Kyiv National Taras Shevchenko University
Astronomy & Space Physics Department
Student Science Association

Abstracts

13th Young Scientists' Conference

on Astronomy and Space Physics

With assistance of "Fund of Assistance to Student Initiative"

April 25-29, 2006 Kyiv

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Preface

PREFACE

This year Young Scientists' Conference "Astronomy and Space Physics" is held for the thirteenth time. We all have been looking forward to the annual meeting of astronomers at Kyiv National Taras Shevchenko University. 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 Kyiv National Taras Shevchenko University as a students' conference in 1994. Since 1996 our conference has welcomed young researchers from other universities and scientific institutions. During 1994-2004 participants from Ukraine, Russia, Poland, France, Germany, Sweden, Libya, Egypt, Japan and other countries took part in Young Scientists' Conference.

This year the Ukrainian scientists celebrate two great events: the 100-th anniversary of Prof. Vsehsvyatsky and the 160-th anniversary of Kyiv Astronomical Observatory. So our present conference is devoted to these important dates.

The conference is held with the aim to strengthen the position of astronomy and promote space physics research. The lectures and reports presented by the participants will traditionally reflect modern trends and actual problems of the science, the sessions will facilitate informational exchange about the latest innovations and achievements. We also hope the twelfth conference will be a significant step in development of astronomy and space physics.

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

Andrew Simon and
Local Organizing Committee

_____Organizing committee_

ORGANIZING COMMITTEE

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Prof.S.L.Revo, Vice-Dean on Research
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Dr.Bohdan I.Hnatyk, Head of Astronomical Observatory of KNU

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«Ôîíä ñïðèÿííÿ ñòóäåíòñüêèì ³í³ö³àòèâàì» - ìàéáóòíº óêðà¿íñüêîãî ñòóäåíòñòâà!

Ìîëîäü – íàä³ÿ ³ ìàéáóòíº êðà¿íè. Ñàìå òîìó, ñë³ä ï³äòðèìóâàòè ìîëîä³æíó ³í³ö³àòèâó ó âñ³õ ñôåðàõ æèòòÿ, äàâàòè çìîãó ìîëîäèì ëþäÿì îñîáèñòî ïðèéìàòè ð³øåííÿ, âïëèâàòè íà äåðæàâîòâîð÷³ ïðîöåñè â êðà¿í³.

Îñü äëÿ ÷îãî áóëî ñòâîðåíî ìîëîä³æíó íåäåðæàâíó îðãàí³çàö³þ «Ôîíä ñïðèÿííÿ ñòóäåíòñüêèì ³í³ö³àòèâàì».

Îñíîâíèìè çàâäàííÿìè Ôîíäó º ï³äòðèìêà ä³ÿëüíîñò³ ñòóäåíòñüêèõ òà ìîëîä³æíèõ îðãàí³çàö³é, ï³äâèùåííÿ ðîë³ ìîëîä³ ó ñóñï³ëüíî-ïîë³òè÷íèõ ïðîöåñàõ äåðæàâè òà ïîë³ïøåííÿ ñîö³àëüíîãî ñòàíîâèùà ñòóäåíòñòâà, çàëó÷åííÿ ì³ñöåâèõ îðãàí³â âèêîíàâ÷î¿ âëàäè òà ì³ñöåâîãî ñàìîâðÿäóâàííÿ, ãðîìàäñüêèõ, òóðèñòè÷íèõ òà ³íøèõ îðãàí³çàö³é äî ó÷àñò³ â ïðîãðàìàõ Ôîíäó, à òàêîæ, ñï³âðîá³òíèöòâî ç ì³æíàðîäíèìè óðÿäîâèìè òà íåóðÿäîâèìè îðãàí³çàö³ÿìè.

Íàä ïðîåêòàìè òà çàõîäàìè Ôîíäó ïðàöþº ïðîôåñ³éíà êîìàíäà ñèëüíèõ òà ä³ºâèõ ìîëîäèõ ëþäåé, âèïóñêíèê³â ïðîâ³äíèõ âèùèõ íàâ÷àëüíèõ çàêëàä³â ñòîëèö³, çîêðåìà Êè¿âñüêîãî Íàö³îíàëüíîãî óí³âåðñèòåòó ³ì. Òàðàñà Øåâ÷åíêà, Íàö³îíàëüíîãî òåõí³÷íîãî óí³âåðñèòåòó Óêðà¿íè «Êè¿âñüêèé ïîë³òåõí³÷íèé ³íñòèòóò», à òàêîæ Êè¿âñüêîãî ì³æíàðîäíîãî óí³âåðñèòåòó. Íà ñüîãîäí³øí³é äåíü ó íèõ â ðîçðîáö³ çíàõîäÿòüñÿ äåñÿòêè ïðîãðàì, ïîâ’ÿçàíèõ ç ïîêðàùåííÿì ñîö³àëüíîãî çàáåçïå÷åííÿ òà êóëüòóðíîãî â³äïî÷èíêó ñòóäåíò³â. Òàê, «Ïðîãðàìà ï³ñëÿâèïóñêíîãî ïðàöåâëàøòóâàííÿ ìîëîä³», ñïðÿìîâàíà íà íàëàãîäæåííÿ ìåõàí³çìó âçàºìîä³¿ êåð³âíèöòâà âèùèõ íàâ÷àëüíèõ çàêëàä³â òà ðîáîòîäàâö³â ó âèð³øåíí³ ïèòàíü, ïîâ’ÿçàíèõ ç ïðàöåâëàøòóâàííÿì ñòóäåíò³â-âèïóñêíèê³â.

Îäíàê ïîë³òèêà òà ñîö³àëüíà ñôåðà – äàëåêî íå ºäèíå, ùî òóðáóº ñó÷àñíó ìîëîäü ³ ÷ëåí³â «Ôîíäó ñïðèÿííÿ ñòóäåíòñüêèì ³í³ö³àòèâàì». Íåìåíø âàæëèâèì º ïèòàííÿ äóõîâíîãî, êóëüòóðíîãî ðîçâèòêó òà ñòàíîâëåííÿ ìîëîäèõ óêðà¿íö³â, â³äðîäæåííÿ ó ñòóäåíòñüê³é ñâ³äîìîñò³ íàö³îíàëüíèõ òà åòí³÷íèõ òðàäèö³é. Ó çâ’ÿçêó ç öèì, ïðåäñòàâíèêè âñ³ëÿêî íàìàãàþòüñÿ çàîõî÷óâàòè ÷åìíèõ ñòóäåíò³â áåçêîøòîâíèìè êâèòêàìè äî ñòîëè÷íèõ òåàòð³â, îðãàí³çàö³ºþ äîñòóïíîãî ë³òíüîãî â³äïî÷èíêó íà êóðîðòàõ ï³âäåííîãî Êðèìó.

Ìè õî÷åìî ìàòè äîñòîéí³ óìîâè æèòòÿ, æèòè â ðîçâèíåí³é ºâðîïåéñüê³é êðà¿í³, ³ ìè çíàºìî ÿê öüîãî äîñÿãòè, àäæå «Ôîíä ñïðèÿííÿ ñòóäåíòñüêèì ³í³ö³àòèâàì» - ìàéáóòíº óêðà¿íñüêîãî ñòóäåíòñòâà.

“Fund of Assistance to Student Initiative” – Future of Ukrainian Student Body!

Youth – hope and future of our country. That is why is so important to support initiative of young people in any field of life, to give an opportunity to make decisions independently.

So, that is the main reason why “Fund of Assistance to Student Initiative” was created.

The main task of Fund is to support activity of student and youth organizations.

Professional team of strong and active young people, graduates of leading Kyiv universities (like as Kyiv National Taras Shevchenko University, National technical University “Kyiv Polytechnic Institute” and Kyiv International University) works under the projects of Fund. Today there are several programs for improvement of social conditions and cultural rest of students.

Political and social fields – not the only fields that disturb youth and members of Fund. Cultural development of young Ukrainians, ethnical traditions are also very important. So, we try to encourage the best students with tickets to theaters and with organization of summer rest in Crimea.

We wish to provide good conditions for life and we know how to achieve this, because “Fund of Assistance to Student Initiative” – is the future of Ukrainian student body.

Program

Tuesday, 25 April

13:00-14:00 Registration of participants
14:15 Evening section

Official opening
Chairman Andrew Simon

Section "Space Physics and Astrometry"

Lecture: Christian Bizouard, Polar motion: observations, explanation and enigma. Observatoire de Paris, Paris, France

1. Karen Arakelyan, Ashot A. Chilingarian, New Detector for Space Weather research at mt. Aragats. Yerevan Physics Institute, Cosmic Ray Division, Yerevan, Armenia
2. Amin Rikhtegarghiasi, D.G. Stankevich, Michel Bernhard, The New Method of Computer Modelling for Scattering of Light Rays, used of Mie theory. Kharkov State University, Kharkov, Ukraine
3. Mary Kiyanchuk, I.O. Anisimov, Evolution of the Modulated Electron Beam in Plasma: Computer Simulation of Initial-Boundary Problem. Kyiv Taras Shevchenko National University, Kyiv, Ukraine
4. Taras Litoshenko, I.O.Anisimov, 2D Simulation of Plasma-beam Interaction Using PIC Method. Taras Shevchenko National University of Kyiv, Kyiv, Ukraine
5. Kateryna Musatenko, V.Krasnosselskikh, V.Lobzin, Evolution of the Beam Driven Langmuir Wave Packet in the Randomly Inhomogeneous Plasma. Kyiv National Taras Shevchenko University, Kyiv, Ukraine
6. Alexander Tsikaviy, O.I. Gerzanich, V.P. Epishev, Use of Colorimetry for Identification of Space Objects. Uzhgorod National University, Uzhgorod, Ukraine
7. Sergey Korzhavin, Estimate of Motion Parameters of Artificial Satellites Using Angular Measurements of Spacecrafts on Close Circles. Odessa National University, Odessa, Ukraine
8. Vitaly Breus, I.Andronov, S.V.Kolesnikov1, N.M.Shakhovskoy, Computer Program for Polarimetric Observations "PolarObs2006". Odessa National University, Odessa, Ukraine
9. Dmitriy Nasonov, V.E. Panchuk,Analysis of Applying Absorbtion J2 Cell in High Precision Spectroscopy. Sternberg Astronomical Institut, Moscow, Russia

20:00 Excursion to Astronomical Observatory of Kyiv National Taras Shevchenko University, Welcome Party

Wednesday, 26 April

09:30 Morning section

Chairman Ganna Ivashchenko

Section "Cosmology and Astrophysics"

Lecture: Marcus Kirsch, XMM-NEWTON and the hot X-RAY UNIVERSE. ESA, European Space Astronomy Centre

1. Aram Eghikyan, Ashot A. Chilingarian, Data Visualization Interactive Network for the Aragats Space-environmental Center. Yerevan Physics Institute, Cosmic Ray Division, Yerevan, Armenia
2. Dmitry I. Podolsky, Gary N. Felder, Lev Kofman, Marco Peloso, Equation of State and Beginning of Thermalization After Preheating. CITA, University of Toronto, Toronto, Canada
3. Satyavarapu N.P.Gupta, SSV. Krishna, SKSM. Kiron, Comparison of Uniform and Non-uniform Mass Distributions In Dynamic Universe Model of Cosmology. Bhilai Steel Plant, Bhilai, India
4. Abbas Farmany, Hot Dark Matter and Accelerating Universe. Azad Iniversity of Ilam, Ilam, Iran
5. Stanislaw Kodzis, Bogdan Wszolek, Historical View About Gravity. Jagiellonian University Astronomical Observatory, Krakow, Poland
6. Oliwia Madej, Relativity in Our Neighbourhood. Institute of Astronomy in Wroclaw, Wroclaw, Poland
7. Vladimir Kazemir, M.P. Korkina, T-models with Homogeneous Magnetic Field. Dnepropetrovsk National University, Physics Faculty, Dnepropetrovsk, Ukraine
8. Krzysztof Bolejko, Cosmological applications of the Szekeres model. Nicolaus Copernicus Astronomical Center, Polish Academy of Sciences, Warsaw, Poland

13:30 Poster section

Space Physics

1. Assen Grytsai, Amplitude and Phase of Quasi-stationary Wave in Ozone Distribution at the 55-75 S Latitudes. Kyiv National Taras Shevchenko University, Kyiv, Ukraine
2. Andriy Momot, A.G. Zagorodny, Model Description of Grain Screening in Weakly-ionized Dusty Plasma. Kyiv National Taras Shevchenko University, Kyiv, Ukraine
3. Ruslan Ischenko, M.O. Borovoy, Model of X-ray M-emission in Atoms of Heavy Elements. Kiev Taras Shevchenko National University, Kiev, Ukraine
4. Olga Samchuk, O.I. Kelnyk, Transition Radiation of Whistlers Caused by the Modulated Electron Beam in the Weakly in the Weakly Inhomogeneous Plasma. Kyiv Taras Shevchenko National University, Kyiv, Ukraine

Astrometry

1. Ivan Khatko, V.V. Kleshchonok, M.I. Buromsky, B.M. Skoritchenko, The Observations of the Grazing Occultations of Stars by the Moon in 2004-2005. Kyiv National Taras Shevchenko University, Kyiv, Ukraine
2. Tetyana Botnar, T.P. Sergeeva, Development of a Complex of Programs for Estimations of Photometric Characteristics in Images of Stars on Scanned Plates. Main Astronomical Observatory, NAS of Ukraine, Kyiv, Ukraine

Small Bodies of Solar System

1. Larissa Chubko, I.V.Lukyanyk, K.I.Churyumov, V.V.Kleshchenok, N.V.Borisov, Changes in Spectra of Comet 9P/Tempel on 3-4 July, 2005 During Deep Impact Mission. Astronomical Observatory of Kyiv Taras Schevchenko National University, Kyiv, Ukraine

Cosmology and Astrophysics

1. Fahd S. Khan, The Big Crunch Theory And The Dark Energy Quandary. Cambridge Section, Bahria College E-8 Islamabad Pakistan
2. Ganna Ivashchenko, V.I. Zhdanov, Angular Correlation Function of Quasars from SDSS DR3. Kyiv National Taras Shevchenko University, Kyiv, Ukraine

3. Satyavarapu N.P.Gupta, SSV. Krishna, SKSM. Kiron, Missing Mass in Galaxies-Dynamic Universe Model of Cosmology. Bhilai Steel Plant, Bhilai, India
4. Satyavarapu N.P.Gupta, SSV. Krishna, SKSM. Kiron, Stability Analysis of Disks of Galaxies Formed in Dynamic Universe Model of Cosmology: Using SITA (Simulation of Inter-intra-Galaxy Tautness and Attraction Forces). Bhilai Steel Plant, Bhilai, India
5. Kirill Sokolovsky, A. Lebedev, D. Nasonov, S. Nazarov, VAST: the Software Tool for Search of Variable Objects. Sternberg Astronomical Institute, Moscow, Russia
6. Tatiana Shumakova, P.Berczik, Dynamics of Satellite Galaxies Interacting with the Host Galaxy. Main Astronomical Observatory of NAS of Ukraine, Kyiv, Ukraine
7. Daria Dubinovska, B.Zhilyaev, High-frequency Oscillations in Short Gamma-ray Bursts. Kyiv Shevchenko University, Kyiv, Ukraine
8. Olga Melnyk, Andrii Elyiv, Definition of Galaxy Groups via Voronoi Tessellation. Astronomical Observatory of Kyiv National Taras Shevchenko University, Kyiv, Ukraine
9. Andrii Elyiv, Power Spectrum of the Extragalactic Magnetic Field and Sources of UHECR Distribution on the Basis of the IRAS PSCz Catalogue. Astronomical Observatory of Kyiv National Taras Shevchenko University, Kyiv, Ukraine

Wednesday, 26 April

15:30 Evening Section

Chairman Olga Motsyk

Section "Astrophysics"

Lecture: Ivan Andronov, Deterministic and Stochastic Processes in Astronomy. Odessa National University, Odessa, Ukraine

1. Svetlana Malchenko, Population of the Be stars in the Open Clusters h/chi Persei, Tavria National University, Simferopol, Ukraine
2. Alex Golovin, Elena P. Pavlenko, RZ Cassiopeia: Eclipsing Binary with Pulsating Component. Taras Shevchenko Kyiv National University, Kyiv, Ukraine; Crimean Astrophysical Observatory, Crimea, Ukrane
3. Marcin Dyrka, Bogdan Wszolek, M.Pawlikowski, Interstellar C2 Molecule as Seen in HST/STIS Data. Jan Dlugosz Akademy, Institute of Physics, Czestochowa, Poland
4. Alina Volnova, Alina Shulga, D.Tsvetkov, Optical Photometry of Type II-P Supernovae 2005ay in NGC 3938 and 2005cs in M 51. Sternberg Astronomical Institute, Moscow, Russia
5. Christina Ganshina, V.A. Zakhozhay, The Hydrogen Burning Time Dependence on the Initial Masses of Popullation I and III Stars. Karazin Kharkov National University, Kharkov, Ukraine
6. Anatoliy V. Tugay, Flat Galaxies in Sloan Digital Sky Survey. Taras Shevchenko Kyiv National University, Kyiv, Ukraine
7. Ekaterina Koptelova, Viktor Oknyanskij, Elena Shimanovskaya, On the Possibility of Time Delay Determination in the Gravitationally Lensed System QSO2237+0305. Sternberg Astronomical Institute, Moscow, Russia

19:30 Excursion to Kyiv Planetarium

Thursday, 27 April

9:30 Morning section

Chairman Hanna Ivashchenko

Section "Astrophysics"

Lecture: Bogdan Wszolek, Diffuse Interstellar Bands and Their Families. Academy of Jan Dlugosz, Czestochowa, Poland

1. Taras Yakobchuk, Yu. Izotov, On Distance To I Zw 18. Main Astronomical Observatory of NASU, Kyiv, Ukraine
2. Vasyl Beshley, O. Petruk, Nonuniformity of Interstellar Medium and Broadening of the High-Energy End of the Electron Spectrum in Supernova Remnants. Lviv National University, Lviv, Ukraine
3. Ekaterina Filippova, M.G.Revnivtsev, S.N.Fabrika, K.A.Postnov, E.V.Seifina, Diagnostics of SS433 with the RXTE. Space Research Institute, Russian Academy of Sciences, Moscow, Russia
4. Elena S. Shimanovskaya, E. A. Koptelova, Reconstruction of the Quasar Accretion Disk Brightness Profile From Observations of High Magnification Events. Sternberg Astronomical Institute, Moscow, Russia
5. Alexandr Lebedev, V. Slysh, OH Maser Studying with High Resolution, Stenberg Astronomical Institute, Moscow, Russia
6. Katarzyna Bryndal, Bogdan Wszolek, Diffuse Interstellar Band at 5850 as a Member of 5797 Spectroscopic Family. Jan Dlugosz Academy, Institute of Physics, Czestochowa, Poland
7. Vadim Yurchenko, L.S. Pilyugin, Determination of Abundances in HII Regions by Te-metod Using Strong-line Intensities-abundance Calibration. Kyiv National Taras Shevchenko University, Kyiv, Ukraine
8. Sergey S. Tsygankov, A.A. Lutovinov, E.M. Churazov, R.A. Sunyaev, Pulse Profiles and Cyclotron Line Energy Dependence on X-ray Pulsars Luminosity. Space Research Institute RAS, Moscow, Russia
9. Roman Motiyenko, Microwave Spectroscopy of the Exobiological Interstellar Molecules. Institute of Radio Astronomy of NASU, Kharkov, Ukraine

Thursday, 27 April

14:00 Evening section

Chairman Olga Motsyk

Section "Astrophysics"

Lecture: Nikolai Samus, Variable Stars: Catalogs and Automatic Surveys. Institute of Astronomy, Russian Acad. Sci., Moscow, Russia

1. Esin Sipahi, Serdar Evren, The Light Curve Variations of the Active Binaries with Hot Subdwarf Components. Ege University, Bornova, Izmir, Turkey
2. Alex Golovin, Elena P. Pavlenko, Alexandra Zubareva. A Photometric Study of Two-Pole Accretion Polar RX J1846.9+5538, Taras Shevchenko Kyiv National University, Kyiv, Ukraine; Crimean Astrophysical Observatory, Crimea, Ukrane, Kazan State University, Kazan, Russia
3. Radoslaw Poleski, B. Pilecki, Period Change of Eclipsing Binaries From ASAS Catalogue. Warsaw University Astronomical Observatory, Warsaw, Poland
4. Manjari Bagchi, M. Dey, J. Dey, M. Sinha, S. Ray, S. Bhowmick, Why Studying Strange Stars? Presidency College, Kolkata, India
5. Denis Lavreniuk, Ivan Andronov, Nataliya Ostrova, CCD Photometry of the Magnetic Cataclysmic Binary System FO Aquarii. Youth Academy of Sciences "Prometheus", Odessa Branch
6. Olesja Smirnova, A. Alksnis, Photometric Study of Novae in M31. Institute of Astronomy, University of Latvia, Ventspils, Latvia.
7. Arturs Barzdis, Rapidly Evoluting Mira Variable LX Cygni. Institute of Astronomy, University of Latvia, Riga, Latvia
8. David Lomiashvili, G. Machabeli, I. Malov, Non-precession Model of Rotating Radio Transients. Tbilisi state university, Tbilisi, Georgia
9. Vladimir Yushchenko, V.F. Gopka, The Investigation of the Spectrum of Uranium Star HR465. Odessa National University, Odessa, Ukraine

18:30 Conference dinner

Friday, 28 April

9:30 Morning section

Chairman Vyacheslav Olshevsky

Section "Solar Physics and Planetary Systems"

Lecture: Dmitriy Petrov, T-matrix method and its applications to lightscattering studies. Institute of astronomy of V.N.Karazin, Kharkov National University, Kharkov, Ukraine

1. Larisa Istomina, D.G .Stankevich, Yu.G. Shkuratov, Monte-Carlo Modeling of the Coherent Backscattering Effect in a Random Medium Consisting of Large Non-transparent Spheres. Astronomical Institute of Karazin Kharkov National University, Kharkov, Ukraine
2. Davit Kuridze, Teimuraz Zaqarashvili, Resonant Energy Conversion of 3-minute Intensity Oscillations into Alfven waves in the Solar Atmosphere. Abastumani Astrophysical Observatory, Tbilisi, Georgia
3. Szymon Pospiech, B.Wszolek, Astronomy Lessons With Sun, Jan Dlugosz Academy in Czestochowa, Institute of Physics, Czestochowa, Poland
4. Amjad Al-Sawad, Hannu Hoffren, Jarmo Torsti, Kari Lehtomaki, An Interactive Program for Correlative Studies of Solar Energetic Particle Events. Vaisala Institute for Space Physics and Astronomy, Turku, Finland
5. Vyacheslav Olshevsky, N.G.Shchukina, NLTE Effects on the Formation of Ba II Resonance Lines. Kyiv National Taras Shevchenko University, Kyiv, Ukraine
6. Oksana Shalygina, V. V. Korokhin, L. A. Akimov, O. M. Starodubtseva, G. P. Marchenko, E. .V Shalygin, Yu. I. Velikodsky, Causes of Observed Long-Period Variations of the Polarization at Polar Regions of Jupiter. Astronomical Institute of Kharkov National University, Kharkov, Ukraine
7. Olga Zakhozhay, V.A. Zakhozhay, Yu.N. Krugly, Catalogue of Planetary Objects. Version 2006.0, Karazin Kharkiv National University, Kharkiv, Ukraine
8. Sergey Gerasimenko, V.G. Kaydash, M.V. Kaydash, New Approach for Estimation of the Chemical Composition for Lunar Surface on the Basis of Multispectral Clementine Data. Astronomical Observatory of the Kharkov National University, Kharkov, Ukraine
9. Nadiya Kostogryz, The Comparison of the Optical Parameters of the Nonisothermal Uranus and Neptune Atmospheres. Main Astronomical Observatory of NAS of Ukraine, Kyiv, Ukraine

Friday, 28 April

14:00 Evening section

Chairman Vyacheslav Olshevsky

Section "Small Bodies of Solar System"

Lecture: Klim Churyumov, Space Missions from "Vega" to "Rosetta". Astronomical Observatory of Kyiv Taras Schevchenko National University, Kyiv, Ukraine

1. Karina Bsczek, A.Winogrodzka, Bogdan Wszolek, Changing the Civilization Development by Comets, Institute of Geografy, Jagiellonian University, Krakow, Poland
2. Leyla Hasanova, Faint Absorption Band Investigations in Reflectance Spectra of Vesta-like Asteroids. Shamakha Astrophysical Oservatory, Shamakha, Azerbaijan
3. Sergey Velichko, N.N. Kiselev, F.P. Velichko, Polarimetry and Photometry of Comet C/2004 Q2 (Machholz). Institute of Astronomy, Kharkiv Karazin National University, Kharkiv, Ukraine
4. Sergey Zaitsev, F.P. Velichko, Polarimetry and Photometry of Earth Approaching Asteroid 100085 1992 UY4. Kharkiv Karazin National University, Kharkiv, Ukraine
5. Dmitry Lysenko, F.P. Velichko, UBV-photometry and Polarimetry of High-albedo Asteroid 44 Nysa, Kharkiv Karazin National University, Kharkiv, Ukraine
6. Anton Tokovenko, The Model of Rapprochement of Asteroid Apophis 99942 with the Earth and the Moon. Odessa National University, Odessa, Ukraine
7. Irina Solovyova, Ivan L. Andronov, Precession of Elliptic Orbits in the Restricted 3-Body Problem. Odessa National University, Odessa, Ukraine

18:30 Excursion to Main Astronomical Observatory of NAS of Ukraine

Invited Lectures

XMM-NEWTON and the hot X-RAY UNIVERSE

Marcus Kirsch

ESA, European Space Astronomy Centre
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After launch from Kourou, French Guiana on 10 December 1999, the European Space Agency's X-ray Multi-Mirror satellite XMM-Newton is the most powerful X-ray telescope ever placed in orbit. Scientists are sure the mission will help solve many cosmic mysteries of the hot X-ray universe with objects like neutron stars, black holes or active galaxies. European teams are carrying out the calibration of the XMM-Newton instruments. The coordination of the instrument calibration is done at the XMM-SOC by the XMM-Newton calibration scientists, by participating in the calibration efforts and transferring all important calibration information into Current Calibration Files (CCF) and/or software products.

I will give an introduction in X-ray detectors especially focusing on the imaging XMM-Newton EPIC cameras. After that I will explain the principle of X-ray data analysis showing some of the major discoveries of XMM-Newton. The talk will also incorporate a view on the calibration principles and software that provide the astronomer with a flexible and comfortable system to analyse first class scientific data.

As an additional point I will present the current trainee project for pre and post graduate students at the XMM-Newton science operation center.

Variable Stars: Catalogs and Automatic Surveys

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I will review current work on the General Catalogue of Variable Stars with special attention to new tasks and new possibilities following from the advent of modern automatic sky surveys, like ASAS, ROTSE/NSVS, OGLE, etc. Some of them contain their own catalogs of new variable-star discoveries, which can be incorporated into the GCVS only after solving a number of scientific problems. On the other hand, they provide access to original photometric data, of reasonably good quality, for many stars, including those not detected as variables in the corresponding survey. These data are an effective tool for identifications of variable stars and for improving the variability information in the GCVS. Finally, I will report on progress of digitizing Moscow collections of astronomical photographs.

T-matrix Method and its Applications to Lightscattering Studies

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Studies of light scattering by particles comparable and larger than the wavelength are important in many fields of science, e.g., in remote sensing, atmospheric science, planetology and biophysics. Different methods are applied to study scattering by particles of arbitrary shapes. One of them is the T-matrix method [1,2]. This method is probably the most prospective for light scattering calculations [3].

In the T-matrix method, the incident on scattering object and scattered by this object electric fields are expanded in series of suitable vector spherical wave functions, and the relation between the columns of the respective expansion coefficients is established by means of a transition matrix (or T matrix). T-matrix elements depend on optical and geometrical parameters of scatterer, and do not depend on illumination/observation geometry. So, T-matrix approach allows separating the influence of illumination or observation conditions and inner properties of scattering object (such as size, shape and refractive index).

The main advantage of the T-matrix method is that calculations can be made with very high efficiency. In addition, calculations of particles in different orientation and orientation averaging can be performed analytically at relatively low computational cost. Another important feature of the T-matrix theory is that the symmetries of scattering particles may be taken into account. This results in substantial simplifications in making computations. For axisymmetric particles a very efficient implementation of the T-matrix method

is available [1,4]. However, scattering by particles without such shape symmetries has been relatively poorly studied, due to the lack of T-matrix algorithms available and the relatively higher cost of computations. Moreover computation of scattering properties of ensembles consisting of irregular particles of different sizes still has not been sufficiently developed with the T-matrix theory.

We developed a modification of the T-matrix method, which allows us to effectively study scattering properties of particles having irregular shapes. This method allows us to calculate a scattered field in any point of space, and any characteristic of scattered light, that is why this method is very useful. Principal new features: the possibility of calculation of scattering properties of particles without any limitations (such as symmetry axis requirement) on the shape; possibility of analytical averaging of particle scattering properties over ensemble of particles with different sizes and refractive indices. Our approach seems to be useful to quick calculate the T-matrix of different scattering objects of given shape at different sizes or refractive indices. These calculations require a lot of time, especially if we carry out this calculation many times at averaging both over sizes (with definite size distribution) and over refractive indices (with definite refractive index distribution). Owing to using the analytical method for orientation averaging and the averaging over particle size, our approach seems to be very powerful tool to compute the scattering properties of scattering objects with irregular shapes.

These new features of modified T-matrix method make this method much faster than the analogous methods and call forth that this method seems to be most prospective for investigations in many branches of science, for example, in space studies of the moon, planets, and small bodies of the solar system by remote sensing methods – for investigation of scattering properties of remote objects. This method of scattering calculation allow us to interpret the scattered light data, and basing on this data, to carry out the estimation of information about remote planets, such as sizes and refractive indices of particles ensemble, cover the surfaces of moon, planets, and small bodies of the solar system.

[1] Mishchenko MI, Travis LD, Mackowski DW. T-matrix computations of light scattering by nonspherical particles: a review. JQSRT 1996;55:535–75.

[2] Waterman PC. Symmetry, unitarity, and geometry in electromagnetic scattering". Phys Rev 1971;D3:825–39.

[3] Mishchenko MI, Videen G, Babenko VA, Khlebtsov NG, Wriedt T. T-matrix theory of electromagnetic scattering by particles and its applications: a comprehensive reference database. JQSRT 2004;88:357-406.

[4] Mishchenko MI, Travis LD, Lacis AA. Scattering, absorption, and emission of light by small particles. (Cambridge: Cambridge University Press; 2002).

Diffuse Interstellar Bands and Their Families

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Diffuse interstellar bands (DIBs) still await an explanation. One expects that some progress in this field will be possible when all the known DIBs are divided into families in such a way that only one carrier is responsible for all bands belonging to the given family. Analysing high resolution optical spectra reddened stars we try to find out spectroscopic families for two prominent DIBs, 5780 and 5797 angstroms. Among the DIBs observed in the spectral range from 5590 to 6830 angstroms we have found 8 candidates to belong to 5780 spectroscopic family and the other 12 DIBs candidating to family of 5797 structure.

Deterministic and Stochastic Processes in Astronomy

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A review lecture on deterministic and stochastic processes and on the methods of statistically optimal modeling of signals is presented. For deterministic signals, we discuss methods of periodogram analysis for mono- and multi- periodic, multi-harmonic, multi-shift signals with possible trends and of determination of optimal mathematical models. Special attention is paid for highly non-sinusoidal signals, for which special waveforms are to be used instead of multi-harmonic fits. Spline approximations of constant and variable order are introduced. Advantages and disadvantages of the Fourier transform and its numerous modifications for irregularly spaced signals are discussed. Contrary to the "prewhitening" method for multi-periodic signals, a statistically justified one takes into account correlations between the coefficients of trigonometric/ordinary polynomial.

For quasi-periodic signals, we introduce extensions of the scalegram and wavelet analysis to irregularly spaced data, as well as criteria for statistically optimal modeling using local fits with additional weight functions.

For stochastic signals, "auto-regressive - moving average" (ARMA) models are briefly discussed with an extension of auto-regressive models to signals with periodic and aperiodic trends.

The models are applied to different types of variable stars: eclipsing, pulsating, magnetic and non-magnetic cataclysmic and X-ray binaries.

Space Physics

Model of X–ray M–emission in Atoms of Heavy Elements

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The results of theoretical and experimental investigations of processes of ionization of M–electronic subshells in atoms of heavy elements by electron impact and photoionization are widely used in such diverse fields as plasma physics, modeling of astrophysical phenomena, atmospheric physics and interpretation of spectroscopic diagnostics.

Thus, model of X–ray Ma– and Mß – emission in atoms of heavy elements (Z>70), which takes into account the basic channels of generation and migration of vacancies in M– electronic subshells is developed. X–ray emission Ma– and Mß – spectra of Au are experimentally investigated at excitation by characteristic Ka– spectra of Cr and Cu. It is revealed, that experimentally received the relative intensities of components of Ma– and Mß – spectra, which are connected with multiple ionization of Au electronic subshells, within the limits of errors practically coincide with results of the calculations executed with the help of suggested model of X–ray M– emission.

So, the model, suggested in this paper can be recommended for the description of X–ray M– emission in elements Z ?70. Also further the suggested model allows to use Ma– spectroscopy for determination of characteristic atomic parameters of heavy elements, in particular ionization cross sections of M– electronic subshells and probabilities of autoionization processes.

The New Method of Computer Modelling for Scattering of Light Rays, Used of Mie Theory

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More advanced light-scattering methods must be employed, both for refractive index retrieval (Mie Theory) with inverse models, and for back-scattering calculations. The scattering of light from a spherical object has been dealt with by many investigators since the time Gustav Mie worked out the general theory. Analytical expression are found for the derivatives of commonly used Mie scattering parameters, in particular the absorption and the scattering efficiencies, and for the angular intensity function. These derivatives are given with respect to the total number density, to the median radius and spread of the distribution, and to the refractive index.Computation results from polydisperse show that compare better to experimental reflectance values than calculations based on homogeneous spheres. A layered spherical geometry, based on Mie theory, can adequately reproduce experimentally determined light-scattering properties even supposedly shape-sensitive properties such as the backscattering coefficient.

Amplitude and Phase of Quasi-stationary Wave in Ozone Distribution at the 55-75 S Latitudes

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The ozone distribution in high latitudes of Southern Hemisphere has been studied with use of satellite Total Ozone Mapping Spectrometer daily data. These measurements of total ozone content (TOC) cover the time period of 1979-2005 (with the gap in 1993-1995). The spatial resolution is equal 1 degree by latitude and 1.25 degree by longitude. The September, October and November were chosen for analysis owing to the wave impact on ozone layer is maximal during spring months. Quasi-stationary wave has been obtained by averaging of daily longitudinal distributions. The positions and TOC values for wave extremum have been calculated.

The comparison of quasi-stationary wave characteristics for different years shows long-term variability in ozone distribution. In particular, TOC values decrease due to development of ozone hole. The diminution at all the latitudes is larger in minimum value because corresponding air masses are connected with inner parts of stratospheric polar vortex (and ozone hole). This diminution reaches 35 DU/decade at the latitude 65 S and poleward.

The maximum of quasi-stationary wave is situated at the longitudes from 115 E (for the 55 S latitude) till 175 E (for 75 S). Its displacement is not statistically evident for the last 25 years. At the same time, minimum moved eastward with the angular velocity 13-22 degrees/decade. Such changes in quasi-stationary wave structure are the result of the superposition of waves with zonal number 1 and 2.

Model Description of Grain Screening in Weakly-ionized Dusty Plasma

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Dusty plasma (electrons, ions, grains and neutrals) frequently occurs in the nature and laboratory, particularly interstellar clouds, planetary rings, comet tails, ionosphere, magnetosphere etc. give examples of such plasma. One of the most important features of dusty plasma is that grains accumulate and carry large electric charge due to adsorption of electrons and ions from plasma. In the present contribution we study the problem of grain screening with regard to plasma particles fluxes to the grain surface, ionization of neutrals by external sources and electron-ion recombination.

The problem is treated with drift-diffusion approach. Grains are regard as point-like particles. Absorption of electrons and ions by grains is taking into account by introducing the singular point sink in the continuity equation for plasma particles along with ionization and recombination terms. The analytical expressions for electrostatic potential and plasma particles distribution are calculated in the linear approximation. Obtained potential is screened and consist of two terms with different screening lengths, which depend on plasma parameters. The essential feature of such potential is that one of the screening lengths is considerably larger than Debye screening length. If ionization and recombination are absent, when the unscreened term appears, which is proportional to the absorption rate (number of electrons or ions absorbed per unit of time).

Evolution of the Modulated Electron Beam in Plasma: Computer Simulation of Initial-Boundary Problem

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The problem of the modulated electron beam evolution in plasma is of great interest in various branches of plasma electronics such as electron beams using as emitters of the electromagnetic waves in ionosphere, transillumination of the plasma barriers for electromagnetic waves using electron beams etc.

Study of the polarization beam-plasma instability at the single frequency has been demonstrated its saturation due to the beam electrons' trapping by the potential electric wave. But for non-resonant instability these results can be changed strongly due to concurrence with the resonant mode (i.e., mode in synchronism with a beam). If the initial modulation depth is not too large the beam electrons can be trapped by the resonant mode, and further increase of the non-resonant mode will be suppressed. Consequently dependence of the peak signal amplitude on its initial value in some region becomes linear, but it has saturation for the large modulation depth.

Simulation in [1] was carried out for the initial problem. But real experiments correspond to the initial-boundary problem. Evolution of the modulated electron beam moving through plasma was studied via computer simulation using large-particles-in-cell method. Homogeneous background plasma was treated. The development of the beam-plasma instability was investigated. It is shown that the resonant instability at the frequency of the phase synchronism with the electron beam suppresses oscillations at the signal frequency. Continuous instability spectrum was obtained. Dependence of the

peak signal amplitude on its initial value has a form of increasing nonlinear function with saturation. Dependence of the maximization time of the signal was also obtained.

Consequently the results obtained confirm the mechanism proposed in [1].

[1] I.O.Anisimov, S.V.Dovbakh, S.M.Levitsky, G.V.Lizunov, H.V.Podladchikova. Concurrence of modes in the signals' transport through the plasma wave barriers via electron beams. // Kyiv University Bulletin. Radiophisics and Electronics, 2000, #2, pp. 10-17. (In Ukrainian).

Evolution of the Beam Driven Langmuir Wave Packet in the Randomly Inhomogeneous Plasma

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The Langmuir wave propagation in plasma with random inhomogeneities ?an give an understanding to the measurements performed on the border of the satellite spacecrafts. Namely probability distribution functions of the waves observed by CLUSTER satellites in the foreshock region of the magnetosphere can be explained by the interaction of the waves with the random plasma medium [1].

We consider a model of the Langmuir wave packet dynamics in the plasma with random inhomogeneities. In the frames of our model the beam driven packet of Langmuir waves propagates in plasma in the presence of the amplitude growth and angular diffusion. These two effects are caused by the inhomogeneities in plasma. The growth of the amplitude takes place due to the large scale density inhomogeneities with the amplitude that cannot be considered negligibly small. And the small scale density inhomogeneities are responsible for the angular diffusion phenomenon. The plasma density gradient changes the phase velocity of the propagating wave packet and brings it to the resonance with the beam, when the angular diffusion shifts the wave vector out of resonance.

We solved numerically the equation describing spectral energy density of the packet propagating in such a system. The solution shows the influence of the growth and angular diffusion on the packet development process. We performed a computer simulation and obtained the spectral energy density of the packet after crossing one large-scale inhomogeneity. We also found the dependencies of the wave increment on the model parameters.

Using this information one can find the amplitude probability distribution functions for the waves propagating in the inhomogeneous plasma with mentioned properties and compare them with those measured in the experiments.

[1] Soucek, J., V. Krasnoselskikh, T. Dudok de Wit, J. Pickett, and C. Kletzing, Nonlinear decay of foreshock Langmuir waves in the presence of plasma inhomogeneities: Theory and Cluster observations, J.G.R., V.110, 2005

2D Simulation of Plasma-beam Interaction Using PIC Method

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A computer code for simulation of plasma-beam interaction is presented. The report deals both with principles which the program is built on and with physical results of numerical experiments.

The concept of big particles is laid at the basis of the presented code. This concept allows us significantly decrease the simulation time while the main physical processes remain preserved.

The code will be used for investigation of beam interaction with inhomogeneous plasma and for simulation of electro-magnetic radiation caused by this interaction. These features distinguish the presented code from well-known plasma simulators. The rectangular geometry with Dirichlet, Neuman or periodic boundary conditions is used in simulations.

To prove the correctness of the code typical physical effects in cold and hot plasmas was modeled. Values of frequencies and wave numbers obtained from numerical experiments are compared with theoretical predictions.

Finally the results of the first experiments on plasma-beam interaction and possibilities of the future investigations are discussed.

Transition Radiation of Whistlers Caused by the Modulated Electron Beam in the Weakly in the Weakly Inhomogeneous Plasma

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Radioemission in the whistler frequency band was often observed in the active space experiments when the electron beams were injected into the ionosphere. The transitional radiation of the modulated electron beams in the inhomogeneous plasma can be one of the causes of this radioemission. This transition radiation was studied theoretically in the couple of works but mostly in the approximation of the sharp plasma boundary. On other hand, there is a possibility to increase the efficiency of the whistler transition radiation in the weakly inhomogeneous plasma, if such a radiation appears in the point where the Cherenkov resonance conditions are satisfied.

Whistler waves' transition radiation caused by the cylindrical modulated electron beam moving in the weakly inhomogeneous anisotropic plasma along the constant magnetic field direction and concentration gradient is studied. The electromagnetic field of this radiation and its energy flux are calculated for the whistlers emitted from the region where the Cherenkov resonance conditions are satisfied. This radiation in the given point is a superposition of the waves radiated from the points with smaller z coordinates under the corresponding angles.

The angular dependencies of this radiation Pointing vector have various forms depending on beam radius, electron cyclotron frequencies and plasma concentration gradient. These dependencies have a large amount of maxima due to the interference between the partial waves radiated from different Cherenkov resonance points. The density of such maxima increases with the increasing of beam transversal radius because more Cherenkov resonance

points participate in the radiation. Due to this fact, the density of the maxima in the radiation pattern also increases with the electron cyclotron frequencies increasing and plasma density gradient decreasing. These dependencies can also be explained similarly to the large antennae radiation where larger antennae mean more maxima in the radiation patterns.

Astrometry

Use of Colorimetry for Identification of Space Objects

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Determination of each of criteria for identification of space objects is a decision of separate enough intricate problem. Establishment of orientation of every characteristic constituent of EAS's surface in the select system of co-ordinates is a key criterion. Their equation impossible without the use of such optical description as a size of color – index (c) of the separate explored areas of EAS's surface.

It is known, that for the Sun this index c = + 0,65 star size. At the reflection of light from the details of object's surface as a result of redistribution of radiation on a spectrum there is the change of index c. At the reflection of light from rough surfaces it will be considerably anymore ≈1.00 star size, from the panels of sun batteries - achieves the zero value. From this a possibility appears to determine, when the panels of sun batteries in explored the EAS were in poli of sight visible fully or partly. By the example of the effective use of values of colar - index there are the results of supervisions of French companion "Spot-1". Exactly value of colar - index helped to control appearance in poli of sight of panels of sun batteries. Their contribution to general brilliance of object was described on condition of watching by them the Sun with permanent inclination to it under the angle of 30?. From here, on the curves of brilliance areas were equated when in poli of sight were evidently part of EAS's body, - one or two panels of sun batteries. In addition, at an object "Spot - 1" there are the mirror flashes with advantage of dark blue constituent. After establishment of form of satellite, the additional analysis of it's orientation in the moment of flashes showed that they went from the detail placed in the bottom of body under the angle of 21-23? to direction in a subsatellite point which is revolved with a period 84,5 s. We assume that this, presumably is a revolving objective, which allows to extend the area of research of the Earth's surface almost in 2 times.

Estimate of Motion Parameters of Artificial Satellites Using Angular Measurements of Spacecrafts on Close Circles

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We have got angular measurements of some spacecrafts from the space control department of National Space Agency of Ukraine. We developed the software application, which calculates osculating elements of orbit by means of Laplasian method. Mother orbit was defined more precisely by means of differential corrections method. We have made an estimation of measurement coordinates accuracy. We worked out method of calculating orbit elements more precise using close circles measurements.

Computer Program for Polarimetric Observations "PolarObs2006"

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A new computer program "PolarObs2006" was developed for processing observations of linear and circular polarization obtained at the 2.6m Shain telescope of the Crimean Astrophysical Observatory with a new polarimeter constructed by N.M.Shakhovskoy and D.N.Shakhovskoy. The program is applicable as for processing observations of standard stars with zero and nonzero polarization, as well as for processing observations of stars with variable polarization. The program allows to determine instrumental polarization using standards with zero polarization, and to determine position angle using standards with non-zero polarization. For the investigated star, the photometric and polarimetric time series may be computed for an initial time resolution, as well as for mean data points. The program has a graphic interface.

Some modules, like approximation by a polynomial and component for drawing the graphs, which where developed earlier for our program "Variable Stars Calculator" (http://uavso.pochta.ru/breus, presented at YSC-11), were used in "PolarObs2006". Many processes, including search of data files on the user's disk and identification of data type in series (object, star of comparison, background, standard star) are automated, that makes work easier.

The program passed the practical tests. The observations of magnetic cataclysmic variable AM Herculis obtained on August 10, 2005 at the ZTSh

telescope in CrAO were processed using this program. The light curve and polarization curve are modeled using polynomial and trigonometric polynomial fits with a determination of statistically significant order of mathematical model.

Results of these observations are compared to that obtained previously by different authors. The light curve shows a two-hump structure, which is explained by periodic variations of orientation of the accretion column. The phase curve of the circular polarization has also a two-hump structure and a phase interval with a zero polarization, which corresponds to an eclipse of the region of polarized emission by the white dwarf. The timings of characteristic point at the curves are used to study changes of orientation of the accretion column. The characteristics of flickering agree with a "shot noise" model of blobby accretion.

The Observations of the Grazing Occultations of Stars by the Moon in 2004-2005

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Grazing occultations occur when the moon tangentially approaches a star. The non-smooth features on the moon's northern or southern limb cause the star's light to flicker in and out. These events are quite sparse, and with taking into account weather conditions, the abilities to register them are even more pure.

The results of observations of grazing occultations of stars by the Moon that was received in 2004-2005 were shown. A new television complex "Spalakh", which allows to as receive the exact moments of occultation for such observations, was created at the end of 2003. The television complex increased the range of registered star magnitude, and might be used both in stationary and in expedition variant. The accumulation of precision observations with help of the television complex, the absence of self-made mistakes of the observer, allows receiving more exact information on features of the movement of the Moon and other bodies of Solar system.

The results of our efforts on these type observations are given.

[1] Â.Â. Êëåùîíîê, Ì .².Áóðîì ñüêèé. Ï åðø ³ ðåçóëüòàòè ñïîñòåðåæåíü çàòìîí³÷íèõ òåëåâ³ç³éíèì êîìïëåêñîì “Spalakh” äëÿ ðåºñòðàö³¿ ø âèäêîïëîíèõ ïðîöåñ³â. // Â³ñí. Êè¿â. óí-òà. Àñòðîíîì³ÿ. – 2005.-Âèï .41-42.-Ñ.108-110

[2] Soma Mitsuru. Limb Profiles of the Moon Obtained from Grazing Occultations Observations // Publ. Natl. Astron. Obs. Lapan Vol. 5. 99-119 (1999).

[3] Report of Lunar Occultations observations. The observations 1995 and Their Reduction. The Lists of Telescopes and Observers ? 16 /International Lunar Occultations Centre Geodesy and Geophysics Division Hydrographic Departament, Tokyo. Japan. – P. 1-5.

[4] Isao Sato. Catalog of 3539 Zodiacal Stars for the Equinox j2000// Lunar Occultations Observers Croup, Japan.-1986.- P.178;

[5] http://www.jhd.go.jp

Development of a Complex of Programs for Estimations of Photometric Characteristics in Images of Stars on Scanned Plates

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During photographic researches in many observatories great volume of an observant material on photographic plates has collected. Therefore now the question of transferring of the information from plates on digital carriers with the least distortions, and reception of different characteristics of objects which are on plates is actively studied.

We researched opportunities of reception photometric characteristics in images of stars with use packages IDL and comparison with the results received by semi-automatic method PMIS.

The accuracy of the new suggested method of definition of photometric characteristics of images of stars on scanned plates was estimated with the help of standard object NGC 6913.

Further this method will be improved, for reception of the best results as it enables to process rather quickly a plate of the different sizes, and also to receive the necessary information on objects.

[1] *À.Â. Ñåðãååâ, ÒÏ . Ñåðãååâà* Ñèñòåì à áû ñòðîãî ï î èñêà àñòðîí î ì è÷åñêèõ î áúåêòîâ è ñî áû òèé â àðõèâàõ àñòðîí î ì è÷åñêèõ ï ëàñòèí î ê: î ñí î âí û å ï ðèí öè ï û , öåëè è çàäà÷è // Êèí åì àòèêà è ôèçèêà í åáåñí û õ òåë, òî ì 19 ¹ 3 – 2003, Ñ. 272 – 281;

[2] A. Sergeev, T. Sergeeva Flat-bed Commercial Scanners as the Tool for the Creation of Virtual Archives of Astronomical Plates // Astronomical and Astrofisical Transaction Vol. 22, Nos. 4 – 5, August – October 2003, pp. 413 – 416;

[3] http://rsi.org/idl.htm

[4] http://rvo.ru/observ.htm

Analysis of Applying Absorbtion J2 Cell in High Precision Spectroscopy

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This work gives an analysis of applicability J2 cell in 6-m telescope for the purpose of forecasting observation results. The problem of finding uncertainties of a method is considered. Stability of a method on parameters (S/N etc.) are discussed. Procedures of correlation are used for determination of radial velocity for sky spectrum.

Cosmology

Comparison of Uniform and Non-uniform Mass Distributions in Dynamic Universe Model of Cosmology

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Non-uniform mass densities of universe don't collapse in to a singularity. But uniform mass densities do collapse if their spacing and masses are exactly equal. I tried spacing equality to the order of 1 in 1017, which is the limitation of my computer software I am using, and it became non-uniform and did not collapse into a gravitational singularity. They form their own orbits depend on their masses.

SITA (Simulation of Inter-intra-Galaxy Tautness and Attraction forces) was successful in the formation of Dynamic universe model where Blue shifted Galaxies were also present (Paper presented by SNP. Gupta, GR17, Dublin, 2004 & Presented in ICR 2005 International Conference on Relativity), at Amravati University, India, Jan 11- 14, 2005. Testing of model and its behavior at micro sec, 1 sec, 1 month, 1 year, 10 year done. The pictures show a non- collapsing mass distributions and formations of orbits due to mutual gravitational attraction forces. (Paper presented by SNP. Gupta, Brit Grav 4, Oxford, 2004)

Missing Mass in Galaxies-Dynamic Universe Model of Cosmology

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In this present work SITA simulations were used to find out Theoretical star circular velocity curves in a Galaxy (star circular velocity verses star distance from the center of galaxy), depends on various initial conditions and are never half bell shaped curves as predicted by Bigbang cosmologies. Hence the question of missing mass does not arise.

SITA (Simulation of Inter-intra-Galaxy Tautness and Attraction forces) was successful in the formation of Dynamic universe model where Blue shifted Galaxies were also present (Paper presented by SNP. Gupta, GR17, Dublin, 2004 & Presented in ICR 2005 International Conference on Relativity) , at Amravati University, India, Jan 11- 14, 2005. Testing of model and its behavior at micro sec, 1 sec, 1 month, 1 year, 10 year done. The pictures show a non- collapsing mass distributions and formations of orbits due to mutual gravitational attraction forces. (Paper presented by SNP. Gupta, Brit Grav 4, Oxford, 2004).

Stability Analysis of Disks of Galaxies Formed in Dynamic Universe Model of Cosmology: Using SITA (Simulation of Inter-intra-Galaxy Tautness and Attraction Forces)

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In this present work SITA simulations were used to find out some equilibrium state for two different types of initial conditions running time intervals. Surprisingly every time this went to some stable state of some thing like a tri-axial system or a disk. We didn't use different sets of equations and strategies/ methods for GALAXY formation and COSMOLOGY. The same set of rules, which govern the whole Universe, are necessary and sufficient for a stable Galaxy also. We used the same group of particles as in the earlier simulations. Stability analysis was conducted for both the cases, using three different methods of testing equilibrium of the dynamical system formed. We have not assumed any random motions for the stability of disk formed. We have not used any fluid mechanics principles here. First, for testing purposes we gave perturbations with (e << 1) to 10 % of distances and velocities. Perturbed system stabilized after few iterations. On the resultant system we changed the velocities, distances, and DIRECTIONS of velocities RANDOMLY also from error <<1 to 10%. Perturbed system again stabilized after few iterations. Thirdly the JEANS SWINDLE was done. We have drawn a bigger sphere over the system and compressed it for e<<1 to 10%. Nothing happened. System got stabilized in next iteration. The Sphere is of the order of 10^{36} Meters. We compressed it by 10^{15} times and left it to its

enormous gravitational shock. System stabilized in 8 iterations. Now the new stabilized system formed is of 10^{21} meters radius.

SITA (Simulation of Inter-intra-Galaxy Tautness and Attraction forces) was successful in the formation of Dynamic universe model where Blue shifted Galaxies were also present (Paper presented by SNP. Gupta, GR17, Dublin, 2004 & Presented in ICR 2005 International Conference on Relativity) , at Amravati University, India, Jan 11- 14, 2005. Testing of model and its behavior at micro sec, 1 sec, 1 month, 1 year, 10 year done. The pictures show a non- collapsing mass distributions and formations of orbits due to mutual gravitational attraction forces. (Paper presented by SNP. Gupta, Brit Grav 4, Oxford, 2004).

Hot dark Matter and Accelerating Universe

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We have calculated the friedman equation if the universe contain hot dark matter. We show that hot dark matter drives an accelerating universe not cold dark matter.

The Big Crunch Theory And The Dark Energy Quandary

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The hypothesis of the accelerated expansion of universe has posed a serious blow to the theory of the big crunch and has been a source of speculation and research for a considerable amount of time. In this article, logical and mathematically techniques have been used to identify the possibility for the big crunch due to the presence of giant black holes near the edge of the universe that have been formed due to the presence of greater probability of the conditions fulfilling massive star formation. The hypothesis has been based upon the big bang model, Wein's law and Friedman-Lema?tre-Robertson-Walker (FLRW) metric. The resulting applications such as the gravitational red shift, reduction in the speed of light or the curved path of light photons can help to answer the dark energy/mass quandary and the irregular behavior of the observations recognized in the Doppler effect of the expanding cosmos.

Historical View About Gravity

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With the Earth believed to be the center of the universe, gravity did not seem to require much explanation: it was just a force bringing things to a natural place (Aristotle). But with the advent of Copernican astronomy in the 1500s something more was needed. In the early 1600s Galileo noted that the force of gravity seems to depend only on the mass of an object, and not on any of its other features. At the same time Johannes Kepler discovered his Laws of Planet Motion, and suggested that two bodies attracted each other and a value of this attraction is proportional to the mass of objects. In 1687 Isaac Newton argued a universal inverse square law of gravity between objects; the concept 'force attracted on the distance'. At the end of 1700s appeared La Sage's Pushing Theory. Starting in the mid-1800s there were attempts to formulate gravity in the same way as electromagnetism - and in 1900 it was for example suggested that gravitational effects might propagate at the speed of light. Following his introduction of special relativity theory in 1905, Albert Einstein began to seek a theory of gravity that would fit in with it. Then Einstein began to formulate the concept that gravity is associated with curvature of space - it was leading him eventually to his formulation in 1915 of the standard Einstein equations for general relativity. However nature of gravitation seems to be still unknown.

Relativity in Our Neighbourhood

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The aim of the paper is to show in a simple but inspiring way how our world would look like if the speed of light was more or less equal the speed of the bus. The report contains a brief description of relativistic effects such as: angular compression, intensity effect, Doppler effect, Terrell rotation and Lorentz contraction. To make it more clear and understandable I put some graphs, figures and equations describing physical phenomena mentioned above.

T-models with Homogeneous Magnetic Field.

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There are reasons to consider that the strong magnetic field was present in the early universe. So we have considered the cosmological T-model [1] with magnetic field and "dust" matter (with equation of state $p = 0$). Then the metric can be taken in the form

$$ds^2 = dt^2 - e^{\lambda(t,x)}dx^2 - r^2(t)(d\theta^2 + \sin^2\theta d\varphi^2)$$

where $e^{\lambda(t,x)}$ and $r^2(t)$ are two unknown functions of t and x. Let us take for simplicity a magnetic field in the x-direction. Non zero components of electromagnetic tensor are $F_{23} = -F_{32} = H$, [2] and magnetic field energy-momentum tensor has components $T_0^0 = T_1^1 = -T_2^2 = -T_3^3 = \frac{H^2}{8\pi r^4 \sin^2\theta}$. From Maxwell-Lorentz equation and conservation equation

$$T^{\alpha}_{\nu;\alpha} = 0 \tag{1}$$

we obtain $H = q\sin(\theta)$, $q = const$. Einstein's field equations take the form

$$\dot{\lambda}\dot{r}r + \dot{r}^2 + 1 = e^{\lambda}r^2 + \frac{q^2}{r^2} \tag{2}$$

$$\frac{2\dot{r}}{r} + \frac{\dot{r}^2}{r^2} + \frac{1}{r^2} = \frac{q^2}{r^4} \tag{3}$$

$$\frac{\ddot{r}}{r} + \dot{\lambda}\frac{\dot{r}}{r} + \frac{\dot{\lambda}^2}{2} = -2\frac{\ddot{r}}{r} - 2\frac{q^2}{r^4} \tag{4}$$

where dot means differentiation with respect to t. The integration of Eq. (3) gives

$$r = \frac{r_0}{2}(1 - b\cos(\alpha)),\ t = \frac{r_0}{2}(\alpha - b\sin(\alpha)),\ b^2 = 1 - \frac{4q^2}{r_0^2} \tag{5}$$

From Eq. (1) we can obtain $\partial(e^{\lambda}r^2e^{\lambda/2})/\partial t = 0$ and the integral of this equation is given by

$$e^{\lambda}r^2e^{\lambda/2} = M'(x) \tag{6}$$

where $M(x)$ is the proper mass (prime means differentiation with respect to x).
Substituting Eq. (5) and (6) into Eq. (2) we find exact solution

$$e^{\lambda/2} = \frac{b\sin(\alpha)}{1 - b\cos(\alpha)}\left(\frac{M'(x)}{2b^2}(-\mathrm{ctg}(\alpha)(1 + b^2) - b^2\alpha + \frac{2b}{\sin(\alpha)}) + 1\right)$$

[1] Я.Б.Зельдович Релятивистская астрофизика. М: Наука, 1967.
[2] М.П.Коркина, В.Г.Марьяненко Т-миры с однородным магнитным и электрическим полями. // УФЖ, 1977, вып.5, т.22, с.853-855

Cosmological Applications of the Szekeres Model

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Receding galaxies and observations of the CMB do support the hypothesis that we live in an evolving and expanding Universe. Because of large scales and long periods of time one needs to employ general relativity to model the structure formation. On very large scales the Universe can be treated as homogeneous and can be described by the Friedmann models. To describe the structure evolution on smaller scales perturbation theory is often used. However, due to large amplitude of density contrast of the present-day structures such an approach is inadequate. The linear approach is used not only because of its simplicity but also because there are only a few solutions of the Einstein field equations, which can be employed to describe the process of structure formation. The simplest inhomogeneous generalization of the Friedmann model is the Lemaitre-Tolman model, but due to the spherical symmetry assumption its application is limited. This paper discusses the Szekeres model which is a non-symmetrical generalization of the Lemaitre-Tolman models. Hence, the Szekeres model might potentially be of a great importance to cosmology. However, the Szekeres model is also subject to some limitations. The mass distribution in the Szekeres model has a dipole structure so only one pair of structures, such as a void and a supercluster, can be described by a single model. The paper presents an example of evolution of a void and an adjourning supercluser. Moreover, the Szekeres model can be also employed in the studies of null geodesics. The application of the Szekeres model might help to estimate the influence of an inhomogeneous matter distribution on light propagation. Consequently, the Szekeres model might be of great significance not only for models of structure formations but also it can be used to analyze astronomical observations.

Equation of State and Beginning of Thermalization After Preheating

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We study the out-of-equilibrium nonlinear dynamics of fields after post-inflationary preheating. During preheating, the energy in the homogeneous inflaton is exponentially rapidly transfered into highly occupied out-of-equilibrium inhomogeneous modes, which subsequently evolve towards equilibrium. The infrared modes excited during preheating evolve towards a saturated distribution long before thermalization completes. We compute the equation of state during and immediately after preheating. It rapidly evolves towards radiation domination long before the actual thermal equilibrium is established. The exact time of this transition is a non-monotonic function of the coupling between the inflaton and the decay products, and it varies only very weakly (around 10-35 s) as this coupling changes over several orders of magnitude. This result is applied to refine the relation between the number of efoldings N and the physical wavelength of

perturbations generated during inflation.

We also discuss the implications for the theory of modulated perturbations from preheating. We finally argue that many questions of the thermal history of the universe should be addressed in terms of pre-thermalization, illustrating this point with a calculation of perturbative production of gravitinos immediately after chaotic inflation. We also highlight the effects of three-legs inflaton interactions on the dynamics of preheating and thermalization in an expanding universe.

Angular Correlation Function of Quasars from SDSS DR3

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We study the two-point angular correlation function of quasars form Sloan Digital Sky Survey DR3. For this purpose the method of random-catalog construction from [1] is used. Fitting the data for correlation function with a power low dependence $w(\theta) \sim \theta^{-\alpha}$ yields the best-fit value $\alpha = 0{,}92 \pm 0{,}08$. The results obtained agree with that of [2] based on SDSS DR1 catalogue of photometrically identified quasars.

[1] V.I. Zhdanov, J. Surdej, Quasar pairs with arcminute angular separations, Astron. Astrophys., 372, 1-7. 2001.

[2] A.D.Meyers, R.J.Brunner, G.T.Richards, et al. First Measurements of Clustering Evolution of Photometrically-Classified Quasars (astro-ph/0510371)

Astrophysics

Non-precession Model of Rotating Radio Transients

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During the last few years there were discovered and hardly examined several transient neutron stars ("Rotating Radio Transients"). It's already well accepted that these objects are radio pulsars. But their extraordinary features (burst -like behavior) made necessary revision of well accepted models of pulsar interior structure. Nowadays most popular model for RRATs is precessing pulsar model, which is subject of big discussion. We present a non-precession model of these objects, which is not at variance with old theories. An important feature of our model which provides natural explanation of most of the properties of these neutron stars, is presence of very low frequency nearly transverse drift waves propagating across the magnetic field and encircling the open field lines region of the pulsar magnetosphere.

Why Studying Strange Stars?

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The possible existence of strange stars in the universe will help in the understanding of various properties of quantum chromodynamics, like asymptotic freedom and chiral symmetry restoration, which is otherwise very difficult to prove in laboratory experiments[1,2]. We obtained a set of new equation of states (EOS) for strange stars (SS), calculated their properties at high temperatures and found that the transition T from hadronic matter to strange matter is at 80 MeV, close to the 100 MeV estimated in literature[3]. Therefore formation of strange stars may be the only signal for formation of quark-gluon plasma with asymptotic freedom and chiral symmetry restoration and this may be observable through many processes - as example through delayed gamma ray bursts[4]. Our EOSs can give physically plausible values of masses and radii for SS if observed redshifts lie in between 0.3 to 0.5. We also found that for SS, surface tension (ST) depends on the size and structure of the star and is

significantly larger than the conventional value. With our estimated value of ST, we explained the frequency shift in the power density spectrum of type I X-ray burst as the onset of the surface waves.

[1] I. Arsene et al., BRAHMS collaboration, nucl-ex/0410020.
[2] B. B. Back et al., PHOBOS collaboration, nucl-ex/0410022.
[3] E. Witten, PRD 30 (1984) 272.
[4] I. Bombaci, I. Parenti, I. Vidana, ApJ 614 (2004) 314.

Nonuniformity of Interstellar Medium and Broadening of the High-Energy End of the Electron Spectrum in Supernova Remnants

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A number of theoretical results suggest that the shape of the high-energy end of the spectrum of electrons accelerated by the shocks in supernova remnants (SNR) have to be close to the exponential one: with [1]. However, a fit of the observational data from SNR G347.3-0.5 requires a broadening of the electron spectrum, i.e. the value of [2]. In our report we investigate the possibility for such broadening to be a result of the shock evolution in the nonuniform interstellar medium. We check as well the possible influence of the interstellar magnetic field and the shock obliquity on such broadening. Our conclusions are that none of these possibilities are not able to be responsible for the value of $a<1$. Thus, the broadening of the high-energy end of the spectrum should be an internal property of the processes of acceleration and/or energy losses of electrons in vicinity of the shock.

[1] Reynolds, S. & Keohane, J., ApJ 525, p.368, 1999
[2] Lazendic, J. et. al., ApJ 602, p.271, 2004

Diagnostics of SS433 with the RXTE

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We present analysis of extensive monitoring of SS433 by the RXTE observatory collected over the period 1996-2005. The difference between energy spectra taken at different precessional and orbital phases shows the presence of a strong photoabsorption near the optical star, likely due to its powerful dense wind. Assuming a precessing thick accretion disk around the compact object with size restricted by the Roche lobe, we recover the temperature profile in the X-ray emitting jet that best fits the observed precessional variations of the X-ray emission temperature.

The hottest visible part of the X-ray jet is located at a distance of l0/a~0.06-0.09 (where a~4•1012 cm is the binary separation), or ~2-3•1011 cm from the central compact object and has a temperature of about Tmax~30 keV. We discovered appreciable orbital X-ray eclipses at the ``crossover'' precessional phases (jets are in the plane of the sky, disk is edge-on) which sets a lower limit on the size of the eclipsing body R/a>>0.5 and an upper limit on the binary mass ratio . The size of the eclipsing region can be larger than secondary's Roche lobe because of substantial photoabsorption by dense stellar wind. This must be taken into account when evaluating the mass ratio from analysis of X-ray eclipses.

Data Visualization Interactive Network for the Aragats Space-environmental Center

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The ASEC facilities provide real time monitoring of cosmic particle fluxes with a number of particle detectors located at high-altitude research stations at mt. Aragats, Armenia. Data from ASEC monitors is widely used in research of the solar physics and Space Weather.

DVIN is strategically important as a scientific application to help develop space science and to foster global collaboration in solar physics and in forecasting potential hazards of solar storms. The system is highly interactive and exceptional information is easily accessible online. Data can be monitored and analyzed for desired time spans in a fast and reliable manner by the remote users worldwide.

DVIN provides wide possibilities for sharing data and sending warnings and alerts to scientists and worldwide, which have fundamental and practical interest in knowing the space weather conditions.

DVIN gives opportunity to remote groups to share the process of analyzing, exchange data analysis methods and schemes, prepare joint publications and maintain networks of particle detectors.

New Detector for Space Weather Research at mt. Aragats

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The Nor-Amberd Muon Multidirectional Monitor (NAMMM) consists of two layers of plastic scintillators above and below one of the two sections of the Neutron Monitor NM-64. The lead filter of the NM absorbs electrons and low energy muons. The threshold energy of the detected muons is estimated to be 350 MeV. Therefore detector simultaneously measures particles of 3 types: low energy charged component, neutrons and high energy muons. The data acquisition system of the NAMMM can register all coincidences of detector signals from the upper and lower layers, thus, enabling measurements of the arrival of the muons from different directions.

In the report we will demonstrate the sensitivity of the different species of secondary cosmic ray flux to geophysical conditions, taking as examples the extremely violent events of 2003 and 2005. We introduce correlation analysis of the different components of registered time-series as a new tool for the classification of the geoeffective (events on earth affected by solar activity) events and for the forecasting of the severity of the upcoming geomagnetic storm.

VAST: the Software Tool for Search of Variable Objects

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VAST (comes from the Variable Star Toolkit) implements the standard approach to variable star search, based on creation of light curve for each object on series of CCD frames. Detection of objects and aperture photometry measurements are done by Sextractor [1]. VAST compares lists of objects for all frames, generated by SExtractor, to find identical stars, bring there magnitudes to one instrumental system and create a light curves for each star. The only thing required for successful comparison is that the CCD frames have to be be taken with one instrument. Identification of stars is done completely on image-by-image basis, so VAST is not connected to any astronomical catalog such as Tycho-2 or USNO-A2.0. It's not a bug, it's a feature. When light curves for all objects are created, they can be examined with Welch-Stetson method, implemented in VAST, to find which stars are probably variable. After that, light curves of selected candidates are have to be visually checked.

First variables, detected by VAST are published in [2] and [3].

The software can be applied to any fits-images for example to scanned photoplates.

VAST is written in C for GNU/Linux. It's latest version is always available at: http://saistud.sai.msu.ru/vast

[1] Bertin E., "SExtractor v2.3 User's manual.", Institut d'Astrophysique & Observatoire de Paris.
http://terapix.iap.fr/rubrique.php?id_rubrique=91/
[2] Antipin, S. V.; Sokolovsky, K. V.; Lebedev, A. A. 2005 IBVS.5654
http://www.konkoly.hu/cgi-bin/IBVS?5654
[3] Sokolovsky K. V.; Amirkhanyan V. R. 2006 PZP vol.6, N 1
http://astronet.ru/db/varstars/msg/1211059

Reconstruction of the Quasar Accretion Disk Brightness Profile From Observations of High Magnification Events

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The analysis of the high magnification events in the A and C components of the quadruple gravitational lens QSO2237+0305 observed by OGLE and GLITP collaborations in V band was carried out. The significant light amplifications of the components are interpreted as the effect of microlensing with a fold caustic. For the reconstruction of the one-dimensional source profile the technique based on Tikhonov regularization method was used. The estimates of the effective radius of the quasar emitting region (the radius within which half of the light is emitted) based on reconstructed profile of the source from microlensing of the A and C components are in the range of 31 and 21 days and correspond to the linear sizes 0.6215 cm and 0.4215 cm. For the A component the positive crossing of the caustic and for the C component the negative crossing of the caustic were confirmed.

The Light Curve Variations of the Active Binaries with Hot Subdwarf Components

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Hot subdwarfs are immediate progenitors of white dwarfs. There are a few systems contain a hot subdwarf and a cool giant component. The observations of these systems are very important for the evolution of the hot subdwarfs, studying the activity of cool giant stars and also for testing the evolution models. FF Aqr and V1379 Aql are the eclipsing binaries containing a hot subdwarf and a chromospherically active cool giant components. The observations and the light curve variations of these systems are presented.

Microwave Spectroscopy of the Exobiological Interstellar Molecules

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Radio astronomy observations in microwave range is a primary tool for study the molecular content of interstellar hot molecular clouds through the observation of the rotational transitions of different molecular species. Such observations can be interpreted correctly only when laboratory microwave spectrum of the molecule under consideration was studied in detail. One of the modern branches of investigations of interstellar clouds is searching for simple biological molecules which are relevant to the life, as we understand it, and could lead to better insight into the origin of life in the Universe. Here the main interest is attracted the possibility of the detection of the simplest amino acids [1] and sugars [2 - 4].

We present the results of new laboratory investigations of microwave spectra of glycine, furfural and urea – exobiological molecules, which are potential candidates for interstellar detection. The main goal of the investigations was to provide frequency and intensity atlas for these molecules which may be used in further radio astronomy observations.

[1] L. E. Snyder, F. J. Lovas, J. M. Hollis, D. N. Friedel, P. R. Jewell, A. Remijan, V.V. Ilyushin, E. A. Alekseev, and S. F. Dyubko , Astrophys. J., vol. 619, p.914 – 930, 2005.

[2] J. M. Hollis, F. J. Lovas, and P. R. Jewell, Astrophys. J. (Letters), vol. 540, L107 – L110, 2000.

[3]G. Cooper, N. Kimmich, W. Bellsle, J. Sarinanna, K.Brabham, L.Garrel, Nature, vol. 414, p. 879 – 883, 2000.

[4] S. L. Widicus Weaver and G. A. Blake, Astrophys. J. (Letters), vol. 624, L33 – L36, 2005.

High-frequency Oscillations in Short Gamma-ray Bursts

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During our research of the separate class of gamma-ray burst, we found the events, where high-frequency oscillations take place.

We were investigating Time Tagged Event (TTE) data from observations of gamma ray bursts (GRBs) and soft gamma repeaters (SGRs) by the Burst and Transient Source Experiment (BATSE). This data has 2-microsecond resolution for all 4 energy channels (~25-55, 55-110, 110-320, >320 keV), sufficiently good to capture all significant temporal fluctuations in gamma-ray bursts.

Using the Fourier and Wavelet analysis we obtained two types of spectra for BATSE Trigger #00207. The Fourier power spectrum shows 175 Hz oscillation (period of 0.0057 sec). In the same way the wavelet spectrum reveals a harmonic with Fourier period of 0.006 sec.

The coincidence of the results of two different methods allows us to draw a conclusion about the precision of the outcomes.

The Hydrogen Burning Time Dependence on the Initial Masses of Popullation I and III Stars

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Dependences of the stars life time on their initial masses tms=tms(m) are built by means of compiling date for stars of different element composition,which are on the main sequence stage. The approximation expressions are got for tms=tms(m) in the logarithmic scales on three mass intervals. The small and very massive stars are described by the linear dependence in this scale, the massive stars and ones of the solar compositions – by the second-degree polynomial.

Pulse Profiles and Cyclotron Line Energy Dependence on X-ray Pulsars Luminosity

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We present the results of a broad band (3-100 keV) observations of X-ray pulsars with the INTEGRAL and RXTE observatories. We concentrate on the luminosity and energy dependence of the pulse profile and on the variations of the cyclotron line energy. In V0332+53 the line energy varies linearly with the source luminosity, while in 4U0115+63 the behavior is more complicated. Strong variations of the pulse profile shape with energy and the source intensity were found for several pulsars, including V0332+53 and 4U0115+63. In V0332+53 the changes of the pulse profile near the cyclotron line are especially drastic. We discuss these results and possible emission mechanisms in terms of the theoretical models of accreting pulsars.

Diffuse Interstellar Band at 5850 as a Member of 5797 Spectroscopic Family

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The carrier(s) of diffuse interstellar bands are still mysterious species. There exist many arguments that diffuse bands at 5797 and 5850 angstroms have the same carrier. Using high resolution spectra of few dozens of reddened stars we have searched mutual correlation between intensities of considered bands. Results of our analysis indicate that 5797 and 5850 bands really have the same carrier.

Population of the Be Stars in the Open Clusters h/ chi Persei

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Fifty spectra B and Be stars in the Ha region were observed with the high (30000) resolution in the young (log t=7,1 Myr) double cluster h/chi Persei. The main goal of the work was to compare population of Be stars in the cluster and field. It is obtained that among observed stars, 22 show Ha emission. Any new Be stars with the faint Ha emission had not be detected. One of Be star is found to be double and has pronounced line profile variability (Oo2371). Two of Be stars (Oo1161 and Oo2242) demonstrate strong V/R variability that can be easy described by the one arwn oscillations in their envelopes.

Interstellar C2 Molecule as Seen in HST/STIS Data

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Carbon chains are sometimes considered as possible carriers of some diffuse interstellar bands. Spectroscopic observations in UV band carried by spectrometer STIS fed with HST, give us the possibility to detect many interstellar molecules. We focused our attention on C2 molecule and we detected it in spectra of the three reddened stars (HD27778, HD147933), HD207198). Interstellar molecule C2 was detected as a set of absorption lines around 2313 angstroms.

Optical Photometry of Type II-P Supernovae 2005ay in NGC 3938 and 2005cs in M 51

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We present photometric data of two type II-P supernovae SN 2005ay in NGC 3938 and SN 2005cs in M 51. BVRI light curves cover the period of 226 days for SN 2005ay and 129 days for SN 2005cs. The light curves are typical for SN-IIP as revealed by comparison with the ones for the well studied objects SN 1999em and 1999gi. The plateau stage lasted for 93 days for SN 2005ay and 100 days for SN 2005cs. We derived magnitudes at maximum light and estimated absolute magnitudes, using available data on distance of host galaxies. For SN 2005ay we found M(B)=-16.1, M(V)=-16.0; for SN 2005cs M(B)=-14.9, M(V)=-15.5. These values are fainter than average absolute magnitudes for SN II-P, especially for SN 2005cs.

OH Maser Studying with High Resolution

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The calibration procedure was made for data reduction of Star Forming Regions (SFR) observed with the VLBA. Spectra of 19 maser sources emitting in OH 1665 and 1667 Mhz lines were obtained. These spectra were compared with the previous spectra and some interesting peculiar were established.

Flat Galaxies in Sloan Digital Sky Survey

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Revised Flat Galaxy Catalog (RFGC) is used for investigation of collective galaxy motions on 100 Mpc scale. Data on galaxy flows allows to restore density distribution on this scale (including dark matter) and to constrain cosmological models. Galaxy images, magnitudes and spectra from Sloan Digital Sky Survey (SDSS) could be used for more accurate estimating of galaxy distances and velocities. 4-th data release of SDSS contains images and data of 882 RFGC galaxies. In my report I will present some of this images with comments of further applying RFGC galaxies and SDSS data for exploration of large-scale structure of universe.

CCD Photometry of the Magnetic Cataclysmic Binary System FO Aquarii

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The magnetic cataclysmic variable star FO Aqr, which belongs to the subclass of intermediate polars, was studied using the digital images obtained during 8 nights with the CCD camera at the 40-cm telescope of the Astronomical Observatory of Mallorca (Spain). The sample of 1500 images was processed using some complementary computer programs - WINFITS (author V.P. Goranskiy), which was used to obtain instrumental stellar magnitudes for the investigated and 4 standard stars. With the program MCV [1], we reduced the data using the algorithm of the "artificial (weighted mean)" comparison star, which allows to improve accuracy of the comparison star. This program was also used for filtering of the data. As a result, the time series (time in heliocentric Julian date, brightness in stellar magnitudes) has been determined for observations obtained in two filters V (n=570 data points) and R (n=900) in different spectral bands.

The periodogram analysis was performed using the program FO [2] based on the ANOVA (analysis of variances) algorithm with a sinusoidal fitting of the signal. As a result of non-linear least squares fitting, we have determined statistically optimal values of the spin and orbital periods.

The value of the spin period differs significantly from that published by previous authors. This result is of astrophysical significance, as it may be interpreted by a (possibly catastrophic) spin-up of the white dwarf during recent years. Such an effect may be interpreted by a precession of rotational axis of the white dwarf because of the accretion torque from the infalling plasma.

The value of the orbital period coincides with the published values within error estimates, as expected from the theoretical models of evolution, which predict characteristic time scale of billions years, and not decades.

[1] Andronov, I.L., Baklanov A.V., Astron. School Rep., 5, N 1/2, p. 264-272, 2004.

[2] Andronov, I.L., Odessa Astron. Publ.7, p. 49-54, 1994.

Rapidly Evoluting Mira Variable LX Cygni

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The observations of the SC-spectral type Mira variable LX Cygni, obtained with the Schmidt telescope of the Baldone Astrophysical observatory during more than 30 years are presented. It has been found that the period of the pulsations of the LX Cygni is dramatically increasing in good agreement with the results derived by other authors. We note that the pulsation amplitude in R(0,63) band has decreased linearly over the time until the AAVSO visual observations show nearly sinusoidal amplitude variations about a constant mean value. Such a behavior was neglected in other studies. Only a few Mira variables show such a dramatic period changes and accordind to the theory of AGB evolution, these secular changes are expected to occur during the thermal pulses.

Photometric Study of Novae in M31

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The results of the search for novae in Andromeda galaxy on photoplates obtained with Baldone Astrophysical Observatory Schmidt Telescope during 2001-2003 are presented. Six novae were found, three of them were found already reported by other authors. The photometric B-band lightcurves of all observed novae are presented.

Definition of Galaxy Groups via Voronoi Tessellation

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The Voronoi tessellation is a geometrical method based exclusively on galaxy positions in the space, which allows detaching over regions of galaxies in comparison with the background.

We use the 3-D Voronoi tessellation for defining the groups of nearby galaxies with different population (from two to more then 200 components in each group). We also suggest using the 3-D Voronoi tessellation of the highest order for defining galaxy pairs and triplets. Thus, not only we can find the galaxy group members, but also the isolation criterion that is calculated as ratio of the cube root of Voronoi cell volume to a space distance between the galaxies.

Power Spectrum of the Extragalactic Magnetic Field and Sources of UHECR Distribution on the Basis of the IRAS PSCz Catalogue

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Possibility of reconstruction of the extragalactic magnetic field (up to 100 Mpc) on the basis of the IRAS PSCz catalogue is considered. Taking into account the power dependence between densities of galactic luminosities and magnetic field energy we constructed the distribution of magnetic field energy density on different scales. Also we estimated concentration of probable UHECR sources.

Determination of Abundances in HII Regions by Te-metod Using Strong-line Intensities-abundance Calibration

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The oxygen abundance of HII regions by example HII regions of Large Magellanic Cloud is derived using Te-metod (Pagel,1992), based on the determination electron temperature with measured nebular [OII] 3727,3729 Å, [OIII] 4959,5007 Å and auroral [OIII] 4363 Å lines. Results are calibrated by strong line intensities-abundance calibration, which uses only strong nebular [OIII] 4959,5007 Å lines. Also results are compared with results, which give 5-level photoionisation model by OIII ion.

The Investigation of the Spectrum of Uranium Star HR465

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A significant number of upper Main Sequence stars show spectral peculiarities, which reflect abundance anomalies. Microscopic diffusion is considered to be the main physical process that creates these anomalies by building of an abundance stratification in the stable atmosphere of the star. The stratification and the abundances vary with time.

We investigate uranium Ap star HR465. The spectrum of this star was studied for a long time. Previous investigation shows that overabundances can reach 3-4 dex. The lines of U, Th, Tc, Pm were identificated in the spectrum of this unusual star.

We studied two spectra of the star. The first one we took from the site of Haute Provence observatory (France), the second was obtained at Bohuynsan Optical Astronomical observatory (Korea). HR465 vary its magnetic field, brightness and strength of lanthanides spectral lines with period about 22 years. Our spectra were observed near rare earths maximum and minimum. Bohuynsan observatory spectrum shows numerous lines of second and third spectra of actinides. The spectrum of Haute Provence observatory shows the enhanced lines of chromium. We found equivalent widths of spectral lines and calculated the abundances of heavy elements in the atmosphere of HR465.

Period Change of Eclipsing Binaries from the ASAS Catalogue

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We present a statistical analysis of period change of eclipsing binaries from the All Sky Automated Survey Catalogue [1]. For each contact and semi-detached system with a period shorter than 0.4 days and V_{min}<13.3 mag we were simultaneously searching for ù and dù /dt using data presented in [2]. According to our accuracy there is no evidence that dù /dt differs from 0. Light curves, O-C diagrams, ephemeris and illustrations of our method for selected stars are presented.

Acknowledgements. We thank Prof. Marcin Kubiak for his useful hints.

[1] Pojmanski, G., Acta Astronomica 52, p. 397-428, 2002

[2] Paczynski, B. et al., 'Eclipsing binaries in ASAS catalog', MNRAS, accepted

Dynamics of Satellite Galaxies Interacting with the Host Galaxy

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Both cosmological models and detailed observations put forward the idea of considerable influence of mergers of galaxies on their evolution. For the evolution of galaxies not only 'major mergers' – mergers of two large, roughly equal-mass galaxies - play an important role but also 'minor mergers' – interactions of galaxies with small satellite companions. Minor mergers occur frequently and have been seen even in our Galaxy: Magellanic Stream, moving groups of globular clusters in Milky Way halo, Sagittarius dwarf galaxy etc.

In the process of interaction of massive disk galaxy with satellite dwarf galaxy the satellite spirals toward the centre of massive galaxy owing to gravity and dynamical friction and plunges through the galactic disk. The tidal field of the host galaxy acts to gradually strip material from the orbiting companion. This stripped material spreads out along the satellite's orbital path, thus forming the luminous halo of the main galaxy. Unlike major mergers, where dynamical friction is so efficient that the galaxies merge after only a few perigalactic passages, the extreme mass ratio (>10:1) of minor mergers ensures that the orbital decay of the satellite's orbit is slow. The satellite may be totally destroyed as it orbits the host galaxy or falling into the galactic disk can reach the inner portion of the host galaxy before total disruption.

Because of the long timescales involved in galaxy interactions – hundreds of millions or billions of years – observations of interacting systems show only individual 'snapshots' of a complex evolutionary process. Piecing together these varying snapshots into a coherent sequence is a task made

difficult by the unknown initial conditions of the different interactions. To study the dynamics of satellite galaxies interacting with the host galaxy we use the direct N-body simulations. By studying the evolution of these models the observational snapshots can be more easily placed into a evolutionary context.

On Distance to I Zw 18

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We have performed V and I photometry of resolved stars in 13 galaxies with active star formation, using the images from Hubble Space Telescope archive. The resulting color-magnitude diagrams revealed observational feature showing that magnitude difference between the brightest asymptotic giant branch (AGB) stars and the brightest red giant branch (RGB) stars in these galaxies is nearly constant. This fact can therefore be used as an alternative distance indicator in the galaxies with recent star formation in cases when the data are not deep enough to reach the tip of the RGB. We derive a distance to I Zw 18 from the brightest AGB stars and compare it with the value, determined from the brightest blue and red supergiant stars. We consider metal-poor dwarf galaxy SBS1415+437 as the closest example to I Zw 18 and analyze spatial distributions of stars in these galaxies. It is found, that I Zw 18 has no well-developed RGB population in the halo, while that is clearly seen in halos of SBS1415+437 and other galaxies. From our distance constraints and the lack of the RGB population in the I Zw 18 halo we conclude that this galaxy is a unique example of young galaxy, where the star formation started less than 1 Gyr ago.

On the Possibility of Time Delay Determination in the Gravitationally Lensed System QSO2237+0305

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We considered the possibility of measuring time delays between components of the multiplied quasar QSO2237+0305 and between V and R band variations. The analysis is based on the flux variations of four components observed by the OGLE collaboration and Maidanak group during the last quarter of 2003.

RZ Cassiopeia: Eclipsing Binary with Pulsating Component

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We report time-resolved VR-band CCD photometry of the eclipsing binary RZ Cas obtained with 38-cm Cassegrain telescope at the Crimean Astrophysical Observatory during July 2004 – October 2005.

Obtained lightcurves clearly demonstrates rapid pulsations with the period about 22 minutes. Periodogram analysis of such oscillations also is reported. On the 12, January, 2005 we observed rapid variability with higher amplitude (~$0.^m1$) that, perhaps, may be interpreted as high-mass-transfer-rate event and inhomogeneity of accretion stream.

Follow-up observations (both, photometric and spectroscopic) of RZ Cas are strictly desirable for more detailed study of such event.

A Photometric Study of Two-Pole Accretion Polar RX J1846.9+5538

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We present the results obtained from R-band photometric CCD observations of two-pole accretion polar RX J1846.9+5538 made during 36 nights between May and August 2005. Observations were carried out with the help of 38cm Cassegrain telescope of Crimean Astrophysical Observatory (Ukraine) and with 2-meter telescope Zeiss-2000 of Terskol Observatory (Russia).

We found periods of P_1=128.70288 ^{m} (that could be interpreted as the orbital period) and possibly P_2=1889 ^{s} in the data (amplitude of variability with P_2 is not constant, but ussualy exceed 3 sigma level, considering sigma-error to be 0.^{m}09).

The double-humped orbital lightcurve might indicate that system was in two-pole accretion mode during our observations. Also we note that accretion on the second pole is lower compared to the primary one.

Remarkable that dip is present during the primary maxima, very likely caused by absorption in one of the accretion streams.

Also the results of the O-C analysis of both maximuma are reported.

The further photometric and spectroscopic observations are of great interest.

Accretion to a Magnetized Neutron Star in the "Propeller" Regime

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We investigate spherical accretion to a rotating magnetized star in the "propeller" regime using axisymmetric resistive magnetohydrodynamic simulations. The regime is predicted to occur if the magnetospheric radius is larger than the corotation radius and smaller than the light cylinder radius. The simulations show that accreting matter is expelled from the equatorial region of the magnetosphere and that it moves away from the star in a supersonic, disk-shaped outflow. At larger radial distances the outflow slows down and becomes subsonic. The equatorial matter outflow is initially driven by the centrifugal force, but at larger distances the pressure gradient force becomes significant. We find the fraction of the Bondi accretion rate which accretes to the surface of the star.

Solar and Planetary Systems Physics

Resonant Energy Conversion of 3-minute Intensity Oscillations into Alfvén waves in the Solar Atmosphere

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It is generally believed that the solar 3-minute oscillations above active regions can not penetrate into the corona due to the sharp temperature gradient in the transition region. However the oscillations with the same period are frequently observed in the corona by space satellites SOHO (Solar and Heliospheric Observatory) and TRACE (Transition Region and Coronal Explorer). Here we solve weakly nonlinear MHD equations and show that 3-minute acoustic oscillations may effectively transmit the energy into the

Alfvén waves in the region, where the sound and Alfvén speeds approximately equal. Here the harmonics of Alfvén waves with twice period and wave-length are exponentially amplified indicating a resonant energy conversion. Amplified Alfvén waves may easily pass the transition region and deposits the energy back to the density perturbations in the corona.The process can be of importance in coronal heating.

Astronomy Lessons With Sun

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Sun is the brightest star on the sky and it shines during a day. Sun is therefore the best celestial object to watch it during school lessons. We show here few examples of doing easy telescope observations of the sun from school yard. We demonstrate also how to make use from such observations in teaching astronomy.

An Interactive Program for Correlative Studies of Solar Energetic Particle Events

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We have developed an interactive program which shows the solar energetic particle (SEP) intensity-time profile as observed by SOHO/ERNE, simultaneously with the associated coronal mass ejection in optical imaging movies taken by LASCO coronagraph, soft X-ray by YOHKOH, ultraviolet by EIT, DH radio emission by WAVE/Wind, and the Hi location for the solar flare and spectral radio emission from the journal of geophysical data. The whole set of data will provide increased scientific knowledge on the solar energetic particle events and the solar phenomenal associated with them, because in this program one can see easily the temporal associations of each phenomena during the evolution of the particle intensity. The (SEP) intensity-time profile will give a clear view to detect the velocity dispersion in the events, if it exists. The ERNE data are commented in order to follow of phenomena associated with changes of the intensity-time profiles. We introduce this set of data as an index for the ERNE/SOHO solar energetic particle events. The interactive program is applied for statistical, correlative study of SEP events observed on board SOHO.

NLTE Effects on the Formation of Ba II Resonance Lines

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We continue the study of the Ba II spectral lines formation. Current investigation is devoted to the study of the influence of non-LTE effects on the shape of calculated profile of the Ba II 4554A resonance line. We solve numerically the multilevel radiative transfer problem in 1D and 3D models of the Solar photosphere. It is found that in both 1D and 3D cases it is necessary to take into account deviations from LTE to reach an agreement with observations. In 1D the line core is strongly dependent on the choice of the macroturbulent velocity parameter. In 3D case we reach a good agreement with observations even in the centre of the line.

We also report the influence of the following parameters on the line formation: collisional rates, Ba II abundance, oscillator strengths, macroturbulent smearing (in 1D case). We estimate the solar Ba II abundance. It is equal to 2.13, which is in good agreement with previous studies.

Faint Absorption Band Investigations in Reflectance Spectra of Vesta-like Asteroids

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Investigations of Vesta-like asteroids are of interest due to the expected cosmic mission to Vesta and Ceres asteroids. We present the results of reflectance spectrum analysis of the Vesta-like asteroids from catalogue SMASS II. The results will allow to determine how much similar the mineralogy of vestoid surfaces and basaltic achondrites.

Catalogue of Planetary Objects. Version 2006.0

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Planets are the cosmic bodies, which have mass within limits (10-11-10-10) ÷ 10–2msun [1, 2]. Based on this criterion, the analysis of the density and brightness of big planets' satellites, main asteroid belt objects, Kuiper belt objects and centaurs has been carried out as well as the analysis of suspected unseen satellites of the stars. As a result, the catalogue of planetary objects has been compiled.

Catalogue consists of 9 tables: 1) the big planets; 2) 20 satellites of the big planets, their masses exceed minimal mass of the planets – mpo; 3) 3 Main asteroid belt objects, their masses exceed mpo (based on the calculations of the albedo and brightness). Estimation of centaurs and Kuiper belt objects masses were based on absolute brightness and calculations of their albedo and average density (g/cm3). The list of this candidates includes four tables (depending on heliocentric distance): 4) ? < 30 a.u. (centaurs); 5) ? = 40?10 a.u. (general Kuiper belt); 6) 50 < ? < 80 a.u. (near region of scattered-disk Kuiper belt); 7) ? > 80 a.u. (distant region of scattered-disk Kuiper belt). The most probable discovered exoplanets are itemized in the table 8. Table 9 represents a list of the candidates which existence wasn't confirmed.

Optimistic estimations of the number of Solar system planets gives 600 candidates: 9 big planet + 20 satellites of the big planets + 3 Main asteroid belt objects + 5 centaurs + 563 Kuiper belt asteroids (with AH= 0.03, H = 7m.3). Corresponding pessimistic estimations are 122 planets = 9 + 20 + 3 + 0 + 90 (with AH= 0.12, H = 5m.8). Discoveries of 188 planets are enough reliable and 21 exoplanets are needed additional analysis.

[1] Alexandrov Yu.V., Zakhozhay V.A. // Astron. vestn. – 1980. – 14, ?3. – p. 129.

[2] Slyuta E.N., Voropaev S.A. // Astron. vestn. – 1993. – 27, ? 1. – p. 71.

Changing the Civilization Development by Comets

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Comets are very special and still mysterious celestial objects. They strongly influenced thinking of mankind in the past and continually do this today. The celestial mechanics, for example, was developed with comets. Contemporary conquest of cosmos is therefore a straightforward consequence of cometary searches in the past. In this contribution we point out few important aspects connected with investigations of comets in the past as well as today.

New Approach for Estimation of the Chemical Composition for Lunar Surface on the Basis of Multispectral Clementine Data

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Reliable estimation of the chemical and mineralogical composition for the lunar surface is important for the study of lunar resources. Recently the Clementine multispectral mosaics are used to map chromophore elements and minerals on the basis of correlations between optical and chemical properties for lunar samples [1]. Mapping by this method is complicated by intrinsic residual photometric errors in Clementine UVVIS survey. To analyse possible sources of errors we performed the principal component (PC) analysis of the Clementine data. We transformed all data into space of PC. We found that last two PC mainly contain the noise produced by imperfect normalization of the data to standard lightning geometry. Therefore we excluded last two PC from our analysis to improve the estimation of chemical and mineralogical data.

Well-known Lucey's approach to deconvolve the composition and maturity effect on spectral albedo imply the empirical definition of the maturation trends on the albedo-color diagrams [1]. In recent papers [2] some shortcomings of this model were noted (imperfect compensation for the maturity degree in case of iron content estimation). We propose the coordinate rotation in the space of PC for Clementine albedos to more correct estimation the maturity degree and chemical content. The reverse transformation of main three PC into 5 Clementine bands allows constructing a

system of new albedos free of local photometric errors in mosaics. After this compilation we applied the recent technique [3] for estimation the mineralogy for lunar regolith. We found that for some lunar minerals (orthopyroxene, augite, fe-pyroxene) the final distributions are free of latitudinal trend in brightness, which spoil the mineralogical mapping. We conclude that PCA transformation of Clementine data can be used to improve the prediction of the chemical elements abundances and to deconvolve the maturation effects and chemistry on the spectral albedos.

[1] Lucey, P., Blewett, D., Joliff, B. JGR, 105, E8, p. 20297-20305 (2000). [2] Wilcox, B., Lucey, P., Gillis, J. JGR, 110, E11001 (2005).

[3] Pieters, C., et al. submitted to Icarus (2006).

Causes of Observed Long-Period Variations of the Polarization at Polar Regions of Jupiter

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Data of 23-year of Jupiter polarimetric observations [1] have been reprocessed using new improved technique. The data from other observers have been added to the analysis. Anticorrelation between asymmetry of polarization and insolation has been found. The mechanism of influence of seasons' changing (through temperature variations) on north-south asymmetry of polarization formation has been proposed. Also a possibility of existence of influence of solar cosmic rays flux on polarization value is noted.

[1]Starodubtseva,O.M., Akimov,L.A., Korokhin,V.V., Icarus 157, No 2, p.419-425, 2002

Polarimetry and Photometry of Comet C/2004 Q2 (Machholz)

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We present the results of polarimetry and photometry of comet C/2004 Q2 (Machholz) obtained with the 0.7-m, Cassegrain telescope of Institute of Astronomy of Kharkiv Karazin National University on February and March, 2005. The observations were carried out with a single-channel photoelectric photometer-polarimeter with the IHW continuum and emission filters: UC(3650/80?), CN(3871/50?), C3(4060/70?), BC(4845/65?), C2(5140/90?), RC(6840/90?).

Linear polarization of the comet (11.8% and 8.0% at phase angles of 52 deg and 44 deg respectively) in the red continuum was close to a typical polarization for so-called dusty comets. Furthermore, the comet had spectral gradient of continuum polarization dP/dl=0.86% per 1000? that similar to dusty comets one, and an aperture dependence of polarization (9.9% and 10.8% in the diaphragm of 88 and 33 arcsec respectively in the blue continuum at phase angle 52 deg).

In the framework of Haser model we have found gas-production rates of CN, Q(CN)=1.15•1026 mol/s, C3, Q(C3)=4.83•1024 mol/s and C2, Q(C2)=1.45•1026 mol/s and the dust production rate Afro(4845)=36 cm on February 4.68 UT. The normalized spectral gradient of cometary dust S(4845,6840) is 8.8% per 1000? respectively. The ratio log(Afro(4845)/Q(CN))=-24.51 is compatible with averaged data for comets obtained in [1].

[1] A'Hearn et al, Icarus, 1995, V. 118,P. 223.

Polarimetry and Photometry of Earth Approaching Asteroid 100085 1992 UY4

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During three nights in August, 2005 a simultaneous polarimetry and photometry of Earth approaching asteroid 100085 1992 UY4 were carried out. The observations covered asteroid's phase angle range from 18°.2 to 29°.7. It was possible to obtain an increasing part of polarization phase dependence around inversion phase angle and to calculate the following parameters sinv=17°.8±1°.0 and h=0.32 ±0.06% per degree. The polarimetric albedo of the asteroid is pv=0.06 and means, that NEA 1992 UY4 belongs to dark C, D, P or F taxonomic type.

The obtained composite photometric lightcurve of the asteroid shows amplitude of 0m.22. Magnitude-phase dependence is represented by a linear phase coefficient, that is similar to dark asteroids ones.

UBV-photometry and Polarimetry of High-albedo Asteroid 44 Nysa

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We present the new of informations of UBV-photometric and polarimetric observations of the high-albedo E-type main-belt asteroid 44 Nysa. The observations were carried out in August, 2005 at the phase angle from 2°,2 to 4°,7 in the range of brightness opposition effect of the Nysa asteroid. The measured amplitude of V-band composition lightcurve of the asteroid is 0m,23. The polarimetric data are in good agreement with other known for this asteroid.

The Model of Rapprochement of Asteroid Apophis 99942 with the Earth and the Moon

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Is constructed an orbit asteroid approaching with Earth Apophis 99942. The numerical model account of perturbations, from 9 major planets of Solar system and the Moon. For the account of perturbations, coordinate of all planets and the Moon have been calculated according to theory DE405. Sizes of tidal forces from the Moon and the Earth are certain.

Precession of Elliptic Orbits in the Restricted 3-Body Problem

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Results on numerical modelling of orbits in the Restricted 3-Body Problem are presented. Time variations of parameters of osculating orbits with different initial conditions are studied with a special emphasis on major semi-axis, eccentricity, periastron and apoastron times, and timings of crossings by the test particle of the orbital plane. We study separately the apsidal precession in the orbital plane and a nodal precession for motion outside the orbital plane. Periods of precession are computed as functions of the mass ratio of main components, distance of the test particle from the main (accreting) component, velocity and its orientation.

A part of study is directed to divergence of trajectories with small differences in initial conditions with a possible physical link to interactions with other particles.

Results are compared with observations of positive and negative superhumps in dwarf nova and nova-like variables. The dependence of the superhump period excess is studied as a function of the orbital period and mass ratio of the components of cataclysmic binary systems.

Changes in Spectra of Comet 9P/Tempel on 3-4 July, 2005 During Deep Impact mission

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Results of the processing and investigation of spectra of comet 9P/Tempel 1, obtained on July 3-4, 2005 are presented. The comet 9P/Tempel 1 was observed with long-slit spectrograph installed in the Prime focus of the 1-m Zeiss telescope of the SAO of the RAS on July 3-4, 2005 (Mount Pastukhov, Nizhny Arkhyz, Northern Caucasus, Russia). The observations were obtained before and after collision of the copper impactor of the Deep Impact spacecraft with the nucleus of short-periodic comet 9P/Tempel 1. The detailed identification of emission lines in the spectra was made. Physical parameters (velocities of outflow, life time and rate of gas-productivity of the CN, C2 and C3 molecules) of the cometary neutral atmosphere are calculated. The presence of the cometary luminescence continuum (non-solar origin) and changes in the comet spectra are discussed.

Efficient Merger of Binary Supermassive Black Holes in Non-Axisymmetric Galaxies

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Binary supermassive black holes form naturally in galaxy mergers, but their long-term evolution is uncertain. In spherical galaxies, N-body simulations show that binary evolution stalls at separations much too large for significant emission of gravitational waves (the "final parsec problem"). Here, we follow the long-term evolution of a massive binary in more realistic, triaxial and rotating galaxy models. We find that the binary does not stall. The binary hardening rates that we observe are sufficient to allow complete coalescence of binary SBHs in 10 Gyr or less, even in the absence of collisional loss-cone refilling or gas-dynamical torques, thus providing a potential solution to the final parsec problem.