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

18th Young Scientists' Conference on Astronomy and Space Physics

Abstracts

Kyiv, 2011

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Preface

This year Young Scientists' Conference on Astronomy and Space Physics is held for the eighteenth time. We all have been looking forward to the annual meeting of astronomers at Taras Shevchenko National University of Kyiv. 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 Physics faculty of the Taras Shevchenko National University of Kyiv as a students' conference in 1994. Since 1996 our conference has welcomed young researchers from other universities and scientific institutions. During 1994-2010 participants from Ukraine, Russia, Poland, France, Germany, Spain, Sweden, Libya, Egypt, Japan, Finland, Turkey, China, Slovakia, Armenia, USA, Romania 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.

On behalf of the organizing committee we would like to express our gratitude to the invited lecturers and participants for contributing lectures and reports. We are especially grateful to Prof. V. M. Ivchenko for the help in conference organization.

Mykola Malygin and
Local Organizing Committee

PROGRAMME

Monday, May, 2

09.00-11.00 - Registration
11.00-11.30 - Official opening

Section 'Exoplanets'

12.00-12.40 **Siegfried Franck** *(Potsdam Institute for Climate Impact Research, Potsdam, Germany) Diurnal habitability of frozen worlds* **(invited)**

12.40-13.20 **James Jenkins** *(Universidad de Chile, Santiago, Chile) Dissecting precision radial-velocities: searching for planets in Chile* **(invited)**

13.20-14.00 tea-break

14.00-14.15 **Nadia Kostogryz**, T.M. Yakobchuk, A.P. Vidmachenko *(Main Astronomical Observatory of NAS of Ukraine) The causes of the polarization for the transiting exoplanetary system HD189733* **(12+3)**

14.15-14.30 **El Haj Elourabi**, Nour-Eddine Najid *(University Hassan II Casablanca, Casablanca, Morocco) Analytical potential generated by a massive inhomogeneous straight segment. Application to protoplanets formation* **(12+3)**

14.30-14.45 **Michael Barynov** *(Sternberg Astronomical Institute, Moscow State University, Moscow, Russia) Search and investigation of extrasolar planets with high-precision deconvolution-based photometry* **(12+3)**

14.45-15.00 **Grygorii Polinovskyi**, Ya.V. Pavlenko *(Main Astronomical Observatory of NAS of Ukraine, Kyiv, Ukraine) New astrophysical database of the NH3 molecule properties* **(12+3)**

15.00-15.15 **Olga Zakhozhay** *(Main Astronomical Observatory of NAS of Ukraine, Kyiv, Ukraine) New parameters for 10 circumsubstellar disks from Upper Scorpius open cluster* **(12+3)**

15.15-15.45 tea-break

Section 'Solar System'

15.45-16.00 **Alibek Karimov** *(Fessenkov Astrophysical Institute, Almaty, Kazakhstan) Spectrophotometry of Saturn between the equinoxes 1995 and 2009* **(12+3)**

16.00-16.15 **Natalia Bondarenko** *(Fessenkov Astrophysical Institute, Almaty, Kazakhstan) The study of the ammonia absorption band NH3 787 nm behavior on Jupiter* **(12+3)**

16.15-16.30 **Kateryna Frantseva**, A.M. Kazantsev *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Correction of asteroid Apophis orbit to prevent it possible collisions with the Earth* **(12+3)**

16.30-16.45 **Anton Pomazan**, A.V. Ivantsov *(Research Institute "Nikolaev Astronomical Observatory", Mykolaiv, Ukraine) The influence of Yarkovsky and YORP effects on dynamical evolution of asteroids* **(12+3)**

16.45-16.50 **Andrei Klianchin** *(Main Astronomical Observatory of NAS of Ukraine, Kyiv, Ukraine) The tectonic structure of the Jupiter satellite - Europa* **(poster)**

16.50-16.55 **Alexander Baransky**, Yu.M. Krugly, V.O. Ponomarenko, K.I. Churyumov, I.E. Molotov *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Photometry of asteroids at the observational station of Kyiv National Shevchenko University in the village Lisnyky* **(poster)**

16.55-17.00 Julia Andrienko, V. Reshetnyk *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Electronic catalogue of the physical characteristics of comets* **(poster)**

17.00-17.05 Vasyl Ponomarenko, K.I. Churyumov, O.R. Baransky, V.V. Kleshchonok, L.S. Chubko *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Peculiarities of spectra of comet 81P/Wild on 28/29 March and 2/3 April 2010* **(poster)**

17.05-17.10 Sergii Zaitsev, N. Kiselev, V. Rosenbush *(Main Astronomical Observatory of NAS of Ukraine, Kyiv, Ukraine) Polarimetry of the Galilean satellites near opposition* **(poster)**

Section 'Computers in Astronomy'

17.10-17.25 Leonid Zotov *(Sternberg Astronomical Institute, Moscow State University, Moscow, Russia) Application of Multichannel singular spectrum analysis to geophysical fields and astronomical images* **(12+3)**

17.25-17.40 Anastasiia Zolotukhina *(Main Astronomical Observatory of NAS of Ukraine, Kyiv, Ukraine) CCD arhive of observation of the MAO NAS Ukraine* **(12+3)**

17.40-17.55 Alexey Sosnovsky, A.A. Shlyapnikov *(Tavrida National V.I. Vernadsky University, Simferopol, Ukraine) Crimean Astrophysical Visual Observatory: spectra and photografic magnitudes of 3340 stars in Perseus catalogue by E.S. Brodskaya and P.F. Shajn. Digital catalog* **(12+3)**

17.55-18.20 tea-break

18.30-21.00 Excursion to the Main Astronomical Observatory of NAS of Ukraine

Tuesday, May, 3

Section 'Stellar Astrophysics'

09.00-09.30 morning coffee

09.30-09.45 Anastasia Isaeva *(Sternberg Astronomical Institute, Moscow State University, Moscow, Russia) On selection effects in catalogues of binary stars* **(12+3)**

09.45-10.00 Anna Punanova, A.A. Popov, V.V. Krushinsky, A.V. Loktin *(A.M. Gorky Ural State University, Yekaterinburg, Russia) CCD VRI photometry of the old open cluster NGC 7142* **(12+3)**

10.00-10.15 Natallia Sudnik *(Institute of Astronomy, Saint-Petersburg State University, Saint-Petersberg, Russia) Smooth time variation spectra as a tool to study the line profile variability in spectra of hot stars* **(12+3)**

10.15-10.30 Mykola Malygin, Ya.V. Pavlenko *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Abundances determination in hosting solar-like stars* **(12+3)**

10.30-10.45 Oleksiy Ivanyuk, Ya.V. Pavlenko *(Main Astronomical Observatory of NAS of Ukraine, Kyiv, Ukraine) Neutral iron abundance in the fast rotating star PZ Telescopium A* **(12+3)**

10.45-11.15 tea-break

11.15-11.55 Yakiv Pavlenko *(Main Astronomical Observatory of NAS of Ukraine, Kyiv, Ukraine) Spectra and abundances of hosting stars and exoplanets* **(invited lecture)**

11.55-12.35 **Ivan Andronov** *(Odessa National Maritime University, Odessa, Ukraine) Period variations of interacting binary and pulsating stars: physical mechanisms vs. mathematical modeling* **(invited lecture)**

12.35-12.50 **Vitalii Breus**, I.L. Andronov, T. Hegedus *(Odessa National Maritime University, Odessa, Ukraine) Two-period variability of the intermediate polar FO Aqr* **(12+3)**

12.50-13.05 **Karolina Bakowska**, A. Olech *(Astronomical Observatory of A. Mickiewicz University, Poznan, Poland) Catalysmic binary stars on small telescopes* **(12+3)**

13.05-13.20 **Svitlana Artemenko** *(Crimean Astrophysical Observatory, Nauchny, Ukraine) Accretion powered chromospheres in classical T Tauri stars* **(12+3)**

13.20-13.25 **Grygorii Polinovskyi**, Ya.V. Pavlenko *(Main Astronomical Observatory of NAS of Ukraine, Kyiv, Ukraine) Physical and chemical properties of the atmosphere of the carbon star TU Gem* **(poster)**

13.25-13.30 **Andrew Simon**, N.V. Metlova *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Photometric Monitoring of Some Be/X-ray Binaries* **(poster)**

13.30-13.35 **Sergey Belan**, D.N. Shakhovskoy, K.N Grankin, S.A. Lamzin, A. Dodin *(Crimean Astrophysical Observatory, Nauchny, Ukraine) Photopolarimetry of RW Aur: unusual light minimum due to obscuration by circumstellar dust* **(poster)**

13.35-13.40 **Andrey Dolgov**, A.A. Shlyapnikov *(Tavrida National V.I. Vernadsky University, Simferopol, Ukraine) The study of stars from the catalog GTS 10 by archival observations of the Crimean Astrophysical Observatory* **(poster)**

13.40-13.45 **Natalia Virnina**, I.L. Andronov, M.V. Mogorean, S. Zola *(Odessa National Maritime University, Odessa, Ukraine) The seasonal changes of the binary system WZ Crv* **(poster)**

13.45-13.50 **Maxim Kuznetsov** *(Main Astronomical Observatory of NAS of Ukraine, Kyiv, Ukraine) Spectral investigations of CM Draconis - new results* **(poster)**

13.50-13.55 **Sviatoslav Smerechynskyi**, M.V. Vavrukh, N.L. Tyshko *(Ivan Franko National University of Lviv, Lviv, Ukraine) Inverse task in degenerated dwarfs theory* **(poster)**

13.55-14.00 **Elena Nikitina**, I.F. Malov *(Pushchino State University; Pushchino Radio Astronomy Observatory, Lebedev Physical Institute, Pushchino, Russia) On the structure of pulsar magnetosphere* **(poster)**

14.00-14.05 **Dmitry Chulkov** *(Sternberg Astronomical Institute, Moscow State University, Moscow, Russia) On statistical distributions of wide binary stars* **(poster)**

14.05-14.10 **Nikolay Pit**, K.A. Antonyuk *(Crimean Astrophysical Observatory, Nauchny, Ukraine) The photopolarimeteric observations of a unique minimum of UX Ori* **(poster)**

15.00-18.00 City tour (by bus)

18.00-22.00 Kyiv by night (walking tour)

Wednesday, May, 4

Section 'Extragalactic Astrophysics'

09.00-09.30 morning coffee

09.30-09.45 Roman Uklein, D.I. Makarov *(Special Astrophysical Observatory of RAS, Nizhny Arkhyz, Russia) Obsevations of groups of dwarf galaxies. First Results* **(12+3)**

09.45-10.00 Daria Dobrycheva, O.V. Melnyk *(Taras Shevchenko Chernigiv National Pedagogical University, Chernigiv, Ukraine) Criteria for galaxy classification in SDSS* **(12+3)**

10.00-10.15 Maryna Mykhailova *(Institute of Radio Astronomy of NAS of Ukraine, Kharkiv, Ukraine) X-ray emission of kiloparsec jets at large redshift* **(12+3)**

10.15-10.45 Areg Mikaelian *(Byurakan Astrophysical Observatory, Byurakan, Armenia) Astronomical surveys, data bases and virtual observatories* **(invited lecture)**

10.45-11.15 tea-break

11.15-11.45 Bidzina Kapanadze *(Ilia State University, E. Kharadze Abastumani National Astrophysical Observatory, Tbilisi, Georgia) X-ray selected BL Lacertae objects: statistical poroperties and complete catalogue* **(invited lecture)**

11.45-12.00 Kateryna Agiienko, Yu.I. Izotov *(Main Astronomical Observatory of NAS of Ukraine, Kyiv, Ukraine) WR-galaxies from Sloan Digital Sky Survey Data Release 7* **(12+3)**

12.00-12.15 Igor Zinchenko, L.S. Pilyugin *(Main Astronomical Observatory of NAS of Ukraine , Kyiv, Ukraine) Oxygen and Nitrogen abundances in Cool HII regions from the Sloan Digital Sky Survey* **(12+3)**

12.15-12.20 Hayk Abrahamyan, M.A. Hovhannisyan, G.M. Paronyan *(Byurakan Astrophysical Observatory, Byurakan, Armenia) Investigation of radio galaxies in the region 7 C II directory* **(poster)**

12.20-12.25 Zohreh Ghaffari *(Institute for Advanced Studies in Basic Sciences, Zanjan, Iran) Measurements of EWs for the spectral line for metallicity estimation in galaxies* **(poster)**

12.25-12.30 Parvin Mostafavi *(Institute for Advanced Studies in Basic Sciences, Zanjan, Iran) Photometry of galaxies located in the HDE-S area* **(poster)**

12.30-12.35 Irina Lypova *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) The relation "line width - luminosity" for HII galaxies* **(poster)**

12.35-12.40 Anatoliy Vasylenko, A.V. Tugay *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) X-ray emission of galaxies without active nuclei* **(poster)**

12.40-12.45 Stanislav Shihov, A.V. Tugay *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Surface brightness profiles of Seyfert galaxies* **(poster)**

12.45-12.50 Roman Yashenko *(Taras Shevchenko Chernigiv National Pedagogical University, Chernigiv, Ukraine) Radio image analysis of AGN jets* **(poster)**

12.50-12.55 Ganna Ivashchenko, O. Sergijenko *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) The UV spectral properties of quasars from SDSS DR7* **(poster)**

Section 'Gravitation & Cosmology'

14.00-14.30 Yuri Shtanov *(Bogolyubov Institute for Theoretical Physics, Kyiv, Ukraine) What we do not understand about our Universe* **(invited lecture)**

14.30-15.00 Antonino Del Popolo *(Catania University, Catania, Italy) On the non universality of surface density of galaxies* **(invited lecture)**

15.00-15.15 Tomasz Kazimierczak *(Centre for Astronomy of Nicolaus Copernicus University, Toruń, Poland) The shape and the size of the Universe according to the Poincare Dodecahedral Space hypothesis* **(12+3)**

15.15-15.30 Olga Sergijenko, B. Novosyadlyj, R. Durrer *(Astronomical Observatory of the Ivan Franko National University of Lviv, Lviv, Ukraine) Observational constraints on scalar field models of dark energy with barotropic equation of state* **(12+3)**

15.30-15.45 Iurii Babyk, A. Elyiv, O. Melnyk, V.N. Krivodubskij *(Taras Shevchenko National University of Kyiv , Kyiv, Ukraine) Dark matter and intracluster gas distribution in galaxy clusters* **(12+3)**

15.45-16.15 tea-break

16.15-16.20 Ali Azizi, N. Fatahi *(Islamic Azad University, Sanandaj Branch, Sanandaj, Iran) Quantization of spinor field in Krein space* **(poster)**

16.20-16.25 Sarah Fazlollah Pour, S.A. Bidgoli, T.T. Kashani *(Islamic Azad University, Tehran, Iran) Modeling the void size distribution using excursion set theory* **(poster)**

16.25-16.30 Nikita Lovyagin *(Saint Petersburg State University, Saint-Petersburg, Russia) Project of program package for exploring of cosmological fractals* **(poster)**

16.30-16.35 Vitaliy Slyusar, V.I. Zhdanov *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Microlensing of an extended source by binary microlenses* **(poster)**

16.35-16.40 Violetta Sagun, Yu.I. Izotov *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) The primordial abundance determination of* ^{4}*He, including new data on systematic effects* **(poster)**

16.40-16.45 Olga Vasylenko, G. Ivashchenko *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) The angular correlation function of photometrically classified quasars from SDSS NBCKDE Catalogue* **(poster)**

16.45-17.00 Davood Mohammady *(Physics Faculty, Damghan University, Damghan, Iran) Simulation of pleiades cluster by Modified Newtonian Dynamics* **(12+3)**

17.00-17.15 Margaryta Sobolenko, P.P. Berczik *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Post-Newtonian test simulations of the merging super-massive black hole binaries* **(12+3)**

17.15-17.20 Artem Bogdan, B.I. Hnatyk *(G.V. Kurdyumov Institute of Physics of Metals of NAS of Ukraine, Kyiv, Ukraine) Calculation of orbital motion in binary systems of black holes on the example of a quasar OJ287* **(poster)**

17.20-17.25 Farhad Tavakoli *(Islamic Azad University, Tehran, Iran) The effect of self-force on a freely falling massive charged particle in de Sitter universe* **(poster)**

17.25-17.30 Mohammad Reza Tanhayi *(Islamic Azad University, Tehran, Iran) Higher order theories of gravity* **(poster)**

17.30-17.35 Samir Vartabi Kashanian, Zeinab Khorrami *(Institute for Advanced Studies in Basic Sciences, Zanjan, Iran) Dynamical evolution of star clusters in external galaxy tidal field* **(poster)**

17.35-17.40 Zahra Hassani *(Institute for Advanced Studies in Basic Sciences, Zanjan, Iran) Dynamical evolution of globular clusters* **(poster)**

17.45-22.00 Organ hall / opera hall / etc.

Thurthday, May, 5

Section 'High-Energy Astrophysics & Astroparticle Physics'

09.00-09.30 morning coffee

09.30-09.45 Volodymyr Marchenko, B. Hnatyk *(Taras Shevchenko Chernigiv National Pedagogical University, Chernigiv, Ukraine) The possibility of detection of relativistic shock break-out at the surface of Hypernova* **(12+3)**

09.45-10.00 Oleksandr Sushchov, O.O. Kobzar, B.I. Hnatyk, V.V. Marchenko, T.M. Bohdan *(Taras Shevchenko Chernigiv National Pedagogical University, Chernigiv, Ukraine) Centaurus A as a plausible source of ultra high energy cosmic rays events registered by the Pierre Auger Observatory* **(12+3)**

10.00-10.15 Oleh Kobzar, O.B. Sushchov, B.I. Hnatyk, V.V. Marchenko, T.M. Bohdan *(Taras Shevchenko Chernigiv National Pedagogical University, Chernigiv, Ukraine) The influence of galactic magnetic field on the propagation of the ultrahigh energy cosmic rays from Virgo A* **(12+3)**

10.15-10.30 Vasyl Beshley, O.L. Petruk *(Institute for Applied Problems in Mechanics and Mathematics, Lviv, Ukraine) Hadronic gamma-rays emission of supernova remnants* **(12+3)**

10.30-11.00 tea-break

11.00-11.30 Radomir Smida *(Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen, Germany) The results from the Pierre Auger Observatory* **(invited lecture)**

11.30-11.45 Volodymyr Masliukh, B.I. Hnatyk *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Hypernovae as accelerators of high energy and ultra-high energy cosmic rays* **(12+3)**

11.45-12.00 Dmytro Rogozin *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Nonthermal radiation of superconducting cosmic strings* **(12+3)**

12.00-12.15 Dmytro Iakubovskyi, D. Malyshev, A. Boyarsky, O. Ruchayskiy *(Bogolyubov Institute for Theoretical Physics, Kyiv, Ukraine) How to find a dark matter decay line* **(12+3)**

12.15-12.30 Denys Malyshev, M. Chernyakova, F.A. Aharonian, R.M. Crocker, D.I.Jones *(Bogolyubov Institute for Theoretical Physics, Kyiv, Ukraine; Dublin Institute for Advanced Studies, Dublin, Ireland) The high-energy, arcminute-scale galactic center gamma-ray source* **(12+3)**

12.30-12.45 Ievgen Vovk, A. Neronov *(ISDC Data Centre for Astrophysics, Versoix, Switzerland) Fast variability of γ-ray emission from supermassive black hole binary OJ 287* **(12+3)**

12.45-13.00 Elina Ismailova, S.A. Grebenev *(National Nuclear Research University & Space Research Institute, Moscow, Russia) Discovery with INTEGRAL and follow-up investigation of new transient X-ray sources IGR J17473-2721 and IGR J17419-2802* **(12+3)**

13.00-13.05 Ekaterina Sukach, V. Marchenko *(Taras Shevchenko Chernigiv National Pedagogical University, Chernigiv, Ukraine) X-ray image and spectral analysis of AGN jets* **(poster)**

13.05-13.10 Iryna Komok, V. Marchenko, M. Prus *(Taras Shevchenko Chernigiv National Pedagogical University, Chernigiv, Ukraine) The image and spectral analysis of the hot spots in AGN jets* **(poster)**

13.10-13.15 Denis Sokolov, V. Marchenko *(Taras Shevchenko Chernigiv National Pedagogical University, Chernigiv, Ukraine) The transverse structure of AGN jets from radio and X-ray data* **(poster)**

13.15-13.20 Maryna Barylo, V. Marchenko *(Taras Shevchenko Chernigiv National Pedagogical University, Chernigiv, Ukraine) The image and spectral analysis of the knots in AGN jets* **(poster)**

13.20-13.25 Demid Pekur, V. Marchenko, B.I. Hnatyk *(Taras Shevchenko Chernigiv National Pedagogical University, Chernigiv, Ukraine) Neutrinos and gamma-rays from Hypernova explosion* **(poster)**

13.25-13.30 Taras Kuzyo, O. Petruk *(Ivan Franko National University of Lviv, Lviv, Ukraine) Properties of interstellar medium and magnetic field around Tycho SNR* **(poster)**

Section 'Interstellar Medium'

14.30-15.00 Bogdan Wszołek *(Jan Długosz Academy, Institute of Physics, Częstochowa, Poland) Spectroscopic families among diffuse interstellar bands* **(invited lecture)**

15.00-15.15 Paweł Dobierski *(Centre for Astronomy of Nicolaus Copernicus University, Toruń, Poland) Correlation between interstellar atomic lines* **(12+3)**

15.15-15.30 Maryana Sokil, B.Ya. Melekh, V.V. Holovatyy *(Ivan Franko National University of Lviv, Lviv, Ukraine) Chemical composition of planetary nebulae in magellanic clouds* **(12+3)**

15.30-15.45 Roman Korytko, B.Ya. Melekh, V.V. Holovatyy *(Ivan Franko National University of Lviv, Lviv, Ukraine) Determination of energy distribution in ionizing radiation spectrum of Orion Nebula* **(12+3)**

15.45-16.00 Ruslana Kozel, B.Ya. Melekh, I.O. Koshmak *(Ivan Franko National University of Lviv, Lviv, Ukraine) Photoionization modelling of stellar wind bubbles surrounding starburst regions* **(12+3)**

16.00-16.30 tea-break

16.30-16.45 Oleg Buhajenko, B.Ya. Melekh *(Ivan Franko National University of Lviv, Lviv, Ukraine) The diffuse component of the radiation ionization field in the nebular objects* **(12+3)**

16.45-17.00 Geoffrey Okeng'o, D.P. Smits *(University of Nairobi, Nairobi, Kenia; University of South Africa) Polarization in astronomical masers* **(12+3)**

17.00-17.05 Julita Ozga, Łukasz Janik, B. Wszołek *(Częstochowa University of Technology, Częstochowa, Poland) Diffuse interstellar bands towards ξ Persei* **(poster)**

17.05-17.10 Agnieszka Debudej, B. Wszołek *(Polskie Towarzystwo Miłośników Astronomii, Częstochowa, Poland) Narrow interstellar absorption lines in oPer direction* **(poster)**

17.10-17.15 Sylwia Kusiak, B. Wszołek *(Polskie Towarzystwo Miłośników Astronomii, Częstochowa, Poland) Broad diffuse interstellar bands in the direction of HD23180* **(poster)**

17.15-17.20 Agnieszka Kuźmicz, B. Wszołek *(Jagiellonian University Astronomical Observatory, Krak'ow, Poland) Interstellar spectral features and telluric absorption lines* **(poster)**

17.20-17.25 Anna Karnaushenko *(Institute of Radio Astronomy of NAS of Ukraine, Kharkiv, Ukraine) Analytical Solution of Kompaneets equation* **(poster)**

Section 'Astronomical Equipment'

17.25-17.40 Aleksander Kurek *(Institute of Physics, Opole Universtity, Opole, Poland) "Solaris" – a professional astronomical observatory on the roof of a hypermarket* **(12+3)**

17.40-17.45 Roman Esselbakh, Stanislav Melkov *(Donbass State Technical University, Alchevsk, Ukraine) The shaper of a time mark for laser ranging of the Earth artificial satellites* **(poster)**

17.45-17.50 Serhii Pokhvala *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Photometry with the help of digital camera Canon 350D* **(poster)**

19.30-22.00 Conference dinner

Friday, May, 6

Section 'Solar Physics and Heliosphere'

09.00-09.30 morning coffee

09.30-09.45 Anastasiya Boiko, V.N. Melnik, A.A. Konovalenko, E.P. Abranin, V.V. Dorovskyy, H.O. Rucker *(Institute of Radio Astronomy of NAS of Ukraine, Kharkiv, Ukraine) Decametric radio bursts associated with the 13 July 2004 CME event at frequencies 10-30 MHz* **(12+3)**

09.45-10.00 Ievgeniia Sadovenko, M.I. Pishkalo *(Astronomical Observatory, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Calculation and visualisation of coronal magnetic field during 1997, 2006 and 2008 total Solar eclipses* **(12+3)**

10.00-10.15 Olexandra Baran *(Astronomical Observatory of Ivan Franko National University of Lviv, Lviv, Ukraine) Observed photosphere convection on different spatial scales* **(12+3)**

10.15-10.30 Artem Koval, A.A. Stanislavsky, A.A. Konovalenko *(Institute of Radio Astronomy of NAS of Ukraine, Kharkiv, Ukraine) New developments of UTR-2 working modes: two-dimensional heliograph* **(12+3)**

10.30-11.00 tea-break

11.00-11.05 Fateme Amirkhanlou *(Institute for Advanced Studies in Basic Sciences, Zanjan, Iran)* **(poster)**

11.05-11.10 Antonina Klyueva, V.G. Lozitsky *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Comparison of magnetic fields in a sunspot measured by five spectral lines with different Lande factors* **(poster)**

11.10-11.15 Olga Botygina, V.G. Lozitsky *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Strong magnetic fields measured in solar prominences by D3 and Hα lines* **(poster)**

11.15-11.20 Iryna Prunchak, N.L. Tyshko *(Ivan Franko National University of Lviv, Lviv, Ukraine) Analytical calculation of absorption line profiles for deformed normal distribution* **(poster)**

11.20-11.25 Valery Kryvodubskyj *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) On the extended 23rd solar cycle* **(poster)**

11.25-11.40 Olga Katushkina, V.V. Izmodenov *(Lomonosov Moscow State University, Moscow, Russia) Interstellar hydrogen atoms inside the heliosphere: theoretical search of the heliospheric boundary effects* **(12+3)**

11.40-11.55 Valentyn Bovchaliuk, O. Agapitov *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Source of the periodic perturbation in the Solar wind plasma* **(12+3)**

11.55-12.00 Sergey Sergeev *(Pushchino Radio Astronomy Observatory, FIAN, Pushchino, Russia) The dynamic spectrum of scintillating radio sources* **(poster)**

12.00-12.05 Anastasiya Knurenko *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Some plasma aspects of solar-terrestrial relations* **(poster)**

12.05-12.40 Vladimir Busarev *(Sternberg Astronomical Institute, Moscow, Russia) Spectrophotometry of asteroids and some results of it* **(invited lecture)**

Section 'Atmospheric Studies and Space Geophysics'

14.00-14.30 Georgii Lizunov *(Space Research Institute of NASU-NSAU, Kyiv, Ukraine) Satellite missions for ionosphere exploration in Ukraine: from "Warning" to "Ionosat"* **(invited lecture)**

14.30-14.45 Polya Dobreva, M.D. Kartalev *(Institute of Mechanics, Sofia, Bulgaria) Some properties of the magnetosheath flow in gasdynamic simulations* **(12+3)**

14.45-15.00 Olga Mikhailova, D.Yu. Klimushkin, P.N. Mager *(Institut of Solar-Terrestrial Physics, Irkutsk, Russia) Pc1-pulsations: the parallel structure in the plasma with the admixture of the heavy ions* **(12+3)**

15.00-15.30 tea-break

15.30-15.45 Maxim Chelpanov, N.A. Zolotukhina *(Institut of Solar-Terrestrial Physics, Irkutsk, Russia) Subauroral heliosphere-heosphere coupling during November 2004 ionospheric storms: F2-region, North-East Asia* **(12+3)**

15.45-16.00 Sergey Cheremnykh, O.V. Agapitov *(Space Reasearch Institute of NASU-NSAU, Kyiv, Ukraine) MHD modes coupling in the plasma system with dipole magnetic field* **(12+3)**

16.00-16.15 Alexander Tsupko, L.V. Kozak *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Analysis of turbulent processes in the boundary layers of Earth's magnetosphere* **(12+3)**

16.15-16.30 Dmitriy Mendzhul, O.V. Agapitov *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Chorus wave peculiarities in the inner magnetosphere: numerical simulation results* **(12+3)**

16.30-16.45 Oleksandr Shuyenko, L.V. Kozak *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Features of electrical field of the Earth atmosphere* **(12+3)**

16.45-17.00 Vitaliy Zhaborovskyy, V.Ya. Choliy *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Earth's atmospheric parameters estimation from low artificial satellites laser ranging data* **(12+3)**

17.00-17.15 Anatolii Koval, V.Ya. Choliy *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Model issue on ionospheric tomography based upon GNSS satellites* **(12+3)**

17.15-17.30 Andrew Prokhorenkov, V.Ya. Choliy *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Parametric modeling of global TEC fields* **(12+3)**

17.30-17.35 Sonni Setiawan *(Department of Geophysics and Meteorology, Bogor Agricultural University, Bogor, Indonesia) Vertically propagating free atmospheric planetary waves (Kelvin and Rossby-Gravity waves) on an equatorial beta-plane* **(poster)**

17.35-17.40 Sandro Wellyanto Lubis, S. Setiawan *(Department of Geophysics and Meteorology, Bogor Agricultural University, Bogor, Indonesia) Theoretical simulation of free atmospheric planetary waves on an equatorial beta-plane* **(poster)**

17.40-17.45 Dmytro Saliuk, O.V. Agapitov *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) Magnetized Rossby waves in mid-latitude ionosphere F-layer* **(poster)**

17.45-17.50 Andrii Voshchepynets, O.V. Agapitov *(Taras Shevchenko National University of Kyiv, Kyiv, Ukraine) The chorus source structure in the inner magnetosphere* **(poster)**

17.50-18.30 Poster Section + Tea-break

18.30-19.00 Official closure

Saturday, May, 7

08.30-12.00 Excursions to Kyiv-Pechersk Lavra

13.00-15.00 Museum of Folk Architecture and Life of Ukraine

INVITED LECTURES

Diurnal habitability of frozen worlds

Siegfried Franck[1], K. J. Kossack[2], W. von Bloh[1], C. Bounama[1]

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In this work we discuss effects allowing local habitability of some extraterrestrial planets despite of low average surface temperature. We analyze the problem of diurnal and seasonal changes of temperature and biological productivity at different locations on a hypothetical Earth-like planet. Under some circumstances the temperature may locally rise well above the average value, allowing periods of enhanced biological activity. In this way, bioproductivity can become periodically possible on a planet that has average temperature clearly below 0° C. Such thermal conditions are encountered on Mars, generally considered as inhabitable. In reality, an appropriate temperature is not sufficient for habitability. The presence of liquid water at the considered location is also necessary. We discuss how temperature oscillations affect habitability in the framework of a conceptual model. We find, that the considered effect of diurnal and seasonal temperature oscillations can significantly extend the outer boundary of the habitable zone.

Dissecting precision radial-velocities: searching for planets in Chile

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I will describe the necessary steps needed to obtain precision radial-velocity measurements at the m/s level capable of discovering extrasolar planets around stars in the local solar neighbourhood. I will describe new pipelines I am developing to obtain these velocities using the two classical methods to extract precision velocities using optical spectrographs; namely the absorption cell method and the system stabilisation or simultaneous gas lamp method. I will discuss in detail how both of these methods are employed and the results we can gain from them and then I will show some latest results we have obtained in Chile hunting for planets around metal-rich Sun-like stars and southern giant stars using the HARPS, CORALIE, FEROS, FECH and new CHIRON spectrographs. Finally, I will briefly highlight the next generation of spectrographs that plan to deliver radial-velocities at the cm/s level.

Spectra and abundances of hosting stars and exoplanets

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Procedure and results of synthetic spectra of hosting stars and exoplanets are discussed, Some details of the fine analysis of chemical abundances are given. First results of the abundances determination are shown.

Period variations of interacting binary and pulsating stars: physical mechanisms vs. mathematical modeling

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We present a review on physical mechanisms causing period variations of interacting binary and pulsating stars of various types: "conservative" mass transfer, non-magnetic and magnetic stellar wind, gravitational radiation, occasional accretion events, "starquakes", relativistic and non-relativistic apsidal motion, light-time effect in a presence of a third (fourth,...) body, changes of structure etc. Such period variations are characterized by a variety of types, so a set of complementary mathematical models, algorithms and programs it to be elaborated and applied. The following groups of methods are reviewed: a) determination of "seasonal" periods and other characteristics, i.e. when the complete set of data is splitted into "seasons", often with very large gaps between them; b) determination of "characteristic times only", neglecting other characteristics, for further O-C analysis; c) modeling the complete data set without splitting taking into account possible variations of the period and shape. Special attention is paid to accurate accuracy estimates of the model characteristics determined after a non-linear optimization in a multi-dimensional parameter space, contrary to oftenly used simplified formulae (this scientific "illness" even got a term "matrix-phobia"). Currently, a set of proposed methods was used in our group to analyze > 1400 variable stars of different types.

Astronomical surveys, data bases and virtual observatories

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Astronomical surveys give most of the available information and fill astronomical databases for further research. Especially useful are all-sky and large-area surveys as they provide homogeneous data for vast amount of objects and make possible studies on various kinds of objects over large surfaces, such as e.g. the Sloan Digital Sky Survey (SDSS) taken over 10,000 square degrees area. Most of the modern databases give at present VO access to the stored information. This makes possible not only the open access but also a fast analysis and managing of these data. Analyzing and matching data from various surveys and catalogs one can find out a dataset that itself is new, though published long ago in different catalogs. New discoveries this way become possible. Cross-correlations result in revealing new objects and new samples. Very often dozens of thousands sources hide a few very interesting ones that are needed to be discovered. We are going to show, how the discoveries come when a comparative analysis of data from various catalogs and their correlation is made. However, one must be careful with inhomogeneity and make necessary correction and transformations. In addition, new efficient tools for analysis of large catalogs are needed.

X-ray selected BL Lacertae objects: statistical poroperties and complete catalogue

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This review focuses on the statistical properties of X-ray selected BL Lacertae objects (XBLs) whose complete catalogue including their equatorial coordinates, redshifts, multi-frequency flux values and luminosities has been compiled. It consists of 309 sources from different X-ray surveys, unambiguously identified to mid-2010. Redhift values range from 0.031 to 0.702 with peak number of the objects in the interval of $(0.25, 0.30)$. $\log \nu L_\nu$ is of order $39-42$ at 1.4 GHz while those of optical V- and X-ray $0.1-2.4$ keV bands are of $43-46$ order. XBL hosts are elliptical galaxies with effective radius of $3.26-25.40$ kpc and $M_R = -21.11--24.86$ while the nuclei reveal much broader range of optical absolute magnitude of (-19.93,-27.24). $V-R$ indices of the hosts reveal third order polynomial relationship with z. $\log M_{BH}/M_\odot$ values range with almost two order of the masses up to maximum value of 9.30 and do not show a correlation neither with redshift nor with luminosities. Overall flux variability shows an increasing trend towards greater frequencies. The same trend is seen for microvariabilities. As for Synchrotron peak frequencies $\log \nu_{peak} \sim 15-21$ with a median value of 16.98. broadband α_{ro}, α_{ox}, and α_{rx} indices fall within the intervals $(0.17, 0.59)$, $(0.56, 1.48)$, and $(0.41, 0.75)$, respectively. A separate list of 106 XBL candidates is also created including the same characteristics for each source as in the case of XBL catalogue.

What we do not understand about our Universe?

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In spite of dramatic progress in theoretical and observational cosmology during the last decades, several questions of principle about the origin and composition of our universe remain to be a mystery. I will discuss the problems posed by the discovery of dark matter and dark energy, the problem of baryonic asymmetry, and the problem of the beginning of our universe.

On the non-universality of surface density of galaxies

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We study, through an analytical model, the correlation between the central surface density and the halo core radius of galaxy and clusters of galaxies dark matter haloes recently studied on a wide range of scales. Modeling the dark halo with the quoted density profiles, we find that the column density within the halo characteristic radius is not an universal quantity as claimed by Donato et al. and Gentile et al. On the contrary, we find a correlation with the halo mass M200 in agreement with Cardone & Tortora, Boyarsky et al. and Napolitano et al., but the scatter in the the slope of the $S-M$ relation is much smaller namely 0.16 ± 0.05. This leaves small room to the possibility of a constant surface density, as claimed by Donato et al. and Gentile et al.

The results from the Pierre Auger Observatory

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The Auger experiment is the largest observatory of high-energy cosmic rays. It is located in Argentina and has taken data since January 2004. Extensive air showers initiated by cosmic-ray particles are measured by the hybrid detector, which combines a sampling of particle density by water Cherenkov tanks and a measurement of ultraviolet light by telescopes. New detection techniques, like radio and microwave measurement, are also tested. Results on energy spectrum, mass composition and arrival directions are presented.

Spectroscopic families among diffuse interstellar bands

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One of the longest standing problems in astronomy and astrochemistry has been the inability to identify the diffuse interstellar bands (DIBs) carriers. It is debated whether the DIB carriers arise from the dust, the gas, or the large-molecule component of the interstellar medium. Furthermore, different strength ratios of major DIBs along different lines of sight, revealed a DIB origin in many carriers. Any attempt to solve the mystery of DIBs' carriers must involve interdisciplinary collaboration between molecular physicists, chemists and astronomers. One expects that progress in this field will be possible when all known DIBs are divided into families in such a way that only one carrier is responsible for all bands belonging to a given family. Among all known DIBs we can see only few relatively strong bands and many rather weak ones. With better quality spectra one can expect to find more weak DIBs. It is very probable that DIBs originated by the same carrier have different intensities; in one spectroscopic family we expect to find stronger bands as well as weak (and extremely weak) ones. Discovering new very weak DIBs may be therefore crucial when we want to find complete spectroscopic families among DIBs. Extracting spectroscopic families of DIBs is a task to solve with use of astronomical spectra of the best quality. After extracting any spectroscopic family, its carrier will be to find by the way of laboratory search supported by quantum chemical considerations. Analysing high resolution optical spectra of reddened stars we test a new method to find out the first true spectroscopic families among DIBs.

Spectrophotometry of asteroids and some results of it

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Chemical and mineralogical composition of asteroid surface material contains information about the different stages of evolution of the Solar system. It is defined as physical and chemical conditions at the time of origin of the substance and the recent shock events and factors in space "weathering". It is important to answer the question: Can the recent or contemporary processes "erase" information about the early evolution of the asteroids? Obviously, to answer this question it is necessary to study meteorites – fragments of asteroids and

the asteroids themselves. Spectral studies of large Main belt asteroids show that the surface material of the bodies of high-temperature types (S, M, E and V) contains an admixture of atypical low-temperature materials like carbonaceous chondrites. The reflectance spectra of these asteroids are considered, and the likely physical, chemical and dynamical processes are considered that could affect the composition of the substance of these bodies.

Satellite missions for ionosphere exploration in Ukraine: from "Warning" to "Ionosat"

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In present report the historical review of the satellite ionosphere investigations is given. The main attention is concentrated on the projects of Ukrainian space program: "Warning", "Variant", "Ionosat", etc. The cornerstone of these national projects is the exploration of the links between ionospheric disturbances and disasters at the Earth (natural and technogenic), including the ionosphere earthquakes precursors.

EXOPLANETS

The causes of the polarization for the transiting exoplanetary system HD189733

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We present the results of modeling the polarization produced during planetary transits and stellar spots in the systems HD 189733 using the Monte Carlo method. Planetary transit produces polarization maxima at the limb ∼0.022% for HD189733 with stellar polarization according to Chandrasekhar. We assumed typical parameters of starspots and evaluated a maximum polarization. The polarization for the system HD189733 of ∼0.022% is close to that previously published, although this was attributed to scattering of starlight, rather than produced in transit or due to starspots.

Analytical potential generated by a massive inhomogeneous straight segment. Application to protoplanets formation

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The discoveries of binary asteroids have opened an important new field of research concerning the calculation of potential generated by irregular bodies. Some of them have an elongated shape. A simple model to describe the motion of a test particle in that kind of potential requires consideration of a finite homogeneous straight segment. We construct this model by adding an inhomogeneous distribution of mass. To be consistent with the geometrical shape of the asteroid, we explore a parabolic profile of the density. We establish the closed analytical form of the potential generated by this inhomogeneous massive segment. We give some features about the equilibrium positions which could be used to study protoplanets formation.

Search and investigation of extrasolar planets with high-precision deconvolution-based photometry

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Many extrasolar planet researchers should work with the crowded stellar fields. Which, owing to the specificity, superimpose a special requirement on photometry processing methods. One of the most qualitative method used for such fields, is DIA. However recently at it has come to light a disadvantage which in special cases does not allow to gain the maximum accuracy or the use of which leads to systematic errors. Recently developed deconvolution-based algorithm reduces the negative influence of systematic effects on the photometric and astrometric accuracy to the minimum possible level, and it also increases the resolution of astronomical images, which is important for the blends detection. This method is able to cope with a high level of crowding and with large scale variations of spatial resolution from one image to another. It also allows to obtain an unbiased estimate of the transiting and microlensing parameters.

New astrophysical database of the NH3 molecule properties

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We present the compiled astrophysical database of the NH3 molecule using the BYTe line-list data. The features of the NH3 molecule can appear in the spectra of the low-temperature astrophysical objects, such as atmospheres of the extrasolar planets, late-type cold stars and other objects. As yet it is the most completed and full database of the NH3 molecule properties that can be applied widely in astrophysics. In order to create our astrophysical database we have used the data from the BYTe line-list. The data were recompiled; the oscillator strengths and transition wavelengths were calculated. The newly compiled molecular database was tested by making model spectra and comparing them with observed ones. Our NH3 molecule database is opened for access and can be used in the wide field tasks in astrophysics.

New parameters for 10 circumsubstellar disks from Upper Scorpius open cluster

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A new algorithm for spectral energy distributions of systems with circumsubstellar protoplanetary disks is created. Age, geometrical and physical systems characteristics are taking into account. The algorithm is approved on fluxes that were received with ground based and space observations. New disks characteristics (ages, inclinations, disks sizes and central objects temperatures and radii) for 10 substars from Upper Scorpius open cluster are determined.

SOLAR SYSTEM

Spectrophotometry of Saturn between the equinoxes 1995 and 2009

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The space-time variations of the methane absorption bands on Saturn's disk were investigated during the period between equinoxes 1995 and 2009 using zonal CCD-spectrograms and spectrograms of central meridian of the planet. The atlases of the CH4 absorption bands profiles and latitudinal variations of absorption have been prepared Along with latitudinal variations connected with the change of an inclination of Saturn's equator the regular absorption increase in a southern temperate belt of Saturn is revealed. In 2009 almost symmetric distribution of absorption in southern and northern hemispheres was observed in contrast with 1995 when the absorption was much more in northern hemisphere. It is explained by the differences in heliocentric distances of Saturn before approaches of equinoxes 1995 and 2009. Last years there were noted also the distinctions in the NH3 647 nm absorption band intensity which was stronger at midlatitudes of northern hemisphere than at southern one.

The study of the ammonia absorption band NH_3 787 nm behavior on Jupiter

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During the last years the program of the spectrophotometric study of Jupiter included the measurements of the ammonia absorption band NH3 787 nm. This band is blended with more wide CH_4 absorption. To detect NH_3 band we have used the ratio of Jovian spectra to the spectrum of Saturn equatorial region. It was taken into account that the ammonia absorption on Saturn is significantly weaker than on Jupiter. The results of the spectrograms processing have been analyzed for years 2007-2010. The variations of the NH_3 band with latitude show regularly the depression of the absorption at low and temperate latitudes of Jovian northern hemisphere. The equivalent width decreases approximately from 18-16 Å to 14-12 Å. More or less symmetric and more steep decrease of absorption from the disk center to limbs was obtained for the equatorial belt of Jupiter. It may be considered as an evidence for reality of that latitudinal depression but not the instrumental errors. It should be noted that the ammonia decrease in northern hemisphere was detected also from radio observations of Jupiter.

Correction of asteroid Apophis orbit to prevent it possible collisions with the Earth

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As known, the asteroid Apophis in the future can threaten falling on the surface of Earth. For prevention of such falling it is possible to use the correction of orbit of asteroid due to bombardment of his surface. Model calculations are executed for determination of optimum dates of such bombardment, and also direction and size of additional impulse. The most comfortable period can be February in 2013. A necessary correction can be carried out falling on the surface of asteroid of body by mass of 20 t, or explosion a charge, by power of not less than 1000 t of TNT.

The influence of Yarkovsky and YORP effects on dynamical evolution of asteroids

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The two effects are produced by a weak non-gravitational acceleration of asteroids and meteoroids, which is caused by radiative recoil due to anisotropic thermal re-emission of energy. The first one produces secular changes in orbital semimajor axis of body and is called Yarkovsky effect. The second one produces changes in rotational state and is called YORP (Yarkovsky-O'Keefe-Radzievskiy-Paddack) effect. It is believed that these effects have significant influence on orbital and rotational dynamics of asteroids less than 100 km. The Yarkovsky and YORP effects were not investigated earlier due to insufficient precision of observations. The Yarkovsky effect was predicted in 1900 and firstly confirmed in 2003 up to now only for one asteroid (6489) Golevka using radar ranging. At present, YORP effect was detected for 4 asteroids using photometric data. All of these asteroids are NEAs, and detection of YORP and Yarkovsky effects for main belt asteroids is forthcoming. The review presents basic principles of the Yarkovsky and YORP effects, their possible influences on dynamical evolution of asteroids and recent results. The estimation and inclusion these effects to a model of motion among with other already used factors will improve our understanding of the dynamical evolution of small Solar system bodies.

The tectonic structure of the Jupiter satellite – Europa

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The aim of research is to analyze geological and tectonic structure of this satellite of Europa. It is the reason for that it is necessary to familiarize myself with researched and non-researched photographs taken from NASA what shows there to study surface of Europa. It has been analyzed the photos received from Galileo which are the absolute proof of presence of geological activity of Europa and on which, I think, it is possible to judge possible changes which could occur after Voyager flight.

Photometry of asteroids at the observational station of Kyiv National Shevchenko University in the village Lisnyky

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The regular photometric observations of asteroids were started on the observational station of Kyiv National Shevchenko University in the village Lisnyky in 2010. Work is made in the frame of collaboration between the observatories of the Kharkiv and Kyiv Universities and Scientific network of optical instruments for astrometric and photometric observations (Russia). For observations we used the equipment of the 70-cm telescope of AZT-8 by the modern CCD-camera FLI PL47 – 10 and the light filter turret FLI CFW – 7. Observations are carried out in the photometric system BVRI of Johnson-Cousins. Basic objects of exploration are asteroids which approach to Earth. In the report we present the first preliminary results which include the light curves and calculate parameters of rotation and shape of asteroids. Further plans and problems of observations near-by a large city are discussed.

Electronic catalogue of the physical characteristics of comets

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Lack of new catalogues of the physical characteristics of the comets (last 1985) containing not only a orbital elements but also the photometric parameters such as absolute magnitude of comet was the reason of our work. Vsehsvyatskiy and Andrienko catalogues of the physical characteristics of comets from 1950 to 1985 and data on the orbital elements for comets of Jet Propulsion Laboratory NASA were used for creation our electronic catalogue. The special software was developed for solving this task. The input data were identified, corrected and set to the unified format. The data from IAU Central Bureau for Astronomical Telegrams from 1969 to 2008 years were used for determination of the comets visual magnitude. During processing we have obtained the visual magnitude for 943 comets some of them was used for the absolute magnitude comet calculation. The main criterion of the definition of the absolute magnitude was presence enough data of the visual magnitude. For some comets we have obtained light curves.

Peculiarities of spectra of comet 81P/Wild on 28/29 March and 2/3 April 2010

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Short period comet 81P/Wild of Jupiter's comet family was the main target of the space mission "Stardust" in 2005. Five middle-resolution optical spectra of comet 81P/Wild were obtained on 28/29 March and 2/3 April 2010 with the help of the 2-m Zeiss reflector and long slit spectrograph of the High-mountain astronomical station of Institute of Astronomy of Russian Academy of Sciences and Main Astronomical Observatory of National Academy of Sciences of Ukraine at Peak Terskol. The comet was at heliocentric distance 1.6 A.U. and geocentric one 0.7 A.U. and had the integral magnitude equal to 9.3 mag. We present the energy distribution in the spectra of comet 81P and the detailed identification of the spectral emission lines in these spectra. Some physical parameters of the neutral coma of comet (velocities of gas expansion, lives times of some molecules and other parameters) were calculated with the help of Shulman's and Haser's models.

Polarimetry of the Galilean satellites near opposition

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We present new polarimetric observations of the Galilean satellites Io, Europa, Ganymede, and Callisto at phase angles ranging from 0.1 to 3.27 deg. The observations were carried out using 125-cm telescope equipped with the UBVRI double image chopping photoelectric polarimeter on the Crimean Astrophysical Observatory (Ukraine) and 70-cm telescope of Institute of astronomy of Kharkiv National University equipped with one-channel photoelectric polarimeter on July 1-12, 2008, and August 12-29, 2010. New observations fully confirmed the presence of the polarization opposition effect for the Galilean satellites Io, Europa, and Ganymede in the region of phase angles smaller than 2 deg. Although these minima for Io, Europa, and Ganymede show many similarities, they also exhibit a number of distinctions. No polarization opposition effect still was found for Callisto. Our results are in good agreement with previous observations and supplement them.

COMPUTERS IN ASTRONOMY

Application of Multichannel singular spectrum analysis to geophysical fields and astronomical images

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The results of application of multichannel singular spectrum analysis (MSSA) to the Earth monitoring data from satellites Jason, GRACE and Aqua are presented. The method helps to divide annual changes from trend and other periodic components, filter out noises and distinguish patterns of similar spatiotemporal behavior. Increase of CO2 concentration in troposphere by ∼1.7 ppm/yr, sea level by ∼3 mm/year, melting of ice sheets and glaciers are clearly seen, what proofs we are leaving in the epoch of global environmental changes. MSSA sometimes is called extended empirical orthogonal functions decomposition. It can be applied to vector time series of any origin to find correlated behavior of the components, but needs sufficient computater power. We present the results of MSSA application to the series of astronomical images of a particular selected region on the sky, which show that it is a powerful method for filtering noises, finding low luminosity stars and detecting variable objects.

CCD arhive of observation of the MAO NAS Ukraine

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The Kyiv meridian axial circle (MAC) is a refractor ($D = 180$ mm, $F = 2.3$ m) which is used now in a CCD astrometric survey of the equatorial zone. In 2001, it was equipped with a ISD017AP CCD having 1040×1160 pxs, 16 mkm pixel size and $1.394''$ per pixel scale. The dark current is 7e/pks/sec, the readout noise is 18e, the output amplifier responsitivity is 3.3 mkv/e. The photometric system of the MAC reproduces standard V photometric system; the limiting magnitude is about $V = 17$. A special software is used for reduction of observation. The structure and CCD database description of MAO NASU will be discussed.

Crimean Astrophysical Visual Observatory: spectra and photografic magnitudes of 3340 stars in Perseus catalogue by E.S. Brodskaya and P.F. Shajn. Digital catalog

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The spectral type and photographic magnitudes of 3340 stars brighter then 12.5^m were determined in area of about 45 square degrees with the center α =2h30m, *delta* = $+58°0'$ in 1958 by E.S. Brodskaya and P.F. Shajn. We was created the digital version of this catalogue, and analyze the differens between star magnitude in that time and now for searching of new variables stars

STELLAR ASTROPHYSICS

On selection effects in catalogues of binary stars

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An investigation of physical properties of different kinds of binary stars can get us an invaluable information about star formation and evolution. To obtain present-day distributions of binaries along various parameters from catalogues, selection effects should be taken into account. In this presentation some catalogues of visual binaries were explored with respect to selection effects. We have studied and corrected for selection distributions of binaries with respect to the separation of components, limiting magnitude and magnitude difference.

CCD VRI photometry of the old open cluster NGC 7142

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Photometry of 2194 stars in the field of open cluster NGC 7142 in VRI filters was made to search variable stars. All observations were performed with MASTER Robotic Net telescope MASTER II [Lipunov V. et al., 2010] from 2009.10 till 2010.11. Aperture photometry of more than 500 frames was processed with IRAF [Tody D., 1993]. 9 probable variable stars were found using robust median statistics [Rose M.B. and Hintz E.G., 2007], one of them was known as V375 Cep . We separated probable cluster members using proper motions from UCAC3 and our photometrical diagrams. Also we used our VRI photometry and JHK photometry from 2MASS to improve age and reddening for the cluster assuming the distance 1686pc from WEBDA.

Smooth time variation spectra as a tool to study the line profile variability in spectra of hot stars

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Line profiles in spectra of OB stars are usually variable. In many cases the line profile variations (LPV) are extremely weak (not more than 1% of the continuum level). For detection of such micro LPV of the various nature, we used the smooth Time Variation Spectra method (smTVS) proposed by Kholtygin et al. (2006). This method appeared to be very sensitive and can be used to detect the ultra weak line profile variations which can not be detected by other methods. We apply the smTVS method to detect the micro LPV in spectra of bright O stars lambda Cep, lambda Ori and zeta Ori. The spectra of this stars were obtained with using the 6-m telescope of the Northern Caucasus Special Astrophysical Observatory and the 1.8-m telescope of Bohyunsan Astronomical Observatory (Korea).

Abundances determination in hosting solar-like stars

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We present accurate determination of abundances of solar-like stars. Our procedure has an advantage of pipeline usage for considerable amount of spectroscopic data. Best values are found via one by one comparison of an observed spectrum with each subsequent from a grid of precedently calculated synthetic spectra and using χ^2 minimization routine to determine microturbulent velocity and abundances. After having calibrated our technique on the Sun, we applied it for other solar-like stars. We found a good agreement with other published results. The knowledge of the hosting stars abundances is crucial for understanding of their evolution and exoplanets formation.

Neutral iron abundance in the fast rotating star PZ Telescopium A

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We present results of abundance determination for fast rotating star PZ Telescopium A. It is a young solar-type star KOVp with a brown dwarf companion. In this report we focuse on methodology description that is slightly differs from approach used for non-rotating stars.

Two-period variability of the intermediate polar FO Aqr

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We present results of two-color photometric study of the intermediate polar FO Aqr. CCD observations were obtained at the Baja Astronomical Observatory, Hungary, in 2009 using 50cm telescope with alternatively changing filters V and R. The CCD frames were processed using the program written by V.P. Goranskij. The final time series were obtained using the program by Andronov and Baklanov (2004) taking into account multiple comparison stars. Periodogram analysis was carried out using the sine fit (program FOUR-1 by Andronov, 1994). The highest peak at the periodogram for the R data corresponds to the photometric period of 0d.014312(5). This is a daily alias of the spin period of the white dwarf published before. So we conclude that the period during our observations was 0.014521(3) with an initial epoch of 2455068.72430(36). The previous published values were 0d.01451905 (Patterson et al 1998) and 0d.01451718 (Williams 2003, Andronov et al 2005). The period variations of FO Aqr are complicated. From 1981 to 1987, the white dwarf showed a spin-down, then it changed to a spin-up, and data by Williams (2003) argues for a decrease of the period. The value of the orbital period of the system seems to be 0d.2120801. This value better corresponds to our light curve than the published earlier value of 0d.202059. We discuss period variations of the white dwarf in FO Aqr based on our own and previously published maxima timings. This investigations will be continued.

Catalysmic binary stars on small telescopes

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Cataclysmic variable stars are close binary systems containing white dwarf (the primary) and red dwarf (the secondary). In these systems the secondary loses its mass through the inner Lagrangian point in the Roche-lobe and the primary star accretes it. We will present the results of the last 6 months obsevations made on small remote telescopes ($16''$ or smaller)located in New Maxico (USA). There will be also presented the possiblities and techniques of observations made via internet.

Accretion powered chromospheres in classical T Tauri stars

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Classical T Tauri stars (cTTS) are newborn stars of about solar mass surrounded by cool, dusty disks. Optical spectra of cTTSs are rich in emission lines of low excitation species composed of narrow and broad components, thus indicating the existence of two emitting regions with different kinematics, densities and temperatures. The photospheric spectrum is often veiled by an excess continuous emission. This veiling is usually attributed to radiation from a heated region beneath the accretion shock. The broad emission lines of HI, HeI, CaII and other species are supposed to form in a larger volume of gas. We carried out high-resolution spectroscopy of selected cTTS, with a special focus on DR Tau, with aim to clarify whether the narrow chromospheric lines of FeI and other metals represent a standard chromosphere of a late-type star, or induced by mass accretion. We found that the observed veiling of the photospheric spectrum is due to both a non-photospheric continuum and a chromospheric line emission filling in the photospheric absorptions. The later causes the effect of the differential veiling: stronger lines veiled more. In several T Tauri stars we found a common effect: as the star rotates, the radial velocities of photospheric and chromospheric lines vary in anti-phase. The effect is caused by localisation of the chromospheric emission in a spot-like areas associated with the footprints of accretion channel. We conclude that the chromospheric emission in cTTS is related not only to a solar-like magnetic activity, but to a large extent is powered by the accretion processes.

Physical and chemical properties of the atmosphere of the carbon star TU Gem

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We discuss the preliminary results of determination of the physical and chemical properties of the atmosphere of the late-type carbon star TU Gem. The study of the late-type stars like TU Gem is important from the point of view of their short lifetime on the H-R diagram and their unusual chemical composition. These low-mass stars are important sources of the

Carbon observed nowadays in the Galaxy. The main goal of our study is the determination of the TU Gem atmosphere parameters. To investigate the physical condition of the atmosphere of TU Gem we fitted computed synthetic spectra to the observed spectra in the wide spectral region from 5000 to 25000 Å within a framework of the self-consistent approach. Our model atmospheres were recomputed for the adopted abundances.

Photometric monitoring of some Be/X-ray binaries

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We present the results of the last year's monitoring observations of some selected Be/X-ray binaries (RX J0440.9+4431, 1H1936+541, 1H2202+501). Observations were held on the base of the observational station Lisnyky of Astronomical Observatory of the Taras Shevchenko National University of Kyiv with the 70-cm telescope AZT-8 equipped with ST-8XMEI CCD (till March, 2010) and FLI PL47-10 CCD (since March, 2010 till now) and Southern Station of the Sternberg Astronomical Institute (Lomonosov Moscow State University) with the 60-cm Zeiss telescope with Lyuty's UBV photometer. All the data were calibrated and made self-consistented. The low-aplitude (0.05-0.1 m) variations on the time scales from days to months were found.

Photopolarimetry of RW Aur: unusual light minimum due to obscuration by circumstellar dust

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We present UBVRI photometric and polarimetric observations of the Classical T Tau type star RW Aur obtained during recent unusually deep and long-lasting minimum. High degree of linear polarization detected (up to 10%) imply that the minimum was due to obscuration of RW Aur A by a clump or cloud of circumstellar dust. Positional Angle of polarization coincides with orientation of RW Aur A disk and therefore consistent with scattering by the disk as major source of polarized radiation. Discovery of this UX Ori type obscuration event in RW Aur, whose disk is believed to be inclined about 40 degree to line of sight, indicates the presence of dense dusty structures well above the disk plane, yet to be explained and accounted for by current theory of CTTS disks.

The study of stars from the catalog GTS 10 by archival observations of the Crimean Astrophysical Observatory

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In the work we present a preliminary results of the selection of negatives with direct images of the sky from glass library of SRI "Crimean astrophysical observatory" (CrAO). This negatives contain dwarf stars that are included in the catalogue "Stars with the solar-type activity" (GTSh10). The methods of searching negative images on the basis of the studied stars coordinates and limiting photographic magnitude of star are described. In addition, negative viewing from CrAO collection, image processing with software of International Virtual Observatory and results of photometry for different objects are considered.

The seasonal changes of the binary system WZ Crv

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We observed the poorly studied Algol-type binary system WZ Crv using the remotely controlled astrophysical refractor TOA-150 (Tzec Maun Observatory, South Australia) in the V and R photometric filters during the observational seasons in 2010 and 2011. Also we involved the archive observations of SuperWASP and ASAS databases to determine the minima timings. From the analysis of the O-C diagram, we suspect the period variations. From our observations, we noticed the asymmetry of the phase curve, that is usually associated with the presence of the spot(s) in the photosphere of at least one of the components. Comparing the shapes of the phase curves of different seasons, we discovered the seasonal changes, which could be interpreted as the changes in the location, the temperature factor and the area of the spot. We also present results of the mathematical modeling of this system, using our new multi-color observations. Due to a presence of a flat bottom part at the primary minimum, we evaluated the temperatures of the components. From the O-C changes, the third body in the system WZ Crv could be suggested. The model, computed using the Wilson-Devinney code (in an assumption of the presence of a third body), confirms this possibility and yields the contribution of the third light of several percent. The main physical parameters of the system and the characteristics of the spot were determined.

Spectral investigations of CM Draconis – new results

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We present an analysis of a high resolution ($R = 47000$) echelle spectra of the low-mass eclipsing binary CM Draconis, which were obtained on the William Herschel Telescope 4.2-m telescope. Spectra were obtained for the various phases of the orbit. There are some difficulties in the echelle spectra processing for the cool stars, since it iss hard to get energy distribution in a large scale in such spectra. We proposed an efficient methods for spectral analysis of echelle spectra of binary stars with cold components. We refined the parameters (effective temperature, rotational velocity and metallicity) of the components of the system CM Dra using the method of stellar atmospheres. The data that we obtained are in good agreement with the results obtained by other authors which indicating efficiency of our technique. The errors of temperaure and metallicity determinations is about 100 K and 0.3 dex respectively.

Inverse task in degenerated dwarfs theory

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We present a three-parameter model of degenerated dwarfs with arbitrary effective temperature. Model parameters for DA dwarfs from Sloan Digital Sky Survey Data Release 4: relativistic parameter in the stellar centre, central temperature and parameter of chemical composition determined by the previous two are obtained in the frame of mechanical equilibrium equation using the modeling of the temperature distribution along the radius.

On the structure of pulsar magnetosphere

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The angles BETA between rotation and magnetic axes are calculated by two methods for 283 radio pulsars at the wavelength 10 cm and 132 radio pulsars at 20 cm. The common average of the angle BETA is 43.5 degrees. Some effects which can give errors in the values of BETA are discussed. There are no correlations between values of BETA and pulsar ages.

On statistical distributions of wide binary stars

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The life of a single star is determined mainly by its mass, while binary systems possess at least 4 fundamental parameters: component masses, orbital separation and eccentricity. These parameters generally remain conserved throughout evolution in wide systems. Survey of statistical properties of binaries is crucial for our understanding of star formation conditions. To obtain distribution of binaries by orbital separation, we examine relations between angular and linear separations as well as other parameters of visual binaries, and compare predictions with available data sets.

Photopolarimeteric observations of a unique minimum of UX Ori

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We present results of photopolarimety of the pre-main sequence star UX Ori. Our UBVRI data obtained from 2007 to 2009 show a rare minimum of brightness with high polarization. Unlike other minima, when the degree of polarization was 7%, in this minimum, it increased to 11%. This may be due to changes in the geometry of the scattering shell, or is the result of absorption of the circumstellar dust particles.

EXTRAGALACTIC ASTROPHYSICS

Obsevations of groups of dwarf galaxies. First Results

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We present latest results of observations at the Russian 6-m telescope (BTA) of multiple dwarf galaxies. We selected such structures using HyperLEDA and NED databases with visual inspection on SDSS images and on digital copy of POSS. The groups are characterized by size of few tens of kpc and line-of-sight velocity dispersion about 15 km/s. Our groups similar to associations of nearby dwarfs from Tully et al. (2006). These multiple dwarf galaxies like I Zw 18 may contain significant amount of dark matter. Apparently we observe them at the stage just before merging of its components. We are performing spectroscopic survey of dwarfs. The aim of the project to analyze the chemical composition and star formation rates in these specific groups.

Criteria for galaxy classification in SDSS

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We have considered the sample of galaxy pairs collected from SDSS DR5. At first we made a morphological classification of approximately 1100 galaxies by eye. As known the galaxy morphological types strongly depend on the color indices, the concentration parameters, galaxy magnitudes, de Vaucouleurs and exponential fit scale radii. So we used the couples of these parameters and with help of our "eye" classification found the universal criteria which can be used for galaxy morphological classification. According to our criteria we can select early type galaxies with probability 90%.

X-ray emission of kiloparsec jets at large redshift

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In this report we show that the ratio of the flux densities of radio and X-ray emission from kiloparsec scale jets is largely dependent on the spectral index of its electron distributions. We defined the angle between the jet and line of sight, either the maximum electron energy of electron distribution or the position of the low-frequency cut-off of the quasar spectrum for large redshift quasars 1745+624 and PKS 1127-145.

WR-galaxies from Sloan Digital Sky Survey Data Release 7

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We analyze spectra of blue compact dwarf galaxies from the Sloan Digital Sky Survey Data Release 7 with Hβ λ4861 fluxes exceeding 10^{-14} erg s^{-1} cm^{-2}. Nearly all galaxies in our sample show broad Wolf-Rayet (WR) emission in the blue region of the spectrum (the blue bump) consisting of an unresolved blend of NIII λ4640, HeII λ4686 emission lines. Broad CIV λ5808 emission (the red bump) is also detected in a few galaxies. We derive the numbers of early WC (WCE) and late WN (WNL) stars from the luminosities of the red and blue bumps, and the number of O stars from the luminosity of the Hβ emission line and compare the relative number of WR stars N(WR)/N(O+WR) with predictions from evolutionary synthesis models.

Oxygen and Nitrogen abundances in Cool HII regions from the Sloan Digital Sky Survey

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The oxygen and nitrogen abundances for a sample of 113607 cool objects from the Sloan Digital Sky Survey (SDSS) spectra has been derived. The values of oxygen abundances 12+log(O/H) has been obtained using three parametric N calibrations one of which is developed in this paper. The values of nitrogen abundances 12+log(N/H) obtained with two calibrations. The oxygen abundances found by three parametric N calibrations are consistent with an accuracy better than $\sim$0.05 dex for the vast majority of objects. It is possible that there are systematic differences between values of oxygen abundances obtained using this calibrations. However, these differences do not exceed $\sim$ 0.05 dex. Differences between the values of nitrogen abundances obtained using the ON and NS calibration are $\sim$0.1 dex. It is shown that the vast majority of cold SDSS objects in the diagram $O/H - N/O$ is in the same area that cool H II regions in nearby galaxies, oxygen and nitrogen abundances in which are derived using T_e-method. This is indirect evidence that oxygen and nitrogen abundances found with parametric N calibrations are correct.

Investigation of radio galaxies in the region 7 C II directory

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We investigated the area 7C II directory of 320 square degrees. As a result of the study were obtained: apparent optical magnitudes in the average, radio galaxies fainter than quasars, and the flux denistry in the radio galaxies on average have twice as much than the quasars. In the region $z = 1.1 - 1.7$ galaxies are absent.

Measurements of equivalent widths for the spectral line for metallicity estimation in galaxies

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Oxygen is the most commonly used metallicity indicator in the interstellar medium (ISM) in the optical part of a galaxy spectrum (e.g., [O II] 3727Å and [O III] 4959, 5007Å). Equivalent Widths (EWs) are being used to replace the fluxes of their R_{23} values for estimating metallicities of the galaxies, i.e., from the EW-R_{23}. In this talk, my goal is to concentrate on the "measurements of EWs" which are useful for the metallicity estimation in galaxies. We also compare the values of the EWs obtained from our developed code and IRAF script.

Photometry of galaxies located in the HDE-S area

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We have provided a catalog of photometry data in large projects GOODS (Dickinson et al 2004. This information are obtained by different methods and different instruments, from ACS (HST) (Ford et al 2003), ISAAC (VLT) large program of ESO (PI: C. Cesarsky) and IRAC (Spitzer) (Fezio et al 2004) and visible region in the bands (B, V, I, Z), Infrared region of the bands J, H, Ks and Mid Infrared region of the band CH, CH_2, CH_3, CH_4 be obtained.

The relation "line width – luminosity" for HII galaxies

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The Tully-Fisher relation is empirical relationship bitween width of the neutral hydrogen and luminosity of the galaxy. It is one of the most important astrophysical dependencies. In this review for the dependence of line width – luminosity we use the emission lines of hydrogen and ionized oxygen from sample of about 25 HII galaxies. HII galaxies are easy to find at great distances. This relation may be used as a distance indicator for galaxies.

X-ray emission of galaxies without active nuclei

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We explored a sample of 148 galaxies which does not contain AGNs, according to the BPT diagram. We built X-ray spectra for 7 galaxies which have extended images in optical and X-ray band. Besides, SDSS contains spectra of these galaxies out of nuclear region. We found out that X-ray spectra have a maximum about 1 keV and rapidly decreases on higher energies. Such spectra correspond to thermal radiation of star formation regions and have no signs of AGN. We built distributions of different parameters of these galaxies, including morphological types and X-ray luminosity.

Surface brightness profiles of Seyfert galaxies

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In this work we studied 38 Seyfert galaxies observed in Crimean Astrophysical Observatory for many years. With SDSS and POSS images we obtained surface brightness profiles for these galaxies. Such profiles might be used for unification of light curves obtained on telescopes with different apertures and reducing them into a single photometric system. Also we classified our surface brightness profiles and found up to three spiral arms on them.

Radio image analysis of AGN jets

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The radio image and spectral analysis of AGN jets are investigated. Some of Fanaroff and Riley type I/II radio galaxies were considered. The radio data were obtained by VLA and data analysis were processed with AIPS. The radio spectra of different parts of jet are obtained. The comparative analysis of radio and X-ray data are made.

The UV spectral properties of quasars from SDSS DR7

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The Lyα forest in the spectra of distant quasars is a useful tool for studing the evolution of the intergalactic HI distribution. But these studies involve the determination of the quasar continuum level within the Lyα forest region, which is a complicated procedure for low-resolution spectra due to strong blending of these lines. Usually a composite spectra are used for the mean continuum level determination. We present a new more accurate technique for the composite spectra construction, which allows to reduce a noise. With the help of these technique a detailed study of the HI Lyα forest part ($\lambda_{rest} \approx 1050 - 1200$ Å) of the low-resolution quasar spectra from SDSS DR7 was performed. It revealed, except 3 strong known lines of ArI, FeIII, and CIII*, 5 lines detected previously only in UV spectra of the nearest AGNs by HST and FUSE and high-resolution individual spectra of quasars, and also two new weak lines.

GRAVITATION & COSMOLOGY

The shape and the size of the Universe according to the Poincare Dodecahedral Space hypothesis

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One of the best topological models of the Universe is the Pioncaré Dodecahedral Space (PDS) model, which has best fit to the data of the cosmic microwave background (CMB) sky maps from the Wilkinson Microwave Anisotropy Probe (WMAP). Therefore this model is going to be very atractive for cosmologist. Briefly speaking, topology is a science about geometrical poperities of objects, for example spaces (or more general manifolds). Object (space) keeps its topological properities when is streched, bended or crumpled. Unlikely to cutting or splitting, when topology of the object changes after such operation. After short introduction to cosmic topology and methods its discovering, author will show optimal fit, of PDS model to WMAP data, which has been made using an optimal cross-correlation method. Also estimation of the size of the Universe according to PDS model will be shown.

Observational constraints on scalar field models of dark energy with barotropic equation of state

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We constrain the parameters of dynamical dark energy in the form of a classical or tachyonic scalar field with barotropic equation of state jointly with other cosmological ones using the combined datasets which include the CMB power spectra from WMAP7, the baryon acoustic oscillations in the space distribution of galaxies from SDSS DR7, the power spectrum of luminous red galaxies from SDSS DR7 and the light curves of SN Ia from 2 different compilations: Union2 (SALT2 light curve fitting) and SDSS (SALT2 and MLCS2k2 light curve fittings). It has been found that the initial value of dark energy equation of state parameter is constrained very weakly by most of the data while the rest of main cosmological parameters are well constrained: their likelihoods and posteriors are similar, have the forms close to Gaussian (or half-Gaussian) and their confidential ranges are narrow. The most reliable determinations of the best fitting value and 1σ confidence range for the initial value of dark energy equation of state parameter were obtained from the combined datasets including SN Ia data from the full SDSS compilation with MLCS2k2 fitting of light curves. In all such cases the best fitting value of this parameter is lower than the value of corresponding parameter for current epoch. Such dark energy loses its repulsive properties and in future the expansion of the Universe will change into contraction. We also perform an error forecast for the Planck mock data and show that they narrow essentially the confidential ranges of cosmological parameters values, moreover, their combination with SN SDSS compilation with MLCS2k2 light curve fitting may exclude the fields with initial equation of state parameter > -0.1 at 2σ confidential level.

Dark matter and intracluster gas distribution in galaxy clusters

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We present the results of the analysis for five galaxy clusters: Abell 1413, Abell 1204, Abell 2744, Abell 223 and CL 0024+17 observed by Chandra cosmic telescope. In this work we have derived the radial profiles of dark matter density and intracluster gas temperature based on the well-established fact at present: the X-ray observed surface brightness of clusters described by the universal density profile (NFW) as the underlying dark matter distribution. We have found that density and mass profiles for all considered clusters have the same shape. The temperatures of these clusters are from 5 to 10 keV, the masses are $\sim 10^{14} - 10^{15}$ $M_{\odot}$ and the densities are $\sim 10^{-23} - 10^{-25}$ kg/m^3. Also we have determined R_{200} and M_{200} for our galaxy clusters and estimated the fraction of gas and dark matter in total mass of each cluster.

Quantization of spinor field in Krein space

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In covariant quantization of massless minimally coupled scalar field in de sitter space it was proved that Fock vacuum state break de sitter invariance. Then the negative norm state added for quantization. This method was generalized to the interaction quantum field theory in Minkowskian space. In this paper we use this new method of quantization for spinor field in krein space and show that the divergence of two point function and momentum-energy tensor cancelled and this method of quantization is normalized automatically.

Modeling the void size distribution using excursion set theory

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Voids are important features of the large scale structure of the universe and their properties have been studied in recent years. One method for modeling the growth of structure is the excursion set theory proposed Bond et al. 1991. Applying this method on Gaussian fields we calculate the size distribution of voids and compare the results with recent observations. In a second phase of the present study we plan to extend this method to non-Gaussian fields, ex. Voronoi tessellations.

Project of program package for exploring of cosmological fractals

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The value of fractal dimension and inhomogeneity scale of spatial distribution of galaxies is an actual problem in modern cosmology. The reliability of methods of determining this values is doubtful. The project of program package to explore fractal properties of distribution of isolate points (galaxies) is presented.The package including tools both to load catalogs of galaxies and to simulate fractal and uniform distributions of points which is useful to test applicability limits of methods.

Microlensing of an extended source by binary microlenses

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We compare amplifications of microlensed extended source by point and binary microlenses. The models of the surface brightness profile of the source are: Gaussian, power-like, limb-darkening and accretion disk models. The amplification curves are obtained for the linear motion of the source and for about 100 realizations of microlens field corresponding to optical depths (σ_m) 0.3, 0.4, 0.5, shear $\gamma = 0$, continuous matter $\sigma_c = 0$ and different random distances between microlenses in binary system. All light curves are calculated for half-brightness source radii ($r_{1/2}$) 0.1, 0.15, 0.2. The mass ratio for host microlens and the companion in all realizations is assumed to be $q = 0.5$.

The primordial abundance determination of ^{4}He, including new data on systematic effects

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We derive the primordial helium abundance in Universe using the observations of low-metallicity blue compact dwarf galaxies. The intensities of hydrogen and helium emission lines were corrected for the stellar absorption and collisional excitation with the use of the Monte-Carlo simulations. As a result the best determined primordial helium abundance of 0.2557 ± 0.0014 is 3% higher than that derived from the microwave background observations with the WMAP satellite. This implies that new types of light neutrino species were present at the epoch of the primordial nucleosynthesis in addition to three known types.

The angular correlation function of photometrically classified quasars from SDSS NBCKDE Catalogue

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We present the results on the angular two-point correlation function $w(\theta)$ of 473608 photometrically classified quasars from SDSS NBCKDE catalogue. We confirmed the presence of the break in the angular correlation function of scales about $30'$, found previously by several authors. The angular correlation function within the range $\theta > 30'$ is found to be much steeper than for $\theta < 30'$. We found the similar results for the sample of 50303 spectroscopically confirmed quasars from SDSS DR7.

Simulation of pleiades cluster by Modified Newtonian Dynamics

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Current information about Pleiades cluster shows that over thousand stars in this cluster could remain beside each other over hundred million years. Whereas current theorems pridicted that the age of open clusters must be much smaller than this(about twenty million years). How it can be possible? On the other hand, observational mass of galaxies is not compatible with dynamical mass. One theory suggest that about ninety percent of total mass of universe is and its distribution prove this incompatibility. Another hypothesis is proceeding to modify the general gravitational law and called MOND: MOdified Newtonian Dynamics. Some ideas consider MOND agree with not only galaxy dimension but it can be true about open and globular clusters. Now we apply MOND and study structure of Pleiades cluster and it remains to be seen whether or not this idea can be put into practice.

Post-Newtonian test simulations of the merging super-massive black hole binaries

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We study the evolution of super-massive black hole (SMBH) binaries in galactic nuclei using the Post-Newtonian formalism. Our code includes post-Newtonian (PN) corrections to the binary equations of motion up to order 2.5. We show that the evolution of the massive binary is only correctly reproduced if the conservative 1PN and 2PN terms are fully included. We see the effective "merging" of the SMBH's only if we also include the first "dissipative" 2.5PN term. We extensively study the dependence between the light velocity and the time of merging in the set of special test cases.

Calculation of orbital motion in binary systems of black holes on the example of a quasar OJ287

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The supermassive short period black hole binary OJ287 is discussed as a new precision test for general theory of relativity. In present work we calculate the evolution of orbit of binary black hole on the base of Hamilton equations with three post-Newtonian terms, the gravitational radiation term and the term of the spin-orbit interaction. From comparison of observational data concerning the optical outbursts on OJ287 light curve with moments of crossing the accretion disk of massive component by lighter component of binary system, we infer a new set of binary parameter and, on its base, estimate the future evolution of binary OJ287.

The effect of self-force on a freely falling massive charged particle in de Sitter universe

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Observations coming from the astrophysical data indicate that we live in a expanding universe where its evolution is dominated by a small positive cosmological constant. Mathematically this model can be explained by the de Sitter space-time. In this work we study a freely falling massive charged particle in de Sitter space-time. However due to the effect of the charge and mass the particle exceeds from its geodesic. In this paper we want to consider these effects on the geodesic motion.

Higher order theories of gravity

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Recent astrophysical data indicate that our universe might currently be in a de Sitter (dS) phase. The importance of dS space has been primarily ignited by the study of the inflationary model of the universe and the quantum gravity. As we know Einstein's theory of gravitation (with a non zero cosmological constant) can be interpreted as a theory of a metric field; that is, a symmetric tensor field of rank-2 on a fixed de Sitter back ground. It has been shown the massless spin-2 Fierz-Pauli wave equation (or the linearized Einstein equation) is not conformally invariant. This result is contrary to what we used to expect for massless theories. In this paper we obtain conformally invariant wave equation for the massless spin-2 in the dS space. This study is motivated by the belief that conformal invariance may be the key to a future theory of quantum gravity.

Dynamical evolution of star clusters in external galaxy tidal field

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The results of a large set of Nbody simulation of star clusters with NBODY6 code, will be reported. These results include the evolution of both single-mass and multi-mass globular clusters in the Galaxy tidal field. The main focus is to find the effect of different initial parameters of the cluster on their dissolution time, such as their total mass (Mtot), Half-mass radius (Rh), and galactocentric distance (RG). The evolution of initial mass function for multi mass clusters will also be discussed.

Dynamical evolution of globular clusters

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We present our results of a large set of N-body simulation to study the evolution of single-mass and multi-mass star clusters. Our main focus is to study the dissolution time of clusters to obtain the effect of different initial properties of a cluster. This permit us to estimate the lifetime of clusters as a function of the initial conditions. Throughout the investigated parameter-space nearly all clusters show a constant half-mass radius for the time after core collapse until dissolution.

HIGH-ENERGY ASTROPHYSICS & ASTROPARTICLE PHYSICS

The possibility of detection of relativistic shock break-out at the surface of Hypernova

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The characteristics of hydrodynamically accelerated external layers during the relativistic shock break-out at the surface of Hypernova are considered. The interaction of accelerated particles with the particles of circumstellar medium is calculated. The observational signatures of a relativistic shock break-out at the surface of Hypernova are investigated.

Centaurus A as a plausible source of ultra-high energy cosmic rays events registered by the Pierre Auger Observatory

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For UHECR events detected by the Pierre Auger Observatory which arrive from the region near Centaurus A the positions of the corresponding sources were calculated for the two chosen galactic magnetic field models. Also the influence of extragalactic magnetic field was taken into account for different energy and UHECR type to show the possibility of correlation with Centaurus A.

The influence of galactic magnetic field on the propagation of the ultra-high energy cosmic rays from Virgo A

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The propagation of ultra high energy cosmic rays coming from Virgo A region is modeled taking into account the influence of galactic as well as extragalactic magnetic fields. The correlation between the results obtained for different cosmic rays energy and chemical composition and existing data from AGASA and The Pierre Auger Observatory is discussed.

Hadronic gamma-rays emission of supernova remnants

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The observations of supernova remnants (SNRs) in gamma-rays are rapidly increased during last few years. MAGIC and H.E.S.S experiments are the first to produce images of SNRs in this range. The gamma-radiation are produced either by electrons (due to inverse-Compton scattering) or protons (due to pion decays). We present a method to synthesize gamma-ray images of SNRs due to hadronic emission. The model is developed in the frame of a classic approach to proton acceleration and hydrodynamics of the shocks in a uniform interstellar medium; it includes energy losses of relativistic protons due to pp interactions. However, our estimations show that these losses are important only for large densities of protons as it could be in case of interactions of the supernova shock with molecular cloud. Numerical simulations are used to synthesize SNR images and to analyse their properties. An approximate analytical formula is obtained which describes the properties of images close to the shock; it restore all the properties of images revealed by the numerical simulations. Our model may also be applied to calculate the gamma-ray spectrum of SNRs due to hardonic emission.

Hypernovae as accelerators of high energy and ultra-high energy cosmic rays

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There is a wide consensus that the accelerators of cosmic rays of energy below the first "knee" are Galactic supernovae remnants, and that the accelerators of cosmic rays above the "ankle" are extra-Galactic. But there is no consensus regarding the sources of cosmic rays in the energy range between the "knee" and the "ankle". New accelerators of cosmic rays (Hypernovae) was suggested in resent publications. In present work we perform detailed investigation acceleration of cosmic rays by typical (relativistic and semirelativistic) Hypernova shock wave during the free expansion stage in different surrounding medium (revealed from observation of Wolf-Rayet stars in Galaxy and revealed from interpretation of observed emission in known to date Hypernovae). Results was applied to Galactic Hypernovae, as far as to extra-Galactic, and obtained estimation of deposition such objects to observed high energy and ultra-high energy cosmic rays flux.

Nonthermal radiation of superconducting cosmic strings

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Phase transitions in the early Universe can lead to the formation of topological defects – cosmic strings. Motion of a superconducting cosmic string in the galactic or intergalactic magnetic fields is accompanied by generation of electric current inside the string and magnetosphere around it. Interaction of the moving magnetosphere with an ambient plasma generates a relativistic shock wave, which appears by nonthermal synchrotron emission of relativistic electrons, accelerated at the shock wave front. In our paper the flows and spectra of synchrotron emission from the cosmic strings are calculated and possibility of their detection by existing facilities are estimated.

How to find a dark matter decay line?

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It is now the well-established fact that any particle from Standard Model of particle physics cannot constitute the major fraction of the dark matter. This poses the major challenge to particle physicists trying to extend the Standard Model. In many of such extensions, the dark matter particle becomes unstable with respect to 2-body radiative decay. We describe the strategy of its direct astrophysical search and subsequent confirmation by comparing the efficiencies of different instruments and by looking for different classes of DM-dominated objects and present the latest results.

The high-energy, arcminute-scale galactic center gamma-ray source

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Employing data collected during the first 25 months of observations by the Fermi-LAT, we describe and subsequently seek to model the very high energy (>300 MeV) emission from the central few parsecs of our Galaxy. We analyze the morphological, spectral, and temporal characteristics of the central source, 1FGL J1745.6-2900. The data show a clear, statistically significant signal at energies above 10 GeV, where the Fermi-LAT has angular resolution comparable to that of HESS at TeV energies. This makes a meaningful joint analysis of the data possible. Our analysis of the Fermi data (alone) does not uncover any statistically significant variability of 1FGL J1745.6-2900 at GeV energies on the month timescale. Using the combination of Fermi data on 1FGL J1745.6-2900 and HESS data on the coincident, TeV source HESS J1745-290, we show that the spectrum of the central gamma-ray source is inflected with a relatively steep spectral region matching between the flatter spectrum found at both low and high energies. We model the gamma-ray production in the inner 10 pc of the Galaxy and examine cosmic ray (CR) proton propagation scenarios that reproduce the observed spectrum of the central source. We show that a model that instantiates a transition from diffusive propagation of the CR protons at low energy to almost rectilinear propagation at high energies can explain well the spectral phenomenology. We find considerable degeneracy between different parameter choices which will only be broken with the addition of morphological information that gamma-ray telescopes cannot deliver given current angular resolution limits. We argue that a future analysis performed in combination with higher-resolution radio continuum data holds out the promise of breaking this degeneracy.

Fast variability of γ-ray emission from supermassive black hole binary OJ 287

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We report the discovery of fast variability of γ-ray flares from blazar OJ 287. This blazar is known to be powered by binary system of supermassive black holes. The observed variability time scale $T_{\rm var} \lesssim 3 - 10$ hr is much shorter than the light crossing time of more massive (1.8×10^{10} $M_\odot$) black hole and is comparable to the light crossing time of the less massive (1.3×10^8 $M_\odot$) black hole. This indicates that γ-ray emission is produced by relativistic jet ejected by the black hole of smaller mass. Detection of γ rays with energies in excess of 10 GeV during the fast variable flares constrains the Doppler factor of the jet to be larger than 4. Possibility of the study of orbital modulation of emission from relativistic jet makes OJ 287 a unique laboratory for the study of the mechanism(s) of formation of jets by black holes, in particular, of the response of the jet parameters to the changes of the parameters of the medium from which the black hole accretes and into which the jet expands.

Discovery with INTEGRAL and follow-up investigation of new transient X-ray sources IGR J17473-2721 and IGR J17419-2802

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This work is devoted to comprehensive study of X-ray sources IGR J17473-2721 and IGR J17419-2802 based on observational data of IBIS/ISGRI JEM-X telescopes of the INTEGRAL observatory. The new hard X-ray transient IGR J17473-2721 was discovered with IBIS/ISGRI in 2005 March-April and was recognized later as an X-ray burster with Super-AGILE, which detected a type I X-ray burst from this source in 2008 March. The 18-45 keV flux measured from the source at the epoch of its discovery with INTEGRAL was only 3.9 mCrab. However, its steady brightening from 2.7 to 5.6 mCrab on a time scale of one month was detected. The follow-up observations of IGR J17473-2721 with RXTE/ASM have shown that INTEGRAL observed the very initial stage of its outburst in 2005. Second outburst of this source was more intense and long and was observed in 2008 March-August. Another studied new X-ray source IGR J17419-2802 was discovered with IBIS/ISGRI during its outburst in 2005 September. Its average detected flux was 7.8 mCrab in the 18-45 keV band. The next outburst of IGR J17419-2802 was observed in 2006 February - March at the flux level of 7.7 mCrab. The source has a hard X-ray spectrum and is supposed to be an X-ray burster.

X-ray image and spectral analysis of AGN jets

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The image and spectral analysis of AGN jets are investigated. Some of Fanaroff and Riley type I/II radio galaxies were considered. The X-ray data were obtained by Chandra and data analysis were processed with CIAO. The spectra of different parts of jet are obtained. The comparative analysis of spectra from different parts of jet are made.

The image and spectral analysis of the hot spots in AGN jets

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The image and spectral analysis of the hot spots in AGN jets are investigated. Some of Fanaroff and Riley type II radio galaxies were considered. The comparative analysis of radio and X-ray data are made.

The transverse structure of AGN jets from radio and X-ray data

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The transverse structure of AGN jets is investigated. Some of Fanaroff and Riley type I/II radio galaxies were considered. The X-ray data were obtained by Chandra and data analysis were processed with CIAO. The knots and hot spots were taken into account. The results from radio and X-ray data are compared.

The image and spectral analysis of the knots in AGN jets

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The image and spectral analysis of the knots in AGN jets are investigated. Some of Fanaroff and Riley type II radio galaxies were considered. The comparative analysis of radio and X-ray data are made.

Neutrinos and gamma-rays from Hypernova explosion

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The generation of neutrinos and gamma-rays from relativistic shock break-out at the surface of Hypernova explosion is considered. The parameters of neutrino flash and gamma-rays that appears from pions decay as a result of inelastic collisions between accelerated particles and circumstellar environment are estimated.

Properties of interstellar medium and magnetic field around Tycho SNR

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Tycho's supernova remnant (SNR) is the remnant of supernova explosion, which was described by Tycho Brahe in 1572. The SNR is observed in all wavelengths of electromagnetic spectrum. Its radio, hard X-ray and gamma radiation is caused by the interaction of cosmic rays, accelerated in the SNR, with magnetic field (MF), CMB photons or thermal protons. The infrared and soft X-ray relativistic photons are a consequence of the thermal emission of plasma. The surface brightness maps of Tycho SNR are similar on different wavelengths but on the other hand differ in a number of details. We use its maps in radio, infrared, soft and hard X-rays for determination of the interstellar medium and MF properties.

INTERSTELLAR MEDIUM

Correlation between interstellar atomic lines

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Very low density of interstellar medium results in observations of resonance lines of atoms only and that is transitions from the first energy level. Because of that most of this lines are located in part of spectrum unavailable from Earth. In my research I focused on studying abundance of neutral iron, potassium and calcium atoms. I choose relatively weak lines, so I could directly translate equivalent width into column density. However to measure weak lines we need high signal to noise ratio for our observations, that's why most of my data are from UVES and HARPS spectrograph. Having at my disposal statistically significant sample of measurements, I could look for some kind of correlation between this lines or other interstellar structure.

Chemical composition of planetary nebulae in magellanic clouds

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The electron densities and temperatures, as well as ionic abundances in planetary nebulae (PNe) envelopes in Large Magellanic Cloud (LMC) were obtained using DIAGN method. The chemical composition of PNe was obtained using ICFs derived previously for PNe of Milky Way (MW). The primordial helium abundance and its enrichment were redetermined using chemical compositions of HII regions in blue compact galaxies and PNe in MW obtained previously, and PNe in LMC determined in present work.

Determination of energy distribution in ionizing radiation spectrum of Orion Nebula

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The electron densities and temperatures as well as ionic abundances were determined using nebular gaz diagnostic method DIAGN. For the each observed part of the Orion Nebula the energy distribution in the ionizing spectrum beyond 912 Å was determined using NLEHII method. The resulting Lyc-spectra with other data were used to calculation of the optimized photoionization models. New Lyc-spectra was obtained and in the future, along with other individually found from OPhM characteristics, will be using to calculate grid models and to correct the output of new expressions for ionization-correction factors in high-metalicity HII zones.

Photoionization modelling of stellar wind bubbles surrounding starburst regions

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Transformation of Lyc-spectra with different stellar wind bubbles (SWB) was considered. For this purpose, photoionization model grids of SWB within HII regions around starbursts and single star correspondingly were calculated. We used SWB model from Weaver et al. Renormalization of SWB parameters was based on the both of mass inflow from the stellar wind and evaporation from swept-up dense shell.

The diffuse component of the radiation ionization field in the nebular objects

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The aim of this work is to compare different methods of the diffuse ionizing radiation (DIR) calculation in photoionization modelling (PhM) of the various nebular objects. The On The Spot and Outward Only approaches are usually used for this purpose. We considered also detailed method of DIR calculation. It is shown that in some situations it is required to take into account DIR calculated without assumptions. It is decided to add in PhM code Cloudy the procedure of the detailed DIR calculation.

Polarization in astronomical masers

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There currently exists an ongoing debate on the nature of polarization in astronomical masers. In particular, two pararell studies by Elitzur (1991, 1993, 1996) and Watson et al. (1994) are strongly in disagreement on what the polarization should be. Results obtained by Smits (2003) from monitoring a maser source called MonR2 at 4765 MHz for several years reveals that there exits linear polarization at about 15 percent level in this maser. This source is among a handful of 4765 MHz excited hydroxyl (OH) maser sources that have been found to display linear polarization which is a new phenomenon that has not been identified to date. A theoretical model to explain such behaviour needs to be developed. We aim to develop a theory of polarization to explain this behaviour in such a way that the results resolve the ongoing debate. Our theoretical results will be compared against observational data from VLBI observations obtained by Prof Smits. A treatment of the broad-band nature of maser radiation from first principles in a transparent and self-consistent manner will be done in line with the work by Menegozzi & Lamb (1978), which is the only consistent treatment published in literature to date.

Diffuse interstellar bands towards ξ Persei

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Spectroscopic characteristics of interstellar matter strongly depend on direction to the target star. Spectrum of ξ Per contains many prominent and weak diffuse interstellar bands (DIBs) as well as absorption lines of some identified interstellar molecules. In our search we have measured intensities of all noticeable absorption structures to compare them with their counterparts observed in spectra of the other target stars.

Narrow interstellar absorption lines in oPer direction

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Using echelle optical spectra of bright and moderately reddened spectroscopic binary named oPer we selected few dozens of narrow interstellar absorption lines. We have measured equivalent widths and depths of these lines and got good spectral characteristic of interstellar matter interacting with light from the target star. Our results support a good spectroscopic pattern of interstellar matter spread along one direction on the sky. Results achieved with use of other target stars may be compared with this pattern for concluding about the nature of interstellar absorptions carriers.

Broad diffuse interstellar bands in the direction of HD23180

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Small subset of all known diffuse interstellar bands (DIBs) consists of very broad absorption structures. Their carriers most probably are different from carriers of narrow DIBs. Using high resolution echelle spectra of spectroscopic binary HD23180 we selected all measurable broad DIBs and we studied the shapes of their profiles. Exact knowledge of these shapes may be very helpful in identifying carriers of some DIBs.

Interstellar spectral features and telluric absorption lines

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In good quality spectra of stars the weak interstellar absorption lines may be substantially contaminated by telluric lines. Many telluric lines may also simulate interstellar absorptions. To avoid not desirable telluric effects during searches for interstellar absorptions, especially for diffuse interstellar bands (DIBs), we look for all accessible catalogued telluric absorption lines in our spectra, containing DIBs. Furthermore, we see for new weak telluric lines which are not to find in accessible line atlases.

Analytical solution of Kompaneets equation

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Analytical solution of Kompaneets equation which describes the movement of the shock front from strong point explosion in a medium with the density that changes as the hyperbolic tangent was obtained. This solution allows to restore the whole shock front and to investigate its evolution for arbitrary values of the density gradient and for position of the explosion point. The solution is applied for description of interaction of supernova remnants with molecular clouds.

ASTRONOMICAL EQUIPMENT

"Solaris" – a professional astronomical observatory on the roof of a hypermarket

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Solaris is the first astronomical observatory in the world which is always open for the public. It has been built on the roof of a hypermarket for non-commercial purposes and it is fully open to scientific activity. In this speech I would like to present the genesis and the principles of our observatory, the equipment at our disposal, its current state, our achievements, and some future plans connected with it.

The shaper of a time mark for laser ranging of the Earth artificial satellites

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The device of a time reference to pulse signals is represented. The device forms the time label corresponding to the moment of arrival reflected from object of a location of a signal. The device is the shaper with the tracking threshold working in a mode of a time reference to "constant fraction" input signal. The given mode provides preservation of high accuracy of event registration time, with variation amplitude of input signal in a wide range.

Photometry with the help of digital camera Canon 350D

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Results of photometric studies made with a digital camera Canon 350 D are presented. The transition from the instrumental photometric system to the standard Johnson system is implemented. The advantages of CMOS-matrix are presented. Using this camera the series of observations of the photometric standards, the variable stars, the moon, the meteor showers and defining the sky background depending on the inclination angle were made. Photometric inaccuracy is $\sim 0.05 - 0.1$ m. The period of β Lyrae light variation is confirmed and this illustrates the practicability and applicability of the use of camera Canon 350 D for scientific purposes.

SOLAR PHYSICS & HELIOSPHERE

Decametric radio bursts associated with the 13 July 2004 CME event at frequencies 10-30 MHz

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We report on the observations of solar type IV burst and its precursors on the 13 of July 2004 at frequencies 10-30 MHz. The radiotelescope UTR-2 observational data completed by SOHO, WIND, NDA, RHESSI, GOES data were used. The main properties (frequency drift rate, duration, flux) of type IV burst and its precursors, namely solar type III and type II bursts, are analyzed. We consider the type IV burst connected with appearence of the CME (Coronal Mass Ejection), which occurrence coincide with the type IV burst beginning. Several physical characteristics of this CME were estimated.

Calculation and visualisation of coronal magnetic field during 1997, 2006 and 2008 total Solar eclipses

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Coronal magnetic field was calculated by a potential field extrapolation using a Potential Source Surface (PSS) model. Wilcox Solar Observatory photospheric magnetic field data for Carrington rotations 1920-1921, 2040-2042 and 2072-2073 were used. Coronal magnetic field charts at the source-surface distance of 2.5 solar radii were plotted. We used the radial and classical approaches to calculate spherical harmonic coefficients and magnetic field lines in the Sun's corona. Observed structure of the solar corona and calculated coronal magnetic field were compared and analyzed.

Observed photosphere convection on different spatial scales

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Peculiarities of the photospheric convection are investigated by means of the reproduced space-time variations of the temperature and line of sight velocity. The investigations were performed by solving nonequilibrium inverse radiation transfer problem using neutral iron line $\lambda \approx 639.3$ nm profiles obtained during the time interval of 2.5 hours with high spatial and time resolution. The physical conditions whithin the inhomogeneous solar atmosphere have been reconstructed. Acoustic waves were removed by $k - \omega$ filtration. The existence of convective flows of distinct scales is detected: granulation, meso- and supergranulation. Space-time variations of photosphere convection of different spatial scales are analyzed.

New developments of UTR-2 working modes: two-dimensional heliograph

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The UTR-2 antenna system has been used for observing the solar corona of the quiet Sun in the frequency range 16.5-33 MHz from 4 to 6 September of 2010. The multi-frequency radio emission investigations included the measurement of flux density and the determination of angular equatorial and polar diameters of solar corona from scan to scan. During a day the heliograph can produce up to 10-12 scans simultaneously by three-five beams equally spaced in declination. From the series images it follows that the solar corona features clearly vary with time and frequency. Preliminary results of the observations are presented.

Image segmentation of coronal loops

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In this poster, a half-automated coronal loops identification is investigated. We used OMC(Octodirectional Maxima of Convexities)-filter for reducing noises and enhanceing the resolution of AIA/SDO images. The 2-D interpolation method, Bspline is applied for identifying loops in images. Using Frenet-Serret vectors algorithm, perpendicular and tangential vectors, curvature, and torsion are determined, for each loop. The intensity profiles of the loops are presented.

Comparison of magnetic fields in a sunspot measured by five spectral lines with different Lande factors

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The Zeeman splitting of FeI 6093.66, 6094.419, 5436.3 and 5436.6 Å lines is studied using $I \pm V$ Stokes profiles related to a big sunspot observed of 25 March 1991. Measurements in lines FeI 5436.3 and 5436.6 with relatively large Lande factors ($g = 1.44$ and 1.82, respectively) shown, that magnetic field in sunspot umbra was in range 1.4–1.6 kG and had S polarity. However, it was found that lines FeI 6093.66 and 6094.419 with small and opposite Lande factors ($g = 0.33$ and -0.22) have magnetic splitting of the same sign, i.e. second line indicates opposite magnetic polarity, namely N. An analysis of probable causes of this effect allows to conclude the possible influence of the Pashen-Back effect in presence of very strong fields of ~ 105 G. In fact, similar spectral perturbations (like very small Zeeman splitting) were found in FeI 5434.5 line ($g = -0.014$). It was shown, that this splitting is maximum in line core (where it reaches 3-5 mÅ) and decreases, in general, from line core to wings. Corresponding low magnetic strength limit of longitudinal field is about $10-13$ kG. Perhaps, such fields were placed in subtelescopic magnetic structures embedded in more weak background field of sunspot umbra.

Strong magnetic fields measured in solar prominences by D3 and Hα lines

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We present the data of magnetic field measurements in three solar prominences: 24 July 1981 (6:30 UT), 24 July 1999 (6:49 UT) and 12 July 2004 (8:48:50 UT). The Zeeman spectrograms of prominences were made on Echelle spectrograph of Astronomical observatory of National Taras Shevchenko University of Kyiv. Magnetic fields were measured by D3 HeI and Hα lines on following heights: $h = 4.5 - 12.5$ Mm for 24 July 1999 and $h = 3 - 14$ Mm for 12 July 2004. Measurements of the magnetic fields by the method of "centers of gravity" shown, that magnetic field in prominence was in range from -200 to $+580$ G (different for various heights of prominence). Weak, narrow, splitted and polarized features were found in D3 HeI line core for height of 6 Mm, which indicate on subtelescopic (< 1 Mm) magnetic field of 3300 G. An interesting effect was found for both prominences – anticorrelation of measured magnetic strengths in helium and hydrogen lines.

Analytical calculation of absorption line profiles for deformed normal distribution

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There are well known analytical results for absorption line profiles based on the normal fluctuation distribution in magnetic field. The real structure of small-scale magnetic field is more complicated. For more accurate results it is important to choose correct distribution function. Analytical calculation of absorption line profiles for distribution function in the form of Gauss distribution and polynomial product was propounded.

On the extended 23rd solar cycle

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An explanation of the extended 23rd solar cycle duration in the alpha-omega dynamo model is proposed. We took into account the up-to-date observed data on the essential increase of averaged annual module of magnetic fields of large-scales sunspots in the first half of the 23rd cycle as well as the magnetic quenching of the alpha-effect which is connected with this observed fact and calculated by us. The dynamo-period of the solar cycle depends on the intensity of the alpha-effect (the turbulent helicity parameter) and the radial gradient of the inner solar rotation in the solar convection zone. According to the study on the baseground telescopic observation, the average values of magnetic field for the large-scale sunspots in the first half of the 23rd cycle were really higher (about 13%) then in three last cycles. In accordance with these observed data the value of the magnetic quenching function in the maximum of the 23rd cycle was equal about 0.7 quenching-function value in the cycle minimum. Then the alpha parameter also was magnetically quenched just in the same degree. Therefore, the calculated 23rd cycle dynamo-period is bound to increase by a factor of 1.2 and to be about 13 years, in accordance with observations.

Interstellar hydrogen atoms inside the heliosphere: theoretical search of the heliospheric boundary effects

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Our solar system is moving though the Local Interstellar Medium (LISM). The solar wind interacts with interstellar plasma and complex structure of the interaction region is formed due to relative Sun/LISM motion. LISM is a weakly (20-30%) ionized plasma and mainly consists of hydrogen. The mean free path of the interstellar hydrogen atoms (H atoms) is larger or comparable with the characteristic distance of the SW/CHISM interaction region. Therefore, H atoms penetrate deeply to the heliosphere where properties of H atom component can be measured directly or indirectly. This work deals with theoretical modeling of the interstellar hydrogen atoms (H atoms) distribution inside the heliosphere. We study imprits of the heliospheric boundary on the hydrogen atoms near the Sun. To do this we employ newly developed kinetic model for H atoms that takes into account both global effects of H atom perturbations at the heliospheric interface and local (i.e. within 10-20 AU from the Sun) effects of the solar ionization, charge exchange, solar gravitation and radiation pressure. It was shown that the hydrogen distribution in the vicinity of the Sun is strongly affected by the global effects of the heliospheric interface. It means that propeties of the heliospheric boundary can be studied for example from the Earth orbit.

Source of the periodic perturbation in the Solar wind plasma

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Our work is dedicated to analysis of the periodic MHD perturbation detected in the interstellar plasma on the Earth orbit by the THEMIS spacecrafts. We use the magnetic field and plasma parameters measurements aboard THEMIS B spacecraft (the apogee is 30 R_E). Periods of observed perturbations are close to the periods of the field line resonance modes of the Earth magnetosphere so the detected periodic perturbation can effectively couple with the magnetosphere Alfven resonance system. We determine the wave vector direction, the ellipticity, and the polarization properties by use of the singular value decomposition, the imaginary part of the spectral matrix analysis and the minimum variance analysis. We find the wave-vector direction and the wave phase velocity by use the minimization of the Faraday rescue technique. We find that the observed oscillation of the plasma parameters can be explained in terms of the Alfven wave Sun-ward propagation in the moving system of the solar wind. The Alfven wave is observed in the vicinity of the interplanetary shock wave surface and in the region with electron and proton beams accelerated by the shock. We speculate that exactly the observed particle beams generate the periodic MHD perturbations due to beam instability.

The dynamic spectrum of scintillating radio sources

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In 1975 PRAO ASC LPI (Pushchino Radio Astronomy Observatory) was proposed and first implemented method for Radio Astronomy mapping of the interplanetary plasma, based on observations in the meter wave band scintillations of several hundred of the strongest radio sources. Scintillations caused by diffraction of radio sources of radio waves by inhomogeneities of the interplanetary plasma. This process is described by the theory of wave propagation in randomly inhomogeneous media. In a medium is changing velocity of wave propagation due to changes in the refractive index and lengthens its path because of the refractive index direction of the wave front. This leads to fluctuations in the intensity of radiation in the far zone, where the observer. With this method was investigated by the global structure of the solar wind and its evolution in the solar activity cycle. Mapping method allows also to investigate the transient phenomena in the solar wind (e.g., coronal mass ejection), and, in particular, to investigate the structure and evolution of interplanetary shock waves caused by the active processes in the solar corona. Observations of the electron density in the line of sight can get several hundred projections and apply the method of radio tomography for reconstruction of the interplanetary plasma. Currently, the Radio Astronomy Observatory, in accordance with the program "Space Weather", works to increase the number of observed cosmic radio sources, which would significantly increase the number of projections. This work presents an analysis of the dynamic spectra of daily records of observations of the celestial sphere in the region range from $03^{\circ}25'$-$12^{\circ}40'$ in declination. In the analysis in time domain for the faint glimmering of sources can only be estimated basic parameters scintillation (scintillation index average over the ensemble of sources, counting the number of scintillating sources) over a fixed period of time. Homogenization of daily records for half a year allows you to increase signal to noise ratio for the profile of radio, but flicker remain incoherent, which leads to "smearing" of the desired signal over the spectrum. To detect the parameters of weak scintillation radio sources, a comparative analysis of different methods for calculating the dynamic range of Fourier and Wavelet basis.

Some plasma aspects of solar-terrestrial relations

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It is known that one of the main channels of communication between the Sun and the Earth is so-called solar wind (SW). Magnetic storms have direct connectivity with bursts of solar activity, i.e. with Earth's ingress to the region of abnormally intensive SW and to the interplanetary magnetic clouds. It is clear that during these events geomagnetic field undergoing large disturbances. There are many observations of the negative impact of such disturbances in different macroscopic natural and artificial systems on Earth and its biological objects. Conclusions about the well-being of people dependent on magnetic storms are confirmed by statistic data. During solar flares and magnetic storms quantity of charged particles in the ionosphere increases markedly and very uneven. The main reasons are energy flashes and coronal mass ejections. The last ones form giant plasmoids, which can move in the direction of the Earth with speeds more than 2000 km/s. Clearly, these events are defined as extreme SW perturbation. They trigger the condensation of plasma and extra plasma layers in the ionosphere.

ATMOSPHERIC STUDIES & SPACE GEOPHYSICS

Some properties of the magnetosheath flow in gasdynamic simulations

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The influence of the solar wind on the positions of the bow shock and magnetopause is discussed in this study. The research is based on the numerical modeling, using the new magnetosheath-magnetosphere model, developed at the Institute of Mechanics (Bulgarian Academy of Sciences). The model describes self-consistently the complicated region of the magnetosheath and the magnetosphere, applying at each region a different model. The magnetosphere modul calculates the structure of the magnetic field in the magnetosphere, while the magnetosheath model describes the plasma parameters in the magnetosheath. The forms of the bow shock and magnetopause are also received as a part of the solution. ACE solar wind observations are used as a model input. One of the advantages of the model is that it can be used in the interpretation of real events. The object of investigation in this study is the position of the Earth's bow shock and magnetopause for real solar wind events.

Pc1-pulsations: the parallel structure in the plasma with the admixture of the heavy ions

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The report deals with the ULF-waves in space plasma with the admixture of the heavy ions. The frequency of oscillations is supposed to be of the order of the heavy ion gyrofrequency (the range of Pc1 pulsations). The longitudinal structure of oscillations (along magnetic field lines) is considered in detail: the transparent and opaque regions are determined. The case of the quasi-transverse propagation ($k_\perp \gg k_{||}$) is considered. A resonator is found at the equatorial part of the field line, which serves as a wave energy reservoir. Part of the wave energy tunnels through the opaque region from the resonator and gets to the near-ionosphere region, where a standing wave is formed. The wave frequency is determined by the resonator eigenfrequencies. At the result from the resonator's eigenfrequencies are very close to each other the beats are formed which resembles the characteristic structure of the Pc1 pearls.

Subauroral heliosphere-heosphere coupling during November 2004 ionospheric storms: F2-region, North-East Asia

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We analyze ground and in situ data collected on November 9-10, 2004 during ionosphere storm negative phase which consequences retained in the ionosphere till November, 13. The results show that this phase developed on the north-west IMF background in the compressed morning magnetosphere, and was accompanied by Pc5-like pulsations. We believe that high-latitude reconnection and quasi-periodic ULF perturbations provide an additional electromagnetic energy input in the subauroral ionosphere and thus contribute to creation of a long-lived composition disturbance zone.

MHD modes coupling in the plasma system with dipole magnetic field

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The exact solution for eigenmode MHD waves in the dipole magnetic field configuration is proposed. The eigenmode spectrum of the MHD waves in the plasma system with the dipole magnetic field configuration is discrete and consists of Alfven and slow magnetosonic modes. Their interaction depends on boundary conditions and the magnetic field curvature. We present the physical conditions of resonant MHD waves realization obtained for different wave polarization type. The poloidal waves strongly couple with slow MHD waves. The critical influence of the magnetic sheer for the poloidal modes is shown. The toroidal resonant ULF waves have not the magnetic pressure and plasma pressure perturbation component. The verification of obtained conditions with parameters of waves collected in the inner Earth magnetosphere by spacecraft is carried out. The magnetic field pressure and plasma pressure anticorrelation oscillation with partial pressure compensation is obtained for coupled slow MHD and Alfven waves. The obtained polarization properties of magnetosphere ULF waves are in a good agreement with the theoretical prediction.

Analysis of turbulent processes in the boundary layers of Earth's magnetosphere

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The scaling features of the probability distribution functions (PDFs) of the magnetic field fluctuations in different regions of Earth magnetosphere and the solar wind plasma at different timescales were considered. Data obtained by Interball and Cluster spacecrafts were used. Changes of shape and parameters of the probability distribution function for periods of the satellite position in different magnetosphere regions were examined. The probabilities of return $P(0)$ with t, and kurtosis values at different timescales were used for the analysis. Two asymptotic regimes of $P(0)$ characterized by different power laws were founded. In particular, while the large timescale the scaling is quite well in agreement with the typical scaling features for a normal Gaussian process, in the limit of small timescale the observed scaling resembles the behavior of a Levy process. The crossover characteristic timescale is corresponding to $t \sim 1$ s. This value can be connected with ion gyrofrequency. In addition, for the analysis of turbulent processes the structure functions of different orders were investigated, and comparison of the obtained results with log-Poisson cascade model and Kolmogorov's model was made.

Chorus wave peculiarities in the inner magnetosphere: numerical simulation results

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The characteristics of the nonducted VLF waves propagation in the inner magnetosphere are studied in depends on their frequency, source localization, and initial angle between the wave normal vector and ambient magnetic field θ_0. The ray tracing software based on multi-components cold plasma approach is developed. We use the IGRF magnetic field model and diffusion model of plasma density to study whistler waves polarization properties. We described dynamics of the wave normal direction during the wave propagation and magneto-spherical reflection of the waves. Also we shown that the waves can be reflected only then if $\omega_{LHF} > \omega$ is satisfied, where ω_{LHF} is a Lower Hybrid Resonance frequency. It correspond to magnetic latitude near 50°. The numerical simulation of the VLF waves generated near the plasmapause shows that the plasmapause can manifest itself as the waveguide for the whistler waves. We although simulate a propagation of chorus emission, used realistic initial parameters distributions, revealed by CLUSTER satellites. Simulation results showed that the ray traces of waves generated within an interval close to the Gendrin angle $+\theta_G$ with a wave vector directed towards the upper L-shells (from the Earth) minimally diverge for lower-band chorus. Distributions of chorus wave normal directions were obtained for different magnetic latitudes. The good agreement with Cluster spacecraft STAFF-SA measurements is shown. The VLF waves energy distribution in the inner magnetosphere is obtained with respect to the observed location of the global source region.

Features of electrical field of the Earth atmosphere

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Global atmosphere-electrical circuit determines the balance of electrical currents in the atmosphere, conditions for maintenance of the electric field, and the structure of electrical fields and currents. Considered in this work Wilson's model allows to calculate the profile of atmosphere electroconductivity at the given parameters of thunderclouds. The electricity of the near-ground layer substantially differs from processes in the free atmosphere. The presence of the Earth's surface leads to creation of the electrode layer near this surface. Two limit cases are considered in the work: the classical and turbulent electrode effects. The use of numerical modeling with Runge-Cutta method has shown that the electrode effect disappears on the altitude of 3 m, and the concentration of positive ions inside the electrode layer is constant. The comparison of the change of the electrical field intensity with the turbulence presence and without it shows slower changes of E with the altitude. Obtained theoretical profiles of electrical field intensity are compared with experimental ones.

Earth's atmospheric parameters estimation from low artificial satellites laser ranging data

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Satellites at low Earth' orbits (LEO) are very sensitive to atmospheric breaking effects. That is why they aren't used for determination of Earth Orientation Parameters. Possibility of utilization of satellite laser ranging data for estimation of atmospheric parameters (mostly for density determination) is still under discussion. We present the model of LEO satellites motion, method of the determination of atmospheric deceleration and estimation of density

values. NLRMSISE-00 atmosphere model was used and corrections to its numerical values were estimated.

Model issue on ionospheric tomography based upon GNSS satellites

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We present first results of our modeling of GNSS satellites signal propagation through ionosphere with the aim to reconstruct the electron concentration. The task is analyzed from the model point of view when ideal satellites are moved in GNSS-like orbits with the list of ground stations observing them under ideal conditions. The only interference analyzed is the ionosphere itself. Dependence of tomography errors upon ground stations geometry is analyzed.

Parametric modeling of global TEC fields

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We applied ARMA statistical modeling to analysis and forecasting global TEC maps. ARMA is a parametric time series and fields modeling method, widely used in applied statistics. The methodology is applied to TEC modeling first-time. We present new software and discussions of first results.

Vertically propagating free atmospheric planetary waves (Kelvin and Rossby-Gravity waves) on an equatorial beta-plane

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The general analytical solutions of vertically propagating free atmospheric planetary waves were solved by using linearized equation of motion, continuity, and first law of thermodynamic on an equatorial β-plane in log-pressure coordinates. In special case for mode $n = 0$ (Rossby-gravity waves), if Brunt-Vaisala frequency does not change, then these waves become vertically-propagating solutions. The direction of vertically energy propagation highly depends on angular frequency (ω). The energy of Rossby-gravity waves can vertically propagates upward if verticalwaves number (m) is a positive integers. In (X,Z) and (X,T) plane coordinates, the lines of constant phase are tilted westward with earth's height. For mode n=-1 (kelvin waves), the direction of energy and vertical group velocities propagations (C_{gz}) are similar due to disspersivity of the waves. In (X,Z) plane coordinate, the lines of constant phase are tilted eastward with earth's height but in (X,T) plane coordinate the lines are

reversed. Moreover, perturbations of geopotential fields and vertical wind are in the same phase of zonal wind perturbation. Eastward phase propagation of Kelvin waves requires $m < 0$ for downward phase propagation.

Theoretical simulation of free atmospheric planetary waves on an equatorial beta-plane

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A simple theoretical model was developed to investigate behavior of equatorial planetary waves (EPW) in the Earth's atmosphere. Based on linearized equations of EPW in equatorial β-plane, EPW by mode $n = 0$ has greatest meridional wind amplitude at the equator and decays exponentially when away from the equator (Gaussian decay). EPW by mode $n = 1$ has greatest amplitude of meridional wind perturbation (v') at latitude $y = \pm 1$ (nondim) and EPW by mode $n = 2$ has v' equal to zero at latitude $y = \pm 1/2\sqrt{2}$ (nondim), the peak of amplitude is just outside the equator. Simulation of Yanai wave results that both zonal wind and geopotential field have greatest perturbation amplitude at latitude $y = \pm 1$ ($u' = 0$ in Equator) while perturbation of zonal wind (u') and geopotential field (Φ') will be in geostrophic balance at latitude $-1 < y < 1$ (nondim) or $-(\beta^{-1}\sqrt{gH})^{1/2} > y > (\beta^{-1}\sqrt{gH})^{1/2}$ (length dimension). Simulation of Kelvin wave results that either zonal wind or geopotential field has symmetric amplitude and symmetric perturbation relative to Earth's latitude. For special treatments, by mode n=1, 2, and 3 there are two classes of EPW, namely high frequency Poincaré modes waves and the low frequency Rossby modes waves. These waves have special behaviors as functions of n. This paper presents a linear model of EPW and mathematically goes step-by-step to derive and explain their character on an equatorial beta-plane.

Magnetized Rossby waves in mid-latitude ionosphere F-layer

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From the analysis of the critical F2 frequency variations in the ionosphere the waves with temporal scales about 7 days and relative amplitude to 40% were observed. From the temporal scale, position and wave maximum changes it is assumed that the critical F2 frequency variations are caused by Rossby wave-like disturbances. The spatial and temporal planetary scale wave parameters on F-layer hights were obtained based on of mid-latitude ionosonde network measurements and TEC data for Millstone Hill, Dyess, and Point Arguelo (www.ngdc.noaa.gov/stp/IONO/). The long-term existence of 5-7 days period waves are confirmed from critical F2 frequency and TEC variations data. The numerical model based on conservation laws is proposed and some special nonlinear cases are considered to study the wave dynamics on the ionosphere F-layer heights. The model test runs show good correspondence with the simulations according to Hasegawa-Mima and Charney-Obukhov equations (Horton W., Hasegawa A. Chaos. 1996. V. 4(2). P. 227). In linear case the proposed model gives results, which reproduce the dispersion equation for the slow planetary scale waves. The dynamics of separate initial disturbances is considered taking into account the nonlinear term of the generalized Charney-Obukhov equation.

The chorus source structure in the inner magnetosphere

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Discrete ELF/VLF chorus emissions are the most intense electromagnetic plasma waves of the whistler diapason observed in the Earth's radiation belts and in the outer magnetosphere. They are suggested to be generated due to the cyclotron instability in the plasma with the velocity anisotropy. Thus the wave generation region is assumed to be located at the magnetic field minimum which is situated in the vicinity of the magnetic equator in the inner magnetosphere. Previous studies showed that the source position can deviate from the geomagnetic equator by a several degrees. The main aim of our work is to investigate the source position and structure during high geomagnetic activity time intervals. To achieve our aim we use Spatio Temporal Analysis of Field Fluctuations (STAFF) spectral matrices measurements for 27 frequencies (Spectrum Analyser measurements from 8 Hz to 4 kHz) and magnetic field measurements by flux gate magnetometers (FGM) aboard the four Cluster spacecraft. We estimate the Poynting flux direction for whistler wave frequency range. Changes of Poynting flux direction (relatively to the magnetic field direction) indicate the position of the generation region. We confirm that the chorus source is situated at the minimum of the magnetic field on the given geomagnetic field line. On the base of Cluster measurements (2001-2009) we show that the local minimum can be displaced from the geomagnetic equator more then $\pm 5^{\circ}$ during periods of high geomagnetic activity. Two characteristic scales of disturbance are found. First (characteristic time scale is about one hour) refers to global current system rebuilding and can be determined from N. Tsyganenko magnetic field models. Second (the characteristic time scale is about ten minutes) – magnetic field minimum has the fine structure with several minimums along the magnetic field line. On the base of the multi-points magnetic field measurements we have found that during the high geomagnetic a ctivity periods the location and the structure of the generation region can be additionally disturbed and controlled by MHD perturbations.

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