Kyiv National Taras Shevchenko University
Department of Astronomy and Space Physics

14th Young Scientists' Conference on Astronomy and Space Physics

Abstracts

Kyiv, 2007

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Preface

This year Young Scientists' Conference on Astronomy and Space Physics is held for the fourteenth 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 1994-2006 participants from Ukraine, Russia, Poland, France, Germany, Sweden, Libya, Egypt, Japan, Finland, Turkey and other countries took part in Young Scientists' Conference.

The 14th Young Scientists' Conference is dedicated to the 100-the anniversary of the prominent Ukrainian astronomer Olexandr F. Bogorodsky.

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.

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

Andrew Simon and
Local Organizing Committee

PROGRAMME

Monday, April, 23

13.00-14.00 - Registration
14.15-14.45 - Official opening.

Section 'High-Energy Astrophysics'

14.45-15.30 Marcus Kirsch. *The XMM-Newton view of the Crab nebula and its Pulsar* (invited lecture)

15.30-15.45 Kazi Md.Abul Firoz, K. Kudela. *Oblique cutoff rigidity of cosmic ray particles*

15.45-16.00 Antonio Martin-Carrillo, M.G.F. Kirsch, R. Staubert, E. Kendziorra. *Timing analysis of various pulsars in the X-ray regime using ESA's XMM-Newton observatory*

16.00-16.15 Tea-break

16.15-16.30 Vasyl Beshley, O. Petruk. *Synchrotron emission of supernova remnants in X-rays*

16.30-16.45 Alexander Flanchik, V.M. Kontorovich. *An induced inverse Compton scattering role in a formation of pulsar high-energy radiation*

16.45-17.00 Oleksandr Bogdanov, S. Guziy, A.J. Castro-Tirado, G. Johannesson, J. Gorosabel, G. Bjornsson, E.H. Gudmundsson, A. de Ugarte Postigo, M. Jelinek. *Evidence for a strong, single energy injection episode in the long-term optical-near IR monitoring of the GRB 030329 afterglow*

17.00-17.15 Marina Mikhailova, E.Yu. Bannikova. *Distribution of X-ray emission from jet knots of 3C273*

17.15-17.30 Sergey Tsygankov, A.A. Lutovinov, E.M. Churazov, R.A. Sunyaev. *X-ray pulsar 4U 0115+63: cyclotron energy and pulse profile*

17.30-17.45 Dmitri Karasev, A.A.Lutovinov, S.A.Grebenev. *Study of the fast X-Ray transient XTE J1901+014 based on INTEGRAL, RXTE and ROSAT data*

17.45-18.00 Igor Telezhinsky, B.Hnatyk. *Nonspherical postadiabatic supernova remnants*

18.00-18.05 Narek Sahakyan, Mikayel Arzakantsyan. *Detection of VHE γ-rays using the imaging atmospheric Cherenkov technique* (poster)

18.05-18.10 Volnova Alina, Shulga Alina, A. Pozanenko, I. Asfandriyanov, M. Ibragimov, E. Pavlenko, V. Rumyantsev. *Detailed study of the light curve of the GRB060714 optical transient* (poster)

18.10-18.15 Iurii Sushch, B. Hnatyk. *Hydrodynamical Simulation of Interaction of Vela Supernova Remnant with the Stellar Wind Bubble of γ^2 Velorum*

18.30-21.00 Excursion to Kyiv Astronomical Observatory

Tuesday, April, 24

Section 'Variable Stars'

09.30-10.10 Elena Pavlenko. *Beat phenomena in asynchronous polars* (invited lecture)

10.10-10.25 Vitaliy Breus, I.L. Andronov, K.A. Antoniuk, L.L. Chinarova, S.V. Kolesnikov, N.M. Shakhovskoy. *Photo-polarimeric study of the asynchronous polar BY Cam in 2003-2007*

10.25-10.40 Alex Golovin et al. *Detection of a Large Flare in FR Cnc (=1RXS J083230.9+154940)*

10.40-10.45 Alex Golovin et al. *SDSS J102146.44+234926.3: New WZ Sge-type dwarf nova* (poster)

10.45-10.50 Oksana Antonyuk, E.P. Pavlenko. *Outburst activity of dwarf nova NY Ser in 2004* (poster)

10.50-10.55 Anna Litvinchova, E.P. Pavlenko, S.Yu. Shugarov. *Multicolor photometry of the asynchronous polar V1500 Cyg in different phases of synodical cycle in 2006* (poster)

10.55-11.00 Julia Babina, E.P. Pavlenko, M.V. Andreev, A.V. Golovin. *Multicolor BVR photometry of asynchronous polar BY Cam* (poster)

11.00-11.05 Irina Solovyeva, I.L. Andronov, K.A. Antoniuk, V.N. Burwitz, L.L. Chinarova, A.A. Lomach, P.A. Niarchos, N.I. Ostrova, A.V. Yushchenko. *Photometric monitoring of the eclipsing dwarf nova EM Cyg: long-term, outburst and orbital variability* (poster)

11.05-11.20 Tea-break

Section 'Stellar Astrophysics'

11.20-12.05 Nikolai Samus. *The Moscow Program of Cepheid Photometry and Spectroscopy* (invited lecture)

12.05-12.20 Alexey Mints. *Encounters Between Open Clusters and Single or Binary Field Stars*

12.20-12.35 Svetlana Malchenko. *Duplicity and evolution status of the early-type Be star V622Per, the member of the χ Per open star cluster*

12.35-12.40 Ludmila Berdina, A.A. Minakov. *Microlensing effect in atmosphere of substar* (poster)

12.40-12.45 Vladimir Yushchenko. *Analysis of the chemical abundance of the stars HR465* (poster)

12.45-12.50 Vladimir Akhmetov. Determining brightness equation in XC1 catalogue by means of kinematical method (poster)

Section 'Physics of Interstellar Medium'

14.00-14.45 Ivan Andronov. *Structure and Evolution of Magnetic Cataclysmic Variables* (invited lecture)

14.45-15.30 Bogdan Wszolek. *Puzzling phenomenon of diffuse interstellar bands* (invited lecture)

15.30-15.45 Katarzyna Bryndal, B. Wszolek. *Spectroscopic families among diffuse interstellar bands*

15.45-16.00 Marcin Dyrka, B. Wszolek. *Interstellar C2 molecule detected in UV spectra of reddened stars*

16.00-16.15 Tea-break

16.15-16.30 Tomasz Kisiel. *MHD space sailing*

16.30-16.45 Kacper Kowalik, M. Hanasz. *Initial magnetization of galaxies by exploding, magnetized stars*

16.45-17.00 Anna Karnaushenko, E.Yu. Bannikova, V.M. Kontorovich. *Frequency dependence of radio images of jet knots and supernova remnants*

17.00-17.15 Cezary Szyszka. *Mid-infrared spectroscopy of evolved stars in LMC*

17.15-17.20 Svyatoslav Zubrin, V.M. Shulga, A.F. Antyufeyev. Methanol masers observations in the 3-mm bandwidth at the radio telescope RT-22 CrAO (poster)

17.20-17.25 Dmitry Ostryakov, Yu.N. Gnedin. *Magnetic reconnection in Cyg X-1* (poster)

17.25-17.30 Ruslan Ischenko, G.L. Isayenko, M.O. Borovoy. *X-ray $M\alpha$- and $M\beta$-emission spectra of heavy elements under electron bombardment* (poster)

17.30-17.35 Dmytro Mukha, S.V. Stepkin, A.A. Konovalenko. *Observations of Carbon radio recombination lines in the direction of galactic plane and extensive objects at decameter wavelengthes* (poster)

17.35-17.40 Andrey Danilenko, V.N. Komarova, Yu.A. Shibanov, A.V. Moiseev. *Optical spectroscopy of the Guitar Nebula* (poster)

18.00-20.00 Excursion to the Main Astronomical Observatory of NAS of Ukraine

Wednesday, April, 25

Section 'Small Bodies of the Solar System'

09.30-10.10 Klim Churyumov. *Comets after the Stardust and Deep Impact Missions* (invited lecture)

10.10-10.25 Rachel Stevenson. *Detection of small Kuiper Belt objects by stellar occultations*

10.25-10.40 Sergey Velichko, F.P. Velichko. *Polarimetry of B and C nuclei of the comet 73P/Schwassmann-Wachmann 3*

10.40-10.55 Sergey Zaitsev, F.P. Velichko. *Multispectral CCD Photometry of the Binary Asteroid 90 Antiope*

10.55-11.00 Larissa Chubko, K.I. Churyumov, V.L. Afanasiev, I.V. Lukyanyk, V.V. Kleshchenok. *Detection of cometary luminescence continuum in spectra of comets C/2004 Q2 (Machholz) and 9P/Tempel 1* (poster)

11.00-11.05 Larissa Chubko, K.I. Churyumov, V.G.Kruchynenko. *A model of an artificial explosive crater formed on the comet 9P/Tempel nucleus on 4 July, 2005* (poster)

Section 'Planetary Systems'

11.20-12.05 *Michael Mishchenko. Glory: a NASA satellite mission to Sun and planet Earth* (invited lecture)

12.05-12.20 Yuliana Kuznyetsova. *Raman scattering light researches in the giant planet atmosphere spectra*

12.20-12.35 Oksana Shalygina, L.V. Starukhina, G.P. Marchenko, V.V. Korokhin. *Jupiter's stratosphere: polar aerosol haze*

12.35-12.50 Yu-Rong YAN, Z.H.Tang, R.C.Qiao, K.X.Shen, Y.Yu. *Precise determination of the position of the faint moons near a bright primary*

12.50-13.05 Wei LIU, Z.H. TANG, Yong-Da LI. *Evaluation of optical magnitudes of Deep Space Spacecraft*

13.05-13.20 Olga Zakhozhay, A.P. Vid'machenko, V.A. Zakhozhay. *The search of the protoplanetary disc remains in the discovered planetary systems*

13.20-13.35 Sergey Gerasimenko, M.V. Kaydash, V.G. Kaydash. *New photometric study of Lunar regolith by ESA SMART-1 mission*

13.35-13.50 Yuriy Kolesnyk, B.A. Shakhov. *The galactic cosmic ray spectrum transformation in the space homogeneous interplanetary scattering medium*

13.50-13.55 Nadiia Kostogryz. *The reason study of geometric albedo variations of Uranus and Neptune* (poster)

15.00-18.00 Excursion to Musuem of Folk Architecture and Life of Ukraine

Thursday, April, 26

Section 'Extragalactic Astrophysics'

09.30-10.15 Peter Berczik, Mykola Petrov, Alexandr Veles. *Special, Hardware Accelerated, GRAPE/GRID Cluster for Parallel N-body Dynamical Modeling in Astrophysics* (invited lecture)

10.15-10.30 Evgeny Kurbatov. *On star formation rate and turbulent dissipation in galactic models*

10.30-10.45 Nikolay Podorvanyuk. *Kinematics of the interstellar medium in the galaxy IC10*

10.45-11.00 Tea-break

11.00-11.15 Bidzina Kapanadze. *R-band Photometry of X-ray selected blazars*

11.15-11.30 Roman Krivonos, M. Revnivtsev, A. Lutovinov, S. Sazonov, E. Churazov, R. Sunyaev. *Hard X-ray emitting Active Galactic Nuclei in the local Universe*

11.30-11.45 Yuri Sholudchenko, Yu.Izotov. *A spectroscopic study of Wolf-Rayet galaxies from the Sloan Digital Sky Survey*

11.45-12.00 Yuriy Babkin. *Hα fluxes from some bright southern galaxies and Milky Way*

12.00-12.15 Tatiana Shumakova. *Observed anisotropy in the distribution of Milky Way satellites and its evolution in time. Numerical modeling*

12.15-12.30 Olga Kashibadze. *Peculiar velocities of the Local Volume galaxies and the total mass of the Virgo Cluster*

12.30-12.35 Andrew Simon, Yu. N. Kudrya. *Intermediate Mass Black Holes in Flat Galaxies*

Section 'Cosmology'

14.00-14.45 Mikheil Maziashvili. *The nature of dark energy due to quantum (micro)structure of space-time* (invited lecture)

14.45-15.00 Tea-break

15.00-15.15 Dmytro Iakubovskyi, A. Boyarsky, O. Ruchayskiy, V. Savchenko. *Sterile Neutrino Warm Dark Matter constraints from XMM-Newton M31 observations*

15.15-15.30 Ganna Ivashchenko. *The quasar clustering evolution from SDSS DR5*

15.30-15.45 Oleg Tsupko, G.S. Bisnovatyi-Kogan. *Dynamics of three-axis ellipsoidal figures*

15.45-16.00 Anaïs González Iglesias et al. *Statistical Analysis of the Large Scale Structure with Dark Energy Parameter* $w \neq 1$

16.00-16.05 Dmitry Zyuzin, Yu.N. Gnedin. *Values of the mangetic field and brightness temperature of the region of active galaxy nuclear radioemission as testing method for the cosmological models* (poster)

16.05-16.10 Abbas Farmany, S. Abbasi, A. Naghipour. *Distribution of dark matter in the Universe* (poster)

18.00-22.00 Conference Dinner

Friday, April, 27

Section 'Solar Physics'

09.30-10.15 Armin Siegfried Franck. *Habitable zones in extrasolar planetary systems: the search for a second Earth* (invited lecture)

10.15-10.30 Amjad Al-Sawad, J. Torsti, T. Laitinen. *Multi eruption Solar energetic particle events (MESEP) obsorved on ERNE/SOHO*

10.30-10.45 Vyacheslav Olshevsky, E.V. Khomenko, M. Collados. *Numerical modelling of MHD wave propagation in sunspots: a 3D case*

10.45-11.00 Tea-break

11.00-11.15 Bohdan Seredyuk. *Charge transfer processes between solar wind ions and CH4 molecules*

11.15-11.30 Borys Rutkevych, V.N. Melnik, A.A. Konovalenko, H.O. Rucker, V.V. Dorovskyy, E.P. Abranin, A. Lecacheux, A.I. Brazhenko, A.A. Stanislavskyy. *Type III-like bursts in the decameter range*

11.30-11.45 Andrey Sukhorukov, N.G. Schukina. *Influence of the non-LTE effects on the Solar Silicon abundance*

11.45-12.00 Oksana Osyka, V.G. Lozitsky. *omparative small-scale magnetic field diagnostics in Solar flares using FeI lines of different mutiplets*

12.00-12.05 Szymon Starzynski, M.Jarosik, A.Ceglarek. *The first steps of the radio astronomy in Czestochowa* (poster)

12.05-12.10 Evgenia Sadovenko, M.I. Pishkalo. *Structure and shape of the Solar corona during the total Solar eclipse on March, 29, 2006*(poster)

12.10-12.15 Nikolai Shevchuk, V.N. Melnik, A.A. Konovalenko, H.O. Rucker, E.P. Abranin, V.V. Dorovskyy, A. Lecacheux. *Solar decameter spikes* (poster)

12.15-12.20 Mariya Statsenko, V.G. Lozitsky. *Magnetic field measurements in a limb Solar flare: observational evidences to small-scale cold features with 2 kG fields* (poster)

12.20-12.25 Dariya Redchenko, N.I. Lozitska. *Fast magnetic field changes in sunspots* (poster)

13.30-14.15 Masakatsu Murakami. *Self-similar solution for star formation with energy dissipation* (invited lecture)

14.15-14.30 Karina Bączek, B. Wszolek. *The Jagiellonians and the stars*

14.30-14.45 Tea-break

15.00-17.30 Poster session

17.30-18.00 Official Closure

INVITED LECTURES

The XMM-Newton View of the Crab Nebula and Its Pulsar

Marcus Kirsch

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Since the discovery of the Crab Pulsar in 1968, the Crab has been one of the best studied objects in the sky and it remains one of the brightest X-ray sources regularly observed. With an X-ray luminosity of $\sim 5\,10^{37}\,\mathrm{erg\,s^{-1}}$, the Crab emits a significant fraction of its energy output in the X-ray band (the total luminosity of the Crab is $\sim 2\,10^{38}\,\mathrm{erg\,s^{-1}}$). As a standard candle for instrument calibration, it has been repeatedly studied by many astronomy missions. The 33 ms Crab Pulsar has been observed in almost every band of the electromagnetic spectrum. Its pulse profile exhibits a double peaked structure with a phase separation of 0.4 between the first and the second pulse.

I discuss the current X-ray view of the Crab Nebula and Pulsar, summarizing our analysis of observations of the source with the EPIC-pn camera on board the XMM-Newton observatory. Different modes of EPIC-pn were combined in order to yield a complete scenario of the spectral properties of the Crab resolved in space and time (pulse phase).

Structure and Evolution of Magnetic Cataclysmic Variables

Ivan Andronov

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Main processes taking place in magnetic cataclysmic variables (MCV) of different types (classical, asynchronous and intermediate polars) are reviewed. These systems exhibit variability in a wide range of time scales from seconds to decades, depending on the accretion structure (stream, disk, column(s)) and on an intrinsic variability of stellar components - the white dwarf and the red dwarf. There are at least 24 main types of variability which are seen in magnetic and non-magnetic cataclysmic variables and sometimes are present in all or few sub-classes. From these, 16 types are seen in the magnetic systems starting from 1-sec oscillations of the accretion column, 10-sec and 170 sec "shot noise" in AM Her, flickering, quasi-periodic oscillations (QPOs); spin, orbital, spin-orbital beat variations; "swingings" and "idlings" of the magnetic axis of the white dwarf; precession of gravi-magnetic rotators; rotational evolution of the white dwarf; magnetic activity of both stellar components; evolutionary changes of the binary.

Some recent results based on the multilateral photopolarimetric monitoring of some key objects (AM Her, BY Cam, V1432 Aql, RXJ0625, BG CMi et al.) in a frame of the "Inter-Longitude Astronomy" (ILA) project are presented.

This talk is dedicated to the memory of the prominent Scientist, Popularizer and Organizer of Science Prof. Vladimir Platonovich Tsessevich (1907-1983), the founder of the scientific school on variable stars' research in Ukraine.

Beat Phenomena in Asynchronous Polars

Elena Pavlenko

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Among the known magnetic cataclysmic variables the small subgroup of asynchronous polars exists. It consists from the four binaries only: V1500 Cyg, BY Cam, V1432 Aql and CD Ind. V1500 Cyg and BY Cam are widely studying in the Crimean astrophysical observatory. The spin-orbital asynchronism generates a synodical period in the binary that is the spin-orbital beat period. Hence one could expect that the variable magnetic field orientation of the white dwarf in respect to the secondary component could produce a variety of the beat phenomena in the binary. In action the beat phenomenon looks as the mean light variation with beat phase in V1500 Cyg with different year-to-year amplitude. BY Cam displays more variety of the beat phenomena: similarly to the V1500 Cyg it also shows the mean brightness beat modulations but only during the low accretion state; as well as the amplitude of the photometrical period of rotation depends on the beat phase. The O-C of the maxima of rotational light curves display sudden shift three times per synodical period at definite beat phases. These observations testify to the complex structure of the white dwarf magnetic field that has a strong quadrupole component in BY Cam, point to the accretion geometry and to the role of the strong magnetic field in operating of the accretion and/or mass loss by the secondary component.

Puzzling Phenomenon of Diffuse Interstellar Bands

Bogdan Wszołek

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The discovery of the first diffuse interstellar bands (DIBs) dates back to the pioneering years of stellar spectroscopy. Today, we know more than 300 absorption structures of this kind. There exists a great variety of the profiles and intensities of DIBs, so they can not be readily described, classified or characterized. To the present day no reliable identification of the DIBs carriers has been found.

Many carriers have been proposed over the years. They ranged from dust grains to free molecules of different kinds, and to more exotic specimens, like hydrogen negative ion. Unfortunately, none of them is responsible for observed DIBs. Furthermore, it was shown that a single carrier can not be responsible for all known DIBs. It is hard to estimate how many carriers can participate in producing these bands. The problem is further complicated by the fact that to this day it is still impossible to find any laboratory spectrum of any substance which would match the astrophysical spectra.

Here, a historical outline concerning DIBs is followed by a brief description of their whole population. Then, a special attention is focused on the procedures trying to extract spectroscopic families within the set of all known DIBs

Comets after the STARDUST and DEEP IMPACT Misions

Klim Churyumov[1], Leonid Shulman[2]

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The Stardust space craft has been launched on February 1999. The main goal of this mission was to investigate the Comet Wild 2 and its dust environment. After the Earth gravity assist (Jan 2001) the space craft was redirected to the Comet Wild 2. It passed by the asteroid Annefrank and then (Jan 2004) reached Comet Wild 2. The images of the nucleus of

this comet were transferred to the Earth. The special capsule with samples of near-cometary dust was returned to the Earth on Jan 2006. The dust grains were collected in the volume of aerogel where they were decelerated without being destroyed. The dust particles were of micron and submicron sizes. Their mineralogical composition was typical for those formed by high temperature melting.

The Deep Impact mission to the Comet Tempel 1 was started on Dec 2004. The science objectives for the mission are: to shoot a weightily copper cylinder onto the nucleus of the comet; to observe how the crater forms after the impact; to measure the crater's depth and diameter; to measure the composition of the interior of the crater and its ejecta; to determine the changes in natural outgassing produced by the impact. The Tempel 1 nucleus was impacted on Jul 4, 2005.

Unfortunately, the dust cloud formed after the impact did not permit to see the crater and to measure its parameters. The brightness of the cloud decreased rapidly and the cloud disappeared in several minutes when the nucleus became unavailable for observation from the space craft. The Deep Impact mission showed that the nucleus has abundant small dust particles.

Glory: a NASA Satellite Mission to Sun and Planet Earth

Michael Mishchenko

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The NASA Glory mission will support the U.S. Climate Change Science Program (USGCRP) by continuing and improving upon long-term monitoring of key forcings influencing global climate. Specifically, Glory is an Earth-orbiting observation and scientific data evaluation mission designed to achieve three critical objectives. One is to determine the global distribution, microphysical properties, and chemical composition of natural and anthropogenic aerosols and clouds with accuracy and coverage sufficient for a reliable quantification of the aerosol direct and indirect effects on climate. The second is to continue the 27-year total solar irradiance (TSI) measurement record to quantify the effect of solar variability on the Earths climate. A third is to demonstrate the operational weather benefits of these measurements for eventual adoption by the National Polar-orbiting Environmental Satellite System (NPOESS) to meet three Aerosol and Cloud Climate Data Records (CDRs) incorporated into the NPOESS Integrated Operational Requirements Document (IORD-II) in 2001. These objectives are met by implementing two separate science instruments. The Aerosol Polarimetry Sensor (APS) has the ability to collect multi-angle photopolarimetric measurements of the troposphere along the satellite ground track within the visible, near- and short-wave infrared spectral regions from 400 to 2200 nm. Based on a proven technique demonstrated by the aircraft Research Scanning Polarimeter (RSP), APS is essential for NPOESS because it can provide aerosol measurements to an IORD minimum-required accuracy ten times better than possible with intensity radiometry offered by current sensors such as MODIS and MISR or the Visible Infrared Imager/Radiometer Suite (VIIRS) under development for NPOESS. The Total Irradiance Monitor (TIM) will measure sunlight incident on the Earths atmosphere by collecting high accuracy and precision measurements of TSI. Glory is expected to be launched in December of 2008 and fly as part of the A-Train constellation of Earth-orbiting spacecraft, which will include the EOS Aqua and Aura, CALIPSO, CloudSat, OCO, and PARASOL satellites. APS data will be contemporaneous and synergistic with data from several other key A-Train instruments. Glory observations will improve retrievals of aerosol climate forcing parameters and global aerosol assessments with other A-Train instruments as well as paving the way for improved operational results from NPOESS. The scientific knowledge provided by the Glory mission will be essential to understanding climate change for sound, scientifically based economic and policy decisions related to environmental changes caused by climate variability as well as to offer significant improvements in operational weather observations and forecasting. It is expected that both Glory instruments will be subsequently flown on NPOESS platforms

to continue their benefits to operational weather as well as climate trend assessments well beyond the initial Glory mission demonstration. The Glory TIM is a rebuild of the proven TIM currently flying on the SOlar Radiation and Climate Experiment (SORCE), so will maintain continuity of the 27-year TSI record.

The Nature of Dark Energy Due to Quantum (Micro)Structure of Space-Time

Mikheil Maziashvili

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General Relativity and Quantum Mechanics provide a natural quantum (micro)structure of space-time quantified by the Karolyhazy uncertainty relation. Time-energy and Karolyhazy uncertainty relations together predict the existence of dark energy even for the background Minkowskian space-time having a finite age. Dark energy density estimated in this way is in good agreement with its observed value and turns out to be responsible for the existence of space-time itself with a resolution allowed by the laws of nature.

Special, Hardware Accelerated, GRAPE/GRID Cluster for Parallel N-body Dynamical Modeling in Astrophysics

Peter Berczik, Mykola Petrov, Alexandr Veles

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We present our first results from the recently built 9 node GRAPE/GRID cluster at the Main Astronomical Observatory (NASU). This system is a new type of supercomputer based on a standard PC's with the special hardware cards calls GRAPE. The cards is constructed for the ultra fast gravity interaction calculations between the set of particles. Each of such a cards have a peak performance for gravity calculation around 120 Gflops. Our first results show that our 9 node cluster when we use in parallel our 9 GRAPE cards can have a peak performance around 1 TFlops (which is roughly equivalent to the speed of 2000 ordinary CPU).

Habitable Zones in Extrasolar Planetary Systems: the Search for a Second Earth

Armin Siegfried Franck, C. von Bloh W. Bounama

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Is there life beyond planet Earth? This is one of the grand enigmas which humankind tries to solve through scientific research. Recent progress in astronomical measurement techniques has confirmed the existence of a multitude of extra-solar planets. On the other hand, enormous efforts are being made to assess the possibility of life on Mars. All these activities have stimulated several investigations about the habitability of cosmic bodies. The habitable zone (HZ) around a given central star is defined as the region within which an Earth-like

planet might enjoy the moderate surface temperatures required for advanced life forms. At present, there are several models determining the HZ. One class of models utilises climate constraints for the existence of liquid water on a planetary surface. Another approach is based on an integrated Earth system analysis that relates the boundaries of the HZ to the limits of photosynthetic processes. Within the latter approach, the evolution of the HZ for our solar system over geological time scales is calculated straightforwardly, and a convenient filter can be constructed that picks the candidates for photosynthesis-based life from all the extra-solar planets discovered by novel observational methods. These results can then be used to determine the average number of planets per planetary system that are within the HZ. With the help of a segment of the Drake equation, the number of "Gaias" (i.e. extra-solar terrestrial planets with a globally acting biosphere) is estimated. This leads to the thoroughly educated guess that there should exist half a million Gaias in the Milky Way.

HIGH-ENERGY ASTROPHYSICS

Oblique cutoff rigidity of cosmic ray particles

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L.I. Dorman et al (2001) computed Cutoff Rigidities of Cosmic Ray Particles incident obliquely onto the surface of the Earth by employing the IGRF model. We have determined the oblique cutoff rigidities for the same locations they did by utilizing Stormer formula while observed differences. In our paper we show the differences in cutoffs because of the reasons of the differences geographic and geomagnetic coordinates.

Timing Analysis of Various Pulsars in the X-ray Regime Using ESA's XMM-Newton Observatory

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I am studying from the timing point of view isolated pulsars with different pulse profiles and different periods. These kind of pulsars have stable profiles that makes them useful for calibration accuracy studies with respect to timing of X-ray detectors. I will talk about different methods of measuring periods and the accuracy of those measures comparing simulated and observational results for some pulsars like the Crab, PSRB1509 and PRSB0540.

Synchrotron Emission of Supernova Remnants in X-rays

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Recent observations confirm that shocks of supernova remnants (SNRs) are effective accelerators of charged particles. They can be responsible for relativistic protons in our Galaxy with energy up to 10^{15} eV. Electrons also are accelerated to high energies. They however experience radiative losses due to synchrotron emission and inverse Compton effect. These lead to maximum energy of accelerated electrons of order $10 - 100$ TeV (Reynolds & Keohane, 1999). Synchrotron emission of such electrons is in X-ray band. The model of this emission including radiative loss effects as well as properties of particle injection is developed. We consider SNR in uniform ISM and uniform magnetic field. The role of different parameters in modification of electron spectrum and synchrotron emission is considered. The fluxes in X-rays are compared with those in radio in order to find conditions for more intensive synchrotron X-rays. The length scales of electron distribution and emissivity are compared for different sets of parameters that allows us to obtain limitations on possible values of magnetic field amplified by the SNR shocks. This is important question for modern astroparticle physics (Bell, A.R.; Lucek, S.G., 2001; Berezhko, E. G. & Völk, H.J., 2004).

An Induced Inverse Compton Scattering Role in a Formation of Pulsar High-Energy Radiation

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As it is known a theory completely explaining a pulsar radio emission has not been developed yet. We propose a model [1], in which a powerful coherent radio emission arises in a vacuum gap above star polar cap.The gap is considered as a resonator [2] excited by sparks in longitudinal electric field. The resonator is bounded by pulsar surface and electron-positron plasma produced in star magnetosphere.The production of electron-positron pairs is suppressed near magnetic axis and it leads to formation of waveguide through which the radio emission undergoes. Spectral properties of the radio emission can be related to resonator and waveguide parameters [3]. An inverse Compton scattering(ICS) of radio emission leads to high-energy radiation and limits energies of accelerated electrons [4]. An influence of induced processes upon ICS is considered. It has been shown that the high-energy luminosity stops increasing when radio emission luminosity increases and saturates.

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Evidence for a Strong, Single Energy Injection Episode in the Long-Term Optical-Near IR Monitoring of the GRB 030329 Afterglow

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Tantalizing evidence for supernovae (SN) underlying Gamma-Ray Bursts (GRBs) have been mounting over the last years, mostly due to the presence of bumps in the late optical light curves of afterglows. The GRB of 29 Mar 2003 represents a unique chance of characterizing this behavior due to the fact that this is one of the nearest GRB afterglow (the post-GRB emission extending to longer wavelengths) detected so far, at z=0.1685. We have obtained optical and near-IR monitoring from different observatories around the world, starting 0.45 days after the GRB and continued until April 2004. A bump seen in the optical-near IR light curves at around 1 day is interpreted within the refreshed-shock model, in which a single energy injection episode with $E \sim 1.3 \cdot 10^{50}$ erg took place at 1.04^d after the burst onset. We do not detect however, an obvious bump at late times as seen in other GRBs and as would be

expected in this case on the basis of a strong SN spectral signature as reported elsewhere. We also reconcile this observational fact to the existence of a break occurring at about 11 days after the GRB and an underlying SN similar to 1998bw peaking around 15 days but evolving about a 30% faster than SN 1998bw. This is in agreement with the spectral evidence found.

Distribution of X-ray Emission from Jet Knots of 3C273

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The 3C 273 is one of nearest (z=0.158) and most studied quasars. It has a jet that is observed at different wavelength ranges. The jet has knot structure. These jet knots are locations where electrons accelerated in shocks. Jet radiation in radio and optical bands is connected with synchrotron mechanism, however, the emission mechanism originating the X-rays has been controversial. The distribution of jet X-ray emission differs from one of the radio and optical bands. The X-ray emission has two peaks corresponding to the nearest optical knots. Then it decreases to a lower level but it is still detectable until it reaches the terminating optical knot [1]. The X-ray emission observed for two nearest knots can originate by the inverse Compton scattering of relativistic electrons on external source radiation (IC/ES). We suppose that in the jet region with constant X-ray intensity the inverse Compton scattering on cosmic microwave background photons (IC/CMB) is essential because the intensity of external source decreases [2]. In this scenario it is essential to take the absorption of radiation in two nearest knots into account. The physical parameters were obtained for two nearest knots of 3C273 jet. The dependence of the optical thickness from the angle between the jet axis and the line sight was considered.

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[**2**] Bannikova E.Yu., Kontorovich V.M. Space Science and Technology, 2003, 9, V. 5/6, p.153

X-ray Pulsar 4U 0115+63: Cyclotron Energy and Pulse Profile

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We present the results of broad band (3-100 keV) observations of X-ray pulsar 4U 0115+63 with the INTEGRAL and RXTE observatories. We concentrate on the luminosity and energy dependence of the pulse profile and the variations of the cyclotron line energy. The influence of cyclotron resonance and different intensity on pulsed fraction was investigated. Results and possible emission mechanisms are briefly discussed in terms of theoretical models of accreting pulsars.

Study of the Fast X-Ray Transient XTE J1901+014 Based on INTEGRAL, RXTE and ROSAT Data

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The source XTE J1901+014 discovered by the RXTE observatory during an intense outburst of hard radiation and classified as a fast X-ray transient is studied. The source's spectral characteristics in the quiescent state have been investigated for the first time both in the soft X-ray energy range (0.6-20 keV) based on ROSAT and RXTE data and in the hard energy range (>20 keV) based on INTEGRAL data. A timing analysis of the source's properties has revealed weak nonperiodic bursts of activity on time scales of several tens of seconds and two intense (∼0.5-1 Crab) outbursts more than several hundred seconds in duration. Certain assumptions about the nature of the object under study are made.

Nonspherical Postadiabatic Supernova Remnants

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Inhomogeneity of interstellar medium (ISM) and the anisotropy of the energy release during the outburst results in nonsphericity of Supernova remnants (SNRs) and in creation of difference in evolutionary stages of certain parts of SNRs. In our work we present the analytical description of 3D evolution of nonspherical SNR in nonuniform medium including adiabatic, transition and radiative stages. It is shown that in the ISM with large-scale density gradient and in the case of anisotropic SN outburst the transition to radiative stage with formation of cold dense shell takes place in different time moments for the different parts of the front surface. Therefore such SNR will simultaneously have sections in adiabatic, transition and radiative stages. The observable High Energy signatures of such SNRs are discussed. The proposed analytical method of 2D and 3D SNR evolution in nonuniform medium as well as in the case of isotropic explosion near the boundary between two phases of the ISM and anisotropic explosion in the uniform medium will be useful for modeling and interpretation of observations of the specific SNRs.

Detection of VHE Gamma Rays Using The Imaging Atmospheric Cherenkov Technique

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The Imaging Atmospheric Cherenkov Technique (IACT) for the detection of Very High Energy (VHE) gamma rays is described. The properties of the Cherenkov light produced by air showers in the atmosphere are discussed. The results of Monte-Carlo calculations of effective collection area for the system of IACTs are presented. For comparison the effective collection area for the single IACT also is estimated.

Detailed Study of the Light Curve of the GRB060714 Optical Transient

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We present the results of observations of the GRB060714 optical afterglow (z=2.71) since 62 minutes after BAT trigger and during 6 days. Most of these observations were carried out with telescopes of Maydanak (1.5 m) and CrAO (2.6 m) observatories. For the light curve and spectral features studying we also used data from NOT, UVOT/Swift and ANDICAM telescopes. We present the light curve of the GRB060714 optical afterglow (filter R), estimates of its time variability and jet-break parameters. We also obtained estimates of spectral variability (B-R) of the light curve at the moment of the afterglow rebrightening (from 1 to 2.5 hours after the burst). Spectral characteristics and estimates of the host galaxy absorbtion were obtained using the broadband photometry (BRIJ).

Hydrodynamical Simulation of Interaction of Vela Supernova Remnant with the Stellar Wind Bubble of γ^2 Velorum

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The aim of this work is to explain the peculiarity of the Vela SNR shape, especially the density contrast of interstellar medium between North-East and South-West of Vela SNR $n_{NE}/n_{SW} \approx 4$. We try to explain this contrast by the interaction of Vela SNR with the stellar wind bubble of the closest to us Wolf-Rayet star γ^2 Velorum. Using the solution of Weaver et al. (1977) for evolution of interstellar bubbles we build a self-consistent model of Vela SNR expanding into γ^2 Velorum bubble. From a self-consistent model we find out characteristics of γ^2 Velorum and Vela SNR. The expected flux in Al26 line is also estimated.

VARIABLE STARS

Photo-Polarimeric Study of the Asynchronous Polar BY Cam in 2003-2007

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Results of the observations of the asynchronous polar BY Cam obtained in 2003-2007 in the Crimean Astrophysical Observatory (CrAO) are presented. This work is a part of the "Inter-Longitude Astronomy" observational campaign. The observations have been carried out at the 2.6m Shain telescope (ZTSh) equipped with a fast photometer-polarimeter, and at the 1.25m telescope AZT-11 in two regimes: fast UBVRI photometry and the CCD (R)photometry. The description of the data reduction program for simultaneous measurements of the circular and linear polarization at ZTSh was presented by Breus et al. at YSC 13 and is in press in the "Astronomical and Astrophysical Transactions"). The following astrophysical processes have been studied: flickering at a time scale of dozens seconds; quasi-periodic variations; spin variability modulated by a periodically changing orientation of the white dwarf in respect to the red dwarf ("synodic", or "spin-orbital beat" period); wavelength dependence of characteristics of the fast, QPO and spin variability based on the "sigma" and "lambda" scalegrams and on the principal component analysis (PCA). Polarimetric curves show a noticeable variability of amplitude from cycle to cycle, which is interpreted by changes of the accretion structure and a transient contribution of the cyclotron emission from the accretion column. Based on PCA of the UBVRI data, we report on 3 sources of variability with different spectral energy distribution and different time scales. One of them is "blue" (high temperature) and has much larger amplitude of both spin and QPO variability, and the second is "red" (smaller temperature, possibly a cyclotron emission), the third component shows no QPOs and has a low-amplitude spin component only. This work is dedicated to the memory of Prof. V.P.Tsessevich (1907-1983).

Detection of a Large Flare in FR Cnc(=1RXS J083230.9+154940)

Golovin et al.

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We report detection of an optical flare in the BY Draconis type star FR Cnc. The flare duration is 41 min, the amplitude is $1.^m02$ in the B band. It is the first flare reported for this object.

SDSS J102146.44+234926.3: New WZ Sge-Type Dwarf Nova

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We report CCD photometry and spectroscopy during 2006 outburst of the dwarf nova SDSS J102146.44+234926.3 (SDSS J1021). The light curves unambiguously show double-peaked superhumps with a period of $P_{sh} = 0.^d05633 \pm 0.00003$ and an amplitude of $0.^m1$. The applied $O - C$ analysis does not reveal P_{sh} changes at the 3σ level. A rapid brightening with rate of $0.^m13$ per hour was detected on JD 2454067.61 that most probably was the early beginning of the echo-outburst. The rebrightening phase lasted at least 8 days and can be classified as "type-A" echo-outburst according to classification system proposed by Imada et al. (2006). We also report spectroscopic observations which were carried out on November 21.8 UT with the CCD spectrograph mounted on the 1.01-m telescope of Bisei Astronomical Observatory (Japan). The spectral range is 400-800nm, and the resolution is 0.5 nm at H_α. Spectrum shows blue continuum and Balmer absorption lines (from H_ϵ to H_α) together with K CaII 3934 in absorption. Very weak HeI 4471, Fe 5169, NII 5767 absorption lines may be present. H_ϵ 3970 is probably blended by H Ca II 3968. The FeIII 5461 line resembles weak P-Cygni profile. It is remarkable that H_α manifests a "W-like" profile: an emission component embedded in the absorption component of the line. The photographic plates from the MAO, SAI and CrAO plate archives, which cover the position of the SDSS J1021, were inspected for the presence of previous outbursts. None were detected. We also present the BVR_cI_c photometric calibration of 52 stars in SDSS J1021 vicinity, which have V-magnitude in the range of $11.^m21 - 17.^m23$ and can serve as comparison stars. The large amplitude of the SDSS J1021 outburst of 7", double-peaked superhumps with a period below the "period gap", rebrightening during the declining stage of superoutburst, rarity of outbursts and obtained spectrum allow to classify this object as a WZ Sge type dwarf nova.

Multicolor Study of the Dwarf Nova NY Ser in 2004

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The multicolor study of the dwarf nova NY Ser in 2004 is presented. The observations were done with 38-cm cassegrain telescope of the Crimean astrophysical observatory. They revealed 6 outbursts with the shortest interval between them close to 6 days during 68 days. The mean amplitude of outbursts was 2 stellar magnitudes and the system became redder when fainter. No superoutbursts were detected on the 68-day time scale, but a short-time light variability with typical time of ∼2 hours was found at some phases of the outbursts.

Multicolor Photometry of the Asynchronous Polar V1500 Cyg in Different Phases of Synodical Cycle in 2006

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We present multicolor CCD BVR photometry of the asynchronous polar Nova Cygni 1975 = V1500Cyg in 2006. BVR observations have been carried out in the Crimean astrophysical observatory in the primary focus of the 2.6-m Shajn telescope and with the 1.25 meter ZTE telescope of the Crimean Laboratory of the Sternberg Astronomical Institute. The brightness of star in V varied from 20^m to $18^m.3$. We constructed and analyzed the light curves of V1500Cyg in the all intervals of phases of the synodical cycle. The typical Nova light curve has the sine-like shape caused by the strong reflection effect that is dominating in the system.

At the definite phases of synodical cycle the atypical light curves appear, that indicate on the large contribution of the hot white dwarf.

Multicolor BVR Photometry of Asynchronous Polar BY Cam

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We present the result of the multicolor CCD observations of the asynchronous polar BY Cam in the Crimean astrophysical observatory in 2006 with 2.6-m and 38-cm telescopes. The diagnostic magnitude-color and color-color diagrams were constructed for the different accretion states. The star is blue when fainter in B-V and displays more complicate behavior in V-R. This could be caused by the variable contribution of the cyclotron radiation from the accretion columns and white dwarf.

Photometric Monitoring of the Eclipsing Dwarf Nova EM Cyg: Long-term, Outburst and Orbital Variability

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Results of the observations of the eclipsing dwarf nova EM Cygni obtained in the University of Athens Observatory (Greece) in 2000, Astronomical Observatory of Mallorca (Spain) in 2004 and in the Crimean Astrophysical Observatory (CrAO) in 2006 are presented, as well as results of the time series analysis of the observations from the international AFOEV and VSOLJ databases and photographic observations from the "7-camera Astrograph" of the Astronomical Observatory of the Odessa National University. This work is a part of the "Inter-Longitude Astronomy" observational campaign.

In the previous study (I.L.Andronov, L.L.Chinarova, 1997, Odessa Astron. Publ. 10, 9, *http* : *//oap*09.*pochta.ru*), the season-to season changes of the mean outburst characteristics were reported, which have shown a 3000-day cyclicity with a high correlation between the amplitude and mean magnitude (in a sense of larger effect of amplitude with a much less variable brightness at the outburst maximum). This may be interpreted by variations of the accretion rate due to either magnetic cycles of the red dwarf secondary, or by a "trigger-like" amplification of the influence of minor variability in the orbital separation because of a third body.

In the present study, we have used more wide interval of the "Sky Patrol Observations", as well as new more precise runs of the CCD observations . The parameters of orbital variability are determined at different outburst stages, their variability dependence on time and luminosity are discussed. This work is dedicated to Prof. Vladimir Platonovich Tsessevich (1907-1983).

STELLAR ASTROPHYSICS

Encounters Between Open Clusters and Single or Binary Field Stars

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The scattering of single and binary stars on the open star cluster is studied. Probability of the capture of single or binary star by a star cluster is measured depending on the velocity. For low-velocity object we got exponential decrease of the capture probability with the initial velocity. For high-velocity case there is v^{-6} dependence for capture probability. Probability of the binary disruption is also measured, together with the probability of the capture of one or two binary members. Analytical estimations, Monte-Carlo and full N-body simulations are all in a good agreement.

Duplicity and Evolution Status of the Early-Type Be Star V622Per, the Member of the χ Per Open Star Cluster

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Radial velocities analysis based on high-resolution spectra, obtained in the Hα region and low resolution spectra obtained in the region 4420-4960 $\AA$ together with radial velocities, obtained from other published sources allow us to obtain orbital parameters of the massive binary system V622 Per. It is shown that this system has an orbital period 5.2 days and is a post-mass transfer binary. Light curve analysis of the ellipsoidal variability allow us obtain inclination angle of the system and temperatures of the component. Luminosity ration of the components was found of about 1:4 and of T_{eff} and $lg\, g$ for each of the component was estimated. It is shown that primary, less massive but brighter star is an evolved object that lost large part of the mass during its evolution. Estimations of chemical composition of the primary show noticeable enrichment by products of the CNO cycles such that He/H reach 0.15, N is in excess of about 0.5-1 dex, carbon has low abundances (by 2-3 dex lower) and oxygen has 1 dex lower abundance. The possible evolution of the binary with the known age 17 Myear is discussed.

Microlensing Effect in Atmosphere of Substar

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At research of Helix Nebula by Hubble space telescope it was revealed, that inside nebula near to a central star the extensive cluster of the objects recalling comets is observed. The further observations and the analysis have shown, that these object can be referred to a class of substars. Masses of substars are not enough for origination in their bowels of thermonuclear reactions. However substars are surrounded by the dense gas envelopes and have plasma corona, such as solar. At observation of distant sources - quasars through the dense fields of substars it is necessary to take into account a refraction of rays in their atmospheres and gravitational fields. The refraction of rays can result in the lens effect under which activity parameters of observed quasars, will be distorted. On the one hand, the careful analysis of

these distorted is necessary, first of all, for the exact interpretation of observational data. On the other hand, observed cluster of substars are of interest for research as they can be used for monitoring well-known microlensing effect. Observations microlensing effect on substars will allow to gain the important information on a mass distribution of substars, on structure of their atmospheres, and also high resolution to study thin structure of radiating region of quasars. Advantage of the detected cluster of substars will be that they have sufficient masses for microlensing effect, are disposed near of the Earth and can be observed directly with ground instruments. Realization of monitoring of the quasars observed through fields of microlenses - substars in optician and a radio range will allow to receive the information both on substars, and on radiation sources - quasars.

Analysis of the Chemical Abundance of the Stars HR465

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Among the chemically peculiar stars of the upper main sequence (CP stars), the star HR465 has been known for a long time as one of the most interesting object. The spectroscopic data, as well as photometric data and magnetic field measurements, could be well represented by a period of 22-24 years. We investigated two spectrum of HR465: at 1996 and 2002 years. As generally known the star make up double system, however the second satellite was not found.

We are obtained that the 1996 spectrum has stronger line of chromium and 2002 one has stronger line of auctioned and lanthanides. Also was founded the line of ThIII in visible part of spectrum.

Determining Brightness Equation in XC1 Catalogue by Means of Kinematical Method

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Using proper motions of Tycho 2 catalogue stars as referent in the Ogorodnikov-Millns method one can obtain kinematical parameters of stars in Suns neighborhood. In their turn, these parameters help to calculate proper motions of XC1 catalogue stars. By comparing proper motions of XC1 catalogue stars and their calculated motions one can determine brightness equation in XC1 catalogue.

PHYSICS OF INTERSTELLAR MEDIUM

Spectroscopic Families Among Diffuse Interstellar Bands

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Looking for spectroscopic families in the whole set of discovered diffuse interstellar bands (DIBs) is an indirect trial of solving the problem of DIBs carriers. Basing on optical high resolution spectra, covering the range from 5655 to 7020 $\AA$, we found few relatively strong DIBs which are not well correlated one with another and therefore they may play a role of representatives of separate spectroscopic families. In the next step we indicated DIBs which tend to follow the behaviour of their representatives. As a result of our analysis we propose few, probably not complete yet, spectroscopic families of DIBs.

Interstellar C2 Molecule Detected in UV Spectra of Reddened Stars

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C2 molecule is sometimes considered as a crucial component of carriers of some diffuse interstellar bands. Using UV data achieved by spectrometer STIS fed with HST we detected interstellar C2 lines for few reddened target stars. We tried to verify the idea that intensity of C2 lines around 2313 angstroms is correlated with some diffuse interstellar bands.

MHD Space Sailing

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The rocket technology dates back as far as the medieval China. Used initially for entertainment and religious practices over time rockets evolved into weapons and finally into means of transportation. Today, we are nearing the top of the rockets' capabilities. Although, for now they are the only way for us to send anything into space we are becoming more and more aware of the limitations of this technology. To send a bigger object into space we need a bigger rocket. To lift the greater mass of the rocket itself the amount of the required fuel grows quickly. Using the highly explosive fuel becomes the more dangerous and expensive, the more material we have to use. It becomes apparent that the technology is near its limits when we consider that the largest rocket ever used was constructed in the 1960s. It is essential that we invent other means of propelling probes and other interplanetary vehicles through space. The author had performed a series of magnetohydrodynamic simulations using the University of Chicago's Flash package to find out whether the interactions between the Solar Wind and the conducting ring with the electric current would occur. The MHD simulations gave the results similar to the monte-carlo calculations performed by Dr. Charles Danforth from the University of Colorado. It is the author's conclusion that the promising results should encourage further study of the phenomenon and the possibility of using it in practice.

Initial Magnetization of Galaxies by Exploding, Magnetized Stars

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There is a strong observational evidence that the magnetic fields are present in virtually all galaxies. It is commonly accepted that those fields are generated due to $\alpha\omega$ dynamo process, where differential rotation and helical turbulence are responsible for creating a strong, large-scale magnetic field from a weak, small-scale initial magnetic field. Although, the origin of the seed magnetic field is a mystery yet to be solved, there is a few theories that try to deal with this problem. One of them (Rees 1987) suggests that the first generation of stars could be a source of galactic scale seed magnetic fields. Even without any primordial magnetic field, the star can generate weak field (Biermann battery process), that can be subsequently amplified by a stellar dynamo. If, during its evolution, the star explodes or undergoes significant mass loss, the "frozen-in" magnetic field spreads throughout the galaxy. We conduct a series of numerical magnetohydrodynamical simulations, of magnetized interstellar medium (ISM) disturbed by exploding stars. Each star deposits a randomly oriented dipolar magnetic field into ISM. We apply our own parallelized 3D MHD code based on the "Relaxing TVD" algorithm. The simulations are performed in a Cartesian box with shearing-periodic boundary conditions. The medium is stratified by vertical galactic gravity. The resulting turbulent state of ISM magnetized by stellar explosions, is processed with the aid of Fourier analysis. We discuss the possibility of further amplification of this kind of random magnetic field by means of the galactic dynamo process.

Frequency Dependence of Radio Images of Jet Knots and Supernova Remnants

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Fine structure of jet knots and hot spots of radio galaxies and quasars, and also supernova remnants is discussed within the diffusion model [1]. The frequency dependence of synchrotron radiation distribution is investigated [2]. We considered how the finite sizes of the source of injected electrons (shock wave) influences the synchrotron radiation distribution. The intensity maps for sources of injected electrons with different forms and sizes are calculated. In the framework of the diffusion model is given an explanation of observational data obtained using the UTR-2 [3], according to which the size of the supernova remnants on decameter waves more than size of remnants on high frequencies.

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Mid-Infrared Spectroscopy of Evolved Stars in LMC

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The Spitzer Space Telescope works on orbit since 2004. As this new facility with extremely large sensitivity is available we can study dust around evolved stars in external galaxies. The talk will shield some light on physical processes connected with carbonous dust in post-AGB stars as well as in HII regions.

Methanol Masers Observations in the 3-mm Bandwidth at the Radio Telescope RT-22 CrAO

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We report the beginning of the astronomical masers investigations in the 3-mm bandwidth at the radio telescope RT-22 (CrAO, Ukraine). For this purpose the special complex for maser lines investigation in 85..115 GHz frequency band was developed. It was made on the base of the low noise cryogenic Shottky-diode receiver and high resolution Fourier-spectrometer. The cryogenic receiver had the DSB noise temperature less than 100K. The Fourier-spectrometer had channel separation 4kHz and bandwidth 8MHz. Results of maser observations of 8 0-7 1 A+ transition of methanol (95.169 GHz) towards DR-21, DR-21W and NGC7538 are in good agreement with early results received by other authors. On the basis of the analysis of location of masers in the NGC7538 direction we can assume that the origin of all known 1st class methanol masers in this region is connected with existing molecular outflows from young stars.

Magnetic Reconnection In Cyg X-1

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According to recent observations the system of Cyg X-1 shows giant outbursts with durations up to 7 hours. We associate these outbursts with tearing current sheet and nonstationary phase of reconnection. Using different models of accretion and reconnection we can estimate where such an outburst originates: in accretion disk or in a hot corona above the disk. Our estimations show that in standard disk (Shakura&Sunyaev model) outbursts occur in the disk. Turbulent reconnection is likely to cause these giant outbursts.

X-ray Mα- and Mβ- Emission Spectra of Heavy Elements Under Electron Bombardment

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The results of theoretical and experimental investigations of ionization cross sections (ICS) of M-electronic subshells in atoms of heavy elements by electron impact are widely used in such diverse fields as plasma physics, astrophysics and interpretation of spectroscopic diagnostics. However, many problems, connected with theoretical and experimental determination of ICS are existed. For example, direct theoretical calculation of ICS of M-subshells of heavy elements $Z > 70$ are practically absent, because they demand accounting of large number of open and close decay channels. However, up to now simplified models of calculation of ICS such as the first Born approximation (FBA) and model of classical binary impact (CBI) are widely used. Thus, in the present work we carried out the experimental investigation of the X-ray $M\alpha$ - and $M\beta$ - emission spectra of Pb and Bi atoms under electron bombardment with aim of determination, which with models more correctly description of ionization process of M-subshells in heavy elements.

X-ray Mα- and Mβ- emission spectra of Pb and Bi atoms were obtained by using a Bragg spectrometer with bent single-crystal of quartz. Energy region of incident electrons was E = (5÷100) keV with step ΔE = 5 keV. Using these spectra the relative intensities of Mα-, Mβ-satellites ($S\alpha = I(M\alpha_S)/I(M\alpha)$, $S\beta = I(M\beta_S)/I(M\beta)$) and $\gamma = I(M\beta)/I(M\alpha)$ were determined. In resent works [1,2] the model of X-ray M-emission, which takes into account the most important generation and migration channels of vacancies in M-subshells was offered. This model can be used for determination of Sα, S*beta* and γ using values of ICS of M-subshells. In this work we used ICS calculated with help of FBA and CBI models. It is revealed, that in region $E < 15$ keV good agreement between experimental and calculated data of Sα, S*beta* and γ was observed using values of ICS, calculated by CBI model. In region E ¿ 20 keV distinctions between experimental and calculated results using different theoretical models didn't fall outside the limits of experiment errors (7%). Thus, in region of small energy excess the CBI model can be recommended for the description of ionization process of M-subshells in heavy elements $Z > 70$.

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Observations of Carbon Radio Recombination Lines in the Direction of Galactic Plane and Extensive Objects at Decameter Wavelengths

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We present the attempt to carry out a large scale survey of the Galactic plane in carbon radio recombination lines (RRLs) at frequencies near 25-26 MHz as well as the observations against several adjacent to the Galactic plane objects (among them are 3C144, DR-21,

GSH139-03-69, HB21, IC443, L1407, and S140). Space atoms producing these RRL are excited up to the levels corresponding to principal quantum numbers more than 600 and are concentrated around the Galactic plane. The features are strongly broadened mostly due to Doppler processes. The Galactic plane was scanned using West-East arm of the decameter wavelength radio telescope UTR-2 (spatial resolution was $40'x10^\circ$) in the range of galactic longitude from 30° to 180° with the step of 10. Unexpectedly, the features were detected in all measured directions. The distribution of RRLs radial velocities was in good correspondence with the standard model of the Galactic rotation. Low frequency spectroscopy provides effective ways of diagnostic of the cold low density and partially ionized interstellar plasma, but the achievable at the moment spatial resolution limits the possibilities of mapping using this kind of spectral lines. LOFAR characteristics make this instrument very suitable for carrying out such investigations.

Optical Spectroscopy of the Guitar Nebula

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We present the results of the 6m BTA spectroscopy of the Guitar bowshock nebula produced by the pulsar PSR B2224+65 moving supersonically through the interstellar matter. First of all we present the results of the low-resolution longslit spectroscopy. In comparison to the previous spectral observations by [Cordes et al., 1993] showing Hα and Hβ emission lines, we detect also a weak Hγ line. We confirm also absence of any forbidden lines in the bowshock spectrum, which is indicative to the Balmer dominated (or non-radiative) shocks observed in some supernova remnants. The measured Balmer decrement I(Hα)/I(Hβ)=5.1±0.5 is in agreement with the previously measured value of 5.5±0.5 (Cordes et al., 1993), while the newly measured ratio I(Hα)/I(Hγ)=9±2. The comparison of these decrements with their ranges allowed by available non-radiative shock theories (Chevalier & Raymond, 1978; Chevalier et al., 1980) provides a constraint on the visual interstellar extinction value towards the object $A_v < 1$. This is significantly lower than $A_v = 1.65$ obtained by [Cordes et al., 1993] based on comparison observed I(Hα)/I(Hβ) value with 3, but is in a good agreement with A_v estimates followed from the pulsar dispersion measure measurements in the radio and from the hydrogen column density estimates towards the pulsar obtained from recent Chandra X-ray spectral observations (Hui & Becker, 2006). Second we present some preliminary results of the high-resolution Fabry-Perot spectroscopy. The analysis of the Fabry-Perot spectroscopy data also based on comparison observed data with the non-radiative shock theories.

SMALL BODIES OF THE SOLAR SYSTEM

Detection of Small Kuiper Belt Objects by Stellar Occultations

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Knowledge of the Kuiper Belt is currently limited to those objects that can be detected directly. Due to the decrease in light reflected from small Kuiper Belt Objects (KBOs) compared to large KBOs, objects with diameters less than $\sim 10km$ cannot be detected. These smaller bodies could contain most of the mass in the Kuiper Belt and the abundance of these bodies will constrain the distribution of mass. The overall size distribution of bodies within the Kuiper Belt can also be inferred from the relative abundances of sub-km and larger bodies.

Stellar occultations are already used to study dark objects in the Solar System, such as asteroids or planetary rings. Occultation by a KBO with an angular size comparable to that of the occulted star will result in Fresnel diffraction. Detection of diffraction effects requires fast multiple-star photometry, which will be conducted in July 2007 using the Orthogonal Parallel Transfer Imaging Camera (OPTIC) mounted on the University of Hawaii's 2.2m telescope on Mauna Kea.

I will present estimated occultation rates with simulated light curves of events, along with how the results could influence our understanding of the structure of the Kuiper Belt.

Polarimetry of B and C Nuclei of the Comet 73P/Schwassmann-Wachmann 3

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The comet 73P/Schwassmann-Wachmann 3 (SW3) is the unique object. It is classified as the gaseous comet with a very low dust-to-gas ratio (about to ten times less, then for the well-known gaseous comet 2P/Enke [1]). It belongs to comets with very low content of carbonaceous molecules. The comet had split into three fragments on 1995 and for the approaching to perihelion on 2006 split to about of 50 fragments again [2]. During April - May of 2006 were carried out the polarimetric observations of B and C fragments of the comet SW3. We used the 70-cm telescope of Institute of Astronomy of Karazin Kharkiv National University equipped by a single-channel photometer-polarimeter. The polarimeter worked on the modulation principle with a rapidly rotating polaroid. Two continuum narrow-band filters BC (4845/65Å), RC (6840/90Å) and wide-band filter WRC (7228/1140Å) were used. We have measured the linear polarization and obtained the polarization phase angle dependence of the nucleus C in the range of phase angle from 47.6 to 95.0 degs. The measured part of phase dependence is close and a little bit low then the mean one of dusty comets but it is a far above than for so called gaseous comets. This fact intensified doubts in correctness of division of the comets on dusty and gaseous groups according to polarization in continuum [1]. The polarization of nuclei B and C in red continuum are close one to another within the errors of measurement. This points on the similarity of physical properties of dust of the B and C nuclei. The estimate value of spectral gradient of polarization gives quantity of -0.96% per 1000 for nucleus B. The similar anomalous negative spectral gradient observed earlier for the comet 21P/Giacobini-Zinner [3], and C/1999 S4 (LINEAR) [4] under the disintegration one.

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Multispectral CCD Photometry of the Binary Asteroid 90 Antiope

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During seven nights of August-September 2006 multispectral photometry of the main belt binary asteroid 90 Antiope was carried out. We used the 70-cm reflector of Institute of Astronomy of Karazin Kharkiv National University which was equipped with the CCD camera FLI 47-10 and a set of standard BVRI filters. The obtained lightcurve of the asteroid in R-band shows brightness variations with amplitude of 0.06 mag. The lightcurve has regular shape and does not demonstrate the eclipsing events in the asteroid binary system under observation aspect on 2006. This fact is in good agreement with the predictions.

Detection of Cometary Luminescence Continuum in Spectra of Comets C/2004 Q2 (Machholz) and 9P/Tempel 1

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Spectra of comets C/2004 Q2 (Machholz) and 9P/Tempel 1 comets were observed with the help of the 6-m BTA telescope and the spectrograph SCORPIO with the long slit at the SAO of the RAS. We suppose that in spectra of these comets we detected the real luminescent cometary continuum tied with the luminescence of the comet organic species which are in comet dust particles. For comet 9P/Tempel 1 the level of the luminescent cometary continuum is 30% of the level of the total cometary continuum with the maximum near $\lambda \approx 525$ nm and for comet Machholz (C/2004 Q2) the level of the luminescent cometary continuum is 46% of the level of total cometary continuum with the maximum near $\lambda \approx 630$ nm. Comparison of spectra of two comets shows that "new" comet C/2002 Q2 in Oort's sense has the more high level of luminescent continuum and therefore more number of organic luminophors (CHON-particles) than "old" exhausted short period comet 9P/Tempel 1 has such luminescent motes.

A Model of an Artificial Explosive Crater Formed on the Comet 9P/Tempel Nucleus on 4 July, 2005

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The theoretical model of an explosive crater formation on a surface of a comet nuclei is presented. According to work Opik (1976), the basis of the theory of the crater formation is transfer by impactor to target of quantity of movement (impulse), instead of energy. The theory is checked up and coordinated with experimental data (for speeds from 2 km/s up to 9 km/s) and according to lunar craters statistics is verified for speeds up to 40 km/s. Calculations show that explosion of meteorite in a target occurs for such depth of submergence where it reaches of maximal drag. It has been shown that as a result of collision of the Deep Impact copper impactor with the comet 9P/Tempel nucleus an artificial explosive crater by a diameter from 22 to 57 m and by a depth from 4.8 to 5.7 m must be formed on the nucleus surface. The model was used and confirmed for Arizona crater. The dependence of strength p of superficial layers of the cometary nucleus of comet 9P/Tempel 1 from diameter D of the formed crater is given by $\sigma_p = 5.17 \cdot 10^{20} D^{-4.286}$. At the same time, in the work ('Hearn, et. al., 2005) from the analysis of emission of very fine (micron) particles which make a surface of a comet as authors approve, by depth in tens meters, strength of such substance it is certain as extremely small - less than 65 P = 65 N/m2. If to accept such strength in our model we receive, that diameter of a crater can be the order of 150 m.

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PLANETARY SYSTEMS

Raman Scattering Light Researches in the Giant Planet Atmosphere Spectra

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The results of observations for atmosphere spectra of Solar System giant planets and stars with extrasolar planets in visible range are presented. There are offered brief method of data receiving with help the hanging spectrometer placed on the 2-m telescope of peak Terskol Observatory and principles of spectral data processing. Researches of mentioned spectra are realized taking into account Raman light scattering by hydrogen molecules. There are estimated the Raman scattering contribution to giant planet atmosphere spectra and influence degree of Raman scattering on the reflective capacity of planet atmospheres. Comparative analysis of Raman scattering effects for giant planet atmospheres of Solar System and stars with extrasolar planets has been carried out.

Jupiters Stratosphere: Polar Aerosol Haze

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In our previous works [1,2], on the basis of Jupiter photopolarimetric observations during 1981-2004, seasonal variations of north-south asymmetry of linear polarization P in polar regions and anticorrelation between P asymmetry and insolation were found. Qualitative mechanism of seasonal variations of P asymmetry (through temperature variations) has been proposed [2]. We suppose that the main cause of these effects is change of aerosol concentration in the haze observed at top levels of Jupiter stratosphere at high latitudes [1-3]. Aerosols may be unstable, and temperature changes may influence upon generation and destruction of aerosol particles. According to [4], the observed aerosol haze is located on p 20 mbar pressure level and consists of benzene and polycyclic aromatic hydrocarbons (PAH) like naphthalene, phenanthrene, pyrene. Our estimates show that components of Jovian stratospheric haze which consists of PAH (crystal naphthalene, phenanthrene) particles may be formed by homogeneous nucleation. Temperature variations in Jupiter stratosphere have strong influence on PAH condensation; benzene does not condensate at temperatures > 120 K. Also we find that flux of solar cosmic rays may influence upon concentration of aerosol haze particles only through series of chemical reactions that produce source material for aerosol formation.

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Precise Determination of the Position of the Faint Moons Near a Bright Primary

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When determine the center of the image of the faint moons near a bright primary, the position of the center of the faint moons will be shifted toward the bright primary because of the uneven background caused by the halo light of the primary. The polynomial-fit method has been used to correct the uneven background. In this paper, detailed analysis of this method was given. Results of simulated and real data are presented.

Evaluation of Optical Magnitudes of Deep Space Spacecraft

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Since the deep space spacecrafts are non-self-illumination objects, the formulas of estimation of the optical magnitude of spacecraft is constructed according to the radiation theory and the extra-atmospheric radiant emittance of the sun at a visible light wave band. Taken Chinese first lunar probe "chang'e-1" as an example, the magnitude of it in different distance is calculated.

The Search of the Protoplanetary Disc Remains in the Discovered Planetary Systems

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The major semiaxis mass dependence for Solar System planets and exoplanets was built and analyzed. The planet systems which are immerse into the remains of the protoplanetary discs are predicted. The models for infrared surplus and polarization of the protoplanetary disc remains of different mass which are necessary for analyze of the planetary systems with the remains of the protoplanetary discs were calculated. The comparison between the planets catalogues and IRAS is carried out.

New Photometric Study of Lunar Regolith by ESA SMART-1 Mission

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We use images obtained in 2006 by Advanced Moon micro-Imager Experiment (AMIE) camera onboard SMART-1 spacecraft [1] to access photometric properties of selected lunar areas in the context of geological and structural properties of the regolith. Following [2] we use an approximation of photometric function proposed by Akimov [3] to obtain photometric properties of the surface. An adjustable parameter of phase function part of this formula (i.e. the dependence of photometric function solely on phase angle) is the steepness U of

phase function. We use this description to map the U parameter. Knowing the reflectance and photometric angles, we apply least squares fit procedure to find the parameter U. We studied two lunar areas: 1) Gruithuisen domes and surrounding mare in the western part of Mare Imbrium (centered at 39.5 W, 35.8 N); 2) the cracked-floor crater Lavoisier (80.8 W, 38.2 N). We found true photometric variations associated with small craters characterized by high U values and craters with diffuse extended halos of low U; these halos have no albedo expression. We explain low U anomalies for distal ejecta areas as modification of the fairy-castle microstructure of the regolith by the impact event and producing a less porous layer [4]. The high U values for craters might be caused by an increase of mesoscale roughness in the proximal ejecta zone. We found the large negative anomaly of U parameter in the center of crater Lavoisier. It might be explained by pyroclastic deposits associated with tectonic fractures across the floor.

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The Galactic Cosmic Ray Spectrum Transformation in the Space Homogeneous Interplanetary Scattering Medium

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In this paper the iteration method of the cosmic rays (CR) propagation in space homogeneous interplanetary scattering medium solution problems is proposed. The method based on the smallness of the anisotropy CR degree. The comparison of exact analytical solution and iteration solution for the constant diffusion coefficient was done. The iteration solutions for diffusion coefficient depended on energy is obtained.

The Reason Study of Geometric Albedo Variations of Uranus and Neptune

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The method of the optical parameters estimation of the nonisothermal giant planet atmospheres by using detailed intensity data of Raman scattering was used. Applied this method to observational data of Uranuss and Neptunes geometric albedo in 1981, 1993, 1995, we obtained the spectral values of the optical depth, namely, (τ_a/τ_R) and (τ_κ/τ_S) (where τ_a, τ_R are aerosol and gas components, $\tau_S = \tau_a + \tau_R$ and τ_κ is absorbing component of effective optical depth of the formation of the intensity of diffuse reflected radiation). We obtained that these ratios are different for 1981, 1993, 1995 years. The possible reason of long period variations of Uranuss and Neptunes geometric albedo was revealed.

EXTRAGALACTIC ASTROPHYSICS

On Star Formation Rate and Turbulent Dissipation in Galactic Models

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The models of star formation function and of interstellar medium turbulent energy dissipation are proposed. In this models the turbulent energy of the interstellar medium and its structure is taken into account. It is shown that using the expressions proposed is able to explain the observable star formation lag in the Galaxy. The reliability of the star formation and dissipation models to scenario of Galaxy star populations formation is shown.

Kinematics of the Interstellar Medium in the Galaxy IC10

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Galaxy IC10 possesses a very large number of Wolf-Rayet stars. We carried out detailed kinematic studies of the ionized gas (H-alpha) in the regions of the Wolf-Rayet stars in this galaxy. Our results are compared to results of the HI-observations (VLA, NRAO). Our work based on observations with the 6-m telescope of the Special Astrophysical Observatory of the Russian Academy of Science.

R-band Photometry of X-ray Selected Blazars

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We present the results of optical R-band photometry of 11 X-ray selected blazars. The target objects (1ES0229+200,1ES 0323+022, 1ES 0414+009, 1ES 0502+675, 1ES 0647+250, 1ES 0806+524, 1ES 1028+511, 1ES 1426+428, 1ES 1517+656, 1ES 1959+650, 1ES 2344+514) were selected from the catalog Einstein Slew. Three of them (1ES 1426+428,1ES 1959+650,1ES 2344+514) are confirmed to be TeV sources. Observations were performed with CCD ST6 camera attached to Newtonian focus of 70cm meniscus telescope of Abastumani Observatory during 1997-2006 years. All of our objects show brightness variability, exept 1ES 0229+200. We discovered both as log-term variations, as flickering. The objects under consideration vary their brightness relatively slow with timescales of 1-4 years. 1ES 1426+428 don't exhibits clearly long-term variations but there are intensive rapid flickering. No intraday variabilities have been found, which are revealed for other subclasses of the blazars. Variation amplitudes range from about 0.3 till 1.3 magnitudes. Flickering are found during both as brightening as decay epochs. Long-term variations carry no periodical character.

Hard X-ray Emitting Active Galactic Nuclei in the Local Universe

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The properties of local ($z < 0.1$) Active Galactic Nuclei (AGN) were examined in recent hard X-ray (17-60 keV) all-sky survey performed with INTEGRAL observatory (astro-ph/0701836). Using catalog of detected AGNs, the number-flux relation and luminosity function of extragalactic sources were derived. We also present for the first time evidence of strong inhomogeneity in the spatial distribution of nearby (< 70 Mpc) hard X-ray emitting AGNs, which reflects the large-scale structure in the local Universe.

Spectroscopic Study of Wolf-Rayet Galaxies from the Sloan Digital Sky Survey

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We analyzed long-slit spectral observations of 206 Wolf-Rayet (WR) galaxies from the Sloan Digital Sky Survey with heavy elements mass fraction ranging over 2 orders of magnitude. Nearly all galaxies in our sample show broad WR emission in blue region (blue bump) consisting of unresolved blend of NIII(4640), CIII(4650), CIV(4658) and HeII(4686) emission lines. Broad CIV(5808), red bump, is detected only in 20 galaxies. We derived the number of early WC (WCE) and late WN (WNL) stars from the luminosities of red and blue bump, and the number of O stars from the luminosity of Hb emission line.It is found that the relative number of WR stars N(WR)/N(O+WR) decreases with decreasing metallicity, in agreement with predictions of evolutionary synthesis models. The relative number ratios N(WC)/N(WN) and the equivalent widths of the blue bump EW(4650) and of the red bump EW(5808) derived from observations are also in satisfactory agreement with theoretical predictions, except for the most metal-deficient WR galaxies. A possible source of disagreement is too low a line emission luminosity adopted for a single WCE star in low-metallicity models. Models for Wolf-Rayet and O stars populations were taken from works of Daniel Schaerer and William D. Vacca.

H_α Fluxes from Some Bright Southern Galaxies and Milky Way

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H_α fluxes from some bright southern galaxies are defined using the SHASSA [1] survey data. The sample of southern galaxies is formed of objects identified in the survey with angular diameters more than 20'. Image processing and data reduction are performed in the ESO-MIDAS system. To calibrate the flux, we have used ESO spectrophotometric standard stars [2].

In the second part of the work we try to give an estimation of the H_α flux from Milky Way based on the theoretical model. This model includes two components: the ionized hydrogen distributed in our Galaxy which causes H_α emission as well as interstellar dust absorbing the radiation. The spatial distribution of the dust is presented by the double exponential law. Its equation is found by the least squares method using Schlegel's work [3].

H_α spatial distribution model is developed in a similar way. The H_α fluxes from some selected squares in the SHASSA images cause as an actual data for the model. The forthcoming result is seen in integrating dust and ionized gas density over the line of sight and to find the best fit for spatial distribution of emitting regions.

[1] *http* : *//amundsen.swarthmore.edu/SHASSA/*

[2] *http* : *//www.eso.org/observing/standards/spectra/*

[3] Sclegel D.J., Finkbeiner D.P., Davis M. ApJ, 500, 525, 1998.

Observed Anisotropy in the Distribution of Milky Way Satellites and its Evolution in Time. Numerical Modeling

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Anisotropy in satellite distribution with respect to the disc plane of the host galaxy is observed in many galaxies. Most of the satellites are found in polar orbits, this anisotropy being stronger the more distant the satellite is from the host galaxy. The reason of such distribution may be connected with the satellite formation processes in volumes where the predominating orbits were polar or it may be the result of the evolutionary processes that may remove satellites with low and intermediate orbital inclinations. To examine how orbital inclinations of the satellite change with time we try to build the evolutionary model of Milky Way galaxy with their known satellites. For this purpose we use Superbox, a particle-mesh code with high resolution sub-grids and an NGP (nearest grid point) force-calculation scheme based on the second derivatives of the potential. As initial conditions for such a simulation we use the last data for proper motions of Milky Way satellites and nearly self-consistent disc-bulge-halo model for Milky Way galaxy generated by GalactICS, a software package for generating N-body realizations of axisymmetric galaxy models.

Peculiar Velocities of the Local Volume Galaxies and the Total Mass of the Virgo Cluster

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The recent accurate measurements of distances to the most (266) nearby galaxies made mainly by the RGB method with Hubble Space Telescope [1] provide a unique opportunity to investigate the peculiar velocity field within the limits of 80 Mpc. Besides this sample, we use also a sample of 272 galaxies from the Tonry's work [2] with SBF distances and a sample of 410 flat galaxies from the 2MASS Flat Galaxy Catalog [3] which are quite smoothly distributed on the sky.

The distances to the galaxies of the latest sample were determined using the infra-red Tully-Fisher relation completed with some additional regressors, $K - m\_21$ "color index", particularly. This way allows to decrease scatter in the TF diagram significantly and seems to be precious and "cheap" method of mass measurements of distances to galaxies.

Based on these three samples counting altogether 907 galaxies, we have mapped accurately peculiar velocity field of the Local Volume galaxies. Its analysis shows that the most of its features trace the large-scale variations of mass distribution (the Great Attractor, Shapeley concentration, the Local and Bootes voids), while others (the "local velocity anomaly") are not explained yet.

The second part of the work includes mass estimations of the Virgo Cluster based on the spherical collapse model [4,5]. In our work, this model is improved by introducing power-law distributed density instead of a point mass and by accounting the cosmological constant; moreover, we have found a new analytical method of accounting the cosmological constant which seems promising enough and requires further investigation and approbation.

The total mass of the Virgo cluster based on the obtained data on peculiar velocities is estimated as $M = (3.91 \pm 0.44) \cdot 10^{14} M_{\odot}$.

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[**2**] Tonry J.L., Dressler A., Blakeslee J.P., Ajhar E.A., Fletcher A.B., Luppino G.A., Metzger M.R., Moore C.B. The SBF Survey of Galaxy Distances. IV. SBF Magnitudes, Colors, and Distances. ApJ, vol.546, is.2, pp. 681-693, 2001.

[**3**] Mitronova S.N., Karachentsev I.D., Karachentseva V.E., Jarrett T.H., Kudrya Yu.N. The 2MASS-selected Flat Galaxy Catalog. Bull. Special Astrophys. Obs., 57, pp. 5-163, 2003 (2MFGC).

[**4**] Lynden-Bell D. The dynamical age of the local group of galaxies. Observatory, vol.101, pp. 111-114, 1981.

[**5**] Sandage A.R. The redshift-distance relation. IX - Perturbation of the very nearby velocity field by the mass of the Local Group. ApJ, P.1 vol.307, pp. 1-19, 1986.

Intermediate Mass Black Holes in Flat Galaxies

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Masses of black holes in the nuclei of flat galaxies have been estimated using empirical dependence obtained by X.Y. Dong and M.M.De Robertis for Ks band. For bulge separation from disk the result of de Vaucouleurs was used. Determinations of masses were made for spiral galaxies S0-Sm from 2MFGC catalogue. We conclude that there is a tendency of the central body mass decreasing for later types galaxies. More than a half of flat galaxies of Sd - Sm types should contain an intermediate mass black holes in their nuclei.

COSMOLOGY

Sterile Neutrino Warm Dark Matter constraints from *XMM-Newton* M31 observations

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We derive constraints on parameters of a radiatively decaying warm dark matter particle, e.g., the mass and mixing angle for a "sterile" neutrino, using *XMM-Newton* MOS spectra of the Andromeda galaxy (M31). We show that the observation of its outer parts can provide nearly the bigger amount of DM flux, although the X-ray signal from the outer parts is much less than that from the central part. This makes better constraints on sterile neutrino complementary to earlier results that used M31 on-center observations. Our limits are comparable and even better to the best existing constraints

The Quasar Clustering Evolution from SDSS DR5

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About 57800 photometrically classified quasars taken from the Fifth Data Release of the SDSS were used for studing the evolution of their clustering within the redshift range 0.1-2.2. The measurements of the angular and projected correlation functions and their redshift and magnitude dependences were made with an application of a special random-samples construction technique. The results reveal some differences of the quasar clustering from the galaxies.

Dynamics of Three-Axis Ellipsoidal Figures

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Dynamics of three-axis ellipsoidal figures is considered. Collapse and development of different types of instability are investigated.

Statistical Analysis of the Large Scale Structure with Dark Energy Parameter $w \neq 1$

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We test the effect of changing the dark energy parameter value w, on the equation of state, analysing the statistical properties of the large scale structures formation in N-body simulations. We compare the correlation function measurements in 5 numerical simulations using an equation of state with constant parameter $w \neq 1$. We identify groups in this simulations with a *friends-of-friends* (FOF) algorithm and compare the mass distribution for all the different models. The shape of the dark matter infall patterns and the distortions in the redshift space of the $\xi(\pi, \sigma)$ are also analysed. These tests are intended to be applied in the forthcoming deep galaxy catalog DES (Dark Energy Survey), where the volume of the survey is big enough to detect differences in the dark energy parameter w from statistical measurements.

Values of the Mangetic Field and Brightness Temperature of the Region of Active Galaxy Nuclear Radioemission as Testing Method for the Cosmologies Models

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Values of the magnetic field and brightness temperature from region of active galaxy nuclear radio-emission were calculated in the context of theory synchrotron emission taking into account self-absorption. Strong dependence of given variables on the choice of cosmological model is shown. Thus, the cosmological model defining method is formulated basing on the galactic's nuclear magnetic field and brightness temperature measurements.

SOLAR PHYSICS

Numerical Modelling of MHD Waves Propagation in Sunspots: a 3D Case

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We present the first results of a 3D numerical modeling of linear wave propagation in a realistic sunspot model. In our simulations, a piston located beneath the photosphere generates MHD waves with a certain period. The ratio between the acoustic and the Alfvén speed, c_S/v_A, decreases from much larger than 1 below the photosphere to much lower than one in the chromosphere in our simulation domain. Waves propagate through the region where $c_S = v_A$, where mode transformation and coupling of different wave phenomena is observed. At somewhat higher region, where the $c_s \ll v_A$, the fast (magnetic) mode reflects back into the photosphere due to the vertical and horizontal gradients of v_A. The slow (acoustic) mode goes to the upper layers and increases its velocity amplitude. The Alfven mode is also generated by the piston and experiences transformations at the $c_S = v_A$ layer. Oscillations of the magnetic field obtained from the simulations are of order of a few Gauss in the photosphere, in agreement with observations.

Charge Transfer Processes between Solar Wind Ions and CH4 Molecules

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Experimental measurements of charge exchange between highly charged He^{2+}, C^{4+}, and O^{6+} solar wind ions in collisions with CH_4 molecules are presented for the collision energies in the energy range 200 - 2000 eV/u. The measurements were performed using the technique of Translational Energy Spectroscopy which relies on measuring the change in the kinetic energy of the impact ions as the result of the collision. This change in the kinetic energy allows us to infer the electronic states of the electron transferred from CH_4 to the impact ion and to quantitatively estimate state selective electron capture cross section. High velocity impact ions leave CH_4 ionized with possible dissociation. Relative importance of dissociative and non-dissociative states of the ionized CH_4 as well as various electronic states in which the electrons are captured into have been measured as a function of the collision energy. Despite an exorbitant variety of possible electronic transitions that can potentially take place only a very limited number of them are participating in charge transfer, which confirms a highly selective nature of charge transfer processes.

Type III-like bursts in the decameter range

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Since 1960s, Type III bursts with large drift rates in the frequency range 100-900MHz have been reported. These bursts have frequency drift rates 2-6 times of drift rates of usual Type III bursts. In this paper we report about first observations of more than 1100 Type III-like bursts at frequencies 18-30MHz, which were carried out during summer campaigns 2002 - 2004 at UTR-2 radio telescope equipped with new back-end (DSP) with frequency resolution 12 kHz, time resolution 20 ms, 50 ms, and 100 ms and sensitivity 100 Jy., 60 channel spectrometer with frequency resolution 3 kHz, and time resolution 10 ms. The circular polarization was measured with the radio telescope URAN-2, which consists of 512 wideband (10-30MHz) dipoles. The measured drift rates (5-10MHz/s) and durations (1-2s) of these bursts are below the corresponding values (2-4MHz/s and 4-10s) for usual Type III bursts at decameter wavelengths. The Type III-like bursts had comparatively low fluxes of 10-50 s.f.u. Possible connection of these bursts with relativistic electron beams accelerated in solar flares is discussed.

Influence of the non-LTE Effects on the Solar Silicon Abundance

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This work presents investigations of the influences of non-LTE effects on the derived solar silicon abundance. We have collected most precise and up-to-date atomic data for neutral and singly ionized silicon and produced atomic model including data for 269 Si I and Si II fine-structure energy levels, approx. 400 bound-bound transition and 295 bound-free transition. In compliance with mentioned model we synthesized spectral line profiles in standard 1D (MACKKL, VALC etc) and new 3D solar photosphere models for the purpose of exploring influences of non-LTE parameters (granulation, convection etc) on a solar silicon abundance.

Comparative Small-Scale Magnetic Field Diagnostics in Solar Flares Using FeI Lines of Different Mutiplets

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Three solar flares were studied, of 25 October 2003, 5 November 2004 and 4 August 2005, of importance M1.8/2N, M4.1/1B and C8.4/1N, respectively. The Echelle Zeeman-spectrograms of the flares were obtained on horizontal solar telescope of Astronomical Observatory of Kyiv Shevchenko University. Four spectral lines of FeI multiplets Nos. 1 and 816 were used to diagnose the small-scale magnetic field structures, namely 5247.1, 5250.2, 6301.5 and 6302.5 Å. Each pair of green and red spectral regions has practically the same heights of formation and temperature sensitivities, but different Lande factors, that is important for small-scale magnetic field diagnostics.

We have compared the effective magnetic field strengths B_{eff} measured from 'center of gravity' of Stokes I+V and I-V profiles. In a case of weak or moderate magnetic field (< 1 kG), we can expect practically the same values of B_{eff} measured from each line. If true magnetic field is kG range and structured in form of any small-scale (spatially unresolved) features (perhaps flux tubes), we should obtain some differences of B_{eff} for lines with different Lande factors.

As to reality, we surprisingly found $B_{eff}(5247)/B_{eff}(5250) = 0.97 - 1.09$, but $B_{eff}(6301)/B_{eff}(6302) = 0.62 - 0.75$. First line ratio, taking into account the error bars, correspond to magnetic field of 'subkilogauss' range, whereas second one - of 'kilogauss' value. Perhaps, this results indicate essential magnetic field changes in vertical directions.

The First Steps of the Radio Astronomy in Częstochowa

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In the presented paper the technical construction of the radio telescope which collaborating with VLF 40 kHz spectrometer is presented together with results of sun crown signals measurements. Our radio telescope is still under construction. We are planing to extend observations and add another astronomical objects.

Structure and Shape of the Solar Corona During the Total Solar Eclipse on March, 29, 2006

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Structure and shape of the solar corona during the total solar eclipse on March 29, 2006 were studied. Corona on March 29, 2006 was classified as corona of the intermediate preminimal type with northern and southern polar ray systems over polar coronal holes and six streamers of different brightness, located in middle and low heliographic latitudes. It was found that all of coronal structural features have their counterparts on photosphere-chromosphere level at the limb or near it. The flattening index was found to be 0.16.

Solar Decameter Spikes

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High-frequency spikes have a narrow band ($\Delta f/f = 1 - 2\%$) and short duration ($\tau = 100msk$. Similar phenomenon in decameter range is called stria. Their properties are usually discussed when they are found in chains and form Type IIIb bursts. In the present report results of observations of the stria bursts out of the chains, or spikes, chaotically placed on dynamic spectrum are presented. More then 1000 of such bursts were analyzed during the Type bursts storm of July, 24 August, 03, 2002. Statistical analysis has shown that their average

duration and frequency width equal approximately to 1sec and 60 kHz correspondingly. But if the duration slowly increases with the moving off the active area from the central meridian, their frequency width remains almost constant. Average meanings of these values are close to parameters of striae in chains. We have not found dependencies of these bursts fluxes from observation frequency. A spike emission model in the assumption of fast electrons travel through the filamentary density irregularities in the solar corona is discussed.

Magnetic Field Measurements in a Limb Solar Flare: Observational Evidences to Small-Scale Cold Features with 2 kG Fields

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We study the X1.2 limb solar flare of July 14, 2005 using the Echelle Zeeman spectrograms obtained with horizontal solar telescope of the Astronomical Observatory of Kyiv Shevchenko National University. Our data related mainly to the low solar corona, about 2-10 Mm above the photosphere. Magnetic field measurements using the 'center of gravity' method based on Stokes I±V profile splitting of H-alpha 6563 $\AA$ line shows the moderate values of the averaged magnetic field strengths, up to 200-300 G. However, the detailed investigation of the line bisectors shows that their shape in some places does not corresponds the case of the homogeneous field. In particular, narrow spectral bisector splitting maximums were observed, and these manifestations indicate presence of small-scale strong fields of 2-2.5 kG related to any cold plasma volumes. Existence of such magnetic field in the corona presents a very sharp and interesting problem for theory of flares.

Fast Magnetic Field Changes in Sunspots

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We have analyzed a long series of magnetic field measurements in sunspots using Zeeman effect in FeI 5250.2 spectral line. The observations were carried out on horizontal solar telescope of the Astronomical Observatory of Kyiv Shevchenko National University. Dates of observations were 1, 3, 4, 5, 6 and 7 of July 2006 (AR 898) and 24, 26 and 27 of July 2006 (AR 901). Diameters of sunspots were in range 20-60 arc sec.

Three different methods were used:

a) Measurements in non-polarized light (Stokes I) and with reduction of Zeeman components via $\sigma \rightarrow \sigma$;

b) Measurements in Stokes V spectra and with reduction of Zeeman components via $\sigma \rightarrow \pi$;

c) with Skomorovskyy's mosaic and $\lambda/4$ plate and reduction of component as $\sigma \rightarrow \sigma$.

All data were reduced taking into account the long-term trends. After such reduction, the Fourier and autocorrelation analysis were applied to search short term variations. We found that observed amplitude of the magnetic field changes reach of 1-5 cT. The typical periods of changes was from 3-5 to 10-15 min.

HISTORY OF ASTRONOMY

The Jagiellonians and the Stars

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The importance of astrology at royal courts in England, France and Italy has been a subject of special study for a considerable time but the largest centre for astrological study in the fifteenth-century was the University of Cracow. The use of astrology at Jagiellonian courts in the fifteenth century is examined here.

Sponsorship of astrology is a feature of the Jagiellonian courts of central Europe (including both Bohemia and Hungary) and it is to the use and appeal of astrology in Poland and Lithuania in the fifteenth century. We present briefly the support granted to astronomers at Jagiellonian courts, the relationship between astrology and history, astrology and historians and the extension of astrological science to the Grand Duchy of Lithuania by the early sixteenth century.

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