XII SERBIAN - BULGARIAN

ASTRONOMICAL CONFERENCE 2020

25 - 29. September 2020, Sokobanja, Serbia

SB 2020

BOOK OF ABSTRACTS

Eds. Luka Č. Popović, Vladimir A. Srećković, Milan S. Dimitrijević and Anđelka Kovačević

BELGRADE, 2020

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BELGRADE, 2020

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INVITED LECTURES

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Invited lecture

A NEW APPROACH TO MEASURING THE SIZE OF THE DUST SUBLIMATION REGION IN AGNs

V. Afanasiev and E. Shablovinskaya

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Here we give an observational method for measurements of the equatorial scattering region radius using variability in the polarized broad lines in Type 1 active galactic nuclei (AGNs). The polarization in broad lines of Type 1 AGNs is mostly caused by equatorial scattering which specific features allow one to separate its contribution from the total polarized flux. We propose to monitor variability in the polarized line flux and finding the time lag between the non-polarized continuum and polarized broad line variability, then the distance to the scattering screen can be determined from the time delay.

The method was, for the first time, applied to the observations of Type 1 AGN Mrk 6, and we found that the size of the scattering region in this AGN is around 100 light days. That is significantly smaller than the dusty region size estimated by the infrared interferometric observations and also larger than known broad line region (BLR) size. This indicates that the scattering region lies between the BLR and the dusty region and could be used as a probing of the dust sublimation radius.

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Invited lecture

VENUS IN THE MYTHOLOGY OF THE SOUTHERN SLAVS

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The paper tested the hypothesis that the folk literature of the Balkan Slavs could be a good and reliable source for the study of their pre-Christian religion and mythology. Religion and mythology, as a rule, include understanding of the world in a particular culture, i.e. cosmology. If so, the same source may contain knowledge and understanding of heaven and celestial bodies together with the way these understandings were incorporated into myths and rituals. Since Venus has no significance in Christianity, folk poems that refer to it probably have their origins in pre-Christian beliefs. In this particular case, the place of the planet Venus in the pre-Christian religion of the Balkan Slavs was examined.

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Invited lecture

ASTROPHYSICALLY INTERESTING STARK PARAMETERS MEASURED IN LASER-INDUCED PLASMA

Srđan Bukvić, Miloš Skočić and Dejan Dojić

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Laser Induced Plasma (LIP) is a small object with fast expansion rate, strong temperature, strong density and pressure gradients. Almost all spectroscopic diagnostic techniques are difficult to apply due to unstationary nature of LIP. We provide a brief overview of the main features of LIP and their relation to basic physics. Despite the difficulty in understanding underlying processes and problems in diagnostics, LIP is a very valuable spectroscopic source with complex but clean spectra suitable for Stark broadening and shift estimation. In the last decade germanium and molybdenum have become important in astrophysics as the elements relevant in nucleosynthesis processes. We present Stark parameters for number of spectral lines belonging to Ge II and Mo II spectra and discuss some specific aspects arising in processing raw spectroscopic data.

Invited lecture

CHARACTERISTICS OF SEPs ASSOCIATED WITH SOLAR FLARES

Ramesh Chandra

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The study of the solar energetic particle events (SEPs) and their association with solar flares and other activities are very crucial to understand the space weather. Keeping this in view, in this paper, we present the study of the SEPs (intensity ≥ 10 pfu) during the solar cycle 21 to 24 (1976-2017) in > 10 MeV energy channels associated with solar flares. For our analysis, we have used the data from different instruments onboard SOHO satellite and the high temporal and spatial resolution data from Solar Dynamics Observatory (SDO). We have examined the flare size, source location, CMEs characteristics of associated SEPs.

Invited lecture

SOLAR ACTIVITY INFLUENCE ON GLOBAL CLIMATE OSCILLATIONS

Yavor Chapanov

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The solar activity affects all geosystems, including climate and weather. The terrestrial systems are influenced by direct radiation over Earth surface, solar wind, and the solar magnetic field. The variations of these solar parameters are presented in the observed data of sunspot numbers, Total Solar Irradiance (TSI) and North-South (N-S) solar asymmetry. The TSI cycles are the main source of climate indices variations. The solar wind directly affects Earth magnetic field, ionosphere and atmosphere. The variations of solar magnetic field modulate solar wind and Cosmic Rays (CR) in the frame of the heliosphere. The cosmic rays near Earth are modulated by Earth magnetic field variations, too. The variations of sunspot numbers, TSI, N-S solar asymmetry and CR have different spectra for some frequency bands and corresponding different influence on terrestrial systems. The solar activity influence on global climate oscillations is investigated by long time series of global Earth temperature over land and ocean, some regional precipitation and Palmer Drought Severity Index (PDSI). Common solar and climate interannual, decadal and centennial cycles in narrow frequency bands are determined and possibility of their use in climate change prediction is discussed.

Invited lecture

GAIA DR3 AND SOME RESULTS OF SERBIAN-BULGARIAN COOPERATION

Goran Damljanović

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After Gaia DR1 (First release, 14st September 2016) and Gaia DR2 (Second release, 25st April 2018), it is going to be available the Third release, soon. In the third quarter of 2020, an early Gaia EDR3 is expected, and the Gaia DR3 catalog is expected after June 2021. Mainly, the Gaia EDR3 catalog will be consisting of improved astrometry and photometry, but the Gaia DR3 catalog of Gaia EDR3 contents and other data: mean radial velocities for starrs (with atmospheric-parameter estimates), variable-star classifications with the epoch photometry, solar-system results (some orbital solutions, epoch observations, etc.), double and multiple stars, QSOs and results of extended objects, etc. Also, some results about the Serbian-Bulgarian cooperation in line with Gaia mission are presented.

Invited lecture

THE MODIFIED SEMIEMPIRICAL METHOD 1980-2020

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Forty yers ago, together with Nikola Konjević, we published the modified semiempirical formula, an approximate methods for the calculation of Stark widths of non-hydrogenic spectral lines, for ionized emiters (Dimitrijević, Konjević 1980). With Vladimir Kršljanin we extended this method for the line shifts (Dimitrijević, Kršljanin 1986) and with Nikola Konjević we adapted it for low temperature limit obtaining an even simpler formula (Dimitrijević, Konjević 1987). They were used many times, especially in astrophysics and have been cited hundreds of times. This method is especially useful when it is not possible to perform more sophysticated semiclassical perturbation calculations due to the lack of the needed atomic data. Using this method we performed calculations of Stark linewidths and shifts for a large number of spectral lines of various ions. The obtained results are included in STARK-B database (Sahal-Bréchot et al. 2015) a part of Virtual Atomic and Molecular Data Center (VAMDC - Dubernet et al. 2010).

In this contribution we will review the Modified Semi-Empirical Method (MSE) and its simplified, low temperature limit form as well as its usage in astrophysics and plasma physics.

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Astronomical Observatory, Belgrade, 2020

Invited lecture

MYTHOLOGICAL ORIGIN OF CONSTELLATIONS AND THEIR DESCRIPTION: ARATUS, PSEUDO-ERATOSTHENES, HYGINUS

Milan S. Dimitrijević[1] and Aleksandra Bajić[2]

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A long, didactic poem, *Phaenomena* writen by Aratus of Soli (Ἄρατος ὁ Σολεύς; *c.* 315/310 BC – 240 BC) is the oldest preserved astronomical text in Europe, created about 270 BC. The macedonian king, Antigonus II Gonatas (*c.* 319-239 BC) probably ordered and financed this work. Aratus sought and found the sources of astronomical knowledge in the work with the same name of Eudoxus of Knid, which he transformed in a poem, making it easier to read and remember. In the following times his poem became very popular, gladly read throughout ancient Greece and then Rome, often translated into Latin, which greatly increased the number of transcripts so that it has been preserved to these days, unlike the book of Eudoxus.

The similar description of mythical origin of constellations is *Catasterismi* (Καταστερισμοί) the only surviving scripture associated before with Eratosthenes of Cyrene (Ἐρατοσθένης ὁ Κυρηναῖος - *c.* 276 - *c.* 194 BC), the chief librarian at the Library of Alexandria, whose works were burnt down when it is burned and exist only in fragments. This text came to our time as an *epitome*, a short version of a larger work, and, the unknown author is named Pseudo-Eratosthenes. It is also a famous works of antiquity about heaven and, unlike the text of the similar content (*Phaenomena*) of Aratus, from which many mythological topics in this text have been taken, provides data on the number, and brightness of stars in the described constellations, so that represents a kind of the first preserved star catalogue of ancient Greece.

The third book with the similar content is *De Astronomica*, also known as *Poeticon Astronomicon,* attributed earlier to the Roman historian Gaius Julius Hyginus, though the true authorship is disputed.

We translated in Serbian *Phaenomena* and *Catasterismi* and now we work on the translation of *Poeticon Astronomicon.* In this contribution we consider and discuss these three writings as well as their similarities and differences.

Invited lecture

ACCRETION DISK IN THE MASSIVE CLOSE BINARIES

Gojko Đurašević

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In this paper we present the results of the study of the massive close binary systems based on the spectroscopic and photometric data. From observations and our modeling it is clear that the spectral features and light-curves shapes of these systems can be successfully interpreted by the CB Roche model in which the less-massive donor fills the critical Roche lobe and transferring mass on the more massive gainer, which is mostly hidden with a large optically and geometrically thick accretion disk. Two active regions are supposed to exist on the rim of the disk, which can be interpreted as a consequence of the mass-transfer from the donor star, and by the effects of the gas dynamics in the system. Our model fits the observations well for all individual pass-band light-curves. From the model best fit to the observed light-curves, orbital and physical parameters of the components are estimated, together with the accretion disk characteristics and the active regions on the disk edge. In some cases we present the evolution stage of these systems, especially for the systems shoving double periodicity.

Invited lecture

ON COSMOLOGY OF NONLOCAL GRAVITY

Branko Dragovich[1,2]

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Despite of numerous significant phenomenological confirmations and many nice theoretical properties, General Relativity (GR) is not final theory of gravity. Problems mainly come from quantum gravity, cosmology and astrophysics. In this talk, we consider some models of nonlocal modified GR, where nonlocality is presented by an analytic function of the d'Alembert-Beltrami operator. We are interested mainly in exact cosmological solutions of the corresponding equations of motion. We pay special attention to the model which exact cosmological solution contains effects that mimic dark matter and dark energy. Here, dark energy is produced by the cosmological constant Lambda. For this solution, computed cosmological parameters are in good agreement with cosmological observations. Details can be found in our recent papers, see references.

This is joint work with Ivan Dimitrijevic, Zoran Rakic, Jelena Stankovic, all from the University of Belgrade, and Alexei S. Koshelev from Universidade de Beira Interior, Covilha, Portugal.

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Invited lecture

PHOTOMETRY OF STARS ON DIGITIZED PLATES FROM THE COLLECTION OF ODESSA ASTRONOMICAL OBSERVATORY

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We present the results of photometry of a number of stars from the database of digitized astroplates from Odessa collection obtained with the help of seven-camera astrograph (1957−1998). The goal of this work is to search for the long-term brightness variations on a time interval of about 30 years.

We would like to note that Odessa Astronomical Observatory possesses the collection of Sky Patrol Plates, which is one of the biggest collection in the world after Harvard and Sonneberg collections. The collection in total consists of about 110,000 photo plates exposed from 1909 to 1998.

It should be noted the importance of maintaining in good conditions and the need to digitize archives of astronomical plates, which may in the future provide a good opportunity for long-term studies of various phenomena recorded on the plates.

Invited lecture

MAGNETIC FIELD AND ACTIVITY STUDY IN M GIANT STARS

Renada Konstantinova-Antova[1], Agnes Lebre[2], Stefan Georgiev[1,2], Michel Auriere[3], Ana Palacios[2], Rumen Bogdanovski[1], Julien Morin[2], Eric Josselin[2], Natalia Drake[4,5] and Svetla Tsvetkova[1,2]

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We present our long-term study of the magnetism and activity in selected stars on tip Red Giant Branch (RGB) and on the Asymptotic Giant Branch (AGB). The properties of their magnetic activity is compared to the activity in G and K giants that are the earlier evolutionary stages, and to the more evolved Mira-type pulsating stars and the supergiant Betelgeuse. The possible mechanisms for their magnetic field generation are discussed in the context of the stellar evolution.

Invited lecture

SOME APPLICATIONS OF WAVELET ANALYSIS TO PHENOMENA IN THE IONOSPHERE

O. Kounchev and G. Simeonov

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We apply wavelet analysis to analyze short-period geomagnetic field variations, ionospheric parameter variations, and IMF variations in quiet periods as well as during the manifestation of geomagnetic storms. The main idea is to observe some soliton type phenomena in the ionosphere in both stormy and quiet periods. In order to extract the "pure ionospheric effect", one needs to analyze not only the ionospheric parameters, but also the incoming signal from the sun radiation (the data from the ACE satellite), and also the geomagnetic field measured at the geomagnetic observatories.

We have used data for different parameters of ionospheric plasma, however we have focused mainly on TEC. We use ionosphere sounding data from ground ionospheric stations, located near the ground geomagnetic field registration points. Thus we may compare the two signals and analyze them for possible correlation. Hence, we have the possibility of identifying the origin of individual modes (wave packages) and groups of modes. In particular, we use data from the ionosound station in Athens. The main trend of the signal is given by the daily variation of the TEC, however there are fast oscillations with periods less than 3 hours observed during the whole day. At midday time we observe modes (wave packages) with a larger amplitude which are apparently of soliton type. This phenomenon seems to be closely related to a soliton effect already observed and studied in Belashov et al. (2015), see also references therein.

The present talk is based on a joint research with B. Srebrov, G. Simeonov, and L. Pashova (Srebrov et al. 2018, 2020).

Research sponsored by Grants DN-02-13 and KP-06-N32-8 with NSF of Bulgaria, and by the Alexander von Humboldt Foundation (Bonn).

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Invited lecture

A NEW SPACE WEATHER SERVICE IN BULGARIA: THE MULTI-ENERGY PROTON EVENT CATALOG

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We present the results from a recently completed study on the identification, analysis and solar origin association of solar energetic protons over nearly two solar cycles (1996-2017). Data with the highest temporal resolution of 1 minute is used from SOHO/ERNE instrument over 10 channels covering the energy range from 14 to 131 MeV. Statistical correlations with solar flares and coronal mass ejections are performed and compared to earlier results.

A dedicated web-site to host the proton catalog is available at https://catalogs.astro.bas.bg/ and the results (times, amplitudes, quick-look plots) will be provided freely to the scientific community. This new service is hosted and will be supported in the future by the Institute of Astronomy and National Astronomical Observatory – Bulgarian Academy of Sciences.

Invited lecture

ACTIVITIES OF SERBIAN SCIENTISTS IN EUROPLANET

A. Nina[1], M. Radovanović[2], L. Č. Popović[3], A. Černok[4], B. Marinković[1], V. Srećković[1], A. Kovačević[5], J. Radović[6], V. Čelebonović[1], I. Milić Žitnik[3], Z. Mijić[1], N. Veselinović[1] and A. Kolarski[7]

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The Europlanet Society, an organization that promotes the advancement of European planetary science and related fields, has 10 hubs. The Serbian Europlanet Group (SEG) is included in the Europlanet South Eastern European Hub (ESEEH) and has 20 active scientists.

In this work, we present activities of SEG. Primarily, we describe two EUROPLANET meetings organized in the Petnica Science Center: training school "Geology and geophysics of the solar system bodies" and workshop “Integrations of satellite and ground-based observations and multi-disciplinarity in research and prediction of different types of hazards in Solar system” (Nina et al., 2019) that took place in 2018 and 2019, respectively. Besides, we present other activities that were primarily aimed at connecting SEG members coming from eight institutions and the promotion of EUROPLANET and ESEEH organizations.

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Invited lecture

LUCKY IMAGING AT AS VIDOJEVICA. PRESENT STATE AND FUTURE PLANS

Rade Pavlović[1], Zorica Cvetković[1], Goran Damljanović[1], Miljana D. Jovanović[1], Svetlana Boeva[2], Georgy Latev[2] and Yanko Nikolov[2]

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CCD camera iXon 897 is still under testing for the purpose of observing double stars by use of the lucky imaging technique. This a consequence of a number of circumstances, such as non-synchronisation of the derotators at the left and right ports of the 1.4 m telescope ``Milankovic'' at AS Vidojevica, auxiliary CCD camera Apogee U42 out of order and, eventually, aluminising of the great mirror and mounting of the telescope in a new dome. For the lucky imaging technique it is necessary to use concurrently two CCD cameras, one capable of obtaining frames of short exposures, of the order of a few milliseconds, and another one which has a wide field of view used in orientation determination, i. e. position mirror. In the present paper we shall describe the difficulties and obstacles which we have met and how to get rid of them in order to be make it possible using the lucky imaging technique for the purpose of observing double and multiple stars.

Invited lecture

EVOLUTION OF MASSIVE BINARY SYSTEMS

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Some of the most exciting cosmic phenomena are though to occur in massive binary systems. For example, gamma-ray bursts are associated with collapsars evolved from Wolf-Rayet stars that lost their hydrogen shell due to the mass transfer in massive binaries. Also, sources of gravitational waves recently observed by the LIGO-Virgo telescopes are binary systems containing compact objects, relics of massive stars - black holes and neutron stars. Evolutionary calculations of massive close binaries were performed by various authors, but many aspects are not yet fully understood. Rotation, magnetic fields, stellar wind mass loss, accretion efficiency during the mass transfer, as well as angular momentum accretion are some of the most important parameters that can influence the final outcome of the binary system evolution.

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Invited lecture

PRE-MAIN SEQUENCE STARS FROM UX ORIONIS TYPE

Evgeni Semkov[1], Asen Mutafov[1], Stoyanka Peneva[1] and Sunay Ibryamov[2]

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For several decades we perform photometric monitoring of some of the star formation regions. We believe that the study of photometric variability of T Tauri and Herbig Ae/Be stars is of great importance in understanding stellar evolution. Many of the young stellar objects within the surveyed fields indicate a photometric variability. These variations comprise transient increases in brightness (outbursts), temporary drops in brightness (eclipses), and large amplitude irregular or regular variations for a short or long time scales.

A significant part of pre-main sequence stars show strong photometric variability with sudden quasi-Algol drops in brightness and amplitudes up to several magnitudes. During the deep minimums in brightness, an increase in polarization and specific color variability are observed. The prototype of this group of pre-main sequence objects with intermediate mass named UXors is UX Orionis. The widely accepted explanation of its variability is a variable extinction from dust clumps or filaments passing through the line of sight to the star. In this presentation, we present results of the study of several of the most interesting objects like: V1184 Tau, GM Cep, V1180 Cas, V350 Cep and others.

Invited lecture

BLACK HOLE MASSES AND BROAD LINE REGION GEOMETRY OF QUASARS

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It is now believed that supermassive black holes (BHs) reside in the centres of practically all bulge galaxies. A number of relations scale the BH mass with host galaxy properties, in particular bulge luminosity and velocity dispersion. Concerning Active Galactic Nuclei (AGNs), the BH mass can be estimated given the size and velocity of the Broad Line Region (BLR) under the virial assumption. Reverberation mapping provides the most precise estimate of the radial size of BLR, however, the single-epoch method is less time-consuming and, therefore, applicable to larger samples. The BLR cloud velocity is usually inferred from the line width, assuming a deprojection factor *f*, responsible for the BLR geometry and kinematics. Thus, the BH mass expression can be disentangled into a putative part, the *f*-factor, and a measurable part, the so called virial product.

The aim of our study is to estimate and analyze the *f*-factors based on comparing the virial products and the BH masses determined on the base of host galaxy relations for high-luminosity AGNs. We present the detailed results for the flat spectrum radio quasar 3C 273, consistent with a disk-like BLR. The virial product is determined using the H_β, Mg II, and C IV lines, which allows a discussion on the BLR stratification.

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Invited lecture

OPTICAL AND X-RAY OBSERVATIONS OF THE D-TYPE SYMBIOTIC STAR EF Aql

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We performed high-resolution optical spectroscopy and X-ray observations of the recently identified Mira-type symbiotic star EF Aql. Based on high-resolution optical spectroscopy obtained with SALT, we determine the temperature and the luminosity of the hot component in the system. The heliocentric radial velocities of the emission lines in the spectra reveal possible stratification of the chemical elements. Our Swift observation did not detect EF Aql in X-rays. The upper limit of the X-ray observations is 10^{-12} erg cm^{-2} s^{-1}, which means that EF Aql is consistent with the faintest X-ray systems detected so far. Otherwise we detected it with the UVOT instrument with an average UVM2 magnitude of 14.05. During the exposure, EF Aql became approximately 0.2 UVM2 magnitudes fainter. The periodogram analysis of the V-band data reveals an improved period of 320.4 ± 0.3 d caused by the pulsations of the Mira-type donor star.

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Astronomical Observatory, Belgrade, 2020

Invited lecture

HIGH RESOLUTION INVESTIGATION OF THE SYMBIOTIC BINARY BF CYGNI DURING ITS BURST AT THE BEGINNING OF 2017

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Based on high resolution echelle data the visual line spectrum of the classical symbiotic star BF Cyg is investigated during its development of activity (burst) in 2017. Profiles, fluxes and radial velocity data of different groups of lines have been obtained. The satellite components of some lines indicating collimated ejection from this system disappeared for some time during the optical maximum and appeared again. The satellite components of different groups of lines have different behaviour indicating stratification in the collimated streams. The data are interpreted in the framework of the model of collimated stellar wind.

Invited lecture

SHADOW BANDS AND RELATED ATMOSPHERIC CONDITIONS REGISTERED DURING TOTAL SOLAR ECLIPSES

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This study is dedicated to the atmospheric phenomena accompanying total solar eclipses. Observations of shadow bands are shown. We look for connection between their distribution and the variations of the temperature, speed and directions of the wind before, during and after the totality of two total solar eclipses. A new experiment for registering the shadow bands realized during the last total solar eclipse (2019 July 2) is presented.

Invited lecture

COSMIC RAY FLUX MEASUREMENTS AT BELGRADE COSMIC RAYS STATION DURING SOLAR CYCLE 24

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It has been well known for more than half a century that solar activity is responsible for modulation of galactic cosmic ray reaching Earth (Potgieter 2013). Low-background Laboratory for Nuclear Physics at the Institute of Physics, Belgrade is dedicated to low-background spectroscopy and cosmic rays measurement. Measurements are performed at interconnected spaces: at the surface level (78m a.s.l.) and in the underground laboratory at the depth of 25 m.w.e. with identical sets of detectors and analyzing electronics thus creating opportunity to monitor simultaneously muon flux at different energies. The cosmic-ray muon count rate and energy loss spectra in plastic scintillator detectors are recorded and from experimental data and with the use of GEANT4 computer simulation the flux and vertical intensities have been determined (Veselinović *et al.* 2017).The aim of the present work is to present study of energy dependent solar modulation process during Solar cycle 24 utilizing a shallow underground laboratory with detector configuration sensitive to primaries in the energy region exceeding sensitivity of neutron monitors (Savić *et al.* 2019).

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Invited lecture

PROPER MOTION OF Cyg LOOP FILAMENTS

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We determine the shock velocities in the Cygnus Loop supernova remnant (SNR), using proper motions of the associated filaments. The proper motions are measured by comparing the Halpha images of the SNR observed in two epochs: in 1993 (obtained at Kitt Peak National Observatory), and in 2018 (our observations obtained at National Astronomical Obsevatory Rozhen, Bulgaria). The shock velocities are derived using the most recent distance estimate of Cygnus Loop (735 ± 25 pc), based on Gaia DR2 parallax measurements. The velocities of both nonradiative and radiative filaments are obtained and compared. The radiative filaments are selected because they are visible, while nonradiative are not visible in [SII] images of the SNR. Additionally, we use XMM-Newton observations of Cygnus Loop parts (Obs. ID 0741820101, PR Brian Williams; Obs. ID 0082540101, PR Emi Miyata) for comparison of the optical and X-ray properties of targeted filaments.

Invited lecture

SOLITONS IN THE IONOSPHERE – ADVANTAGES AND PERSPECTIVES

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Solitary vortex structures in the atmosphere of the Earth, as well as of other planets, have been investigated in last decades. Rossby solitons have been derived under different approximations, usually investigating nonlinear effects associated with large amplitude acoustic-gravity perturbations in the Earth's atmosphere, using approximation of incompressible fluid with stream function with no rotational effects, or equivalently, in the plasma environment with temperature gradient for the ion-acoustic perturbations.

However, so-called magnetized Rossby waves have been investigated recently, in the Earth's ionosphere, in order to explain rotational and magnetic filed effects. In our research, we have included for the first time compressible fluid and horizontal effects of self-organized conductive fluid accompanied with Poisson's equation, instead of stream function approach. The existence conditions for these nonlinear structures are discussed with respect to the presence of inhomogeneities of the layer thickness in the equilibrium.

Advantages of the soliton structure are numerous. First, these strucures are stable in time and space and it is much easier to deal with them, instead of number of linear waves existing in the ionosphere. They are, at the same time, more accurate since they involve nonlinearities balancing dispersion effects. Neglecting of nonlinearity could lead to catastrophic conclusion of offten break down of linear waves due to dispersion.

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SHORT TALKS

Short talk

A PAIR OF MONUMENTAL MEDIEVAL BOSNIAN TUMBSTONS (STEĆAKS) FROM DONJA ZGOŠĆA

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In this paper the hypothesis was tested that visual representations on stećak tombstones can illustrate certain knowledge and beliefs from pre-Christian mythology, cosmology and religion, as well as the calendar knowledge of the Balkan Slavs. The stećak tombstones were made of large marble monoliths, in medieval times. Older researchers attribute these to the Bogumils, a religious sect whose religious beliefs are not sufficiently known, but this assumption has been abandoned in recent times. Some are richly decorated with relief, some with inscriptions, written in Bosnian Cyrillic, in a language that is indisputably Slavic. The subject of analysis is the pair of stećak tombstones, found at a local cemetery in Donja Zgošća near Kakanj, in present-day central Bosnia. Both of these are reachly decorated with relief. One can see formations of horsemen, scenes of hunting, as well as some abstract symbols, which appear in characteristic formations and numbers. These abstract symbols are aranged in groups of three, four or twelve elements, associating to calendar numbers. A more detailed analysis of this symbolism, as well as the spatial relations of these two stećak tombstones, leads to the conclusion that these two artefacts were at the same time a record of calendar knowledge as well as an instrument for determining the summer solstice.

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Short talk

OSCILLATIONS IN KR Aur AT MINIMUM

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In some of the light curves at minimum state of KR Aur we observed structures with high amplitude. We estimated the typical periods of oscillations and discussed their possible origin.

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Short talk

STUDY OF THE FRACTAL DIMENSIONS IN THE MOLECULAR CLOUD ROSETTE BY USE OF DENDROGRAM ANALYSIS

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The observed hierarchy of embedded condensations in star-forming regions (filaments, clumps and cores) hints at their underlying fractal structure. The latter can be traced in terms of the fractal dimension defined usually as $D=\log N / \log L$ where N is the number of fragments at given level and L is the scaling factor to the upper level (Elmegreen 1997). Such approach requires a clump-extraction technique. An alternative approach is to explore the exponent γ of the mass-size relationship $M \sim L^{\gamma}$ where the scales L are defined in an abstract way (Beattie et al. 2019). We use the clump extraction technique DENDROGRAM (Rosolowsky et al. 2008) to extract the hierarchy of embedded substructures from $^{12}CO/^{13}CO$ and *Herschel* maps of the molecular cloud Rosette. We obtain the distributions of fractal dimensions for various sets of input parameters of the method and explore the correlation between the mean fractal dimension of the sample and exponent of the mass-size relationship as derived by different approaches.

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Short talk

SERBIAN-BULGARIAN OBSERVATIONS OF GAIA ALERTS (GAIA-FUN-TO) DURING 2019

Goran Damljanović[1], Rumen Bachev[2], Svetlana Boeva[2], Georgy Latev[2], Milan Stojanović[1], Miljana D. Jovanović[1], Oliver Vince[1], Zorica Cvetković[1], Rade Pavlović[1] and Gabrijela Marković[1]

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We used a set of six optical Serbian-Bulgarian telescopes at three sites (Belogradchik, Rozhen, and Vidojevica) to monitor astronomical objects in line with: GAIA ESA mission (Gaia astrometry, Gaia Alerts or Gaia-Follow-UP Network for Transients Objects), WEBT international project, cataclysmic and symbiotic stars, etc. Some results about observations of Gaia Alerts (Gaia-FUN-TO) during 2019 using "the Serbian-Bulgarian mini-network telescopes" are presented here; usually we did about 15 objects per year. Mentioned activities are in line with actual SANU-BAN (Serbian and Bulgarian Academy of Sciences) joint research project "Gaia Celestial Reference Frame (CRF) and fast variable astronomical objects" (period 2020-2022), and similar international investigations supported by IAU.

Short talk

DEEP LEARNING FOR CLASSIFICATION OF LONG-PERIOD VARIABLE STARS IN THE LOCAL GROUP

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The rapid growth of photometric data for variable sources in the past few years has solidified the need for their automated classification. In this paper, we apply different neural network architectures (1D-convolutional NNs, one- and bidirectional recurrent NNs using GRUs and LSTM cells) and architecture augmentation techniques (residual networks – He et al., 2016, Inception blocks – Szegedy et al., 2015 and self-attention – Vaswani et al., 2017) to data obtained by the synoptic survey of M33 (Pellerin & Macri, 2011). In addition, we use the WISE, OGLE-III and Gaia catalogs as controls to validate the research methods.

We take raw multi-band light curves as input and produce classification probabilities as output. We focus on long-period variable stars – Cepheids, RR Lyrae, Miras and eclipsing variables. We compare the performance of the deep learning models to traditional classifiers – linear models and random forests in terms of classification performance and computational complexity.

The analysis shows that neural networks have comparable or better performance to standard machine learning techniques. In addition, they need minimal to no data preprocessing which enables their application to very large datasets with little scientist intervention.

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Short talk

STARK BROADENING OF Be II SPECTRAL LINES

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Calculations of the Stark broadening parameters of singly ionized beryllium spectral lines will be presented. The work is based on the semi-classical theory developed in (Sahal-Bréchot, 1969a,b). Values of energy levels in (Kramida *et al.* 2005) are used.

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Short talk

DENSITY PROFILE OF A SELF-GRAVITATING POLYTROPIC TURBULENT FLUID IN THE CONTEXT OF MOLECULAR CLOUDS

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The present work is aimed at obtaining of an equation for the density profile function in self-gravitating polytropic spherically symmetric turbulent fluids. Using the equations for such physical media, on the assumption of steady state, we show that the total energy per unit mass is an invariant with respect to the fluid flow. We obtain a non-linear integral equation for the density profile function. It describes the balance of the kinetic, thermal and gravitational energy of a fluid element and resembles the classical Bernoulli's equation. A method to obtain an approximate solution is also proposed.

This study is a natural continuation of the research program set in Donkov, Veltchev, Klessen 2017, Donkov, Stefanov 2018 and Donkov, Stefanov 2019. In these works the case of a self-gravitating isothermal spherically symmetric turbulent fluid was considered.

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Short talk

APPLICATIONS OF MANIFOLD LEARNING TECHNIQUES TO SPECTRAL PARAMETERS OF QUASARS

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Variations in different spectral parameters of type 1 quasars may be explained by their position in the parameter space known as Eigenvector 1 (E1) where quasars populate an elbow-shaped main sequence. The E1 and the quasar main sequence were first revealed by applying principal component analysis (PCA) on a sample of ~80 quasars (Boroson & Green 1992). In this contribution, we apply manifold learning techniques on a sample of low redshift ($z < 0.35$) type 1 quasars taken from the Sloan Digital Sky Survey Data Release 7 quasar catalog (Liu et al. 2019) and compare our results to previous research related to identification of driving mechanism behind the main sequence. Furthermore, we test how well manifold learning algorithms perform in classification of different quasar populations (Sulentic et al. 2000) compared to PCA. Our preliminary results indicate that Locally Linear Embedding (LLE) algorithm performs better than PCA in classification of quasar populations when we input large number of parameters. Also, the results are in agreement with the previous findings which indicate that Eddington ratio is indeed driving the main sequence.

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Short talk

COLOR VARIABILITY OF SOME QUASARS IMPORTANT TO THE ICRF – GAIA CRF LINK

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Observations of 47 candidate sources important for the ICRF – Gaia CRF link have been carried out by using two telescopes at the Astronomical Station Vidojevica (of the Astronomical Observatory of Belgrade) and the one at the Rozhen National Astronomical Observatory (Bulgaria). We tested brightness variability of five candidate sources using the F–test. For the four variable objects we estimated sinusoidal parameters of quasiperiods of their light curves using the method of Least Squares. The color variability for the period from July 2016 to August 2019, and color-magnitude variability for the same period are presented here.

Short talk

INFLATIONARY MODELS, REHEATING AND SCALAR FIELD CONDENSATE BARYOGENESIS

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We analyze the baryon asymmetry value obtained for 70 sets of parameters of the Scalar Field Condensate Baryogenesis (SFC) model in different inflationary scenarios and for different reheating scenarios. We have found sets of SFC model's parameters , for which the observed value of the baryon asymmetry of the Universe can be successfully generated in the following inflationary scenarios: modified Starobinsky inflation, quintessential Inflation, chaotic inflation in SUGRA and chaotic inflation in case of delayed thermalization. Interestingly enough these inflationary models are among the observationally preferred by latest Planck data. On the contrary new inflation, Shafi-Vilenkin chaotic inflation and MSSM inflation lead to baryon asymmetry generation by several orders of magnitude higher than the observed one.

Preliminary results on these issues were presented in (Kirilova, Panayotova 2019).

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Short talk

STARK BROADENING OF Co II LINES IN STELLAR ATMOSPHERES

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Stark Full Widths at Half Maximum for 46 Co II multiplets have been calculated (Majlinger et al., 2018, 2020) using modified semiempirical method (Dimitrijević and Konjević, 1980). The obtained results have been used to investigate the significance of Stark broadening mechanism for Co II lines in DA and DB white dwarf and A type star atmospheres. We examined the influence of surface gravity (log g), effective temperature and wavelength of the spectral line, on the importance of the inclusion of Stark broadening contribution in the profiles of the considered Co II spectral lines, for plasma conditions in atmospheric layers corresponding to different stellar opacities.

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Short talk

THE FIRST RESULTS OF THE PHOTOMETRIC REVERBERATION PROJECT AT THE 1-M TELESCOPE OF SAO RAS

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The most popular method of supermassive black hole (SMBH) mass estimation in active galactic nuclei (AGN) is the reverberation mapping based on measuring the time delay between the continuum flux and the flux in the emission lines. We apply the method of photometric reverberation mapping in mid-band filters, adapted for observations on the 1-m Zeiss-1000 telescope of Special Astrophysical Observatory of Russian Academy of Sciences (SAO RAS), for the study of 8 AGN with broad lines. We present the first results for the two most bright objects of the sample – 2MASX J0853+77 and VII Zw 244. The central SMBH masses were estimated by the correlation analysis of the two-year time series provided by JAVELIN and spectral data obtained with SCORPIO-I/II at the 6-m BTA telescope of SAO RAS.

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Short talk

EXTRACTION OF A SECOND POWER-LAW TAIL OF THE (COLUMN-) DENSITY DISTRIBUTION IN STAR-FORMING CLOUDS

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The emergence and development of a power-law tail (PLT) at the high-density end of the observed column-density distribution is thought to be indicative for advanced evolution of star-forming molecular clouds. As shown from many numerical simulations, it corresponds to a morphologically analogous evolution of the mass-density distribution. The latter may display also a second, shallower PLT at the stage of collapse of first formed protostellar cores (Kritsuk et al. 2011). However, it is difficult to estimate the parameters of this second PLT due to resolution constraints. To solve the problem, we extend the method for extraction of single PLTs from arbitrary density distributions, suggested by Veltchev et al. (2019), and apply it to a set of hydrodynamical simulations of isothermal self-gravitating clouds with high level of refinement in the high-density zones. The results confirm the emergence of a shallower second PLT at timescales, comparable with the free-fall time of the average density in the box.

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Short talk

NO-Z MODEL FOR MAGNETIC FIELDS OF ACCRETION DISCS

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Magnetic fields of accretion discs around such objects as white dwarfs, neutron stars and black holes can play an important role in their evolution. For example, they can explain the transition of angular momentum and another effects (Shakura, Sunyaev 1973). The typical kinematic parameters of them allow us to suggest that they can be connected with the dynamo mechanism. This process is well known for the Sun, galaxies and another celestial bodies. It is usually based on differential rotation and alpha-effect, which compete with turbulent diffusion. So the dynamo is a threshold mechanism: the magnetic field can be generated only for large values of dimensionless dynamo number.

As for the galaxies which have a shape of thin disc, the magnetic fields are usually studied using no-z approximation (Moss 1995). It assumes that the field mainly lies in the equatorial plane, so we can change some of the partial derivatives by algebraic expressions. This model gives us an opportunity to have both theoretical estimates and numerical solutions (Moss *et al.* 2016a).

As for the accretion discs, it is possible to use the similar approach, taking into account another time and length scales (Moss *et al.* 2016b). We have constructed a model of the magnetic field of accretion discs using no-z approximation. One of the main features is connected with conditions on the inner boundary and type of the nonlinearity in the dynamo equations. We have shown that if we take physically justified formula, it is possible to obtain the solutions that describe different effects properly. During first period, the magnetic field grows exponentially and then saturates. The saturated field has quite moderate values, having a maximum near the inner boundary. We present typical dependences for the field in different typical cases.

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Astronomical Observatory, Belgrade, 2020

Short talk

N-BODY SIMULATIONS OF STELLAR STREAMS, BARS, SHELLS AND RINGS IN SPIRAL GALAXIES

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We used N-body simulations to explain the formation of structures in spiral galaxies. Those observed structures like bars, shells, streams can be formed in mergers, flybys, and the evolution of galaxies in isolation. We used N-body models for spiral galaxy similar to Milky Way and a dwarf galaxy. Spiral galaxy is presented with three components: disk, bulge and dark matter halo. For dwarf galaxy, we investigated two possibilities: with and without disk, while other components are also spherical bulge and dark matter halo. In different scenarios of merger and flyby events, different structures are formed. We found parameters of those interactions, like initial positions and velocities of galaxies and describe properties of the formed bar, stream, and other structures.

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Short talk

POLARIZATION OF WHITE-LIGHT SOLAR CORONA DURING TOTAL SOLAR ECLIPSES

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We summarize the observations of the polarized white-light solar corona obtained during two total solar eclipses – 2006 March 29 and 2019 July 2. Our results are connected to the effect of polarized light of the sky to the polarized solar corona. The impact of sky polarization effect is defined by the position of the singular polarization point (where the intensity of the K-corona equals the sky polarization emission). Observations of 2006 total solar eclipse show that the singular polarization point is approaching the solar disk center as the Sun's altitude above the horizon decreases. Data from two observational teams situated at different locations (in Chile and in Argentina) during 2019 is also presented. Contrary to the previous results, the singular polarization point is closer to the center of the solar disk when the Sun is higher. These two opposite dependences suggest that the polarized sky emission reaches maximum value during the totality when the Sun is located between 10 and 40 degrees above the horizon.

Short talk

SPECTROPOLARIMETRIC OBSERVATIONS OF THE RECURRENT NOVAE

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Recurrent Novae (RNe) are nova systems that have more than one recorded outburst. There are currently 10 confirmed RNe in the Galaxy (Schaefer, B. 2010). The presence of a massive, accreting white dwarf in RNe systems, with the possibility of the white dwarf increasing its mass, makes them potential progenitors of Type Ia supernovae. RNe can be divided into (a) long and (b) short period systems (Anupama, G.G. 2013). The long period systems consist of red giants and white dwarf: RS Oph, T CrB, V3890 Sgr and V745 Sco. The short period systems are further divided into U Sco and T Pyx groups based on the outburst and quiescent properties (Anupama, G.G. 2013).

Cropper (1990) observed variable linear polarization of RS Oph during 1985 outburst indicating the presence of intrinsic polarization. Our observations of RS Oph from July 2017 to July 2018 indicate that at the time of our observations, there is no intrinsic polarization in RS Oph (Nikolov et al., 2019). T Pyxidis show variable, intrinsic linear polarization during 2011 recurrent novae outburst (Pavana et al.,2019).

I will present spectropolarimetric observations of long period systems RS Oph and T CrB.

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Short talk

BROAD LINE POLARIZATION IN ACTIVE GALACTIC NUCLEI: MODELS AND OBSERVATIONS

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Spectropolarimetry of broad emission lines allows us to probe the geometry and dynamics of the innermost region of active galactic nuclei (AGNs). A key information about the kinematics is obtained from the polarization plane position angle and it can be used for measuring the mass of the supermassive black holes (SMBHs) which reside in the center of AGNs (Afanasiev, Popovic 2015). This method has been successfully applied to around thirty AGNs and it is in a good agreement with other methods. However, this method has only been applied to Hα emission line, but never applied to other broad lines such as Mg II, C III] and C IV.

In this work, we present the simulated profiles of the polarization angle for Mg II line using the radiative transfer code STOKES (Goosman, Gaskell 2007, Marin *et al.* 2012). We compare the results of our simulations with the observations.

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Short talk

STOKES POLARIMETER FOR 1-METER TELESCOPE

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In this work we describe a new device Stokes-polarimeter (StoP) designed in the Laboratory of spectroscopy and photometry of extragalactic objects of SAO RAS and put into operation on the 1-m Zeiss-1000 telescope in January 2020. Using the device one can conduct observations in both photometric and polarimetric modes using a double Wollaston prism (Geyer et al. 1996, Oliva 1997). The characteristics of the device and the accuracy achieved in each of the modes are presented. The capabilities of the device are demonstrated by examples of observations of several astronomical objects.

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Short talk

TRACING THE LOCAL MORPHOLOGY OF THE MOLECULAR CLOUD ROSETTE USING MOLECULAR-LINE AND DUST-EMISSION DATA

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High-resolution molecular-line maps of molecular clouds combined with dust opacity data manifest their fractal hierarchical structure traced by local condensations: clumps and cores. The physics of the latter is governed by gravity and supersonic turbulence testified by large non-thermal linewidths scaling with the size. We perform a comparative analysis of the derived properties of clump populations in the molecular cloud Rosette extracted from ^{12}CO and ^{13}CO FCRAO and *Herschel* maps. Two alternative extraction techniques are used: i) GAUSSCLUMPS, which defines clumps as an ensemble of independent objects with Gaussian shapes; and ii) DENDROGRAM, which considers clumps as hierarchical set of embedded structures. Analysis of the scaling relations of basic clump characteristics allows provides some links between the local moprhology in the cloud and its general structure and physics.

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Short talk

APPLICATIONS OF PHOTONICS IN EXOPLANETOLOGY: DIFFRACTION LIMITED SINGLE MODE ECHELLE SPECTROGRAPHS AND ATOMIC LINE REFERENCED FIBER FABRI PEROT CALIBRATORS FOR REACHING EXTREME PRECISION RADIAL VELOCITIES IN DOPLER SPECTROSCOPY

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In this work we will discuss aplications of photonic technologies in the field of exoplanetology. In order to fulfill a task of detection of earth mass planet around a solar analagous star a suite of stirgient requirements have to be met. First is stabilisation of the instrument be it mechanical stability, pupil illumination and PSF profile, temperature or pressure. Second is precise and absolute referenced callibation sistem with equidistant and uniform spectral features. First criterion is met by use of single mode optical fibers that couple spectrograph to the telescope. SMFs conduct only fundamental mode that result in a Gaussian beam profile through which modal noise is mitigated. Due to of small size of the pseudoslit presented by the fiber exit resolution is larger, spectrograph optics can be made order of magnitude smaller, less dependent on aberration control an due to reduced volume such instrumetns are easy to temperature and pressure stabilise. Second criterion is met by use of Fiber Fabry Perot Interferometers that are absolutely referenced to the D_2 line transition of Rubidium atoms by use of Saturation Absorption Spectroscopy. The FFPI are compact photonic devices that deliver a set of equidistant and homogeneous spectral features. By use of cross-correlation, absolute locking to Rubidium lines, and periodic referencing to Th-Ar lines we can achieve stability of less than m/s during the weeks of continuous use.

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Short talk

SOLAR WALTZ

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A sundial is a clock that measures time according to the position of the sun. As the position of the sun changes, the shadow shows time. Sundials can be adjusted to any surface on which a fixed object throws a shadow. Sundials show only a day's solar time. The sundials were known in Egypt. They were also developed by other cultures: the Chinese, the Ancient Greeks and the Romans. The type of sundial with a pointer (gnomon) is described in the Old Testament (Isaiah 38: 8). It is believed that the mathematician and astronomer Theodosius of Bithynia (about 160 BC - about 100 BC) invented an universal sundial that could be used anywhere in the world.

In this report we will give an overview of the location of sundials in Vojvodina. Who are the makers of the clocks? From which period do they origin? The work will show photographs of sundials in: Sombor, Zrenjanin, Krušedol, Pančevo, Kumane, Mokrin, Sremska Mitrovica, Kikinda. The contribution also offer the data on the clocks and their makers, those who are known to be certainly the creators.

СУНЧАНИ ВАЛЦЕР

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Сунчани часовник је часовник који мери време према положају сунца. Како се положај сунца мења, мења се и време које сенка показује. Сунчани сатови могу да се прилагоде свакој површини на коју фиксирани објекат баца сенку. Сунчани сатови показују само дневно соларно време. Сунчане сатове су познавали у Египту. Развиле су их и друге културе: Кинези, Антички Грци и Римљани. Врста сунчаног сата с показивечем (гномон) описана је у Старом Завету (Исаија 38:8). Сматра се да је математичар и астроном Теодосије из Битиније (око 160. п. н. е. – око 100. п. н. е.) изумео универзални сунчани сат који је могао да се користи било где на свету.

У овом прилогу дађемо преглед сунчаних сатова у Војводини. Ко су аутори сатова. Из кога времена потичу. У раду ће бити приказане фотографије суначаних сатова у: Сомбору, Зрењанину, Крушедолу, Панчеву, Куману, Мокрину, Сремској Митровици, Кикинди. У прилогу се такође пружају подаци о сатовима и њиховим ауторима, за које се поуздано зна.

POSTER PAPERS

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Poster paper

ON THE DISTRIBUTION FUNCTION OF PARTICLES AT QUASI-PARALLEL COLLISIONLESS SHOCKS

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The departure of particle distributions from the Maxwellian is commonly observed in space plasmas. These non-Maxwellian distributions which are typical for plasmas that are not in thermal equilibrium, can be modeled with Kappa distribution function. Kinetic simulations of quasi-parallel collisionless shocks show that proton distribution is a composite of thermal, supra-thermal, and non-thermal parts, which correspond to thermalized, pre-accelerated, and diffusive-shock-accelerated protons, respectively. By using particle-in-cell shock simulations, we show that Kappa distribution adequately fits thermal and supra-thermal parts together, as one continuous distribution in early proton spectra. We find that the index κ of the distribution increases over time, following the decrease in supra-thermal part. At later times, initially strong supra-thermal part almost completely fades, leaving the proton distribution composed of a Maxwellian and a power-law.

Poster paper

OPTICAL FOLLOW-UP OF TRANSIENT EVENTS FROM BELOGRADCHIK OBSERVATORY IN THE ERA OF THE MULTI-MESSENGER ASTRONOMY

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For the last two decades the 60cm telescope of Belogradchik Observatory, Bulgaria was extensively used to monitor optical behavior of transient events: flaring blazars, variable X-ray binary systems, asteroid occultations, etc. Since year 2020, in the era of the multi-messenger astronomy, a new wild-field camera has been installed to search for optical counterparts of neutrino, gravitational-wave and gamma-flare events. Here we present examples of successful transient observations. Variability characteristics and the role of the small telescopes for understanding the physics of these interesting objects are discussed.

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Poster paper

MID-CYCLE OBSERVATIONS OF CR Boo AND ESTIMATION OF THE SYSTEM PARAMETERS

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We present simultaneous observations (with Rozhen and Vidoevica telescopes) of the AM CVn star CR Boo in UBV bands. The data are obtained in two nights in July 2019, when the V band brightness was in the range 16.1 - 17.0 mag. In both nights a variability with a period of 25±1 minutes and amplitude of about 0.2 magnitudes is visible. These brightness variations are most likely indications of "humps". During our observational time, they appear with the period similar to the CR Boo orbital period. Possible reason of their origin is the phase rotation of the bright spot, placed in the contact point of the infalling matter and the outer disc edge.

We estimated some of the parameters of the binary system, on the base of the observational data.

Poster paper

INTERANNUAL VARIATIONS OF J2 COEFFICIENT OF EARTH GRAVITY FIELD DUE TO SOLAR HARMONICS

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The variations of low degree gravity coefficients are strongly connected with Earth rotation oscillations, winds, atmospheric angular momentum, mean sea level, polar ice thickness and global hydrologic cycles. The energy source of their excitation is usually solar activity. The coefficient of second gravity harmonic J_2 is determined by laser observations of several geodetic satellites for the last 40 years. The time series spectrum of J_2 variations consists of several significant oscillations with periods of 1yr, 1.2yr, 1.3yr, 1.5yr, 2yr, 2.5yr and 4-7yr. These oscillations are compared with the interannual harmonics of the Total Solar Irradiation (TSI) variations for the period 1976-2012. The possible interconnection between the solar harmonics, atmospheric angular momentum, mean sea level, earth rotation and J_2 variation is discussed.

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Poster paper

KINEMATICS AND EUV BRIGHTENING EVOLUTION OF A SURGE TRIGERING AN ERUPTIVE PROMINENCE

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We study a solar surge in AR SPoCa: SOL2014-03-14T04:081 using the multiwavelength data obtained by Atmospheric Imaging Assembly (AIA) of Solar Dynamics Observatory (SDO) on 2014 March 14. The surge appeared at the eruptive prominence (EP) footpoints and rises vertically up to a height of ~73 Mm then it falls and fades gradually. Its total lifetime was ~65 minutes. The surge rising clearly showed two subphases: accelerative and decelerative. The accelerative subphase showed speeds in the range 3-65 km/s at accelerations 0.5-129 m/s^2. During the deceleration the surge rose with constant deceleration of -54.8 m/s^2 and at falling speeds 65-13 km/s. During the downflow phase the surge plasma fell back with a speed of 27 km/s. The analysis of surge EUV brightening, as a signature ot tether-cutting (TC) reconnection revealed four brightening episodes. The results infer that TC reconnection led to the surge triggering in first episode and the surge splitting and EP bright flux rope origin in second and third episodes, as well. The EUV brightening at the footpoints of surge-EP event and in the thin BFR in fourth episode was due to surge mass impact at footpoints. The crucial role of the BFR for the further EP evolution infer that the surge via TC reconnection triggered the EP.

Poster paper

THE NEW COMPUTATIONAL CLUSTER OF THE INSTITUTE OF ASTRONOMY AND NAO

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We present here the newly built computational cluster Urania.

Last year, the Institute of Astronomy and NAO (IANAO) purchased new server hardware for the needs of the institute network, which was subsequently consolidated into a computer cluster called "Urania".

The Urania cluster is built on the basis of hyper-converged infrastructure (storage and computing nodes share the same hardware – servers). Urania's total capacity is: Processor cores: 192; Memory: 256 GB; HDD space: 31TB.

Two main technologies were used – ProxMox Virtualization Environment and CEPH - a software defined storage.

The main tasks that are currently underway are described and the prospects for future development are discussed.

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Poster paper

MILUTIN MILANKOVIĆ AND ASSOCIATES IN THE CREATION OF THE "KANON"

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Milutin Milanković (1879–1958) took a different approach to climatology, when compared to meteorologists of his time, and can be considered a key figure in laying down the foundations of modern climatology, were celestial mechanics was the foundation upon which Milanković based his theory of climate change.

A great deal of work has been done at the Astronomical Observatory in Belgrade, on the scientific research of Milutin Milanković. Regarding the work of the French astronomer Le Verrier (1811–1877), the calculations of secular changes in the astronomical elements of the Earth's trajectory were revised, taking into account the mass of each of the planets known until 1928. Under the guidance of Vojislav Mišković (1892–1976), director of the Astronomical Observatory, mathematicians Stanimir Fempl (1903–1985), then an assistant, and Dragoslav Mitrinović (1908–1995), then a student, performed the lengthy and very comprehensive calculations using mechanical calculators. At the University of Belgrade in 1932, their scientific endeavor was completed. It consisted of forming an approximate picture of the insolation of the Earth's surface, as well as the relationship that exists between the insolation and the temperature of both the Earth's surface and the atmosphere. The work involved mathematicians and astronomers who taught mathematical physics, celestial mechanics and astronomy. Mathematician Mihailo Petrović Alas (1868–1943) published a paper on this important project. The problem of the shape of the Earth and the position of the Earth's poles was addressed by Milanković in 1932 and 1933, prompted by the earlier suggestions of Alfred Wegener (1880–1930).

Milutin Milanković published papers on the subject of *Mathematical Climatology* in significant scientific publications, such as the *Handbook of Climatology* and Gutenberg's *Handbook of Geophysics*. However, as he noted, his works were rarely accessible to scientists interested because few of the libraries had all the volumes of these Handbooks and other journals. The idea of creating his *Kanon* was presented on March 27, 1938 at a meeting of the Academy of

Natural Sciences in Belgrade, when a decision was made to publish it in the edition of the Serbian Royal Academy in German language, thereby making it accessible to foreign scientists as well. It was completed in 1941.

Mathematician Tatomir Andjelić (1903–1993) did a tremendous amount of work in checking the formulas, numeric tables, and language during the preparation of Milankovic's *Kanon*.

After WWII, under the heading *Open Problems*, Milanković presented 26 topics, related to his work, for further investigation to members of the Mathematical Institute, the Astronomical Institute, as well as graduate and doctoral students. He presented several topics that are related to his overall Kanon as well, such as "Calculating the coefficients b_o, b_1, b_2, b_3 of Table VI (*Kanon*, p. 312) using the method reported on pp. 313–315 of the *Kanon.*"

Poster paper

STORM ACTIVITY OVER BALKAN REGION DURING MAY 2009

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Intense storm activity over Balkans (40°/48° N, 12°/23° E) at the end of May 2009 was analysed. Surveying was carried out by integration of satellite and ground-based observations. Very Low Frequency (VLF) signals (3-30 kHz) recorded by Absolute Phase and Amplitude Logger station in Belgrade (44.85° N, 20.38° E), video recordings of sprite events from ITALIAN METEOR and TLE NETWORK and lightning stroke data from Cooperation for Lightning Detection network were inspected for possible relationship. Different type and magnitude of perturbations on monitored VLF signals were observed, even originated from same lightning discharge. Correspondence between all three examined phenomena was found, in some of analyzed cases.

Poster paper

PRESENTATION OF THE PROJECT "ERUPTIONS, FLOWS AND WAVES IN SOLAR ATMOSPHERE AND THEIR ROLE IN SPACE WEATHER"

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Various types of solar eruptions such as: filament eruptions, solar flares, Coronal Mass Ejections in solar atmosphere are common characteristics of solar activity. These activities can generate various flows and waves which carry the significant amount of energy in the upper solar atmosphere to heat it. They can affect our space weather in various ways like: geomagnetic storms, sudden ionosphere disturbances, ground level enhancements (GLEs), Solar Energetic Events (SEPs) etc. However, physics involved in these activities is poorly understood. Therefore the investigation of their physical mechanism is very crucial for the space weather prediction.

We outline a new collaborative project between scientists from the Bulgarian Academy of Sciences (BAS), Bulgaria and the Department of Physics, Kumaun University, Nainital, India. The goal of this project is to investigate the solar eruptions from small-to-large scales and the generation of various types of waves/flows in the solar atmosphere. Efforts will be made to probe the role of these activities on the space weather. For this study, we will analyze the data from various ground based and space borne instruments.

Poster paper

SUPERMASSIVE BINARY BLACK HOLE CANDIDATE PG 1302-102: OSCILLATIONS AND PERTURBATIONS IN THE PHOTOMETRIC LIGHT CURVE

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PG 1302-102 shows periodic variability, which makes this object one of the most promising supermassive black hole binary candidates. Interestingly, a newly collected data shows an interesting pattern which was interpreted as a decrease in the significance of periodicity, which may suggest that the binary model is less favorable. We present detailed analysis of photometric PG 1302-102 light curve including 1) a supermassive black hole binary system model in which a perturbation in the accretion disk of a more massive component is present; 2) our 2DHybrid method for periodicity detection in the light curves.

Our model explains well observed light curve, using a slight perturbation of a sinusoidal feature, and predicts that a slightly larger period than previously reported, of about 1899 days, could appear due to a cold region in the disk of a more massive component of a close, unequal-mass (q=0.1) black hole binary system. According to our model, one could expect that light curve follows the pattern of a sinusoid-like shape within a few years, which could be observed by sky surveys. Using our 2DHybrid method for periodicity detection, we calculated that the periods in the observed (1972 ± 254 days) and modeled (1873 ± 250 days) light curves are within 1σ, which is also consistent with result from our physical model and with previous findings. Thus, the periodic nature and its slight fluctuation of the light curve of PG 1302-102 are explained by our physical model and confirmed by our 2DHybrid method for periodicity detection.

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Poster paper

THE SPECTRAL PROPERTIES OF THE LARGE SAMPLE OF AGN TYPE 2

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We investigated the spectral properties of the large sample of the AGNs (Active Galactic Nuclei) type 2 taken from the SDSS, DR12. We found that ~49% of the sample have asymmetry in narrow line profiles, while in the rest of the sample there is no asymmetry, and the narrow line profiles can be fitted with the only one Gaussian. We compared the correlations between the spectral properties in these two subsamples (with and without asymmetry in narrow line profiles), and we found significant differences, which reflect different physical and kinematical properties in emission regions of these subsamples.

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Poster paper

MODELING THE SHOCK ACCELERATION AND HELIOSPHERIC TRANSPORT OF SOLAR PROTONS WITH SPREAdFAST

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We present the project SPREAdFAST – Solar Particle Radiation Environment Analysis and Forecasting - Acceleration and Scattering Transport, as well as recent updates to the modeling and forecasting framework. This investigation fulfills a vital component of the space weather requirements of ESA's Space Situational Awareness program by contributing to the capability to protect space assets from solar activity space radiation. It will allow for producing predictions of SEP fluxes at multiple locations in the inner heliosphere, by modelling their acceleration at Coronal Mass Ejections (CMEs) near the Sun, and their subsequent interplanetary transport using a physics-based, data-driven approach. The system prototype will incorporate results from our scientific investigations, the modification and linking of existing open source scientific software, and its adaptation to the goals of the proposed work. It will incorporate a chain of data-driven analytic and numerical models, for estimating: coronal magnetic fields; dynamics of large-scale coronal (CME-driven) shock waves; energetic particle acceleration; scatter-based (not simple ballistic), time-dependent SEP propagation in the heliosphere to specific time-dependent locations.

Poster paper

THE SPECTROSCOPIC CORRELATIONS AND MODEL OF DUSTY HYPERBOLOID WITH A THIN DISK

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We found the possible connection between the model of the dusty hyperboloid shell with a thin disk (Stalevski et al. 2019) and several correlations of optical and mid-infrared spectroscopic parameters (Lakićević et al. 2018. and references therein) obtained for Narrow Line Seyfert 1 (NLS1) galaxies and Broad Line Active Galactic Nuclei (BLAGN). That may suggest that NLS1s are seen under the smaller inclination angles than BLAGNs (as proposed in numerous literature). That could explain why NLS1s have lower luminosities than BLAGNs and why NLS1s have different correlations than BLAGNs.

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Poster paper

THE INFLUENCE OF THE INTERNAL REDDENING ON ESTIMATION OF BLACK HOLE MASS IN QUASARS

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Here we investigate the influence of the internal (intrinsic) reddening (caused by the extinction within the quasars) on estimation of the central black hole mass in 84 quasars, using the spectra obtained from the SDSS database. This investigation aims to improve a relatively weak correlation (Spearman coefficient ρ=0.47 Po=5.6E-6) found between the masses of the supermassive black holes obtained by the virial method (using the width of Hβ) and those estimated using the M-σ correlation.

Poster paper

DATA MINING: ANALYSIS OF THE HQM AND JOMPQ LIGHT CURVES OF AGNs

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We select a sample of blazars within the Hamburg Quasar Monitoring Programme (HQM) and the Joint Optical Monitoring Programme of Quasars (JOMPQ) with a sampling rate (defined in Borgeest, Schramm 1994) of the long-term light curve larger than 5 to guarantee enough data points. We perform structure function analysis of the light curves and determine the corresponding slopes. The linear trends are interpreted as a change in the viewing angle of the emitting blobs and the corresponding rates are calculated. Colour-magnitude analysis is performed for multi-band data. In the cases of repeated observations during the night the intra-night variability is also characterized.

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Poster paper

INTRA-NIGHT MONITORING OF THE BLAZAR 0716+714: RESULTS FROM THE 2011 CAMPAIGN

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The BL Lac object 0716+714 is among the brightest and most highly variable blazars. Its duty cycle (i.e., the fraction of time when an object displays intra-night variability, Romero *et al*. 1999) is close to 90% (e.g., Agarwal *et al*. 2016).

We started a monitoring programme of 0716+714 variability on intra-night time scales. Here we report the results for the 2011 observing campaign – a total of 6 successful observing runs. The observed light variations of the blazar could be described as smooth trends with some fluctuations superimposed most probably related to a change in the orientation of the emitting blobs and turbulences in the jet. Flaring activity was detected in a single night – for that night we approximated the light curve with a double-exponential function and estimated the flare parameters. Generally, the light variations are best pronounced in the *B* band and less – in the *I* band.

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Poster paper

OCCURRENCE RATE AND CAUSAL RELATIONSHIP OF EXTREME SPACE WEATHER EVENTS

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As extreme space weather phenomena in this study are considered all solar flares above X9, the fastest coronal mass ejections, the strongest geomagnetic storms and the most-intense in proton flux solar energetic particles. These phenomena are mutually interconnected and/or occur in close succession. The extremes of each category in the recorded history of ground-based and satellite observations are identified and their occurrence rates are calculated. A set of criteria is proposed to relate a given geo-effective event with its origin and the accompanying space weather phenomena. The results are presented and discussed.

Poster paper

MULTICOLOUR OBSERVATIONS OF THE FLICKERING SOURCE OF RX And

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Here we present optical CCD photometry of *RX Andromedae*, a cataclysmic variable of type Z Cam dwarf nova. Observations were conducted for 5.5 hours on October 25th 2019. Data was collected quasi-simultaneously using the 50/70 cm Schmidt telescope at the National Astronomical Observatory Rozhen in 5 bands - U, B, V, R, and I.

After analyzing the amplitude of the variability in time we can conclude that the flickering amplitude reaches ~0.2 magnitudes in filter U. Following the approach of Bruch (1992) and its application (e.g. Zamanov 2010) we also estimate the temperature of the flickering source.

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Poster paper

LOWER IONOSPHERE DISTURBANCES: THEIR POSSIBLE RELATIONSHIP WITH EARTHQUAKES, AND INFLUENCE ON SATELLITE SIGNALS

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We present two directions in recent studies of the lower ionosphere related to natural hazards and to the satellite signal propagation. In the first part, we focus attention on variations in the short-period noise amplitude within the time period around an earthquake onset which can be considered as a possible earthquake precursor (Nina, Pulinets et al. 2020). The second part contains detailed explanations about effects of the perturbed D-region on propagation of satellite signals utilized for positioning and Earth observation purposes (Nina, Nico et al. 2019).

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Poster paper

STUDY OF THE BRIGHTNESS SPREADING IN SOLAR ERUPTIVE PROMINENCE IMAGES

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We study an interesting case of solar prominence eruption (EP). The EP was observed on 2012 August 31. We describe the brightness evolution of the event, seen from two different points of view. For the purpose of our study we used EUV data from the Atmospheric Imaging Assembly (AIA) onboard the Solar Dynamic Observatory and from EUVI/ STEREO.

The test points in the images are localized after alignment and full overlapping of the sun disc. A field of gradient calculated between two images is used to enclose the slices with minimal changes of the luminosity. Since the image processing is provided over fts file format, the initial data are restricted to 12 digital bits. A special software module is prepared for the aim of the study.

We discuss some possible trigger mechanisms of the observed eruptive sequence.

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Poster paper

MICROLENSING OF POLARIZED LIGHT OF THE GRAVITATIONAL LENS J1004+4112

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Here we present spectroscopic and polarimetric observation of gravitational lensed quasar J1004+4112. We found that change in the polarization parameters of component D can be explained by microlensing. We discuss the effects of microlensing in the C IV spectral line of component A giving a model of a partly outflowing BLR that emits C IV line. The results of our investigations and detailed discussion are given in Popović et al. (2020).

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Poster paper

STAR FORMATION IN THE HOST GALAXIES OF RADIO-QUIET QUASARS

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The far-infrared (FIR) and radio luminosities of star forming galaxies are involved in a tight linear empirical correlation over a wide range of galaxy types and magnitudes. Besides, the contribution of star formation in the radio emission of radio-quiet quasars (RQQs) is still an open issue. Generally, disentangling the share of the active galactic nuclei (AGNs) and host galaxies in the Spectral Energy Distributions (SEDs) is not trivial.

Considering the above arguments, we initiated a study on the star formation in RQQs. We constructed the FIR-to-UV SEDs and fitted them with models accounting for the accretion disk, torus, host galaxy stellar population, and cold dust using the AGNfitter code (Calistro Rivera et al. 2016). We present the results for Mrk 477, the closest obscured quasar (z=0.0377). Its innermost regions are scrutinized using high-resolution structure maps. Star formation (SF) parameters (history, age, rates in the optical and infrared, etc.) are estimated. We discuss the time delay between the AGN and the star formation triggering.

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Poster paper

DESTRUCTION OF SOME MOLECULAR IONS OF ASTROPHYSICAL INTEREST

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Opacities of stellar atmospheres are caused by a huge number of radiative processes. As part of the development of more sophisticated stellar atmosphere models, we can further explore known processes and include all processes not previously discussed (Srećković *et al.* 2017). The average cross-section for the photodissociation and the corresponding spectral absorption coefficients of the molecular ions Li_2^+, Na_2^+, $LiNa^+$, H_2^+ and HeH^+ are calculated for the wide region of temperatures and wavelengths ready for further use with a particular accent to the applications for astro plasma research and low temperature laboratory plasma research.

The results for the average photodissociation cross-sections and rate coefficients of the diatomic molecular ions as examples are presented in this poster. The results show the behavior of destruction cross-section and rate coefficient as a function of wavelengths, for a wide range of temperatures T, which are relevant for modeling astrophysical plasmas (Ignjatović *et al.* 2017) and low temperature laboratory plasma research created in gas discharges (Marinković *et al.* 2017), where plasma conditions may be favorable for processes investigated here (Pichler *et al.* 2017).

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Poster paper

COOPERATION BETWEEN THE ASTRONOMICAL OBSERVATORY IN BELGRADE AND INSTITUTE OF PHYSICS BELGRADE IN INVESTIGATION OF COLLISIONAL AND RADIATIVE ATOMIC PROCESSES IN ASTROPHYSICS

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In this poster we present the results of man-years cooperation between members of the Institute of Physics Belgrade and members of the Astronomical Observatory in Belgrade in the field of investigation of radiative and collisional atomic processes in astrophysics.

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Poster paper

DISTURBANCES OF THE LOWER IONOSPHERE INDUCED BY SOLAR FLARES DURING TRANSITION PHASE OF 24 SOLAR CYCLE

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VLF radio amplitude and phase measurements are used to study changes in the reflection height and sharpness of the D region of the ionosphere induced by different classes of solar flares during the phase transition of 24 Solar Cycle. Solar flares of C, M and X (up X9) classes occurred in this period. Our results are based on investigations of amplitude and phase perturbations of VLF radio waves during time sectors before dusk or after dawn. These perturbations are usually higher than the perturbations occurring during local noon under similar intensities of solar flares. Also, the values of perturbations are different over VLF short (located in one time sector) or long (located over five or six time sectors) distances between transmitters and Belgrade site.

Poster paper

ROLE OF DIFFRACTION LIMITED PHOTONIC SPECTROGRAPHS IN EXOPLANETOLOGY: CASE STUDY OF HPCF COUPLED ECHELLE SPECTROGRAPH – MODAL STABILITY, SPECTRAL SENSITIVITY AND NOISE FLOOR FOR DETECTION OF SUPER EARTHS

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In this poster I will demonstrate the potential of using photonic technologies in the field of exoplanetology. Case study that will be presented is a compact echelle spectrograph that is coupled with the telescope via the Hollow Core Photonic Fibre. Rigorous numerical simulation of mode coupling and propagation will be demonstrated. The fiber in this study is the endlessly single mode HPC fiber whose properties will be discused. The greatest hinderance to stability of clasicall echelle spectrographs is the PSF nonuniformity and the multitude of modes that propagate through the multimode fiber that transforms to inaccuracies in wavelenght on CCD. A number of devices have been implemented to mitigate this noise contribution: from fiber shakers to modal scramblers but none of them is as suitable for high stability and precision RV studies as are single mode fibers. Standard single mode fibers have Gaussian beam profile and are restricted in diameter to 7 micrometers and in spectral bandwith to a interval of 200 nm. HPC fibers mitigate those two shortcomings of classical single mode fibers by carefuly sculpting arrayed waveguide structure through which only single mode propagates but which is not limited in terms of diameter, polarisation state or spectral bandwith. The use of one such HPC fiber coupled to crosdispersed echelle spectrograph will be presented in order to qunatifiy the gains in resolution, SNR and spectral sensitivity.

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Poster paper

QUASI-PERIODIC VELOCITY FLUCTUATIONS IN ERUPTIVE PROMINENCES OBSERVED BY AIA/SDO

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We present an investigation of prominences behavior during eruption. Variations in the distribution of their velocities are detected at altitudes < 0.6 solar radii. Detailed analyses are carried out for 304Å Solar Dynamics Observatory/Atmospheric Imaging Assembly (SDO/AIA) observations. To track prominences behavior during eruptions, 41 events in the period 2010 – 2017 are studied. To follow the rising of a filament on higher altitudes (up to 32 solar radii), Solar and Heliospheric Observatory/Large Angle and Spectrometric Coronagraph (SOHO/LASCO) data are also inspected. They are used to obtain kinematic profiles of eruptions. Obtained height-time and speed-time plots of the eruptions show velocity fluctuations in 83% of the explored cases, detected only in SDO/AIA field of view, but not in any of the prominences observed at higher altitudes by SOHO/LASCO. Time intervals between fluctuations and heights at which they are detected are estimated. Strong periodicity cannot be determined.

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Book of Abstracts, Eds. L. Č. Popović, V. A. Srećković, M. S. Dimitrijević and A. Kovačević
Astronomical Observatory, Belgrade, 2020

Poster paper

SOME OBSERVATIONS ON EXTRATERESTRIAL SOLAR VARIABILTY AND INFLUENCE OVER ATMOSPHERIC OZONE CONCENTRATION AND SOLAR UV RADIATION FLUXES

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The impact of solar variability on terrestrial atmosphere is a research topic for many years but still remains under debate, not fully understood and explained. Several physical mechanisms are announced in the literature - the role of solar magnetic field, the role of interaction of solar UV irradiation with stratospheric ozone, the role of energetic charged particles with cosmic origin on cloud formation, the atmospheric electricity and lightning generation, but the common opinion is clear -the solar energy input is hard to predict. This study presents some results on short-time measurements of solar UV-A, UV-B, UV-C irradiation at mountain research station and observatory sites in Bulgaria.

Poster paper

THE ACCRETION DISK IN THE GALACTIC NUCLEI

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In this paper we consider the magneto-hydrodynamics of the disk in the quasars. Our attention is especially focused to MHD in the system 'disk – corona' around the central black hole. We will analyze the restructuring in the disk stream under conditions of relativistic advection. We will discuss emerging connections on the disk to the other components of quasar.

XII SERBIAN-BULGARIAN ASTRONOMICAL CONFERENCE

PROGRAMME

Friday, September 25

12:00 – 16:00 Arrival

16:00 – 17:00 Registration

17:00 – 17:30 Opening ceremony

Chairs: **Ognyan Kounchev and Vladimir Srećković**

17:30 – 19:00 Round table: COLLABORATION BETWEEN SERBIAN AND BULGARIAN ASTRONOMERS - PRESENTATION OF THE EXISTING PROJECTS

20:00 - Welcome cocktail

Saturday, September 26

Chair: **Luka Č. Popović**

09:00 – 09:25 Dejan Urošević: PROPER MOTION OF Cyg LOOP FILAMENTS
09:25 – 09:50 Evgeni Semkov: PRE-MAIN SEQUENCE STARS FROM UX ORIONIS TYPE
09:50 – 10:15 Renada Konstantinova-Antova: MAGNETIC FIELD AND ACTIVITY STUDY IN M GIANT STARS
10:15 – 10:30 Isidora Jankov: APPLICATIONS OF MANIFOLD LEARNING TECHNIQUES TO SPECTRAL PARAMETERS OF QUASARS

10:30 – 11:00 Coffee break

Chair: **Katya Georgieva**

11:00 – 11:25 Rositsa Miteva: A NEW SPACE WEATHER SERVICE IN BULGARIA: THE MULTI-ENERGY PROTON EVENT CATALOG

11:25 – 11:50 Miroslava Vukcevic: SOLITONS IN THE IONOSPHERE – ADVANTAGES AND PERSPECTIVE
11:50 – 12:15 Yavor Chapanov: SOLAR ACTIVITY INFLUENCE ON GLOBAL CLIMATE OSCILLATIONS
12:15 – 12:30 Yoana Nakeva: POLARIZATION OF WHITE-LIGHT SOLAR CORONA DURING TOTAL SOLAR ECLIPSES
12:30 – 12:45 Saša Topić APPLICATIONS OF PHOTONICS IN EXOPLANETOLOGY

13:00 – 14:30 Lunch

Chair: **Nikola Petrov**

14:30 – 14:55 Milan S. Dimitrijević: THE MODIFIED SEMIEMPIRICAL METHOD (1980-2020)
14:55 – 15:20 Srđan Bukvić: ASTROPHYSICALLY INTERESTING STARK PARAMETERS MEASURED IN LASER-INDUCED PLASMA
15:20 – 15:35 Magdalena Christova: STARK BROADENING OF Be II SPECTRAL LINES
15:35 – 15:50 Mariyana Bogdanova: STUDY OF THE FRACTAL DIMENSIONS IN THE MOLECULAR CLOUD ROSETTE BY USE OF DENDROGRAM ANALYSES
15:50 – 16:05 Zlatko Majlinger: STARK BROADENING OF Co II LINES IN STELLAR ATMOSPHERE

16:05 – 16:35 Coffee break

Chair: **Andjelka Kovačević**

16:35 – 17:00 Aleksandra Bajić VENUS IN THE MYTHOLOGY OF THE SOUTHERN SLAVS
17:00 – 17:25 Milan S. Dimitrijević MYTHOLOGICAL ORIGIN OF CONSTELLATIONS AND THEIR DESCRIPTION: ARATUS, PSEUDO-ERATOSTHENES, HYGINUS
17:25 – 17:40 Aleksandra Bajić: A PAIR OF MONUMENTAL MEDIEVAL BOSNIAN TUMBSTONES (STEĆAKS) FROM DONJA ZGOŠĆA
17:40 – 17:55 Petar V. Vuca: SOLAR WALTZ
17:55 – 18:20 Svitlana Kashuba: PHOTOMETRY OF STARS ON DIGITIZED PLATES FROM THE COLLECTION OF THE ODESA ASTRONOMICAL OBSERVATORY

Sunday, September 27

Chair: **Vladimir Srećković (EUROPLANET SESSION)**

10:30 – 10:40 EUROPLANET INFORMATION
10:40 – 11:05 Aleksandra Nina: ACTIVITIES OF SERBIAN SCIENTISTS IN EUROPLANET
11:05 – 11:30 Nikola Veselinović: COSMIC RAY FLUX MEASUREMENTS AT BELGRADE COSMIC RAYS STATION DURING SOLAR CYCLE 24
11:30 – 11:55 Ramesh Chandra: CHARACTERISTICS OF SEPs ASSOCIATED WITH SOLAR FLARES
11:55 – 12:20 Ognyan Kounchev: SOME APPLICATIONS OF WAVELET ANALYSIS TO PHENOMENA IN THE IONOSPHERE

12:3 Lunch and afternoon excursion

Monday, September 28

Chair: **Evgeni Semkov**

09:30 – 09:55 Nikolai Tomov: HIGH RESOLUTION INVESTIGATION OF THE SYMBIOTIC BINARY BF CYGNI DURING ITS BURST AT THE BEGINNING OF 2017
09:55 – 10:20 Goran Damljanović: GAIA DR3 AND SOME RESULTS OF SERBIAN-BULGARIAN COOPERATION
10:20 – 10:35 Milan Stojanović: SERBIAN-BULGARIAN OBSERVATIONS OF GAIA ALERTS (GAIA-FUN-TO) DURING 2019
10:35 – 10:50 Miljana Jovanović: COLOR VARIABILITY OF SOME QUASAR IMPORTANT TO THE ICRF -- GAIA CRF LINK

10:50 – 11:20 Coffee break

Chair: **Dragana Ilić**

11:20 – 11:45 Viktor Afanasiev: A NEW APPROACH TO MEASURING THE SIZE OF THE DUST SUBLIMATION REGION IN AGNs
11:45 – 12:10 Lyuba Slavcheva-Mihova: BLACK HOLE MASSES AND BROAD LINE REGION GEOMETRY OF QUASARS

12:10 – 12:25 Elena Shablovinskaya STOKES POLARIMETER FOR 1-METER TELESCOPE
12:25 – 12:40 Djordje Savić: BROAD LINE POLARIZATION IN ACTIVE GALACTIC NUCLEI: MODELS AND OBSERVATIONS
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12:55 – 13:10 Orlin Stanchev: TRACING THE LOCAL MORPHOLOGY OF THE MOLECULAR CLOUD ROSETTE USING MOLECULAR-LINE AND DUST-EMISSION DATA

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Chair: **Milan S. Dimitrijević**

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14:55 – 15:20 Kiril Stoyanov: OPTICAL AND X-RAY OBSERVATIONS OF THE D-TYPE SYMBIOTIC STAR EF Aql
15:20 – 15:35 Svetlana Boeva: OSCILLATIONS IN KR Aur AT MINIMUM
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16:55 – 17:10 Yanko Nikolov: SPECTROPOLARIMETRIC OBSERVATIONS OF THE RECURRENT NOVAE
17:10 -17:25 Lyubov Marinkova: EXTRACTION OF A SECOND POWER-LAW TAIL OF THE (COLUMN-) DENSITY DISTRIBUTION IN STAR-FORMING CLOUDS

Chair **Maša Lakićević**

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20:00 Conference dinner

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09:55 – 10:20 Jelena Petrović EVOLUTION OF MASSIVE BINARY SYSTEMS

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10:50 – 11:15 Branko Dragovich: ON COSMOLOGY OF NONLOCAL GRAVITY
11:15 – 11:40 Daniela Kirilova: INFLATIONARY MODELS, REHEATING AND SCALAR FIELD CONDENSATE BARYOGENESIS
11:40 – 11:55 Evgeny Mikhailov: NO-Z MODEL FOR MAGNETIC FIELDS OF ACCRETION DISCS
11:55 – 12:10 Sava Donkov: DENSITY PROFILE OF A SELF-GRAVITATING POLYTROPIC TURBULENT FLUID IN THE CONTEXT OF MOLECULAR CLOUDS

12:10 – 12:30 Closing the conference

12:30 – 14:00 Lunch

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P03. Daniela Boneva: MID-CYCLE OBSERVATIONS OF CR Boo AND ESTIMATION OF THE SYSTEM PARAMETERS

P04.Yavor Chapanov: INTERANNUAL VARIATIONS OF J2 COEFFICIENT OF EARTH GRAVITY FIELD DUE TO SOLAR HARMONICS

P05. Momchil Dechev: THE NEW COMPUTATIONAL CLUSTER OF THE INSTITUTE OF ASTRONOMY AND NAO

P06. Momchil Dechev: KINEMATICS AND EUV BRIGHTENING EVOLUTION OF A SURGE TRIGERING AN ERUPTIVE PROMINENCE

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P08. Aleksandra Kolarski: STORM ACTIVITY OVER BALKAN REGION DURING MAY 2009

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P12. Kamen Kozarev: MODELING THE SHOCK ACCELERATION AND HELIOSPHERIC TRANSPORT OF SOLAR PROTONS WITH SPREAdFAST

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P15. Boyko Mihov: DATA MINING: ANALYSIS OF THE HQM AND JOMPQ LIGHT CURVES OF AGNs

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