Taras Shevchenko National University of Kyiv
Department of Astronomy and Space Physics

23rd Young Scientists' Conference on Astronomy and Space Physics

Abstracts

Kyiv, 2016

23rd Young Scientists' Conference on Astronomy and Space Physics

April 25 – 30, 2016
Kyiv, Ukraine

Scientific Organizing Committee

Vasyl M. Ivchenko (chair), Kyiv, Ukraine
Vasyl Ya. Choliy (co-chair), Kyiv, Ukraine
Gennadi P. Milinevsky, Kyiv, Ukraine
Bohdan I. Hnatyk, Kyiv, Ukraine
Klim I. Churyumov, Kyiv, Ukraine
Nataliya G. Shchukina, Kyiv, Ukraine
Ivan L. Andronov, Odessa, Ukraine
Peter P. Berczik, Kyiv, Ukraine
Yuri Shtanov, Kyiv, Ukraine

International Advisory Committee

Bogdan Wszolek, Czestochowa, Poland
Marcus Kirsch, Darmstadt, Germany

Local Organizing Committee

M. Mogoryan (chair), K. Vynokurova(secretary), O. Torbaniuk, O. Shubina, G. Ivashchenko, A. Dmytriiev, V. Lyakh, I. Yatsun, O. Ivaniha, V. Sadova, Yu. Yukhimchuk, O. Kompaniiets, P. Plotko, V. Mogylchak, O. Ivanyuk, A. Simon

Address for correspondence:

Dr. V. M. Ivchenko, P.O. Box 7, Kyiv-22, 03022, Ukraine
e-mail: *ysc.kyiv@gmail.com*

Address:

Astronomy and Space Physics Department,
Faculty of Physics,
Taras Shevchenko National University of Kyiv,
Glushkova ave., 4, Kyiv, 03127, Ukraine.
Phone: +(380) 44-526-44-57
Fax: +(380) 44-526-45-07

Preface

This year Young Scientists' Conference on Astronomy and Space Physics is held for the twenty third time. We all have been looking forward to the annual meeting of astronomers at the Taras Shevchenko National University of Kyiv (KNU). Now it has friendly opened its doors for participants from all over the world.

Young Scientists' Conference has a long history. The first meeting was organized by Faculty of Physics of KNU as a students' conference in 1994. Since 1996 our conference has welcomed young researchers from other universities and scientific institutions. During 1994-2015 participants from Ukraine, Russia, Poland, France, Germany, Spain, Sweden, Libya, Egypt, Japan, Finland, Turkey, China, Slovakia, Armenia, USA, Romania, Iran, Armenia, Georgia, Morocco, South Africa and other countries participated in Young Scientists' Conference.

The conference is aimed at strengthen the position of astronomy and promote space physics research. The lectures and reports presented by the participants traditionally reflect modern trends and actual problems of the science, the sessions facilitate informational exchange about the latest innovations and achievements.

We would like to express our gratitude to the invited lecturers and participants for contributing lectures and reports, and to Prof. V. M. Ivchenko for the help in conference organization.

We are especially grateful to Prof. Viktor Khalack (Université de Moncton, Moncton, Canada) and also the following former students of the Astronomy and Space Physics of KNU whose contribution made it possible to provide personal grants for several participants from Ukraine: Dr. Oleksiy Agapitov (University of California, Berkeley, USA), Dmytro Rogozin (Institut für Kernphysik, Karlsruher Institut für Technologie, Karlsruhe, Germany), Kateryna Frantseva (Netherlands Institute for Space Research, Groningen, The Netherlands), Dr. Ievgen Vovk (Max-Planck Institut für Physik, Munich, Germany), Dr. Iurii Babyk (Dublin City University & Dublin Institute for Advanced Studies, Dublin, Ireland), Dr. Iurii Sushch (Centre for Space Research, North-West University, Potchefstroom, South Africa), Dr. Ganna Ivashchenko (KNU, Kyiv, Ukraine).

Maxim Mogoryan and
the Local Organizing Committee

PROGRAMME

Monday, April 25

09.00-13.00 - Registration
13.00-13.30 - Official opening

Section 'Solar Physics & Heliosphere'

14.00-14.45 Oleksiy Agapitov, F. Mozer *(University of California, Berkeley, USA) Nonlinear wave-particle interactions in the outer radiation belts: Van Allen Probes results* **(invited)**

14.45-15.15 tea-break

15.15-15.30 Yaroslav Volvach, A. A. Stanislavsky, A. A. Konovalenko, A. A. Koval, V. V. Dorovskyy *(Institute of Radio Astronomy of the National Academy of Sciences of Ukraine, Kharkiv, Ukraine) A comparative study of decameter "drift pair" bursts observed in 2002 and 2015* **(12+3)**

15.30-15.45 Dima Balalaev, V. Olshevsky *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Modeling Kelvin-Helmholtz instability with Fluid Particle-in-Cell method* **(12+3)**

15.45-15.50 Andrij Prysiazhnyi *(Ivan Franko National University of Lviv, Lviv, Ukraine) Data processing of 2D spectral observations of the Sun* **(poster)**

15.50-15.55 Valeria Lyakh *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Intensity and velocity variations along the solar atmosphere above the facular region* **(poster)**

18.30-21.00 Excursion to the Main Astronomical Observatory of the National Academy of Sciences of Ukraine

Tuesday, April 26

Section 'Stellar Astrophysics and Interstellar Medium'

09.00-10.00 morning coffee

10.00-10.15 Ihor Kravtsov, V. V. Zakharenko, I. Y. Vasylieva, S. S. Mykhailova, O. M. Ulyanov, A. I. Shevtsova, A. O. Skoryk, P. Zarka, O. O. Konovalenko *(Institute of Radio Astronomy of the National Academy of Sciences of Ukraine, Kharkiv, Ukraine) Search for transient signals in the data of decameter survey of Northern Sky* **(12+3)**

10.15-10.30 Abid Ali Abid *(The Federal Urdu University of Arts, Science & Technology, Islamabad, Pakistan) Vasyliunas-Cairns distribution for space plasma species* **(12+3)**

10.30-10.45 Iryna Kushniruk, Ya. Pavlenko, J. Jenkins, O. Ivanyuk *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Metallicity of the Beta Pictoris moving group* **(12+3)**

10.45-11.00 Jaime Andrés Rosales Guzmán *(University of Concepción, Concepción, Chile) Spectroscopic study of the system V495 Centauri* **(12+3)**

11.00-11.15 Nikolay Britavskiy, A. Bonanos, A. Mehner *(Astronomical Observatory, Odessa I. I. Mechnikov National University, Odessa, Ukraine) Dusty massive stars in the Local Group* **(12+3)**

11.15-11.30 Vitalii Breus *(Odessa National Maritime University, Odessa, Ukraine) Detection of new variable stars using CCD photometry: improved algorithm* **(12+3)**

11.30-11.45 Oleg Bobrov, I. L. Andronov *(Odessa I. I. Mechnikov National University, Odessa, Ukraine) Processing of Overlapped Stellar Images Using the Program "Gauss2D"* **(12+3)**

11.45-12.15 tea-break

12.15-12.30 Natalia Virnina *(Odessa National Maritime University, Odessa, Ukraine) Direct impact stage in binary stars* **(12+3)**

12.30-12.45 Marina Galunka *(Odessa Mariinsky High School, Odessa, Ukraine) Modeling of five newly discovered eclipsing binary stars* **(12+3)**

12.45-12.50 Viktor Kudak, Š. Parimucha *(Institute of Physics, Faculty of Natural Sciences, University of P. J. Šafárik, Košice, Slovakia)* O-C diagrams of Algol types binary stars **(poster)**

12.50-12.55 Mert Acar, A. Devlen *(ISTEK Belde Schools Observatory, Uskudar, Istanbul, Turkey; Department of Astronomy and Space Sciences, University of Ege, Bornova, Izmir, Turkey) Period Change and Evolutionary Status of SW Tau* **(poster)**

12.55-13.00 Volodymyr Vasylenko, A. O. Simon, N. V. Metlova *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Photometric variability of the 1H1936+541 star in 2008–2014* **(poster)**

13.00-13.05 Oleksii Patoka, O. V. Antyufeyev, V. M. Shulga *(Institute of Radio Astronomy of the National Academy of Sciences of Ukraine, Kharkiv, Ukraine) Bipolar Outflows in the Star Forming Regions 34.403+0.233, 77.462-+1.759 and 121.28+0.65.* **(poster)**

13.05-13.10 Alisa Shchurova, E. Pavlenko, S. Shugarov, Yu. Babina, A. Simon, V. Vasylenko *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Colorimetric investigations of V1006 Cyg* **(poster)**

13.15-14.00 Lunch

15.00-19.00 City tour (walking tour)

Wednesday, April 27

Section 'Extragalactic Astrophysics & Cosmology'

09.00-10.00 morning coffee

10.00-10.15 Mykhailo Illiashyk, V. S. Akhmetov, P. N. Fedorov, A. B. Velichko *(V.N. Karazin Kharkiv National University, Kharkiv , Ukraine) The kinematics research of the Galaxy using of XPM catalogue data* **(12+3)**

10.15-10.30 Yura Bondar, A. V. Tugay *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Accretion processes in OJ287* **(12+3)**

10.30-10.45 Andrii Maliuk *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Comparison of different methods oxygen abundances measurements in galaxies from the SDSS* **(12+3)**

10.45-11.00 Inna Yatsun, I. Zinchenko *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Oxygen and nitrogen abundance in galaxies from the SDSS data* **(12+3)**

11.00-11.30 tea-break

11.30-11.45 Nadiia Maslova *(Odessa Mariinsky High School, Odessa, Ukraine) Does Cepheids' Kinematics Indicate the Presence of Dark Matter?* **(12+3)**

11.45-12.00 Maksym Vasylenko, Y. M. Kudria, I. D. Karachentsev, V. E. Karachentseva, S. N. Mitronova *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Talley-Fisher's multiparametric dependence for galaxies 2MFGC* **(12+3)**

12.00-12.15 Olena Torbaniuk, G. Ivashchenko *(Main Astronomical Observatory of the National Academy of Sciences of Ukraine, Kyiv, Ukraine) Measurement of the Lyα-forest transmission from the SDSS DR10 quasar spectra* **(12+3)**

12.15-12.30 Iryna Ivanchenko, V. M. Gorkavenko, Yu. O. Sitenko *(Bogolyubov Institute for Theoretical Physics of National Academy of Sciences of Ukraine, Kyiv, Ukraine) Induced magnetic flux in the presence of an impenetrable magnetic-flux-carrying tube* **(12+3)**

12.30-13.30 Lunch

17.45-22.00 Organ hall / opera hall / etc.

Thursday, April 28

Section 'High Energy Astrophysics'

09.00-10.00 morning coffee

10.00-10.45 Iurii Sushch *(Centre for Space Research, North-West University, Potchefstroom, South Africa) Gamma-ray binaries* **(invited)**

10.45-11.00 Taras Kuzyo, O. Petruk *(Pidstryhach Institute for Applied Problems of Mechanics and Mathematics, Lviv, Ukraine) Post-Adiabatic Supernova Remnants in the Non-Uniform Interstellar Medium and Magnetic Field* **(12+3)**

11.00-11.15 Anton Dmytriiev, A. Neronov *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine; University of Geneva, Geneva, Switzerland) Observations of the Crab Nebula at TeV energies with the FACT Cherenkov Telescope* **(12+3)**

11.15-11.30 Vadim Voytsekhovskyi, A. V. Tugay, V. V. Tkachuk *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) X-ray emission of ICRF sources* **(12+3)**

11.30-11.45 Roman Gnatyk *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Search of the galactic sources of the cosmic ray triplet with energies above 10^{20} eV* **(12+3)**

11.45-11.50 Lidiia Zadorozhna, B. Hnatyk, M. Khelashvili *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) The explanation of Fast Radio Burst phenomenon as electromagnetic radiation from cusps on superconducting cosmic strings* **(poster)**

12.00-13.00 Lunch

Section 'Atmospheric studies and space geophysics'

13.00-13.45 Gennadi Milinevsky *(Taras Shevchenko National University of Kyiv, Main Astronomical Observatory of the National Academy of Sciences of Ukraine, Kyiv, Ukraine) Future space missions for aerosol remote sensing in the Earth atmosphere* **(invited)**

13.45-14.00 Vladyslav Mogylchak *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Temporal features of stratosphere ozone distribution over Kyiv by 2011-2014 satellite and ground-based data* **(12+3)**

14.00-14.15 Andrew Prokhorenkov, L. Kozak, A. T. Y. Lui, E. Grigorenko, E. Kronberg *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Methods and approaches to characterize turbulent environment* **(12+3)**

14.15-14.30 Eugen Tkachenko, Yu. Rapoport, Yu. Selivanov, V. Ivchenko, V. Grimalsky *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Magnetohydrodynamic waves: excitation and propagation with initial mechanical perturbation, MHD large-scale structures. The comparison for the different points of the Earth's ionosphere* **(12+3)**

14.30-14.45 Sofiya Doskich *(Lviv Polytechnic National University, Lviv, Ukraine) Geodynamics and Troposphere research using the software GAMIT-GLOBK* **(12+3)**

14.45-15.00 Leonid Olifer, V. Choliy *(Institute of Physics and Technology, National Technical University of Ukraine "Kyiv Polytechnic Institute", Kyiv, Ukraine) On the analysis of multistep-out-of-grid method for celestial mechanics tasks* **(12+3)**

15.00-15.05 Yuliya Yukhimchuk, G. Milinevsky *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Pollution of Kyiv atmosphere by aerosol from fires according to lidar sensing and transfer modeling* **(poster)**

Friday, April 29

Section 'Solar System & Exoplanets'

09.00-10.00 morning coffee

10.00-10.15 Pablo Antonio Moreno Casares, A. M. Montero Martínez *(Faculty of Science, University of Extremadura, Cáceres, Spain; Institute of Astrophysics, University of Zielona Góra, Zielona Góra, Poland)* On detection methods of habitable exoplanets **(12+3)**

10.15-10.30 Viktor Kudak, Š. Parimucha *(Institute of Physics, Faculty of Natural Sciences, University of P. J. Šafárik, Košice, Slovakia)* Project DWARF – Using Of Eclipsing Binaries For Searching Of Exoplanets And Brown Dwarfs **(12+3)**

10.30-10.45 Vadym Kostiuk, A. Bazyey *(Odessa I. I. Mechnikov National University, Odessa, Ukraine)* Thermal activity of Enceladus **(12+3)**

10.45-11.00 Olena Shubina, N. Kiselev, V. Rosenbush, O. Ivanova *(Main Astronomical Observatory of the National Academy of Sciences of Ukraine, Kyiv, Ukraine)* Upgrade to a newer version the Database of comet polarimetry **(12+3)**

11.00-11.15 Dmytro Shymkiv, I. G. Slyusarev *(V. N. Karazin Kharkiv National University, Kharkiv, Ukraine)* Analysis of albedo distribution of large asteroid families **(12+3)**

11.15-11.30 Vasyl Vovk, M. O. Kaliuzhnyi *(Research Institute "Nikolaev Astronomical Observatory", Mykolaiv, Ukraine)* Radio Meteors Observations facilities at RI NAO **(12+3)**

11.30-11.45 Mykola Kulichenko, O. V. Shulga, Y. S. Sibiryakova *(Research Institute "Nikolaev Astronomical Observatory", Mykolaiv, Ukraine)* Observation of faint meteors in Nikolaev Astronomical Observatory **(12+3)**

11.45-11.50 Kostiantyn Radchenko, S. O. Yasenev *(National Technical University of Ukraine "Kyiv Polytechnic Institute", Kyiv, Ukraine)* Peculiarities in limits of the possible existence of the satellite in the gravitational field of planets **(poster)**

11.50-11.55 Vasyl Ponomarenko, A. O. Simon, K. I. Churyumov *(Astronomical Observatory, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine)* Spectral studies of gas and dust atmosphere of the comets C/2014 Q2 (Lovejoy) and C/2013 US10 (Catalina) **(poster)**

12.00-13.00 Poster section + tea-break

13.00-13.30 Official closure

13.30-14.30 Lunch

INVITED LECTURES

Nonlinear wave-particle interactions in the outer radiation belts: Van Allen Probes results

Oleksiy Agapitov, F. Mozer

University of California, Berkeley, USA

oleksiy.agapitov@gmail.com

Data from the Van Allen Probes have provided the first extensive evidence of nonlinear (as opposed to quasi-linear) wave-particle interactions in space with the associated rapid (fraction of a bounce period) electron acceleration to hundreds of keV by Landau resonance in the parallel electric fields of time domain structures (TDS) and very oblique chorus waves. The experimental evidence, simulations, and theories of these processes are discussed.

Gamma-ray binaries

Iurii Sushch

Centre for Space Research, North-West University, Potchefstroom, South Africa

iurii.sushch@nwu.ac.za

Gamma-ray binaries is a relatively small class of sources comprising only five objects. Binary systems are variable sources consisting of a massive star and a compact object such as a black hole or a pulsar. Very high energy (VHE; $E >$ 100 GeV) emission in these systems is believed to originate from the interaction between the two objects, either in the accretion-powered jet, or in the shock between pulsar and stellar winds. A review of the physics of gamma-ray binaries is presented focusing particularly on PSR B1259-63/LS 2883 as it is the only gamma-ray binary for which the compact object is clearly identified as a pulsar.

Future space missions for aerosol remote sensing in the Earth atmosphere

Gennadi Milinevsky[1,2]

[1] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*
[2] *Main Astronomical Observatory of the National Academy of Sciences of Ukraine, Kyiv, Ukraine*

genmilinevsky@gmail.com

For quantitative evaluation of aerosol impact to Earth climate effects and, especially, of its anthropogenic components, the several space projects for aerosol remote sensing are under development. The distribution and properties of atmospheric aerosols are still not well known for comprehensive climate modelling. The climate influence of aerosol is difficult to measure without microphysical properties knowledge. Currently, several satellite missions are studying aerosol distribution in the terrestrial atmosphere, such as MISR/Terra, OMI/Aura, AVHHR, MODIS/Terra/Aqua, CALIOP/CALIPSO. To improve the quality of data and climate models as well as to reduce aerosol climate forcing uncertainties, several new missions are planned. The NASA's Aerosol Cloud Ecosystems (ACE) mission is planned to reduce the uncertainty regarding climate forcing in aerosol-cloud interactions and ocean ecosystem carbon dioxide uptake. The ACE mission is expected for launch in 2024, preceded by the Pre-ACE mission in 2019 or later. After successful nine years of operation of the POLDER/PARASOL aerosol space mission of the CNES (France), an advanced aerosol polarimeter in the framework of the project 3MI/EPS-SG is planned for 2010 or later. Two more new instruments/missions are designed: ACE mission and the SPEX instrument designed in NWO-SRON Netherlands Institute for Space Research. In Ukraine the space project "Aerosol-UA" is also developed to monitor the spatial distribution and microphysics properties of terrestrial tropospheric and stratospheric aerosols. The aerosol remote sensing concept of the "Aerosol-UA" project is based on precise measurements from space of the intensity and polarization of sunlight scattered by the atmosphere and the surface by scanning polarimeter accompanied by wide-angle multispectral panoramic camera. The peculiarities and general ideas of the various planned aerosol missions are discussed and are compared. The state of art of "Aerosol-UA" instruments design — the polarimeter ScanPol and the panoramic multispectral camera PanCam, and the method for the validation of future satellite data using a mobile sunphotometer station are considered.

Acknowledgements. The work was supported by the Special Complex Program for Space Research 2012-2016 of the National Academy of Sciences of Ukraine (NASU), and NASU, and project 16BF051-02 of Taras Shevchenko National University of Kyiv.

SOLAR PHYSICS & HELIOSPHERE

A comparative study of decameter "drift pair" bursts observed in 2002 and 2015

Yaroslav Volvach[1], A. A. Stanislavsky[1], A. A. Konovalenko[1], A. A. Koval[2], V. V. Dorovskyy[1]

[1] *Institute of Radio Astronomy of the NAS of Ukraine, Kharkiv, Ukraine*
[2] *Institute of Space Sciences, Shandong University, Shandong, China*

yarvolvach@ukr.net

We report about new observations of solar "drift pair" (DP) bursts by means of the UTR-2 radio telescope at frequencies 10-30 MHz. Our experimental data included both "forward" and "reverse" bursts with high frequency and time resolution. The records of 313 bursts, observed in 10-12 July of 2015, are investigated. The main properties of these bursts (frequency bandwidth, duration, central frequency and others) are analyzed. In this report our main attention is paid to the comparison of our observations with the similar observations of decametre DPs performed earlier during 13-15 July of 2002 in the same frequency range. Common features of DPs in the two different pieces of data have been found. This may indicate the possible presence of stability in the frequency-time properties of decameter DPs from one cycle of solar activity to another.

Modeling Kelvin-Helmholtz instability with Fluid Particle-in-Cell method

Dima Balalaev[1], V. Olshevsky[2]

[1] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*
[2] *Main Astronomical Observatory of the National Academy of Sciences of Ukraine, Kyiv, Ukraine*

balalaevdm@gmail.com

Kelvin-Helmholtz instability is widely represented in nature. It can be encountered everywhere: from planetary atmospheres to solar corona and astrophysical plasma flows. In the same time, it is a perfect test case for numerical codes. A fluid particle-in-cell code that does not suppress the so-called ringing instability can not pass the KH test. However, our newly developed asset employs a

dedicated particle volume evolution strategy that allows it to successfully model the KH problem. The results of our simulations are elaborately compared with benchmark solutions.

Data processing of 2D spectral observations of the Sun

Andrij Prysiazhnyi

Astronomical Observatory of Ivan Franko National University of Lviv, Lviv, Ukraine

andrij13p@gmail.com

We used the data of the solar observations with high spatial and temporal resolution in BaII $\lambda = 4554.03$ Å line, provided to us by scientists MAO NASU. The processing of observational data was performed into three stages. The aim of the first stage of data processing was the elimination of the artifacts from previous data processing and artifacts associated with defects of the telescope's optics. At this stage images were coordinate-wise filtered by a Lanczos digital filter. It was determined the optimal cutoff frequency. The aim of the second stage of data processing was the elimination of the artifacts associated with the influence of the atmosphere and defects of the telescope's tracking. We ignored the effects of relative shifts of parts of image and believed that distortion occurs only as parallel shift the whole image at a certain integer number of pixels. One of the images of the array we used as a reference image, relative to which we calculated shifts of all the other images. At the third stage of data processing obtained at the previous stage array was initially normalized on the continuum of averaged profile, and then on the normalization coefficient, obtained by comparing the average profile with the profile from Atlas of solar spectrum. The second normalization coefficient was determined considering the scattered light correction. Then we compared the processed data with the theoretical data. For this purpose a number of dependencies were plotted for theoretical and observational data: dependencies between central residual intensity, full width at half maximum, equivalent width and continuum intensity. Theoretical profiles of selected line were obtained within 3D Asplund model. Profiles were calculated by solving the equation of radiative transfer and statistical equilibrium equations using accelerated Λ-iteration method. Atmospheric blurring was simulated by convolution image, built on theoretical data, with 2D Gaussian function. It was determined the optimal value of parameter σ in Gaussian function. The processed data will be used for: 1) investigation of the influence of magnetic field on photospheric convection; 2) studying of the solar atmosphere structure in a range of heights from the lower photosphere to the lower chromosphere, including the region of the temperature minimum.

Intensity and velocity variations along the solar atmosphere above the facular region

Valeria Lyakh

Taras Shevchenko National University of Kyiv, Kyiv, Ukraine

walllerka@ukr.net

We study the velocity and intensity variations obtained at the different atmospheric heights from observations in Si 10825 Å and He 10830 Å spectral lines. The observations have been obtained during good seeing at the VTT at the Observatorio del Teide, Tenerife. We calculated the velocity and intensity variations from the Si and He lines following the λ-meter technique (Stebbins,Goode, 1987). The line 10825 Å is formed deep in the photosphere and the line 10830 Å is formed high in the chromosphere. We used ten reference widths of the average Si and He profiles. We then found intensity variations δI and red and blue wing velocities V_r, V_b at the corresponding ten reference widths. We also obtained spatial and temporal dependencies of intensity and velocity variations.

STELLAR ASTROPHYSICS & INTERSTELLAR MEDIUM

Decameter survey of pulsars and transients of the Northern Sky. Current status

Ihor Kravtsov[1], V. V. Zakharenko[1], I. Y. Vasylieva[1], S. S. Mykhailova[2], O. M. Ulyanov[1], A. I. Shevtsova[1], A. O. Skoryk[1], P. Zarka[3], O. O. Konovalenko[1]

[1] *Institute of Radio Astronomy of the NAS of Ukraine, Kharkiv, Ukraine*
[2] *V. N. Karazin Kharkiv National University, Kharkiv, Ukraine*
[3] *LESIA, Observatoire de Paris, CNRS, UPMC, Universite Paris Diderot, Meudon, France*
i.p.kravtsov@gmail.com

Radio telescope UTR-2 has recently accomplished a survey of the northern sky to find pulsars and sources of transient radio emission. Studies in such a low-frequency range are very difficult because of the extremely high influence of scattering in the interstellar medium, very strong radio interference and high temperature of Galactic background, but large dispersion delay allows to determine the dispersion measure (DM) of broadband signals with a small characteristic length very accurately. Parameters of our survey: DM range is 0..30 pc cm^{-3}, declination ($-10°$..$90°$), time resolution is 8 ms. Search is held in a five-beam (or sometimes four-beam) mode with recording of the sum, the difference and the product of signals of the "East-West" and "North-South" antennas. The recorded data's volume exceeds 80 terabytes. The results are confident detection of known pulsars (signal/noise ratio (SNR) is more than 1000) and detection of the large number of transient signals, the discovery and parameterization of decameter emission of the pulsar J0243+6257. The single criterion to discriminate between wideband short duration signals, coming from cosmic sources and interference of terrestrial origin is the dispersion law. That's why the utmost attention is paid to the precise definition of the dispersion delay of each transient signal. Current results of processing of the transient signals (after the exclusion of signals of the known pulsars) are shown in the present work. Intensities and duration of the signals, distances and coordinates of candidates, their distributions with respect to different parameters (such as energy, distance, galactic latitude etc.) were obtained. We compared these distributions with distributions of the known nearby pulsars and known RRATs. The analyzed similarities and differences were lead to a conclusion, that a overwhelming majority of these signals are generated by cosmic sources. Results of the work are likely to give a new reference data for the neutron stars population synthesis and for studies of the nearest galactic surroundings.

Vasyliunas-Cairns distribution for space plasma species

Abid Ali Abid

Department of Applied Physics, Federal Urdu University of Arts, Science and Technology, Islamabad, Pakistan

abidaliabid1@hotmail.com

A more generalized form of non-Maxwellian distribution (that can be named as Vasyliunas-Cairns distribution) is introduced. Its basic properties are numerically analyzed by the variation of two important parameters, namely α (which shows the amount of energetic particles present in the plasma system) and κ (which is the spectral index showing the super thermality effect of plasma species). It has been observed that: i) for $\alpha \to 0$ ($\kappa \to \infty$) the Vasyliunas-Cairns distribution function reduces to Vasyliunas or κ (Cairns or non-thermal) distribution; ii) for $\alpha \to 0$ and $\kappa \to \infty$ it reduces to a Maxwellian distribution; iii) the effect of the parameter $\alpha(\kappa)$ significantly modifies the basic properties of Vasyliunas (Cairns) distribution function. The applications of this generalized (new) non-Maxwellian distribution (called here Vasyliunas-Cairns distribution) in different space plasma situations are briefly discussed.

Metallicity of the Beta Pictoris moving group

Iryna Kushniruk[1], Ya. Pavlenko[2], J. Jenkins[3], O. Ivanyuk[2]

[1] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*
[2] *Main Astronomical Observatory of the National Academy of Sciences of Ukraine, Kyiv, Ukraine*
[3] *University of Chile, Santiago, Chile*

nondanone@gmail.com

The Beta Pictoris Moving Group is known as a young moving group of stars located at a distance of 35 pc from the Earth, what makes it the closest youthful group of stars to the Earth. The group consists mostly of cool (K, M) stars, what makes it an important object for astronomical studies. Using self-consistent approach developed by Pavlenko et al. 2012 and FEROS and HARPS high-resolution spectra we determined metallicity, surface gravity and effective temperature of seven stars of the moving group. It shows [Fe/H] ratio close to solar and is in agreement with some previous studies.

Spectroscopic study of the system V495 Centauri

Jaime Andrés Rosales Guzmán

University of Concepción, Concepción, Chile

jrosales@astro-udec.cl

The interacting binary stars could help understand more about physics and evolution of stars in late stages. In this context, Double Periodics variables (DPV) can play an important role in the restriction on models and responsible for the loss and exchange of mass physical mechanisms in evolutionary stages. These intermediate-mass stars are characterized by a photometric long period of about 33 times the orbital period (Mennickent et al. 2003, 2012a, 2013, Poleski et al. 2010). This long periodicity is interpreted as evidence of cycles of mass loss (Mennickent et al. 2008, 2012b). In late 2014 we performed a photometric analysis V0495 Cen system with data obtained from ASAS Catalogue of semi-detached binaries (Pojmanski 1997). We have determined the orbital period and the long period by IRAF PDM Program (Stellingwerf 1978). Here we presented an orbital period of $33,490 \pm 0.018$ days and a long period of 1283 days (Mennickent, RE; Rosales, J. 2014) revealing the nature of DPV. Errors were obtained from a visual inspection of the light curve in phase with attempts Nearby mimino obtained in the periodogram periods.These initial results indicate that it is the VPD with the longest period found so far. We have also separated the two main frequencies using a specially designed for this purpose by Zbigniew Kolaczkowski code. This code sets the orbital signal to a Fourier series consisting of the fundamental frequency plus harmonics. So this removes the signal from the original time series eventually surrendering periodocidad in a new light curve. In the first half of 2015, we conducted a spectrographic study CHIRON (Highly stable cross-dispersed Echelle spestrometer at the Smart 1.5 m Telescope) located at the Cerro Tololo Inter-American Observatory (CTIO), obtaining 10 spectra mode fiber and 30 in slicer mode, allowing us to fully cover an orbital cycle with good accuracy. From the spectral analysis we can talk to priory that is a supergiant star with a mass function $f = 4.237 \pm 0.004\ M_{\odot}$. The radial velocities obtained by spectral lines characteristic of this system, will give us important information about the interaction between them, their records and winds have. The spectral energy distribution is not substantially different with respect to other DPVs features. We have analyzed the presence of nebulosity around the system with Wide-field Infrared Survey Explorer (WISE), W1 and W4 particularly where we have not found evidence of nebulosity around this system. We hope to soon conduct an analysis of the forces of the emission lines (Tester Wind) as a function of the orbital cycle and the long cycle and with the help of Doppler maps, we can build residual areas of emission lines of higher emissivity in such systems.

Dusty massive stars in the Local Group

Nikolay Britavskiy[1], A. Bonanos[2], A. Mehner[3]

[1] *Astronomical Observatory, I. I. Mechnikov National University, Odessa, Ukraine*
[2] *National Observatory of Athens, Athens, Greece*
[3] *European Southern Observatory*

britvavskiy@gmail.com

The identification and investigation of RSGs and other dusty massive stars in the Local Group and beyond are extremely important for understanding massive star evolution and episodic mass-loss phenomenon. Star forming dwarf irregular (dIrr) galaxies serve as ideal laboratories for investigating physics of red supergiants within the context of different metallicities of host galaxies. Also, RSGs may be used as tracers for abundance determinations and star formation history of dIrrs. We present a systematic survey of RSGs and luminous blue variables (LBVs) with the goal to complete the census of these objects in the Local Group. Using the fact that RSGs and LBVs are bright in mid-infrared colours due to dust, we applied a technique that allows us to select dusty massive stars based on their [3.6] and [4.5] Spitzer photometry (Britavskiy et al. 2014, 2015). We applied our criteria to 7 dIrr galaxies: Pegasus, Phoenix, Sextans A, Sextans B, WLM, IC 10 and IC 1613 selecting 124 point sources, which we observed with the VLT/FORS2, GTC/OSIRIS and duPont/WFCCD spectrographs in multi-object and long-slit spectroscopy modes. In total we have observed 124 targets, among which we identified 28 RSGs (21 are new discoveries) and 2 new emission line objects in these galaxies. These new discoveries are statistically significant and this sample increased the number of spectroscopically confirmed RSGs in dIrrs by 50%. Moreover, for the newly identified RSGs we measured the fundamental physical parameters by fitting their observational spectral energy distributions with MARCS stellar atmosphere models. This work serves as a basis for further investigation of the newly discovered dusty massive stars and their host galaxies.

Detection of new variable stars using CCD photometry: improved algorithm

Vitalii Breus

Odessa National Maritime University, Odessa, Ukraine

bvv_2004@ua.fm

A distinct advantage of the CCD photometry is that CCD observations allow us to measure brightness of all stars from the field of the telescope simultaneously. Sometimes it happens that in the same field of view besides the main object we

may see also other variable stars. Over the years using CCD photometry different techniques for identifying variable stars were developed, including traditional "blinking" and "scatter" searches. One of the simplest algorithms is based on the dependency of noise level to mean brightness. The fainter an objects is, the smaller is the signal-to-noise ratio and the noisier is the measurement of the object. According to the statistics, if all stars were constant, the dependence of standard deviation of brightness vs. mean brightness of an object would have a parabola-like shape. If one star is variable, its standard error is greater than a constant object of the same mean brightness. Particularly, this algorithm is implemented in the C-Munipack software package, one of the most popular complete solutions for CCD images reduction ("Find variables" dialog). However, this method works great in case of very good quality CCD data with small standard deviation of stars. In case of relatively big CCD noise, mediocre weather or other reasons, variable stars would appear in a heap of points, and some constant stars with few measurements or big scatter will be located above the curve like they are variables. In this work we studied the ways to improve this algorithm using well-known relatively simple mathematical and statistical methods. The multiple comparison stars method is regularly used in our group as implemented in the MCV. We applied it to the CCD data using dozens of comparison stars and it allowed us to decrease the influence of the scatter of some particular comparison star on the light curves. We got better dependence of standard deviation vs. mean brightness of stars for the calculated light curves where more variable stars are located above the curve. Later on we compared different modifications of it including criteria for comparison star selection and the quantity of the comparison stars to get it work at the time series obtained using different instruments using any weather conditions. Finally, we applied modified Lafler & Kinman method and analyzed obtained periodogram characteristics. As the result of this work, the new software was developed. It reads the data exported using C-Munipack and provides the user-friendly interface to obtain and view light curves and periodograms of the stars suspected in variability.

Processing of overlapped stellar images by the program "Gauss2D"

Oleg Bobrov[1], I. L. Andronov[2]

[1] *Odessa I. I. Mechnikov National University, Odessa, Ukraine*
[2] *Odessa National Maritime University, Odessa, Ukraine*

oleg_bobrov@ukr.net

For the CCD photometry, it is important to separate contribution of the separate stars creating the same asymmetric image. This is usual for the "crowded" fields in the Milky Way, but also may be apparently observed at high galactic

latitudes. To solve the problem, we apply a mathematical model with 2D Gaussian functions with relative shift: $I(x,y) = C_1 + C_2 \cdot G(x - x_1, y - y_1) + C_3 \cdot G(x - x_2, y - y_2)$, where $G(x,y) = \exp(-C_4x^2 - C_5xy - C_6y^2)$. Here (x_1, y_1) and (x_2, y_2) are coordinates of the centres of stellar images. Here the coefficients C_1, C_2, C_3 are determined using the least squares method, and C_4, C_5, C_6, (x_1, y_1), (x_2, y_2) by non-linear optimisation. We elaborated program, that processes set of images and makes possible to use finding parameters for definition of stellar brightness. The program uses matching files of the MuniWin 1.1.30. There is the possibility to process all fits-images by the choosing stars or some fits-images separately in the program. After work of "Gauss2D", obtained data can be processed with MCV code (Andronov, Baklanov). There are options to use the same set of parameters describing the shape of the image (C_4, C_5, C_6) for all images, or to each image separately (produces larger statistical noise). Also in processing of set of images we used next algorithm. Program computes variance of relatively shifts of "binary" star. If the relatively shift of "binary" star of any fits is some times bigger in then this value, then as initial parameters of approximation choose parameters of relatively shift fits of comparison. The program is called "Gauss2D" and is planed for use at the projects "Inter-Longitude Astronomy" and "Ukrainian Virtual Observatory".

Direct impact stage in binary stars

Natalia Virnina

Odessa National Maritime University, Odessa, Ukraine

virnina@gmail.com

Among all varieties of non-degenerated binary stars, two systems deserve special attention. One of them, V361 Lyr, was detected 50 years ago by C. Hoffmeister, another one, 2MASS J05280799+725605, was discovered only 5 years ago by N. Virnina. Both of these stars has the same stable feature on the phase curves — the first maximum (the one which follows the primary minimum) is significantly brighter than the second one. The theory is that these systems are in the stage of initial mass transfer, and thus are on the key point of understanding the evolution of binary stars. In the present study, based on the restricted three-body approximation, we created a series of models for calculation of the trajectory of test particle in the gravitational field of the binary star, as well as the impacting of the stream matter into the gainer. Our models confirm the theory of a hot spot, which is formed by the stream in the photosphere of the gainer.

Modelling of five newly discovered eclipsing binary stars

Marina Galunka

Mariinsky High School, Odessa, Ukraine

Galunka.alp@gmail.com

Lots of stars in our galaxy exist in tight pairs. Such systems are called binary stars and they might have variable magnitudes due to alternative eclipses. A year ago we reported the discovery of five eclipsing binary stars, 4 of which are of EW-type and 1 is of EA-type, and now we present their models. Our study is based on 2 sets of photometric observations conducted in 2011 and 2012 by N. Virnina and T. Krajci, respectively. The first set was collected using remotely-controlled telescope AP-180 (Tzec Maun observatory), equipped with unfiltered monochrome CCD SBIG-STL 11000 with maximum of quantum efficiency close to V-band. The next set was collected using reflector telescope K-28 (AAVSO observatory) with SBIG ST-8 CCD and i' and r' Sloan filters. We discovered that at least 3 of our binaries reveal instability of the shape of their phase curves. In particular the minima of the first star were reversed. Presumably these variations are caused by sporadic appearance of "cold" spots and stay stable at least during a couple of months. To compute models of studied variables and to determine their main physical parameters we used Wilson-Devinney code implemented in BinaryMaker 3 software. The temperature of primary components were evaluated from colour indices, while modelling yielded inclinations of the orbits, mass ratios, temperature of secondary components and configurations of the systems. The binary of EA-type is apparently of semi-detached configuration with significant temperature difference. The remaining four stars appear to be in physical contact. To fit the observed phase curves we had to add one or two spots in the photospheres of first three binaries, which presumably indicate strong magnetic activity of these stars. Further long-term photometric observations might help to determine the periodicity of magnetic activity and presence of mass exchange process, while spectral data would yield more reliable mass ratio values.

O-C diagrams of Algol types binary stars

Viktor Kudak, Š. Parimucha

Institute of Physics, Faculty of Natural Sciences, University of P. J. Šafárik, Košice, Slovakia

viktor.kudak@student.upjs.sk

We present solution of O-C diagrams for six Algol type binary systems: AD And, BD And, CL Aur, IV Cas, TW Cas, UU And. Solution is based on our observations and data from SWASP project.

Period change and evolutionary status of SW Tau

Mert Acar[1,2], A. Devlen[2]

[1] *ISTEK Belde Schools Observatory, Uskudar, Istanbul, Turkey*
[2] *Department of Astronomy and Space Sciences, University of Ege, Bornova, Izmir, Turkey*

mrtacar@hotmail.com

In this work, the relation between the period change and evolutionary status of SW Tau which is a Type II Cepheid variable is examined. The (O-C) analysis of the times of maxima of variable star SW Tau has been carried out for that reason. SW Tau has a characteristic light curve shape of BL Her type stars. By taking into consideration SW Tau's well-defined period decrease obtained from the photometric observations, its position on the HR diagram in accordance with the evolutionary models and its chemical composition, we demonstrated that SW Tau is a Cepheid crossing the instability strip for the fourth time. SW Tau could be interpreted as being early AGB star on the blueward evolutionary phase during the shell helium burning.

Photometric variability of the 1H1936+541 star in 2008 - 2014

Volodymyr Vasylenko[1], A. O. Simon[1], N. V. Metlova[2]

[1] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*
[2] *Sternberg Astronomical Institute, Moscow, Russia*

Vol_odya@ukr.net

We report the results of observations of the Be/X-ray binary system 1H1936+541. 1H1936+541 belongs to the Be/X-ray binaries – a subgroup of high-mass X-ray binaries (HMXB). As an X-ray source it was described first in "The HEAO A-1 X-ray source catalog" in 1984. Our observations were conducted in U, B, V, R and I bands from 2008 until 2016. During this time, photometrical variability occurred in all bands, however the most significant changes were present in U and I bands. Variability in this star, as we think, related with changes in the decretion disc structure, because variability's in U and I bands anti-correlate among ourselves. Further photometric and spectral observations can help us to develop a physical model of this system.

Bipolar outflows in the star forming regions 34.403+0.233, 77.462+1.759 and 121.28+0.65.

Oleksii Patoka, O. V. Antyufeyev, V. M. Shulga

Institute of Radio Astronomy of the NAS of Ukraine, Kharkiv, Ukraine

alekseypatoka@rian.kharkov.ua

Outflows from young stars are a ubiquitous and energetic phenomenon; they have spectacular observational manifestations over a wide range of wavelengths from the ultraviolet to the radio. In general terms, we are now confident that virtually all young stellar objects (YSOs) undergo periods of copious mass loss. In present time even the most basic questions about the outflow phenomenon are still a matter of debate. It is not clear yet what physical mechanism produces the outflows, and the underlying stellar or protostellar wind. The impact of bipolar flow manifested as a change of the shape profile line. The observations were made in April and May 2015 on the 20-m radio telescope of observatory Onsala (Sweden). For spectral analysis was used a new Fourier spectrum analyser (FFT) with a bandwidth of 2.5 GHz. The observations were made for the study of complex spatial-kinematic structure of the chosen clouds. In the three objects (34.403+0.233, 77.462+1.759, 121.28+0.65) bipolar emission in lines SiO(2-1), H13CO+(1-0), HCO+(1-0) were found. Bipolar outflows in lines SiO(2-1) and H13CO+(1-0) were detected for the first time for an object 77.462+1.759. Obtained maps of the integrated intensity in these lines and maps of the bipolar outflows. We estimated parameters of the bipolar outflows and compared these parameters with previously known.

Colorimetric investigations of V1006 Cyg

Alisa Shchurova[1], E. Pavlenko[2], S. Shugarov[3], Yu. Babina[2], A. Simon[1], V. Vasylenko[1]

[1] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*
[2] *Crimean Astrophysical Observatory, Nauchny, Crimea*
[3] *Sternberg Astronomical Institute, Lomonosov Moscow State University, Moscow, Russia*

alisa-katya@mail.ru

We report the results of investigations behaviour of the SU UMa dwarf nova V1006 Cyg in the different outburst states in 2015. We explored two different states of outburst activity: superoutburst (in July 2015) and the minimum activity (in September 2015). The observations were performed in the U, B, V, R, I filters at the Crimean Astrophysical Observatory and at the Kyiv Comet Station (Lisnyky). We defined that star system is changing its position on the color-index diagram during its "life-cycle". And also we recalculated magnitudes of some reference stars in our field.

EXTRAGALACTIC ASTROPHYSICS & COSMOLOGY

The kinematics research of the Galaxy using of XPM catalogue data

Mykhailo Illiashyk, V. S. Akhmetov, P. N. Fedorov, A. B. Velichko

Institute of Astronomy, V. N. Karazin National University, Kharkiv, Ukraine

380934064519@yandex.ua

In this work we present results of comparison of kinematic parameters of the Galaxy obtained using stars proper motion of XPM catalogue for two solutions. The first - using the classical model Ogorodnikov-Milne and second - the method of vector spherical functions. The XPM catalogue data were converted into galactic coordinate system and divided on 16 intervals width 0.5 (from 12 to 20) B magnitude. The averaged positions and proper motions of stars have been assigned to the geometric centres each of 1200 HealPix fields. The software which allow to obtain values of significant coefficients of the vector spherical functions of the velocity field of proper motion of stars has been developed. The analysis and comparison of solutions have been completed.

Accretion processes in OJ287

Yura Bondar, A. V. Tugay

Taras Shevchenko National University of Kyiv, Kyiv, Ukraine

slayer4ever.ru@gmail.com

We analysed XMM observations of OJ287 blazar, which is famous of its binary black hole. Also we present optical photometric observations of OJ 287 at Lisniky station. We compared X-ray spectral parameters at different stages of bypass of minor black hole through the main accretion disc. We considered both optical and X-ray observations of OJ287 with the concept of 40d period. Such periodicity may occur due to helical structure of magnetic field or orbital motion at the inner edge of accretion disc.

Comparison of different methods oxygen abundances measurements in galaxies from the SDSS

Andrii Maliuk

Taras Shevchenko National University of Kyiv, Kyiv, Ukraine

maliuk.andrey@yandex.ru

A sample of emission-line galaxies from the Sloan Digital Sky Survey (SDSS) are investigated. Line intensities in 3865 SDSS spectra of galaxies with different redshifts are measured. Intensities of spectral line [OIII]4363 are determined for them. Oxygen abundances are established in several different ways: direct method and some different calibration methods. The result will help us to compare their accuracies.

Oxygen and nitrogen abundance in galaxies from the SDSS data

Inna Yatsun[1], I. Zinchenko[2]

[1] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*
[2] *Main Astronomical Observatory of the NAS of Ukraine, Kyiv, Ukraine*

inonoyazy@gmail.com

Understanding the way that the metallicities of galaxies depend on galactic properties and events is crucial in understanding galaxy evolution as metallicity is connected to important galactic processes such as inflows, outflows and star formation. We used the Data of the Sloan Digital Sky Survey (SDSS). SDSS spectra have high quality, there to SDSS is considered one of the best ground-based telescopes project. We used Twelve Data Release (DR12) to compare our results of chemical composition with similar researches, which contain data from previous releases.

Does Cepheids' kinematics indicate the presence of the Dark Matter?

Nadiia Maslova

Odessa Mariinsky High School, Odessa, Ukraine

nadiiamaslova@gmail.com

According to modern models, our Galaxy has a spiral structure of SBbc-type, and thus includes 3 mean components: spiral disk, central bulge and a large spherical halo. Though, some part of matter in the Galaxy is easily observable in various electromagnetic bands, still some of it is detectable only due to indirect signs, including kinematics of different objects. Presumably, invisible dark matter is mostly concentrated in spherical bulge. Still, its quantity is unknown and varies depending on applied model. One of the best ways to evaluate the amount of dark matter is to analyze velocities of different objects with different galactocentric distances. The goal of the present project was to determine optimal parameters of components of our Galaxy and evaluate the quantity of dark matter using spatial locations and velocity vectors of Cepheids. Cepheids are radially pulsating giants or supergiants. We assume Cepheids can be used as test particles to study Galactic rotation, since they are members of the first stellar population and distances to these stars can be easily measured from the period-luminosity relation. Knowing radial velocities, distances and proper motions of more than 200 Cepheids, we determined their velocity vectors and thus obtained tangential components. Cepheids' velocities appeared to be in good agreement with other observational data for objects of our Galaxy. To calculate individual masses of bulge, disk and halo of Milky Way galaxy we wrote a code in Python based on the idea of physical model described by Xin and Zheng in 2013. We applied Monte Carlo algorithm combined with weighted least squares method to find the optimal model. It computes a theoretical rotation curve, fits it to Cepheids' velocities and other available observable data. Thus we determined statistically optimal parameters of Galactic components and evaluated the amount of dark matter.

Talley-Fisher's multiparametric dependence for galaxies 2MFGC

Maksym Vasylenko[1], Yu. M. Kudria[2], I. D. Karachentsov[2], V. E. Karachentseva[2], S. N. Mitronova[2]

[1] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*
[2] *Astronomical Observatory, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*

maximka88@meta.ua

In 2006 individual distance, peculiar velocity for 2724 galaxies 2MFGC were calculated according to Talley Fisher's multiparametric dependence (TF) with known apparent J-magnitude, radial velocity and radio line width of 21 cm and/or rotational velocity. For the last 10 years 2MFGC- galaxies' data bank has considerably incrased: for the moment 3631 galaxies have characteristics necessary for construction of 6-parametric TF-dependance declared in the HyperLEDA data

base. Besides only standartized data about rotational velocity is presented in HyperLEDA. In the present research the software on IDL is written (on the basis of a software on Fortran-77) and precomputations of TF-dependence coefficients were obtained. The list of additional dependence factors (surface brightness, colour, concentration ratio, the logarithm of diametral correlation), the list of galaxies with considerable (more than 3σ) deviation from the regression hyperplane and nonphysical peculiar velocities were defined. Final (refined) selection include 3173 galaxies. For them the TF-dependance is characterised by root-mean-square deviation $\sigma = 0.47m$ and corresponds to range determination accuracy $\sim 23\%$.

Measurement of the Lyα-forest transmission from the SDSS DR10 quasar spectra

Olena Torbaniuk[1], G. Ivashchenko[1,2]

[1] *Main Astronomical Observatory of the NAS of Ukraine, Kyiv, Ukraine*
[2] *Astronomical Observatory of Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*

el.torbaniuk@gmail.com

The Lyα forest in spectra of distant quasars traces the thermal and radiative history of the Universe, as well as the evolution of underlying matter distribution over a wide range of scales and redshifts. It is possible due to relation of the Lyα opacity of the intergalactic neutral hydrogen H I to its density and other physical parameters. As a measure of opacity the value F, named the transmission and defined as a ratio of observed (transmitted) and emitted fluxes, is used. One of the main problems in these studies is related to determination of emitted flux, i. e. the continuum level in quasar spectra. We present a new method of determination of the continuum level which involves using composite spectra of quasars with similar monochromatic luminosity at 1450 Å (l_{1450}) and similar spectral index α_λ within the wavelength range 1215-1450 Å. For this study we compiled 55 such composite spectra from 13722 medium-resolution quasar spectra from the Sloan Digital Sky Survey Data Release 10. Our method was applied to our sample of 42140 quasar spectra from SDSS DR10 for studying the redshift dependence of the mean transmission and calculating two-point statistics of fluctuations of the transmitted flux in Lyα-forest (auto-correlation function and flux power spectrum).

Induced magnetic flux in the presence of an impenetrable magnetic-flux-carrying tube

Iryna Ivanchenko[1], V. M. Gorkavenko[2], Yu. O. Sitenko[1]

[1] *Bogolyubov Institute for Theoretical Physics of the NAS of Ukraine, Kyiv, Ukraine*
[2] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*

iiv.ivanchenko@gmail.com

Vacuum polarization effects in a magnetic cosmic string background are considered. Cosmic string is modelled by finite radius (r_0) magnetic-flux-carrying tube that is impenetrable for quantum matter. The vacuum polarization depends on the choice of a boundary condition at the edge of the tube. We consider different boundary condition at the edge of the tube on the charged massive scalar matter field which is quantized outside the tube, notably the Neumann and the Dirichlet boundary conditions. We find that a current circulates around the string. As a consequence of the Maxwell equation, a magnetic field strength is also induced in the vacuum and it is directed along the cosmic string. The behaviour of the current and the field strength is comprehensively analyzed. Both the current and the field strength are decreasing exponentially with the distance from the string. In contrast to the model of singular magnetic cosmic string, magnetic field strength is finite at the edge of the string. We demonstrate that induced vacuum effects in the case of the Neumann boundary condition are sufficiently larger than in the model of the singular magnetic string, but in the case of the Dirichlet boundary condition this effects are smaller than in the model of the singular magnetic string. In any case the vacuum polarization by the magnetic flux tube is quite negligible at $mcr_0 > \hbar$, whereas it becomes noticeable at $mcr_0 \ll \hbar$. If the flux tube is interpreted as a cosmic string topological defect, then the vacuum polarization in its background is absent when the mass of the Higgs field (m_H) does not exceed the mass of the quantum matter field (m). Vacuum polarization is essential for the quantum matter field with the mass which is much less than the Higgs mass, $m \ll m_H$. In other words the cosmic string, which has been formed at the grand unification scale, polarizes the vacuum of the present-day quantum matter, but it has no effect on the vacuum of matter fields with masses which are comparable to the scale of grand unification. Global characteristics of the vacuum effects (integrated over the space coordinates in the transversal direction to the cosmic string, e. g., induced vacuum energy or magnetic flux) can be calculated for the arbitrary space-time dimension as function of the tube radius.

HIGH-ENERGY ASTROPHYSICS

Post-Adiabatic supernova remnants in the non-uniform interstellar medium and magnetic field

Taras Kuzyo, O. Petruk

Pidstryhach Institute for Applied Problems of Mechanics and Mathematics, Lviv, Ukraine

kuzyo.taras@gmail.com

The transition to the adiabatic stage in supernova remnants (SNRs) is accompanied by significant changes both in the flow structure and in the hydrodynamical parameters behind the shock. The presence of the perpendicular interstellar magnetic field can considerably change the SNR structure and its evolution. We study the physics of the post-adiabatic stage of SNR evolution in the non-uniform interstellar medium and non-uniform magnetic field. We reveal the role of the number density and magnetic non-uniformity scale as well as of magnetic field strength on the shock wave dynamics and downstream hydrodynamical flow parameters. For this purpose we carried out spherically symmetric MHD simulations of strong blast wave with radiative cooling.

Observations of the Crab Nebula at TeV energies with the FACT Cherenkov Telescope

Anton Dmytriiev[1,2], A. Neronov[3]

[1] *University of Geneva, Geneva, Switzerland*
[2] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*
[3] *ISDC Data Centre for Astrophysics, University of Geneva, Geneva, Switzerland*

amdmame@gmail.com

The Crab nebula is observed with the FACT (First G-APD Cherenkov-telescope) in energy range from 400 GeV up to 20 TeV. We present the results of data analysis for observations of Crab Nebula from October 2013 till February 2016. Our analysis includes new Monte-Carlo simulations for FACT Cherenkov telescope (taking into the account the latest version of detector simulation), new code for image cleaning, more efficient quality cuts for gamma/hadrons separation and background rejection. We also have improved the data selection and gamma-ray energy estimation. We have calculated the Crab nebula spectrum and compare it with the results of MAGIC and H.E.S.S telescopes.

X-ray emission of ICRF sources

Vadim Voytsekhovskyi, A. V. Tugay, V. V. Tkachuk

Taras Shevchenko National University of Kyiv, Kyiv, Ukraine

jstvdk@gmail.com

ICRF is current astrometric reference frame defined by the positions of extragalactic sources. The most of these sources are active galactic nuclei (AGN) so they should have some active processes with rapid motions. Relativistic motions in AGNs can be detected by astrometric methods in the nearest future. Some signs of such processes can be checked in X-ray band. X-ray emission appears in the very centre of AGN and is influenced by the matter with the fastest motions. One of the best modern X-ray space observatory is XMM-Newton launched in 1999. XMM Serendipitous Source Catalogue (XMM-SSC) is the largest catalogue of X-ray sources by our time. The aim of this work is to consider X-ray emission of ICRF sources and to look for features of their possible proper motions. The first stage of our work was to find ICRF sources in 3XMM-DR4 catalogue (version of XMM-SSC in 2013). Current realization of ICRF includes 3414 sources and 3XMM-DR4 catalogue contains 372728 individual sources. We developed a code for searching ICRF sources in 3XMM-DR4 catalogue and found fifty five sources. Then we considered X-ray light curves of these sources from LEDAS database. We found three variable sources: Supernova SN1993J in M81 galaxy and two blazars (W Com and S5 0716+714). Thus we concluded that some special attention should be paid to these sources when employing and developing ICRF. All other X-ray ICRF sources has constant light curves. To perform more complete analysis, we speculated about the witnesses of possible proper motions in their spectra. AGNs are complex phenomena. There is a relativistic accretion disk around the spinning supermassive black hole at the heart of an AGN. In the center of AGN the emission of relativistic particles occur as thin jet with small knots of uniform brightness. The observations of jet may indicate that some knot is moving with speed larger than the speed of light. The explanation of this effect is that we can only observe a projection of three dimensional system on the sky. The effect of "superluminal" expansion is fixed in jets moving toward the observer at a small angle to the line of sight. Blazars has the smallest values of this angle among other AGN types, so it is quite possible to resolve superluminal motions in such systems. We reduced and analyzed XMM spectra of ICRF blazars and made appropriate conclusions a bout their validity in ICRF system.

Search of the galactic sources of the cosmic ray triplet with energies above 10^{20} eV

Roman Gnatyk

Taras Shevchenko National University of Kyiv, Kyiv, Ukraine

roman_hnatyk@ukr.net

Among the registered extremely high energy cosmic rays (EHECR, $E > 10^{20}$ eV) there is a triplet of events in a circle with radius of 4 degrees in the Galactic center region. With the use of the backtracking method, for the calculation of EHECR trajectories in the Galactic magnetic field, it is shown that potential sources of the triplet can be microquasars SS433, GRS1915+105, magnetar SGR1900+14 and globular star cluster NGC6760.

The explanation of Fast Radio Burst phenomenon as electromagnetic radiation from cusps on superconducting cosmic strings

Lidiia Zadorozhna[1], B. Hnatyk[2], M. Khelashvili[1]

[1] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*
[2] *Astronomical Observatory, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*

Zadorozhna_Lida@ukr.net

During the last decade a new class of objects, that received the name fast radio bursts (FRBs), were discovered by Parkes radio telescope and Arecibo observatory. There are 18 observed fast radio bursts. All of them have the similar characteristics. Cosmic strings are topologically stable, one-dimensional defects in the vacuum, which can appear during appropriate phase transition in an adiabatically expanding early Universe, which cools down from a very hot initial state. According to realistic particle-physics models, cosmic string posses a properties of developing tremendous electric currents, thus they effectively becoming electrically superconducting wires of astrophysical dimensions. Superconducting cosmic strings, during their relativistic motion through the cosmic plasma, could be a powerful source of electromagnetic radiation. The radiation from cusps on superconducting strings is highly beamed and has the nature of bursts. We propose to consider fast radio bursts as an electromagnetic emission from cusps on superconducting cosmic string loops, that moves with the large Lorentz-factor through magnetic field, frozen into cosmic plasma. The observed duration, flow and event rate are in a good agreement with proposed model. In the framework of emission from cusps of superconducting cosmic string loops, we also estimated probability of FRB detecting, that is highly close to probability of detecting, given by observational data.

ATMOSPHERIC STUDIES & SPACE GEOPHYSICS

Temporal features of stratosphere ozone distribution over Kyiv by 2011-2014 satellite and ground-based data

Vladyslav Mogylchak

Taras Shevchenko National University of Kyiv, Kyiv, Ukraine

mogylchak.vlad@gmail.com

The temporal distribution of the total ozone column (TOC) over Kyiv territory (50.5°N – 30.5°E) has been analyzed in this report. The short-term TOC variations have been discussed basing on the OMI satellite spectrometer data, and ground-based Dobson 040 spectrophotometer data, located at the station Kyiv-Goloseyev. The difference between ground-based and satellite observations has been considered as well. The seasonal trend with a maximum in the winter-spring period and minimum in summer and autumn over Kyiv have been found in the 2011-2014 period. The data reflect differences between ground-based and satellite observations with the correlation coefficient ($R = 0.801$) due to the presence of heterogeneity cloud cover and different types of ground-based measurements.

Methods and approaches to characterize turbulent environment

Andrew Prokhorenkov[1], L. Kozak[1], A. T. Y. Lui[2], E. Grigorenko[3], E. Kronberg[4]

[1] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*
[2] *Johns Hopkins University Applied Physics Laboratory, Laurel MD, USA*
[3] *Space Research Institute of Russian Academy of Sciences, Moscow, Russia*
[4] *Max Planck Institute for Solarsystem, Göttingen, Germany*

andrew.prokhorenkov@gmail.com

Methods and approaches that can be used for the analysis of hydrodynamic and magnetohydrodynamic turbulent flows are selected. It was determined that the best methods for determination of turbulent process types are methods of statistical physics. Within the statistical approach the fractal analysis (height of the maximum of probability density fluctuations of the studied parameters) and multifractal analysis (study of a power dependence of high order statistical moments and construction of multifractal spectrum) is considered. It is indicated that the statistical analysis of turbulent process properties can be supplemented with spectral studies: Fourier and wavelet analysis. To test methods and approaches discussed in this work it was used measurements of magnetic field fluctuations made by spacecrafts C1, C2, C3 of "Cluster 2" mission with a step 22.5 Hz in the

transition regions of Earth's magnetosphere, solar wind plasma and the Earth's magnetosphere tail. A good match between different researches and mutual additions can be found to provide an overall view of turbulence. This work is done in the frame of complex program of NAS of Ukraine on space researches for 2012-2016, the grant Az. 90 312 from the Volkswagen Foundation ("VW-Stiftung") and within the framework of the educational program No.2201250 "Education, Training of students, PhD students, scientific and pedagogical staff abroad" launched by the Ministry of Education and Science of Ukraine.

Magnetohydrodynamic waves: excitation and propagation with initial mechanical perturbation, MHD large-scale structures. The comparison for the different points of the Earth's ionosphere

Eugen Tkachenko[1], Yu. Rapoport[1,2], Yu. Selivanov[2], V. Ivchenko[1], V. Grimalsky[3]

[1] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*
[2] *Space Research Institute of the National Academy of Sciences of Ukraine and the National Space Agency of Ukraine, Kyiv, Ukraine*
[3] *Autonomous University of Morelos, Cuernavaca, Morelos, Mexico*

eugen.n.tkachenko@gmail.com

The excitation of MHD large-scale structure and propagation of corresponding waves including the role of non-linearity, inhomogeneity and diffusion losses will be discussed in this report. Using the system of equation without "beta-plane approximation" there were held computer calculations for the different altitudes and latitudes of the Earth and also for the different seasons and times of day. The determination of the main regularities of behaviour of magnetic field and velocity of neutral component of ionospheric plasma will be reported. This publication is based on a work supported in part by STCU Project 6060, Theoretical and experimental investigations of the resonant phenomena in the near-space plasma.

Geodynamics and troposphere research using the software GAMIT-GLOBK

Sofiya Doskich

Department of Higher Geodesy and Astronomy, National University Lviv Polytechnic, Lviv, Ukraine

doskich@polynet.lviv.ua

Nowadays, it is possible to explore the local crustal movements using the observations from GNSS stations network. These movements can be caused by the movement of tectonic plates in general and by local effects. In the absence of any

indirect influences, the stations velocities are actually the movement of geological structure. Theoretically, the station velocities are estimated using the coordinates of GNSS station. The seasonal variations are smoothed out and do not affect the estimation of the station velocities, if the data are available on sufficiently long interval of time (at least three years). By using the observations from GNSS stations network we can also receive the value of zenith delay. It is well known that the component of the zenith delay due to water vapour (zenith "wet" delay, ZWD) and the local gradients cannot be accurately determined from a numerical weather model, so must be estimated from the GPS data. At this moment we have several the scientific software for estimating station velocities and atmospheric delays. One of them is GAMIT-GLOBK. This software has been developed by MIT, Scripps Institution of Oceanography, and Harvard University with support from the National Science Foundation. GAMIT produce estimates and an associated with covariance matrix ("quasi-observations") of the station positions and orbital and Earth-rotation parameters which are then input to GLOBK or other similar programs to combine the data with those from other networks and times to estimate positions and velocities. GAMIT-GLOBK also can be used in troposphere studies. This software allows extracting the zenith delay estimates. The main goal of our research was searching for regional combined GNSS solutions (coordinates and velocities) and estimation of precipitable water using the software GAMIT-GLOBK. For these tasks we use the data from Ukraine network of reference GNSS stations (150 stations). We have estimated the station velocities using five years of data. The accuracy of GNSS the stations velocities which we estimated was about 1 mm/year. This accuracy is based on estimation velocities just weekly data of observations a year. Therefore, if we increase the observation period, then the accuracy should be much better. For estimation of precipitable water GAMIT-GLOBK extract the zenith delay estimates, we applied corrections for the hydrostatic delay, and convert the residual wet delay to precipitable water. The output is a met file containing the zenith wet delay (ZWD) and precipitable water (PW) and their uncertainties. In our estimation we have used weather model computed by TU Vienna (VMF1). Nowadays we have estimated met files for about 150 stations in the time interval of two years (2014-2015).

On the analysis of multistep-out-of-grid method for celestial mechanics tasks

Olifer Leonid[1], V. Cholij[2]

[1] *Institute of Physics and Technology, National Technical University of Ukraine "Kyiv Polytechnic Institute", Kyiv, Ukraine*

[2] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*

LeonAnt@ukr.net

Occasionally there is necessity in high-accurate prediction of celestial body trajectory. The most commonly way to do that is to solve Kepler's equation

analytically or to use Runge-Kutta or Adams integrators to solve equation of motion numerically. For low-orbit satellites there is a critical need in accounting geopotential and another forces influence motion. As the result the right side of equation of motion become much bigger and "classical" integrators won't be quite effective. On the other hand there is a multistep off-grid (MOG) method which combines Runge-Kutta and Adams methods. MOG method is based on using m on-grid values of the solution and $n * m$ off-grid derivative estimations. Such the method could provide stable integrators of maximum order, $o(^{hm+mn+n-1})$. The main subject of this research is to implement MOG method for solving satellite equation of motion with taking into account Earth geopotential (EGM2008) and with possibility to add other perturbations such as atmospheric drag or radiation pressure. Simulations were made for satellites on low orbit and with various eccentricities (from 0 to 0.995). Results of MOG integrator were compared with results of Runge-Kutta and Adams integrators of the same order. It was shown that MOG method has higher accuracy that Adams's one and less right-hand value estimations than Runge-Kutta's. That gives him some advantage over "classical" methods.

Pollution of Kyiv atmosphere by aerosol from fires according to lidar sensing and transfer modelling

Yuliya Yukhimchuk[1], G. Milinevsky[1,2]

[1] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*
[2] *Main Astronomical Observatory of the National Academy of Sciences of Ukraine, Kyiv, Ukraine*

juliyuhim@gmail.com

Biomass combustion is one of the important factors of atmospheric aerosols enrichment. These emissions are worth studed because of there negative impact on the human health. Their effects are differentiated from insignificant allergic reactions to serious diseases, especially the respiratory system. In September 2015, a big part of Ukraine, including Kyiv, was covered by concentrated ash and smoke cloud because of burning peatlands. Aerosol density was so high, that atmosphere became opaque to lidar at altitudes over 500 meters (transparency is about 15 km under the normal atmospheric conditions). Smoke plume was clearly visible on satellite images. At the Atmospheric Research station, located in the Main Astronomical Observatory NAS of Ukraine, it was taken measurements of the aerosol distribution, that help to recreate the pollution picture of the air smoke. Aerosol manifestations' measurement, its power and altitude layer, were held using atmospheric lidar CIMEL370. Considering the inverse air path, air masses transfers contributed the Kyiv pollution, because it brought aerosol from places of burning to the capital of Ukraine.

SOLAR SYSTEM & EXOPLANETS

On detection methods of habitable exoplanets

Pablo Antonio Moreno Casares, A. M. Montero Martínez

Faculty of Science, University of Extremadura, Cáceres, Spain
Institute of Astrophysics, University of Zielona Góra, Zielona Góra, Poland

pmorenocf@alumnos.unex.es

This work has as its main aim to study exoplanets, their localization methods and possible habitability. First, we considered some general features of exoplanets and compare them with the planets of the Solar System. After that, we will move to the analysis of different detection methods, and for what kind of exoplanets they are most suitable. Concerning this topic we have tried to give a suitable answer to whether the diminishing number of detected exoplanets is due to technology-related issues. Later on, we will focus on the habitability of these exoplanets taking into account different models of calculating the temperature, what we suppose is one of the main variables for life (which determines the so called habitable zone). Finally, we chose the more effective detection method for habitable exoplanets. We used two different databases, the first one being a more general one (http://exoplanets.eu/catalog) for the study of the detection methods; and the other more specialised in habitability (http://www.hzgallery.org/table.html). We used R to analyse the data.

Project DWARF – Using of eclipsing binaries for searching of exoplanets and brown dwarfs

Viktor Kudak, Š. Parimucha

Institute of Physics, Faculty of Natural Sciences, University of P. J. Šafárik, Košice, Slovakia

viktor.kudak@student.upjs.sk

Project DWARF is a long-term observation campaign for about 60 selected eclipsing binaries aimed at detection of exoplanets or other objects (brown dwarfs) in low-mass detached binaries of different types (low-mass eclipsing binaries with M and K components, short-period binaries with sdB or sdO component, post-common-envelope systems containing a white dwarf). Existence of other bodies in systems are determined by analyzing of O-C diagrams, constructed from observed

minima times of binaries. Objects are selected with intention to determine minima with high precision. About 40 observatories are involved into network at present time, mostly situated in Europe. The observations are made by small or middle class telescopes with apertures of $\sim 20 - 200$ cm. In this contribution we give information about current status of the project, we present main goals and results after 4 years of observations.

Thermal activity of Enceladus

Vadym Kostiuk, A. Bazyey

Odessa I. I. Mechnikov National University, Odessa, Ukraine

kostyukvadim.dsf@mail.ru

The heat source on Saturn's moon, Enceladus, was detected by Cassini mission. The heating is significantly higher than the calculated one. Due to this heat source, the internal ocean of water in the South polar region of the moon can exist and this ocean works as the source of substance for Enceladus' geysers. The aims of this work are dynamic study of the Enceladus' geysers (which supply the material for the E-ring of Saturn), definition of tidal acceleration, its influence on the moon and comparison with the tidal accelerations of other physically similar moons. And we also study the behaviour of particles emitted from the geysers in the E-ring of Saturn.

Upgrade to a newer version the Database of comet polarimetry

Olena Shubina[1], N. Kiselev[1,2], V. Rosenbush[1], O. Ivanova[1,3]

[1] *Main Astronomical Observatory of the National Academy of Sciences of Ukraine, Kyiv, Ukraine*
[2] *Crimean Astrophysical Observatory, Nauchny, Crimea*
[3] *The Astronomical Institute of the Slovak Academy of Sciences, Tatranská Lomnica, Slovak Republic*

shubina@mao.kiev.ua

We present the updating of the electronic database involving published and some unpublished results of cometary polarimetry. The new version of the database contains more than 3400 measurements of linear and circular polarization for 92 comets made between 1881 and 2015. The narrow-band and broad-band measurements cover the spectral range from 0.3 to 2.3 μm. The ranges of phase angles, helio- and geocentric distances of comets are 0.0–122.1°, 0.3–7.01 AU,

0.01–6.52 AU, respectively. We have comprised nearly to 100 references to the published papers and unpublished sources. The data, which were included in the database, are presented in a tabular format in the ASCII codes. The database can be used as the observational basis for detailed theoretical modelling, interpretation of the phase-angle and spectral dependence of polarization, classification of comets, laboratory simulating, and for selecting future space-mission targets.

Analysis of albedo distribution of large asteroid families

Dmytro Shymkiv, I. G. Slyusarev

V. N. Karazin Kharkiv National University, Kharkiv, Ukraine

dshimkiv@gmail.com

Analysis of distribution of some asteroid families was carried out to investigate the uniformity of families. Ten families of Main-Belt Asteroids were chosen, which are located in different parts of Main-Belt (mean heliocentric distances are from 2.15 a.u. to 3.15 a.u.). The asteroids included in analysis are the numbered asteroids, i. e. they have well-known orbits. The albedos were taken from WISE, Akari and IRAS infrared surveys. For these families albedo distributions were built. We examined if the family albedo distribution is close to normal (Gaussian) distribution. The mean value of albedo and dispersion were calculated. Also asymmetry and excess concerned with other statistical moments were obtained. These values allow us to estimate the degree of proximity of albedo distribution to Gaussian distribution.

Radio Meteors Observations facilities at RI NAO

Vasyl Vovk, M. O. Kaliuzhnyi

Research Institute "Nikolaev Astronomical Observatory", Mykolaiv, Ukraine

vasylvovkastr@gmail.com

The Solar system is inhabited with large number of celestial bodies. Some of them are well studied, such as planets and vast majority of big asteroids and comets. There is one group of objects which has received little attention. That is meteoroids with related to them meteors. Nowadays enough low-technology high-efficiency radio-technical solutions are appeared which allow to observe meteors daily. At RI NAO three methodologies for meteor observation are developed: single-station method using FM-receiver, correlation method using FM-receiver and Internet resources, and single-station method using low-cost SDR-receiver.

Observation of faint meteors in Nikolaev Astronomical Observatory

Mykola Kulichenko, O. V. Shulga, Y. S. Sibiryakova

Research Institute "Nikolaev Astronomical Observatory", Mykolaiv, Ukraine

n_kulichenko@mail.ru

Meteor research using TV CCD unintensified techniques was started in 2011 in Nikolaev astronomical observatory (RI NAO). The method of meteor registration is based on combined observation method developed at RI NAO. The main accent of the research is made on precise astrometry and meteoroid orbits calculation. In 2013 first double station meteors with low baseline were observed. The accuracy of visible radiant estimation is $0.7''$ with baseline 5 km, and less $0.5''$ with baseline 11.8 km. The accuracy of velocity and height estimation is 0.5 km/s and 1-2 km.

Peculiarities in limits of the possible existence of the satellite in the gravitational field of planets

Koctiantyn Radchenko, S. O. Yasenev

[1] *National Technical University of Ukraine "Kyiv Polytechnic Institute", Kyiv, Ukraine*
[2] *National Aviation University, Kyiv, Ukraine*

radche000@mail.ru

It is known that the satellites of the planets may exist in the area, which is bounded, on one side it is the Roche limit, on the other — Hill sphere. The determination of the Roche limit and the Hill sphere for some satellites of the planets in the Solar system are analysed. This analysis allowed to establish some of the features and identify the main factors influencing the value of these parameters. Parameters of the Roche limit and the Hill sphere for the largest satellites of the planets of the solar system are improved.

Spectral studies of gas and dust atmosphere of the comets C/2014 Q2 (Lovejoy) and C/2013 US10 (Catalina)

Vasyl Ponomarenko[1], A. O. Simon[1,2], K. I. Churyumov[1]

[1] *Taras Shevchenko National University of Kyiv, Kyiv, Ukraine*
[2] *Main Astronomical Observatory of the NAS of Ukraine, Kyiv, Ukraine*

vasiliyponomarenko@gmail.com

The observations and research of the long periodic comets C/2014 Q2 (Lovejoy) and C/2013 US10 (Catalina) by optical spectra with an average resolution ($\lambda/\Delta\lambda \approx 1200$) are presented. The spectra were obtained in February and December 2015 using the telescope AZT-14 ($D = 4.8$ m, $F = 7.7$ m) and the spectrograph ACP-9 at the observational station of the Taras Shevchenko National University of Kyiv "Lisnyky" (MPC code 585). At the time of the observations, the comet C/2014 Q2 was at the heliocentric distance of $r = 1.30$ AU and the geocentric distance $\Delta = 0.95$ AU, had the integral magnitude $T = 5.5^m$, the elongation angle was $S - O - T = 84^\circ$ and the phase angle – $S - T - O = 49^\circ$. Comet C/2013 US10, at the time of the observations, was at the heliocentric distance of r = 1.0 AU and the geocentric distance $\Delta = 1.2$ AU, had the integral magnitude $T = 6.2^m$, the elongation angle was $S - O - T = 54^\circ$ and the phase angle – $S - T - O = 52^\circ$. On the basis of obtained spectral material the identification of spectral emission bands was made. We calculated some physical parameters of neutral gas cometary atmosphere (using the models of Shulman and Hazer) and dusty cometary atmosphere and built distribution of general and reflected energy along the slit of the spectrograph. We also calculated flows, the number of molecules and gas productivity for basic molecular emissions, relative dust productivity and spectrophotometric gradient. This work has been partially supported by the research project №0114U003875.

Table of Contents