B. Dluzhnevskaya, Milcho K. Tsvetkov: THE ZVENIGOROD ASTRONOMICAL PLATE COLLECTION: PRESENT IN THE WIDE-FIELD PLATE DATABASE

10:-40 10:55 Momchil Dechev, Georgi Petrov, Emanuil Atanassov: GRID COMPUTING: INFRASTRUCTURE, DEVELOPMENT AND USAGE IN BULGARIA (Invited talk)

Coffee Break 10:55-11:20

Chairman: Darko Jevremovic

11:20-11:35 Katya Tsvetkova, ASTROINFORMATICS FOR THE FLARE STARS IN STELLAR CLUSTERS AND ASSOCIATIONS

11:35-11:50 Svetoslav Christov, ICT INFRASTRUCTURE OF THE ASTROINFORMATICS PROJECT

11:50 -12:05 Emil Kelevedjiev, STAR IDENTIFICATION APPROACH THROUGH LINEAR PROGRAMMING

12:05-12:20 Petar Goulev, Milcho Tsvetkov, Renate Budell: COMPARISON OF DIGITALIZATION TECHNIQUES OF THE PHOTOGRAPHIC SPECTRAL OBSERVATIONS

12:20-12:35 Vladimir Benišek: FIRST PHOTOMETRIC OBSERVATIONS OF THE EXTRASOLAR PLANETS AT THE BELGRADE ASTRONOMICAL OBSERVATORY

Lunch 12:30

ABSTRACTS:

ASTROINFORMATICS: SIGNAL PROCESSING AND ANALYSIS OF DIGITIZED ASTRONOMICAL DATA AND WEB-BASED IMPLEMENTATION, 2008-2010

OGNYAN KOUNCHEV¹, MILCHO TSVETKOV², DIMO DIMOV³, YAVOR CHAPANOV⁴, NIKOLAY KIROV^{1,8}, KATYA TSVETKOVA², DAMYAN KALAGLARSKI⁵, SVETOSLAV CHRISTOV⁵, EMIL KELEVEDJIEV¹, ANA BORISOVA², YULIANA GORANOVA^{1,2,9}, GALIN BORISOV², RUMEN BOGDANOVSKI¹, ALEXANDER KOLEV⁶, ORLIN STANCHEV⁷, ALEXANDER MARINOV³, NADEZHDA ZLATEVA³, LASKO LASKOV^{3,8}, GEORGI MARINOV⁴

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The newly born area of Astrominformatics has emerged as an interdisciplinary area from Astronomy and modern information and communication technologies (ICT), based on the modern Internet developments. Recently, four institutes of the Bulgarian Academy of Sciences have launched a joint project called “Astrominformatics” aimed at the development of the necessary methods and techniques.

Astrominformatics has arisen from the need of ICT methods for preservation and employment of the scientific, cultural and historic heritage of astronomical observations. A main cornerstone of the Astrominformatics project is the Wide-Field Plate Data Base which is an ICT project of the Institute of Astronomy. It has been launched in 1991, by the Working Group “Wide-Field Sky Surveys” of the International Astronomical Union (IAU) and is unique by its nature at the international level. So far 150,000 plates have been already digitized through several European research programs. As a result, image-data is collected with about 2TB size and it tends to rise up to 1PB. The access, manipulation and science data-mining of such a huge amount of information is a serious challenge for the ICT community and the efforts in this direction are funded by European scientific programs as COST Action 283, FP6 & FP7 of the European Virtual Observatory, the Alexander von Humboldt Foundation of Germany, and recently, by the Bulgarian National Science Foundation (Ministry of Education and Science of Bulgaria).

The aim of the present talk is to give an account of the achievements during the first stage of the Astrominformatics project, www.astrominformatics.eu, DO-02-275 with Bulgarian National Science Foundation.

VIRTUAL ATOMIC AND MOLECULAR DATA CENTER (VAMDC) AND STARK-B DATABASE

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Virtual Atomic and Molecular Data Center (VAMDC) is an European FP7 project with aims to build a flexible and interoperable e-science environment based interface to the existing Atomic and Molecular data. The VAMDC will be built upon the expertise of existing Atomic and Molecular databases, data producers and service providers with the specific aim of creating an infrastructure that is easily tuned to the requirements of a wide variety of users in academic, governmental, industrial or public communities. In VAMDC will enter also STARK-B database, containing Stark broadening parameters for a large number of lines, obtained by the semiclassical perturbation method during more than 30 years of collaboration of authors of this work and their coworkers. In this contribution we will review the VAMDC project, STARK-B database and discuss the benefits of both for the corresponding data users.

THE ASTROMATIC SOFTWARE SUITE (Invited talk)

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The purpose of the AstrOmatic project is to provide the global astronomy community with open-source software, for processing large quantities of imaging data in a consistent and fully automated way. AstrOmatic software packages have been developed through the years in the framework of various imaging surveys and data processing pipelines (e.g. TERAPIX, DESDM). After a hands-on overview of the different tasks that can be performed by AstrOmatic software, I will focus on the ongoing development efforts in the field of automated source morphometry.

**WIDE-FIELD PLATE DATABASE (WFPDB): DEVELOPMENT AND INTERNET ACCESS:
2008-2010 (Invited talk)**

MILCHO K. TSVETKOV¹, NIKOLAY K. KIROV^{2,3}, KATYA P. TSVETKOVA^{1,2},
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This work presents the last development of the project “**Wide-field plate database: development and internet access**” supported at present by the Bulgarian National Science Fund (BNSF) with grant DO-02-273 for the period 2008-2010.

This database developed in Sofia Sky Archive DataCenter of Institute of Astronomy, Bulgarian Academy of Sciences, contains descriptive information for more than 2200000 total numbers of astronomical photographic observations from the archives of 125 professional observatories operated in the period 1872-2005 all over the world. De facto the database is an instrument for searching the long term brightness variations of existing (registered) sky objects mainly to the 14(B) magnitude. The WFPDB (www.skyarchive.org) has a mirror in the AIP, Potsdam (<http://vodata.aip.de/WFPDBsearch/>) and its first version works under VizieR. <http://webviz.u-strasbg.fr/viz-bin/VizieR?-source=VI/90> and recently in the Institute of Mathematics and Informatics, of the Bulgarian Academy of Sciences (<http://trillian.magrathea.bg:8080/search/>) Currently the WFPDB provides access to the information for more than 30% of the estimated archives total number. The WFPDB team continues to enlarge the database with submitted or retrieved information from the photographic plates which enable the astronomical community to complement their investigations going more than 130 years back in time.

In the frame of this project where enlarged the scanning facilities in Sofia Sky Archive Data Center and Rozhen National Astronomical Observatory were equipped with new technique for plate digitization and was developed the local network of the SSADC.

DATABASES AND EXTRAGALACTIC ASTROPHYSICAL SPECTROSCOPY (Invited talk)

LUKA Č. POPOVIĆ

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Spectroscopy is a powerful tool for investigation of extragalactic objects. Especially in investigations of the central part of Active Galactic Nuclei (AGNs) which represent one of the most powerful sources in the Universe. In this talk, I will present some recent investigations of spectral properties of AGNs by using the data from Sloan Digital Sky Survey. Also, an overview of useful databases for extragalactic spectroscopical investigation will be given.

BAYESIAN PROBABILITY THEORY IN ASTRONOMY: TIMING ANALYSIS OF NEUTRON STARS (Invited talk)

VALERI HAMBARYAN¹

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We will present a Bayesian statistical approach to the data sets collected by XMM-Newton and Chandra X-ray observatories of neutron stars. It will include methodical aspects of short and long term variations with periodic and variable signal detection and parameter estimation. A comparison of Bayesian and classical approaches will be discussed.

SERBIAN VIRTUAL OBSERVATORY AND VIRTUAL ATOMIC AND MOLECULAR DATA CENTER (VAMDC)

DARKO JEVREMOVIĆ¹, MILAN S. DIMITRIJEVIĆ¹, LUKA Č. POPOVIĆ¹, MIODRAG DAČIĆ¹, VOJISLAVA PROTIĆ BENIŠEK¹, EDI BON¹, NATAŠA GAVRILOVIĆ¹, JELENA KOVAČEVIĆ¹, VLADIMIR BENIŠEK¹, ANDJELKA KOVAČEVIĆ², DRAGANA ILIĆ², SYLVIE SAHAL-BRÉCHOT³, KATYA TSVETKOVA⁴, ZORAN SIMIĆ¹. MIODRAG MALOVIĆ⁵

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In this lecture we review recent developments in Serbian Virtual Observatory (SerVO) as well as its relation with the european FP7 project: Virtual Atomic and Molecular Data Center. Main components of SerVO are going to be the archive of photographic plates, database of Stark broadening parameters and stellar evolution database. Photographic plates were obtained at Belgrade Observatory from 1936 to 1996. Data for Stark broadening were obtained using semiclassical perturbation and modified semiempirical theories. The STARK'B database will enter also in VAMDC. SerVO will contain also Stellar evolution database, a mirror of Dartmouth evolution database with improvement and VO compatible outputs.

CLASSICAL APPROACHES OF INFORMATICS TO ASTRONOMICAL IMAGES PROCESSING

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Major interests of the Bulgarian Astrominformatics project (Kounchev, Tsvetkov, Dimov et al. 2009) are directed towards images obtained by scanning of astronomical wide photo plates and especially towards the ones produced up to about the middle of last century or earlier. Naturally, the waste majority of these plates are related to astronomical methods, approaches and tools that are no more in use, for instance – the star chain plates for flare objects recovering (Aniol et al. 1990), the plates artificially enriched by an auxiliary measuring grid, etc. Nevertheless, the astronomers are currently well interested in these images just because of their information is unique and dated to the past. Most of the archive

astronomical images are covered by a high (and irregular) level of noise caused by atmospheric disturbances over the used telescopes of ground installation. The diffraction distortions that are intrinsic for the optical telescopes often cause so called halo effects around brighter object in the images (Starck, Murtagh 2002). The telescope identification data (cf. its distortions' model) as well as the time and position of the sky quadrant of observation are usually written on the plate itself, which means that it is possible these data to be partially and/or irreparably lost. Thus, the canonical task for registration of a given plate image towards a (contemporarily) stellar catalog (Bertin, Arnouts 1996), is naturally modified into a nonstandard task of the „lost in space” type (Kolomenkin et al. 2004).

The current presentation is going to analyze classical methods, approaches and techniques that can be successfully applied in the computer processing of the above mentioned astro-images, namely: approaches for adaptive binarization (or segmentation by intensity) of stellar objects, projection techniques to localize stellar chains and/or to isolate the auxiliary measuring grid in some plate images, as well as correlation methods to solve registration tasks of the lost-in-space type.

NEW SOLUTION OF EARTH ORIENTATION PARAMETERS 1900-1992 FROM OPTICAL ASTROMETRY, AND ITS LINKING TO ICRF AND ITRF

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Optical astrometry observations were, for most of the 20th century, the only ones used to derive the Earth Orientation Parameters (EOP). In preceding 20 years or so, we collected and re-analyzed these data from 33 observatories using a unique celestial reference frame. It was realized first by the Hipparcos Catalogue, and then by a group of our own Earth Orientation Catalogs (EOC). The latter were obtained by combining Hipparcos/Tycho data with older ground-based observations, to improve the proper motions. In many cases, we were also able to detect and derive periodic changes due to orbital motions of double or multiple star systems. EOC catalogs, being tied to Hipparcos Catalogue, are given in International Celestial Reference Frame (ICRF). On the other hand, the underlying terrestrial reference frame is arbitrarily realized by adopted geographic coordinates (latitudes, longitudes) of participating stations. We also tied the terrestrial system to the plate motion model NUVEL-1A by correcting the observations for the linear motions of the stations computed for that model. Small additional coordinate biases and drifts of individual stations with respect to individual plates are estimated in the solution. We also suppose that each station can exhibit apparent annual and semi-annual changes of geographic coordinates due to anomalous refraction. To remove the singularity of the solution, we apply 18 additional constraints, tying the biases, drifts and seasonal changes of individual stations. As a consequence, the terrestrial reference frame of the optical solution can deviate from ITRF by a constant, linear drift and seasonal (annual, semi-annual) changes, in all three axes. To estimate these deviations, we compare our most recent EOP series, referred to catalog EOC-4, with the one provided by space techniques in the common interval of observations. The deviations found are then applied to our EOP solution to link it more precisely to ITRF.

NATIONAL SERBIAN DIGITIZATION PROJECT: ITS ACHIEVEMENTS AND ACTIVITIES (Invited talk)

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The aim of this paper is to present the efforts in the area of digitization and digital preservation of scientific and cultural heritage of a group of Serbian scientists from the Faculty of Mathematics of the University of Belgrade and the Mathematical Institute of the Serbian Academy of Science and Art. Our starting point was that **digitized scientific works** is one of the most helpful resource and tool for scientific works and fast exchange of scientific information. Also, we understand that every scientific work becomes after some time the part of history and the part of cultural heritage as well. So, our activities are oriented in building of electronic repositories of digitized books, journals and other scientific works. There are two such subprojects:

Virtual Library, <http://elib.matf.bg.ac.rs:8080/virlib>, which includes several hundreds of old and rare books in mathematical sciences written by Serbian authors and most of doctoral dissertations in mathematics, astronomy and mechanics written at the Belgrade University. This is the largest Serbian digital library. It has in its repository about 800 books and about 350 doctoral dissertations in mathematical sciences. Access to the Virtual library is open to the general public. The second one, **E-Library of Serbian mathematical journals**, <http://elib.mi.sanu.ac.rs>, contains, for example, the complete digitized collection (since 1932 when the journal was founded) of the leading and oldest Serbian mathematical journal *Publications de l'Institut Mathématique*. Now it includes nine Serbian mathematical and astronomical journals containing 280 volumes and 3700 articles. Access to the both libraries is open via Internet to the general public.

These subprojects are oriented towards **Digital mathematical library**, a World project on which works many World institutions. The final aim of this project is the fulfillment of a **mathematical dream of a digital archive** containing all peer reviewed mathematical literature ever published, properly linked and validated and verified.

BULGARIAN GRID, BULGARIAN VIRTUAL OBSERVATORY AND SOME ASTRONOMICAL APPLICATIONS (Invited talk)

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The development of the Bulgarian GRID, new possibilities for Bulgarian Virtual Observatory and some basic astronomical GRID applications will be reviewed. Amongst the latter are N_body simulations, looking for dark matter and neutrino, network telescopes architecture, stellar and galaxy evolution, active processes on the Sun, near earth object discovery etc. Special attention of the astronomical GRID and VO software will be paid. Step-by-step tutorials for main astrophysical VO applications and software will be pointed. Some realised GRID projects and astronomy in EGEE will be examined. Women in mathematic and science - GEMS initiative will be outlined. The possibilities to use Mathematica and Matlab software packages with GRID applications will be mentioned. What the GridGude is and how Bulgaria represent itself in GridGuide?

PARTICLE ACCELERATION IN STRONG SHOCKS: INFLUENCE ON THE SUPERNOVA REMNANT EVOLUTION IN RADIO

DEJAN UROŠEVIĆ

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In this lecture I present fundamentals of particle acceleration in strong shocks associated with supernova remnants (SNRs). The modernized version of Fermi 1 acceleration process, so-called diffuse shock acceleration (DSA) mechanism is explained briefly. Two versions of DSA, in microscopic (Bell 1978a) and macroscopic (Blandford and Ostriker 1978) description are presented. After that, I briefly summarize acceleration process in modified shocks by the cosmic ray pressure.

The different models of particle acceleration can be included in theoretical investigation on SNR evolution. The adiabatic decompression of cosmic ray defined by Shklovsky (1960) leads to very rapid evolution of the SNR radio flux density. By using of DSA mechanisms in non-modified (Bell 1978b, Duric and Seaquist 1986) and modified (Berezhko and Völk 2004) forms the flux density evolution appears to be slower, if energy conserving phase of SNR evolution is adopted.

The so-called non-linear kinetic theory of the particle acceleration (Berezhko and Völk 2004) and linear theory of Bell (1978a,b) are discussed in order of their influence on the SNR radio evolution. As a conclusion, I can say that different initial conditions used in these papers lead to different solutions. The both theories are valid and useful for description of the SNR evolution in radio. In the future, the initial conditions should be defined with caution if we wish to properly describe the SNR evolution.

PROPER MOTION ACCURACY OF WFPDB STARS

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The accuracy of latitude and Universal time determination from the optical astrometry observations, obtained during the last century in programs of monitoring Earth orientation, strongly depends on the quality of the Earth Orientation Catalogs (EOCs), where the proper motion is a critical parameter. The possibility of improving the proper motions by WFPDB (Wide-Field Plate Database) is investigated by means of simulated observations. The model includes real observations from the optical astrometry and simulated observations at epochs taken from the WFPDB, corresponding to existing plates containing the EOC stars. The simulated star coordinate deviations are generated as a sum of given proper motion and random noise, corresponding to the expected standard deviation of WFPDB data. Two cases are considered. In the first case the proper motion for the simulated observations is equivalent to the real observations, while in the second case the proper motion differs by 10%. The results from the first simulation show the impact of WFPDB data on the accuracy estimation and from the second simulation - the impact of WFPDB data on the coordinates and proper motion estimation.

INTERACTION OF THE MASSIVE OB STARS WITH INTERSTELLAR MATTER IN THE MONOCEROS STAR-FORMING FIELD

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Surveys of the interstellar medium at various wavelengths obtained via SkyView, the 2MASS catalog, and uvbybeta and UBV photometric data were used in order to investigate the interaction between the interstellar matter and massive OB stars in the field of Northern Monoceros. The region is arguably the most complex star-forming region in the Perseus section of the Milky Way. The area harbors a huge collection of OB stars, both found in compact clusters or loose unbound groups, and also some of the most spectacular features of interstellar matter known to date. The field provides an excellent opportunity to investigate the connection between the young stellar population and its associated interstellar material. Our study establishes reliable homogeneous distances to the massive OB stars toward the Monoceros Loop and Rosette Nebula and spatially correlates the stars to the features of interstellar matter. The environment of the OB stars is then studied via various multi-wavelength surveys of the interstellar medium with aim to provide more insights on the star-formation history of the region.

TEACHING OF ASTRO-INFORMATICS AT THE UNIVERSITY OF BELGRADE

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Bologna Declaration is the basic document which had determined in the last decade the reorganization of the higher and university education in the Western Europe. In the year 2006, the Bologna Declaration was adopted at the Belgrade University and particularly at the Faculty of mathematics where astronomy is taught. This gave us the opportunity to reorganize the studies of astronomy and to introduce new courses and new policy in the teaching of astronomy. One of our achievements was the introduction of obligatory general course of astronomy in alternation with theoretical mechanics for all students of mathematics and informatics. In the second wave of changes that happened in 2008 and 2009 we introduced new study group, astro-informatics. In the autumn of 2009 the first students of astro-

informatics entered the studies of astro-informatics. In general, there are three levels of studies degrees: bachelor degree (lasting four years), master degree (with one year of additional studies) and PhD studies lasting three years. In this paper we describe the organization of studies of astro-informatics at the Faculty of mathematics.

SINGULAR VALUE DECOMPOSITION ON ASTRONOMICAL IMAGES

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The singular value decomposition (SVD) (Basso 2009), and (Strang 1998) has very useful applications. It can be used in approximations, search engines, and image compression. In this paper we will show how it is applied to the decompositions on astronomical images. SVD is related to the well known eigenvalue decomposition. An image can be represented as an m by n matrix, where m , the number of rows, is the pixel height of the image, and n , the number of columns, is the pixel width of the image. Every subsequent value inside the matrix tells the computer how bright to display the corresponding pixel. This is most easily understood in grayscale images, where every value within the matrix runs from 0 (black) to 255 (white). The matrix can be decomposition by SVD method. It takes a matrix A , square or non-square, and divides it into two orthogonal matrices U , V , and a diagonal matrix Σ .

$$A = U * \Sigma * V$$

This allows us to rewrite our original matrix as a sum of much simpler rank one matrices:

$$A = \sum_{i=0}^n \sigma_i u_i v_i^T$$

Eigenvalues are connected with squares of singular values σ_i as well $\sigma_1 \geq \sigma_2 \geq \dots \geq \sigma_n$. Therefore the first terms of singular values (eigenvalues) will have the largest impact on the total sum, followed by the second term, then the third term, etc. With this matrix presentation we can approximate the matrix A by adding only the first few terms of the series. By truncating presentation on image (matrix) A , only the first two columns of U and V and their respective singular values, the square image can be replicated exactly while taking some presents of the original storage space (Basso 2009). We can further approximate the matrix by leaving off more singular terms of the matrix A . Since the singular values are arranged in decreasing order, the last terms will have the least affect on the overall image. This is meaning that we can be good approximation images.

We can see interesting effect on astronomical images, where SVD allows for a nice compression, and easy image feature detection. We also present experimental evidence which add in our analysis.

THE EMISSION LINE RATIOS: A TOOL FOR INVESTIGATING THE PHYSICS OF THE LINE EMITTING REGIONS IN AGN (Invited talk)

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We discuss what we can learn about the physics of the emission line regions in active galactic nuclei (AGN), using the observed emission line ratios. We focus on some specific problems, such as diagnostics of thermodynamical conditions in the broad line region (BLR) or the origin of the optical Fe II emission. We use different line fluxes in order to probe the BLR physics, such as the hydrogen Balmer lines (H α to H ϵ), the helium lines from two subsequent ionization levels (He II λ 4686 and He I λ 5876) and the strongest Fe II lines in the wavelength interval $\lambda\lambda$ 4400-5400 Å. The emission line fluxes were obtained for the samples of galaxies from the Sloan Digital Sky Survey (SDSS) database, but also simulated using the photoionization code CLOUDY. We presented here a tool to estimate the hydrogen density and average temperature in the BLR using the observed Balmer and helium line ratios. Moreover, we present an investigation of the optical Fe II emission in AGN. We found that the origin of the Fe II lines is probably in an intermediate line region (ILR), i.e. that the Fe II emission is mostly emitted from a region located between the NLR and BLR.

APPLICATIONS OF WAVELET ANALYSIS AND COMPRESSIVE SENSING TO WIDE FIELD PLATES IN ASTRONOMY

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Recently some new multivariate wavelets have been developed for the compression and representation of Images. These wavelets are a multivariate generalization of the original compactly supported wavelets of I. Daubechies which are based on a subdivision process. We show how one may apply these new wavelets for a new Compressive Sensing algorithm for efficient compression and representation of large images in Astronomy, in particular WFPDB (www.skyarchive.org) images.

PHOTOMETRIC ACCURACY OF FLATBED SCANNERS COMPARED TO PDS MICRODENSITOMETERS

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This work shows the influence of several parameters on the photometric response of flatbed scanners. The results will be compared with the photometric accuracy of PDS-Microdensitometers.

PDS-Mikrodensitometers, such as the PDS1010 of the Sofia Sky Archive Data Center (SSADC), usually scan both, in density mode and in transmission mode. The electronic of the sensor (a photomultiplier) is adjusted to full-fill the definitions of density and transmission (Altman 1977). The PDS 1010 of the SSADC was updated with a fast logarithmic amplifier/converter (Budell 1998). The response of this amplifier/converter is without any speed depending distortions neither in density nor transmission. With such data, it is easy to calibrate a photo plate and to calculate the intensities of astronomical objects.

The primary object of flatbed scanners is to produce *nice pictures* for instance for advertising or exhibitions. In this case the photometric response is good, when a picture looks *nice* on the screen. For this aim, the routines for scanning need not to keep any definition of transmission or density. The electronics of flatbed scanners are working in a mode, which is nearly like transmission. But the programs are often using photometric transformations. The response function is going to be undefined. With such an output it could be difficult or impossible to calibrate a photo plate and to calculate the intensities of astronomical objects.

There is one program (vuescan) available, which can be used in a mode without any transformation of the photometric response. It is able to save the data from the sensor with out any processing. The output can be simply transformed to transmission or density. In this work some tests will be shown, which are made with vuescan. We appreciate the Grants DO-02-273 and DO-02-275 of the Bulgarian National Science Fund (BGNSF).

WFPDB DEVELOPMENT: RESTORING CHARACTERISTIC CURVE FROM DIGITIZED IMAGES OF SCANNED PHOTOGRAPHIC PLATES

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In the process of the development of the Wide-Field Plate Database (WFPDB) we present our results in transforming the transparency units of the scanned photographic plates into relative intensities restoring the emulsion characteristic curve. This process is highly

relevant to the quality of the photometric results expected from such observations taken with the telescopes of the Bulgarian National astronomical observatory Rozhen. Based on IRAF routines only, we present an algorithm making use of transparency profiles of stars with known magnitudes. The support of the Bulgarian National Science Fund grant DO-02-273 is appreciated.

THE Fe II EMISSION LINES IN AGN SPECTRA

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We present a study of the optical Fe II emission in 302 AGNs selected from the SDSS. The strongest Fe II multiplets are grouped into three groups according to the lower term of the transition which correspond approximately to the blue, central, and red part of the "iron shelf" around H β . We construct the Fe II template based on those three multiplet groups and one additional group of lines obtained from I Zw 1 object. This Fe II template enables more precise fit of the Fe II lines than usually used templates. We notice that the blue, red, and central parts of the iron shelf have different relative intensities in different objects. Their ratios depend on continuum luminosity, FWHM H β , the velocity shift of Fe II, and the H α /H β flux ratio. We analyse the correlations between Fe II line properties and other spectral parameters, and we find different correlations for subsamples with FWHM H β greater and less than 3000 km/s.

SEARCHING FOR PERIODICITIES IN AGN

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Active Galactic Nuclei (AGNs) often show high variability in the spectral lines and continuum. This variability may be periodical, that may indicate a binary black hole in the center of some AGNs. Here we analyze some methods for periodicity searching in the optical AGN spectra. We apply the methods to the long term observations in the case of several

AGNs. We found that in some AGNs (as e.g. 3C390.3) there is a chance that a quasi-periodical variability is present.

DIGITIZING OF ASTRONOMY PHOTO PLATES IN NATIONAL ASTRONOMICAL OBSERVATORY ROZHEN

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The structure and capabilities of computer network in the National Astronomical Observatory Rozhen were carried out. Described is a method and hardware to scan the astronomical observational material on photo plates obtained by telescopes at the Institute of Astronomy, Bulgarian Academy of Sciences. Observations cover the period 1979-1998. Digital representation of the observations is part of the Virtual Astronomical Database. The work is done in the frame of the BNSF grant DO-02-273.

PARALLELIZATION AND CODE IMPLEMENTATION OF AN ALGORITHM FOR SOLVING OF AN ASTRONOMICAL PROBLEM

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Based on the work of [Schneider and Weiss] Ukrainian astronomer V. N. Shalyapin developed software for calculating and generating maps of gravitational micro-lenses. A modification of this software package was used in recent years by a group of Belgrade astronomers. Both versions of the software are developed for execution on one processor. In this paper we present a parallel version of the involved algorithm and its code implementation in FORTAN 77. We achieved the significant speed-up of computation, 10 to 40 times, depending on the number of employed processors, maps resolution and the number of initiated concurrent threads. The main parallelization is done by decomposing loops in computing of elements of matrices that represents gravitational micro-lenses. All computations are realized on the cluster, the parallel computer with 64 nodes of the Mathematical Institute of the Serbian Academy of Science and Art.

KINEMATICS AND DYNAMICS OF SOLAR SYSTEM BODIES: INVESTIGATIONS DURING 2001-2010

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In this paper the authors present results of their specialist and scientific work in the field of kinematics and dynamics of Solar System bodies over the recent ten years. These results have been published continuously in the specialized journals, as well as in the publications of International and national Meetings.

BRASHEAR PLATE CATALOGUES IN THE WFPDB

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We present the work of reduction and inclusion of the Brashear Plate Catalogues in the Wide-Field Plate Database (WFPDB). About 5000 plates were obtained with the Brashear astrograph of the Tokyo Astronomical Observatory located in Mitaka in the period 1943 - 1962. The astrograph was equipped with two cameras: 16 cm Zeiss Tessar and 20 cm Petzval Triplet. The observing programme included mostly asteroids and comets. We divided the Brashear plates in two catalogues accordingly the both used cameras, to which were assigned the following WFPDB identifiers respectively TOK016 and TOK020. Analysis of the catalogues using the available data is present. Comparison of the original catalogues with the files obtained from the scanned in table form catalogues and following image processing is present too.

MODELING OF THREE-DIMENSIONAL CLUMPY TORI AROUND AGN

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According to the unification model of active galactic nuclei (AGN), central engine, an accreting super-massive black hole, is surrounded by a geometrically and optically thick torus of dust. When viewed face-on, the source would look like a type 1 active galaxy, and when viewed edge-on, it would have the characteristics of a type 2 active galaxy. The dust in the surrounding torus reprocesses the optical-UV radiation from the central source into infrared. Since dust in such a hot environment would not survive long, it is suggested that the torus consist of a large number of optically thick clumps orbiting around the central engine. In order to investigate the nature of dusty tori, we employ SKIRT, 3D radiative transfer code based on the Monte Carlo technique. We model 3D clumpy tori with low- and high-density phases, as well as tori with smooth dust distribution.

REMOTE GUIDANCE OF THE 60 CM TELESCOPE AT NAO ROZHEN

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WIDE-FIELD PLATES OBSERVATIONS OF STARS FROM EARTH ORIENTATION CATALOGS (EOC)

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The Earth Orientation Catalogues (EOCs) are primarily meant to provide stable celestial reference frame in optical wavelengths for deriving Earth Orientation Parameters (EOP) from astrometric observations. The EOCs combine catalogues ARIHIP and TYCHO-2 with the rich observation material (variations of Latitude/Universal Time), obtained during the 20th century

in programs of monitoring Earth orientation. Other possible source of information for improving the EOCs is the WFPDB (Wide-Field Plate Database). The number of plates, containing EOCs stars and their distribution in time are determined by means of the search engine of the WFPDB.

IMAGE PROCESSING AT TERA-SCALES (Invited talk)

YULIANA GORANOVA¹, YANNICK MELLIER, CATHERINE GRENET, PATRICK HUDELOT, FRÉDÉRIC MAGNARD, HENRY JOY MCCRACKEN, MATHIAS MONNERVILLE, MATHIAS SCHULTHEIS, GREGORY SÉMAH

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Past decade has witnessed rapid development of the modern astronomical image detectors both in the optical and near-infrared. The new mosaic cameras, however, produce very large volumes of data, thus becoming more and more demanding in terms of data transfer and storage, image processing and visualisation, archiving of the results, etc. Inevitably, the task of handling such large data volumes gets shifted from the individual observers and research teams to image processing specialised data centres such as the TERAPIX.

Here we present a brief overview of our data reduction procedures utilising the latest versions of the TERAPIX web-based quality assessment (QualityFITS) and pipeline processing (Youpi) tools. The later has been successfully used for the recent CFHTLS T0006 data release for the first time. CFHTLS T0006 comprises of 6043 (Wide) and 8876 (Deep) individual input images of 0.7 GB of size each, which together with only the final products (images, stacks, weight maps and binary tables) amount to more than 50 TB in total.

GAMMA RAY BURSTS AND ACTUAL DATABASES

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Nature of Gamma Ray Bursts (hereafter GRBs), are very demanding for observational and recording purpose. That is why we need refined observational equipment for recording of data, as well as intelligent system for early warning and initialization of interplanetary

observational network. Such collected data are placed in to the sophisticated databases to be accessible for detailed analyze among the scientist. In this paper we have examined the actual databases for Gamma Ray Bursts events, their organization and accessibility. Also, we reviewed the actual process of acquiring the data from satellites and observational network.

CONCEPTS OF CLOUD COMPUTING

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The Cloud Computing is a new trend in the network based computing. Its overview and basic concepts are presented here. The different layers and services of cloud computing are explained together with a discussion of their benefits and limitations.

STARK-B DATABASE VIRTUAL ATOMIC AND MOLECULAR DATA CENTER (VAMDC) AND DATA FOR WHITE DWARF ATMOSPHERES ANALYSIS (Invited talk)

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In a number of papers we have demonstrated the importance of Stark broadening mechanism for the modeling and synthesizing of lines observed in spectra of white dwarf atmospheres. We also determined a number of Stark broadening parameters of interest for DA, DB and DO white dwarf plasmas investigations. Now, work on their inclusion in STARK-B database and in Virtual Atomic and Molecular Data Center, an FP7 european project, as well as in Serbian Virtual Observatory is in progress. We review here the part of this work of interest for white dwarf atmospheres analysis.

BAYESIAN PROBABILITY THEORY IN ASTRONOMY: LOOKING FOR STELLAR ACTIVITY CYCLES IN PHOTOMETRIC DATA-SERIES

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The application of the Bayesian probability theory in a various astronomical research works over the past decade is discussed at the presented talk. The basic idea of the Bayesian approach to astronomical data is presented with a special attention for its plausibility to the subject of Astroinformatics. Particularly the Gregory-Loredo method for signal detecting in time-series with Gaussian errors is tested.

THE ZVENIGOROD ASTRONOMICAL PLATE COLLECTION: PRESENT IN THE WIDE-FIELD PLATE DATABASE

SERGEI V. VERESHCHAGIN, NATALIA V. CHUPINA, VALERY P. OSIPENKO, OLGA B. DLUZHNEVSKAYA, MILCHO K. TSVETKOV

GRID COMPUTING: INFRASTRUCTURE, DEVELOPMENT AND USAGE IN BULGARIA

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What's GRID? What is the structure and how to access to GRID resources? Here we try to answer to these questions. We also discuss the development of GRID infrastructure in Bulgaria and the main steps to become a GRID user. A simple example of submitting a job to the GRID is shown.

ASTROINFORMATICS FOR THE FLARE STARS IN STELLAR CLUSTERS AND ASSOCIATIONS

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Very briefly Astrominformatics can be described as data-oriented astronomy including data organization and data description, information retrieval and data mining methods, information visualization and knowledge extraction. Applying the subjects of Astrominformatics to the data concerning the flare stars in stellar clusters and associations we aim to enable extracting unrevealed knowledge for this type of variable stars, as well as to re-use the observing material already in digital form, supplying digital curation. The database for detected flare stars (UV Ceti type variability) in stellar clusters and associations as the Pleiades, Orion M42/M43, Taurus Dark Clouds, Cygnus NGC 7000, Praesepe, NGC 2264, Cygnus IC 1318, Coma Open Cluster, Alpha Perseus Cluster, Scorpius-Ophiuchus, and others is present. The metadata for the flarestars and their registered flare-events is described, as well as the access, data mining, searches for information possibilities and flare stars plate visualization. An automated flare stars search, started on the basis of scanned flare stars monitoring plates of the Rozhen Observatory obtained with the 50/70/172 cm Schmidt telescope in the period 1979 - 1995, is expected to increase the number of discovered flares compared to the visual inspection by a blink-comparator done before in the observatory.

ICT INFRASTRUCTURE OF THE ASTROINFORMATICS PROJECT

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Sofia Sky Archive Data center provides valuable search tool for astronomers. As the amount of data increases during the time, same is also true for the requirements to the ICT infrastructure. This report presents brief historical overview of development of SSADC, present status and some ideas for future development. Special attention is given to remote processing systems, dedicated to the Astrominformatics project.

STAR IDENTIFICATION APPROACH THRU LINEAR PROGRAMMING

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The problem of star identification has been studied during the last years, for example with the purpose of the spacecraft navigation. In this paper, an approach based on linear programming model is considered to solve the problem for the best fitting of two sets of points – extracted data from astronomical wide-field photographic observations and the catalog data.

Computational experiments with simulated and real data are described. The main tool used is the public domain programming code Lp_Solve for linear programming optimization problems. Some known issues are also discussed.

COMPARISON OF DIGITALIZATION TECHNIQUES OF THE PHOTOGRAPHIC SPECTRAL OBSERVATIONS

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A lot of spectral plates have been spread across the variety of storage facilities. Some of these are stored near the place the observation took place, other are archived in purpose build facilities. At present are available the two main digitalization techniques - High Quality Micro Densitometers such as PDS, COSMOS, as well as flatbed scanners. The first are expensive and rather stationary. They are more suited for installation in centralized location with presumption that the plates are transported to them for processing. This is not however always economically viable for small private organization who poses few thousand plates. In such cases the easily affordable and freely commercially available flatbed scanner seems to be a better option.

FIRST PHOTOMETRIC OBSERVATIONS OF THE EXTRASOLAR PLANETS AT THE BELGRADE ASTRONOMICAL OBSERVATORY

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Since July 2009 several photometric observations of the extrasolar planet transits were carried out at the Belgrade Astronomical Observatory. This presentation is an overview of the photometry techniques and procedures used for the exoplanet detection, as well as of the results on some crucial parameters of the exoplanets obtained from the observations.

POSTERS:

SOCIETY OF ASTRONOMERS OF SERBIA, ASTRONOMICAL SOCIETY "RUDJER BOŠKOVIĆ" AND INTERNATIONAL YEAR OF ASTRONOMY

ANDJELKA KOVAČEVIĆ¹, MILAN S. DIMITRIJEVIĆ²,
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We will present Society of Astronomers of Serbia, and the oldest society of professional and amateur astronomers in Serbia, Astronomical Society "Rudjer Boskovic", founded in 1934.

We will review briefly their history and activities with particular attention to the activities concerning International Year of Astronomy in Serbia.

SOME ASPECTS OF CIRCULAR RESTRICTED THREE BODY PROBLEM FROM DIFFERENTIAL GEOMETRY POINT OF VIEW

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This poster considers differential geometry methods for determining local geometrical parameters of zero-velocity curves (ZVC) and surfaces (ZVS) in the circular restricted three-body problem (CR3BP) and emphasizes some interesting characteristics. The obtained results indicate some principles in distribution of local geometrical parameters along ZVC and ZVS and their influence on orbital motion.

SPECTROSCOPICAL INVESTIGATIONS OF EXTRAGALACTIC OBJECTS AT ASTRONOMICAL OBSERVATORY (PERIOD 2008 – 2009)

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Here we give an overview of the activities on the project P146002 (Astrophysical Spectroscopy of Extragalactic Objects) financed by the Ministry of Science and Technological Development of Serbia. Scientific and other activity of researchers on the project are described. Also, we give a list of references which are published by participants of the project in the 2008/2009 period.

ON THE STARK BROADENING OF Ar XV SPECTRAL LINES

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Satellite born spectroscopy creates an increasing need for data on the spectral line profiles of trace elements, which become astrophysically more and more significant. For example, far UV lines of Ar VII were discovered recently in the spectra of very hot neutral stars of planetary nebulae and white dwarfs and Ne VIII lines in H-deficient pre-white dwarf stars. In order to provide Stark broadening data in X-ray and far UV wavelength region, of interest for modelling and analysis of astrophysical plasmas in extreme conditions, we performed calculations of Stark broadened line widths and shifts for 8 Ar XV multiplets using the semiclassical perturbation theory.

INVESTIGATIONS ON THE INFLUENCE OF COLLISIONAL PROCESSES ON THE ASTROPHYSICAL PLASMA SPECTRA AT ASTRONOMICAL OBSERVATORY (PERIOD 2008-2009)

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The review of activities on the project 146001 “Influence of collisional processes on the astrophysical plasma spectra”, supported by the Ministry of Science and Technological development of Serbia from 1st January 2008 up to 31st December 2009 is given, together with the bibliography of published works.

OBSERVATIONS OF M81 GALAXY GROUP IN NARROW BAND [SII] AND H α FILTERS. II

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We present preliminary results of the observations made with 2m RCC telescope at NAO Rozhen, using narrow band [S II] and H α filters. The main target was to identify supernova remnant and HII region candidates in interaction regions in M81 galaxy group, particularly in the NGC 3077 galaxy. Tidal interaction between galaxies in this group, as well

as large HI structure in NGC 3077, are supposed to led to enhanced star formation which will result in a number of HII regions and supernovae, whose remnants we have tried to detect.

SERBIAN ASTRONOMICAL WORKS IN THE VIRTUAL LIBRARY OF THE FACULTY OF MATHEMATICS IN BELGRADE.

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We describe astronomical books digitized and available online in the Virtual Library of the National Digitization Centre (Virtual Library, <http://elib.matf.bg.ac.rs:8080/virlib>). Some of these books are dating in the XVIII century, the newest one at the end of XX century. A selection of these books includes the following authors and titles: Ruđer Bošković: ***Elementorum Universae Matheseos - Tomus I-III***, Venetis, 1757. Zaharije Orfelin, *The Eternal Calendar* (Вечни календар) Atanasije Stojković, *Physics* (Физика), 1810, Budim, Đorđe Stanojević, *Starry Sky over Independent Serbia* (Звездано небо независне Србије), 1882, Beograd, Milan Andonović: *Cosmography* (***Космографија***), Beograd, 1888. Kosta Stojanović: *Atomistics* (***Атомистика***), Niš, 1892. Pavle Vujević, *Basics of mathematical and physical geography* (Основи математичне и физичке географије), Beograd, 1924, Milutin Milanković: *Celestial Mechanics* (***Небска механика***), Beograd, 1935. and ***Kanon Der Erdbestrahlung***, Beograd, 1941, Vojislav Mišković, *Hronolgy of astronomical achievements* (Хронологија астрономских тековина I-II), Beograd, 1975-6, Jovan Simovljević, *Basics of theoretical astronomy* (Основе теоријска астрономија), Beograd, 1977. Most of these excellent books were used in Serbian gymnasiums and at the Belgrade University for many years. The digitization of these books is a part of the project of forming electronic archives containing Serbian mathematical and astronomical books printed in the past. In the article other reasons why these books are selected to be included in the Virtual Library are also given. The contents of these books are briefly presented together with some interesting points.

ELECTRICAL CONDUCTIVITY OF PLASMAS OF DB WHITE DWARF ATMOSPHERES

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The data on electrical conductivity of plasma of stars with a magnetic field or moving in the magnetic field of the other component in a binary system could be of significant interest, since they are useful for the study of thermal evolution of such objects (cooling, nuclear burning of accreted matter) and the investigation of their magnetic fields. Moreover, electrical conductivity was particularly investigated for solar plasma, since it is of interest for the consideration of various processes in the observed atmospheric layers, like the relation between magnetic field and convection, the question of magnetic field dissipation and the energy released by such processes. Given the analogous role electrical conductivity plays in other stars as well, it is of interest to investigate its significance, to adapt the methods for research into stellar plasma conditions and to provide the needed data.

An additional interest for data on electrical conductivity in white dwarf atmospheres may be stimulated by the search for extra-solar planets. Namely Jianke, Ferrario and Wickramasinghe have shown in 1998, that a planetary core in orbit around a white dwarf may reveal its presence through its interaction with the magnetosphere of the white dwarf. Such an interaction will generate electrical currents that will directly heat the atmosphere near its magnetic poles. They emphasize that this heating may be detected within the optical wavelength range as H α emission. For investigation and modelling of such electrical currents, the data on electrical conductivity in white dwarf atmospheres will be useful.

We calculated here the static electrical conductivity of non-ideal, dense, partially ionized helium plasma within a wide range of temperatures and mass densities, of interest for the DB white dwarf atmospheres with effective temperatures between 10000 K and 30000 K. Electrical conductivity of plasma was calculated by using the modified random phase approximation (RPA) method, adapted for the case of dense, partially ionized plasma. The results were compared with the unique existing experimental data, including the results related to the region of dense plasmas. In spite of low accuracy of the experimental data, the existing agreement with them indicates that results obtained in this paper are correct.

SERBIAN VIRTUAL OBSERVATORY: THE SECRET OF OBJECT WILSON

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Five plates from the year 1953, obtained by M. B. Protitch with Zeiss Astrograph kept dark as unknown object nearly sixty years. Recently, during the plate digitization the secret is unveiled. Such detection is one of the episodes only in plate processing for Belgrade WFPDB.

STATISTICAL ANALYSIS OF LANGMUIR WAVES ASSOCIATED WITH TYPE III RADIO BURSTS

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Interplanetary electron beams, produced by CMEs and flares, are unstable in the solar wind and generate Langmuir waves at the local plasma frequency or its harmonic. Radio observations of those waves in the range 4 - 256 kHz from the WAVES experiment (Bougeret, et al. 1995) onboard the WIND spacecraft have been statistically analyzed. A subset of 36 events has been selected for this study. The background consisting of thermal noise, type III bursts and Galactic background has been removed and the remaining power spectral density has been fitted by Pearson's system of probability distributions (Pearson 1895). The coefficients of the probability distributions have been calculated by using two methods: method of moments and maximum likelihood method.

We have shown that the probability distributions of the power spectral density of these waves belong to three different types of Pearson's probability distributions: type I, type IV and type VI. In order to compare the goodness of the fits, a few statistical tests have been applied, showing for all of the considered events that the Pearson's probability distributions fit the data better than the Gaussian ones. This is in contradiction with the Stochastic Growth Theory (Robinson 1993) which predicts log-normal distribution for the power spectral density of the Langmuir waves. The uncertainty analysis that has been performed also goes in favor of the use of Pearson's system of distributions to fit the data.

We should mention that our current results are still preliminary and need to be confirmed in several ways. If the results are still robust, then the reasons for the disagreement

of the observed distributions with the Stochastic Growth Theory predictions should be investigated.

POWER SOLUTIONS OF FRIEDMAN EQUATION

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In this paper we discuss the asymptotic behavior of the solutions (as the cosmic time $t \rightarrow \infty$) of the acceleration equation

$$\frac{\ddot{a}}{a} = -\frac{4\pi G}{3} \left(\rho + \frac{3p}{c^2} \right)$$

related to the Friedman cosmological equation

$$\left(\frac{\dot{a}}{a} \right)^2 = \frac{8\pi G}{3} \rho - \frac{kc^2}{a^2}$$

which describes the expansion scale factor $a(t)$ of the Universe. We are particularly interested in the solutions satisfying the power law $a(t) \sim L(t)t^\alpha$, where $L(t)$ is a regularly varying function. For this reason we introduced a new function $\mu(t) = q(t)(H(t)t)^2$ where $q(t)$ is the deceleration parameter and $H(t)$ is the Hubble parameter. We prove that the acceleration equation has two different fundamental solutions that satisfy the power law if and only if the limit

$$\gamma = \lim_{x \rightarrow \infty} x \int_x^\infty \frac{\mu(t)}{t^2} dt$$

exists and $\gamma < 1/4$. Thus, the values of the constant γ determine the asymptotical behavior at the infinity of the solutions of the acceleration equation, i.e. of the expansion scale factor $a(t)$ of the Universe. Our approach presented in the paper covers all standard solutions, as covered in (Liddle 2000) or in (Peacock 1999), of the Friedman equation.

SOFTWARE APPROACH FOR A PARAMETERISATION OF FITS DATA

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Using ordinary software tools including tiff-fits converting, astronfirmatics science users needs of editing, or repairing table information, named fits header. In this paper are described approach and software realization of the usable software tool for the astroniformatics purposes. Work I done within the support of the BNSF grant DO-02-275.

ON A CYCLIC ACTIVITY AND DIFFERENTIAL ROTATION OF PAR 1724 = V1321 ORI.

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We applied the Gregory-Loredo method, (for periodic signal detection of unknown shape in time-series with Gaussian errors), to the 200000 year old naked weak-line run-away T Tauri star Par 1724, located north of the Trapezium cluster in Orion, for which measurements of the stellar magnitudes in V-band and corresponding errors spanning more than 50 years are available. Preliminary results indicating on a cyclic activity of Par 1724 with a period of ~18 years. It also revealed a second significant periodic signal, in the range of 5.85-5.95 days (together with 5.67 days period, known as rotational one), which might be a mimic on a differential rotation.

RESULTS OF NUMERICAL SIMULATIONS IN THE EXPLORATION OF PATTERNS THROUGHOUT THE ACCRETION FLOW IN THE CLOSE BINARY STARS

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The current survey presents the results of applying a numerical calculation in examination of the hydrodynamical flow runs inside and close to the disc boundary layer. The implication of numerical models is based on the theoretical explanations and descriptions of the matter and processes. In the theoretical predictions, it is used the situation of influx of the matter from the primary star into the secondary. During such mass transfer, the parameters of the accreting flow are perturbed and then the numerical approaches have involved, in the calculations. The simulations show development of patterns, such as: spots, vortices and spirals. These formations have different longevity in depends of their density and velocity of the accretion matter and time period of the disc's rotation.

REMOTE GUIDANCE OF THE 60 CM TELESCOPE AT NAO ROZHEN

DINKO DIMITROV, VASIL POPOV

Institute of Astronomy, Bulgarian Academy of Sciences,

ASSIGNING WCS STANDARDS TO ROZHEN FITS ARCHIVE – PRELIMINARY TESTS

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Assigning physical coordinates to FITS image pixels is important to standardize the Rozhen fits files. Among wide spread WCS software available, here we present tests based on the IDL implementation of the WCS standards. Our goal is to apply this implementation for calculating and adding the necessary WCS FITS keywords in the image headers. The obtained

results are checked by comparing the image object positions with the astrometry from HIPPARCOS and USNO-A2.0 catalogs.

KINEMATICS OF AN ERUPTIVE PROMINENCE OBSERVED ON 22 AUGUST 2006 WITH 15-CM CORONAGRAPH AT NAO – ROZHEN

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The eruption of limb prominence on 22 August 2006 was observed with the Lyot coronagraph at NAO – Rozhen. The investigation of the eruptive process show that the prominence undergone several eruptions during the observation time. The kinematics of first, most significant prominence eruption was investigated and its parameters were determined. The association of the eruptive prominence with other activity events (X-ray emissions, green coronal line brightening, coronal mass ejection, etc.) was established. The obtained results were interpreted and discussed with a view to the level end specific of solar activity during the epoch of minimum between 23rd and 24th solar cycles.

STRUCTURE OF ACCRETION DISK IN THE PRESENCE OF MAGNETIC FIELD

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This paper will show you our results on the problem of the evolution of the disc. We investigate the development of Accretion flow in its interaction with the magnetic field. We analyze the restructuring of the flow under the action of the ongoing processes and activity of instabilities. We consider distribution of entropy and locally heating and how it is tied to the emergence of a crown. We discuss influence of the magnetic fields over viscosity parameter. We investigate distribution coefficients $k_\phi(r, z)$ and $\omega(r, z)$ and connection with behavior of wave numbers $k_\phi(K)$, $k_r(K)$ and $\omega(K)$.

AUTOMATIC RÉSEAU GRID LINES REMOVAL FROM CARTE DU CIEL PLATES

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The réseau grid that was originally superimposed over Carte du Ciel plates to assist the process of visual measurements of stellar images complicates the automatic extraction of astrometrically precise data from the digitized plates. The typical problems of stars detection are due to blending of star image intensities with those from the grid (partial or entire star occlusion by the grid) and false detections along the grid lines.

An automatic réseau grid removal approach is proposed over arbitrary plates with no prior knowledge on the plate's position over the sky. The uniform spread of vertical and horizontal grid lines is addressed by using: the EyE software tool (Bertin & Marmo 2006) to generate a non-linear image filter, which is then loaded in SExtractor (Bertin 1999) to obtain the stars' coordinates; and a simple morphological operator for cross detection.

POLARIZATION OF WHITE LIGHT SOLAR CORONA ON MARCH 29, 2006 AND JULY 21, 2009

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The lower and middle layers as well as the polarization degree of the white light solar corona were analyzed using data from the observations of the total solar eclipse on March 29, 2006 and July 21, 2009. Both eclipses took place near the solar activity minimum. The polarization plane of solar corona is digitized and the radial distribution of the degree of polarization is represented in polar coordinates up to 2.5 solar radii. The position angle and the degree of polarization are found by performing observations of the solar corona with linear polarizing filter positioned at 0, 60, and 120 degrees.

ERUPTIVE PROMINENCES OF THE ROMPOLT'S TYPE II AS TRACERS OF THE DYNAMICS OF HUGE MAGNETIC CORONAL SYSTEMS

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The dynamics and the evolution of five eruptive prominences (EPs) observed in Wroclaw, Poland was studied. All EPs are of type II according to the Rompolt's classification. Four of them are clearly associated with coronal mass ejections (CMEs) that infer the origin of EPs and CMEs in the same huge erupting magnetic system. The comparative analysis of vertical and horizontal expansion of the EPs during the eruption, and especially their post-eruptive phases suggests that the dynamics of EPs of type II is indicative for the dynamics and evolution at the bottom of the huge magnetic systems (HMS) that later produce CMEs. The results obtained in this study were discussed in the light of the pre-existing magnetic flux rope hypothesis for the origin of the EPs and CMEs.

ON A POSSIBLE CYCLIC ACTIVITY OF PLEIADES FLARE STAR HCG 377

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We will present preliminary results of possible cyclic activity of flare star HCG 377 based on flare activity observed during long monitoring photographic campaign of Pleiades region performed in 60-80-ies of the last century. Bayesian statistical analysis of registered flare times and released energies during the maximums of flares indicates on a 3-3.5 year activity period.

SECULAR PLATE DRIFT IN NORTH DIRECTION DETERMINED BY ASTROMETRICAL LATITUDE OBSERVATIONS AT OBSERVATORY PLANA

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The secular plate drift at observatory Plana in North direction is determined by means of astrometrical latitude observations from zenith tube Zeiss 135/1750 for the period 1987.5-2010.5. The latitude variations due to the polar motion are determined from the solution C04 of the IERS for the pole coordinates. The time series of the mean latitude variations and mean polar changes of the latitude are determined by averaging in running 6-year window. The mean nonpolar latitude variations are determined as difference between these time series. The secular plate drift in North direction is estimated by the linear trend of the mean nonpolar latitude variations. The results are compared with the values from GPS measurements, provided by a permanent station, located nearby the observatory Plana.

METHOD FOR TRACKING AND MAPPING A MOTION BASED ON IMAGES OF THE SOLAR CORONA

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This work continues our investigations on possibilities of presentation the time development of eruptive solar protuberance and related magnetic field.

The aim of this work is mapping the direction of movement of different layers of protuberance. The map construction is based on compass directions dividing them to 8 possible – North, South, West, East, North-West, North-East, South-West, South-East.

The tests in this investigation are carried on sequences of images obtained from 15-sm Lio coronagraph-telescope of NAO Rozhen, used for observation of protuberance of low solar corona.

THE INASAN ZVENIGOROD OBSERVATORY PLATE COLLECTION

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The description of the astronomical wide-field plate and film collections of the Zvenigorod observatory of the Institute of Astronomy, Russian Academy of Sciences are presented. The plate archives are a results of photographic observations conducted at the Zvenigirod observatory for more than thirty years from 1972-2005 and included: 1) Photo plates of Carl Zeiss astrograph – 40-cm, totally about 4500, 30x30 cm plates half of them listed in the Sofia WFPDB. Plates are in process of digitization in formats FITS- 700 MB each scan. Two EPSON 1640XL scanners are used. 2) Camera AGF-75cm with about 2800 records, 3) Monitoring observations with very-wide field camera VAU - 100 cm. Maim programmes executed are FON photographic survey, variable, small bodies and comets in the Solar system as well observation of the satellites.

COMPUTER MODELS FOR SKY IMAGE ANALYSIS OF THE INASAN ZVENIGOROD OBSERVATORY

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Development of information systems that includes the archive of digital copies of photos sky obtained at the Zvenigorod Observatory Institute of Astronomy RAS and means of access to those copies. Possible preview pictures in JPG, view any part of the image from the primary file in FITS format with the possibility to save and print the fragment. The system is implemented on the SQL server FireBird.

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