Kyiv National Taras Shevchenko University
Department of Astronomy and Space Physics

15th Young Scientists Conference on Astronomy and Space Physics

Abstracts

Kyiv, 2008

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Preface

This year Young Scientists Conference on Astronomy and Space Physics is held for the fifteenth 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 1994-2007 participants from Ukraine, Russia, Poland, France, Germany, Spain, Sweden, Libya, Egypt, Japan, Finland, Turkey, China, Slovakia, Armenia, USA and other countries took part in Young Scientists' Conference.

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, 14

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

Section 'High-Energy Astrophysics'

14.45-15.00 Yuri Krivosheyev, G.S. Bisnovatyi-Kogan, A.M. Cherepashchuk, A.K. Postnov. *Monte-Carlo Simulation of SS433 Spectrum*

15.00-15.15 Vasyl Beshley, O. Petruk .*Surface brightness distribution of Synchrotron Emission of Supernova Remnants in X-rays*

15.15-15.30 Sergey Tsygankov, A.Lutovinov. *X-ray Pulsars with Space Observatories*

15.30-15.45 Yevgen Vovk, B.I. Hnatyk. *X-ray production in the Supernova remnant RX J0852.0-4622 (Vela Jr.)*

15.45-16.10 Tea-break

16.10-16.25 Piotr Konorski. *A Study of the Science Potential of the 'Lobster-Eye Wide Field X-ray Telescope*

16.25-16.40 Roman Krivonos, S.Yu. Sazonov, E.M. Churazov, M.G. Revnivtsev, R.A. Sunyaev. *Statistics of Local Hard X-Ray Selected AGNs: Clues for the CXB and Unification Model*

16.40-16.55 Iurii Sushch, B.I. Hnatyk. *Vela Supernova Remnant Evolution in the Inhomogeneous Interstellar Medium*

16.55-17.10 Igor Telezhinsky, B.I. Hnatyk. *Nonthermal Radiation from RX J0852.0-4622 (Vela Jr.)*

17.10-17.15 Anatoliy Vasylenko, A.V. Tugay. *Pecularities of Centaurus X-3 X-ray Radiation in 6.4-7.5 keV Region and Some Characteristics of Iron Emission Lines* (poster)

18.30-21.00 Excursion to Astronomical Observatory of Kyiv National University

Tuesday, April, 15

Section 'Variable Stars'

09.30-10.15 Elena Pavlenko. *Classical Novae in Hibernation and Active Post Nova States* (invited)

10.15-10.30 Anna Litvinchova, E.P. Pavlenko. *The Investigation of Light Variations of the Active Post-Nova CP Lac in 2006-2008 yrs*

10.30-10.45 Denis Samsonov, E. Pavlenko, I. Sliusarev. *Multicolor investigation of the microquasar V4641 Sgr in 2007*

10.45-11.10 Tea-break

11.10-11.25 Vitaliy Breus, I.L. Andronov. *Statistically Optimal Polynomial Approximation of Time Series. Application to Variable Stars*

11.25-11.40 Andrii Tkachenko, H. Lehmann, V. Tsymbal, D.E. Mkrtichian. *Ultra-High Gravity Darkening in the oEA Star RZ Cas*

11.40-11.55 Lukas Bukowiecki, G. Maciejewski. *Variable Stars in the Field of Open Clusters NGC 457*

11.55-12.10 Agata Rożek, R. Baranowski, P. Bartczak, et al. *Results of Radial Velocity Measurements for Pulsating Stars*

12.10-12.25 Stanislav Tkachenko, E. Pavlenko I. Sliusarev S. Artemenko. *Photometrical Study of the Microquasar SS 433 over Full Precessional Period in 2007*

Section 'Stellar Astrophysics'

14.00-14.45 Alexander Serber. *Cyclotron Radiation from Magnetic White Dwarfs and Neutron Stars* (invited lecture)

14.45-15.00 Agata Karska, M. Mikolajewski. *How do We Observe a Birth of Planetary Nebula? The Example of V886 Her*

15.00-15.15 Oleksiy Ivanyuk, Ya. V. Pavlenko. *The Models of MgH Lines in Arcturus Atmosphere*

15.15-15.30 Malchenko Svetlana. *Population of the Be Stars in the Young Open Clusters*

15.30-15.45 Maria V.R. Ledesma, R. Mundt, J. Eislöffel, W. Herbst. *Rotational Studies in the Orion Nebula Cluster*

15.45-16.00 Monika Adamów, A. Niedzielski. *Determining Effective Temperatures of Evolved Stars*

16.00-16.20 Tea-break

Section 'Physics of Interstellar Medium'

16.20-17.05 Bogdan Wszołek. *Clusters of Galaxies in Infrared Domain* (invited lecture)

17.05-17.20 Svyatoslav Zubrin, V.M. Shulga. *New Methanol Maser towards the Supernova Remnants Kes79*

17.20-17.35 Katarzyna Bryndal, B. Wszołek. *Search for New Spectroscopic Families among Diffuse Interstellar Bands*

17.35-17.50 Antonina Zamorina, R.A. Stepanov. *Magnetic Helicity from ISM Polarized Maps*

17.50-17.55 Karina Bączek, B. Wszołek. *Doppler Broadening of Diffuse Interstellar Bands* (poster)

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

Wednesday, April, 16

Section 'Solar System'

09.30-10.15 Lev Zelenyi. *Plasma Processes in the Earth's Magnetosphere* (invited)

10.15-10.30 Mihail Chernikov. *Dynamics of Cometary Shells of the Comet 17/P Holmes during Its Outburst*

10.30-10.45 Sergey Zaitsev, V.K. Rosenbush, N.N. Kiselev, F.P. Velichko. *Polarimetry of Jupiters Poles*

10.45-11.00 Sergey Velichko, F.P. Velichko. *Polarimetry and Photometry of comet 17/P Holmes*

11.00-11.15 Amin Rikhtehgar Ghiasi. *Computer Modeling of Light Scattering Using by Mie Theory*

11.15-11.20 Sergiy Kharchuk. *Dust Tail Modelling for Comet Hale-Bopp* (poster)

11.20-11.25 Jakub Szpulak, Lucyna Łaniak, M. Szczęśniak, R. Szczęśniak. *Detection and Analysis of the Jupiter Ionosphere Radiation* (poster)

11.25-11.50 Tea-break

Section 'Extrasolar Planets'

11.50-12.05 Olga Zakhozhay, A.P. Vidmachenko, V.A. Zakhozhay. *Expected Number of Accessible for Observation Circumsubstellar Discs in the Local Stellar System*

12.05-12.20 Mariusz Slonina, K. Goździewski. *Integration of ODEs by Means of High-Order Taylor Method. Dynamics of γ Cephei Binary System*

12.20-12.35 Arkadiusz Musieliński, K. Goździewski. *The Formation of Terrestrial Planets in a System with Jupiter*

12.35-12.50 Piotr Sybilski. *Kepler Mission: Detecting Extrasolar Planets via Eclipses Timing*

12.50-13.05 Wieńczysław Bykowski. *Exploring Extrasolar Planets with Photometry*

13.05-13.20 Kacper Kowalik, M. Pancisin, R. Pawlaszek. *Gravitational Instability in Protoplanetary Disks*

13.20-13.25 Mislav Balokovic, M. Kuerster. *Application of Heuristic Optimization Algorithms to Multiple-planet Radial Velocity Data* (poster)

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

Thurthday, April, 17

Section 'Extragalactic Astrophysics'

09.30-10.15 Piotr Flin. *Why to Study Shape and Orientation of Galaxy Structures* (invited lecture)

10.15-10.40 Tea-break

10.40-10.55 Evgeny Kurbatov. *The Star Formation in dSph Galaxies of M81 Group Stimulated by Tidal Action*

10.55-11.10 Rafał Pawłaszek, M. Hanasz. *Magnetic Reconnection in Astrophysical Disks*

11.10-11.25 Igor Zinchenko, L.S. Pilyugin. *Oxygen Abundances in High Luminosities Star Forming Galaxies*

11.25-11.40 Ibrahim Selim. *Galaxy Pairs in Compact Groups*

11.40-11.55 Amin Rikhtehgar Ghiasi. *Photometry of BL Lac 5C3-178*

11.55-12.00 Irina Kuvshinova, I.K. Rozgacheva. *Dynamics of the Intergalactic Medium in Rich Clusters of Galaxies* (poster)

12.00-12.05 Andrey Borisov. *The 2D Wavelet Analysis of Galaxy Distribution in Coma Cluster* (poster)

12.05-12.10 Zhaklin Martirosyan. *The Connection between the Morphological Types and the Spectra-Morphological Properties of Galaxies with UV-Excess* (poster)

12.25-12.30 Vitaliy Grytsyk, B.I. Hnatyk. *Supermassive Binary Black Holes in the AGNs* (poster)

Section 'Cosmology and Gravitation'

14.00-14.45 Sergio Colafrancesco. *Dark Matter Search through a Multifrequency Space Astronomy Strategy* (invited lecture)

14.45-15.00 Dmytro Iakubovskyi, A. Boyarsky, O. Ruchayskiy. *Lower Bounds on the Mass of Dark Matter Particles*

15.00-15.15 Piotr Skindzier, M. Kutschera, J. Jałocha-Bratek, Łukasz Bratek. *How Many Dark Matter Does Spiral Galaxies Need?*

15.15-15.40 Tea-break

15.40-15.55 Pavel Nakaznoy. *Rotation Curves of Spiral Galaxies in the Models with a Variable Cosmological Term*

15.55-16.10 Anatoliy Tugay. *Constraining Cosmological Parameters with VIRGO Data of Galaxy Clusters*

16.10-16.25 Stanislav Vinogradov, P. Berczik, A. Veles., M. Petrov. *Dynamical Detection of the Milky Way Dark Matter Halo Particles Mass Distribution*

16.25-16.40 Ganna Ivashchenko, V.I. Zhdanov. *Clustering and Velocities of Quasars from SDSS*

16.40-16.55 Mahmoud Reza Oshagh, Sepehr Arbabi-Bidgoli. *Trajectories of Test Particles around Three Types of Black Holes* (poster)

16.55-17.00 Anton Stupka. *Reduced Description of Stellar Dynamics by the Moments of Gravitation Field*

18.00-21.00 Conference Dinner

Friday, April, 18

Section 'Space Geophysics'

09.30-10.15 Anna Odzimek. *Observations of High-Altitude Atmospheric Discharges in Europe* (invited lecture)

10.15-10.20 Anna Odzimek, L.B.N. Clausen, V. Kanawade, et al. *SPARTAN Sprite-Watch Campaign 2007* (poster)

10.20-10.25 Olga Botygina, V.M. Reshetnyk. *Geometry Of Bow Shocks In The Solar Wind* (poster)

10.25-10.30 Vitaliy Shastun, O. Agapitov. *Propagation of the Fast MHD Wave in the Earth Magnetosphere Generated by Sudden Impulses in the Solar Wind* (poster)

10.30-10.35 Anastasiya Knurenko, V.M. Ivchenko, L.V. Kozak, V. Pilipenko. *The Near-Earth Magnetosphere Fluctuations Statistical Analysis by Interball Satellite Measurements* (poster)

10.35-10.40 Evgen Serdyuk, G. Milinevsky, U. Inan. *The project: ELF/VLF interferometer observations of the thunderstorm activity influence on the radiation belt of the Earth proposed by Prof. Umram Inan for realization partly at Vernadsky Ukrainian Antarctic Station* (poster)

10.40-10.45 Azizollah Azadmanesh, M.R. Gheitanchi, A. Eshaghi. *The 2003 December 26 Bam Earthquake (SE Iran) Inferred from the Aftershock Distribution Obtained from IGUT Data*(poster)

10.45-10.50 Sergii Pylypenko, L.V. Kozak. *Analysis of Spread and Dissipation of Inner Gravity Waves in Earth's Atmosphere* (poster)

10.50-11.15 Tea-break

Section 'Solar Physics'

11.15-11.30 Olena Andriets, V.G.Lozitsky. *Magnetic Field Measurements in a Weak Solar Flare by Photospheric and Chromospheric Lines*

11.30-11.45 Andrew Sukhorukov, N.G. Shchukina. *NLTE Formation of Solar Silicon Spectrum in Hydrodynamical 3D-model of Solar Photosphere*

11.45-12.00 Ievgeniia Sadovenko, M.I. Pishkalo. *Magnetic Field in the Solar Corona during the Total Solar Eclipse on March 29, 2006*

12.00-12.05 Roman Zhygalkin. *Solar Corona Photometry Observations* (poster)

12.05-12.10 Alberto Mario Perez Martinez. *Multiwavelength Study of Morphology and Lifetime of Bright Points in Coronal Holes* (poster)

12.10-12.15 Antonina Klyueva, N.I. Lozitska. *Time Delay of Forbush Decreations after Solar Flares* (poster)

Section 'Astrometry and Methods of Astronomy'

14.00-14.45 Svitlana Lytvyn, S. Bolotin. *Investigation of Differences in Realizations of Celestial Reference Frames Obtained by VLBI Analysis Centers*

14.45-15.00 Mykhailo Lytvyn. *New Permanent GNSS-Station Controlling Software*

15.00-15.15 Izabela Spaleniak, A. Richichi. *The VLTI Transfer Function: A Preliminary Study Of The AMBER+FINITO Case*

15.15-15.30 Anton Pomazan. *Calibration of Photometric System of the RTT150 Telescope*

15.30-15.45 Vitaliy Kryuchkovskiy. *Determination of Atmospheric Extinction for Photometry Observations at the RTT-150*

15.45-15.50 Andrew Simon, V.M. Ivchenko. *Photometric Field Nonuniformity of ST-8 CCD Camera* (poster)

15.50-15.55 Liene Osipova. *Possibility of the Near Earth Objects Distance Measurement with Laser Ranging Device* (poster)

15.55-16.00 Yuriy Babyk, V.Ya. Choliy. *Determination of the Station Coordinates Using GPS Satellite Single Frequency Doppler Signal* (poster)

16.00-17.00 Poster section + Tea-break

17.00-17.30 Official Closure

INVITED LECTURES

Cyclotron Radiation from Magnetic White Dwarfs and Neutron Stars

Alexander Serber

Institute of Applied Physics, Nizhny Novgorod, Russia

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Two lectures presenting a detailed overview of the theory of cyclotron radiation transfer and presure in plasmas on magnetic white dwarfs and neutron stars and discussing applications of this theory to interpretation of the observed radiation from these objects. The lectures cover the following topics:

1. Analytical non-LTE theory of cyclotron radiation transfer
2. Cyclotron radiation from polars and magnetic cataclysmic variables
3. Cyclotron radiation from isolated magnetic white dwarfs
4. Radiation-driven diskons - astrophysical objects of new type - and related objects
5. Effects of cyclotron-radiation pressure on plasma dynamics in accreting white dwarfs and neutron stars
6. Cyclotron harmonic lines in X-ray pulsar spectra.

Potentially Observable Effects around Black Holes: Gravitational Waves and Lensing

Roman Konoplya

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This lecture is an introduction to the two well-known effects around black holes: gravitational waves as a response of a black to external perturbations, and gravitational lensing. The summary of some recent results is given.

Classical Novae in Hibernation and Active Post Nova States

Elena Pavlenko

Scientific-Research Institute 'Crimean Astrophysical Observatory', Nauchny, Ukraine

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Classical novae display rare outbursts caused by the thermonuclear runaway in the outer layers of the white dwarf in close binary system. It is widely believed that outbursts occur once in 104105 years. The time between outbursts novae spend in hibernations in the sense of their activity. However some novae imitate the dwarf novae behavior displaying, however, more stunted outbursts in respect to the dwarf novae. The dwarf novae outbursts are caused by the thermal instability of the accretion disk. Until now the similarities of the dwarf novae and active post novae outbursts were based only on the statistical analysis of their outbursts frequencies. Here first the color-magnitude diagrams for selected dwarf novae and classical post novae that prove the common nature of their outbursts are presented.

Dark Matter Search through a Multifrequency Space Astronomy Strategy

Sergio Colafrancesco

Italian Space Agency Data Center, Frascati, Italy

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Dark Matter is the main massive component of the universe and yet its its composition is unknown because of its elusive nature. There are two main observational strategies to detect and probe the nature of Dark Matter: direct detection techniques, mainly provided in underground laboratories, and indirect detection techniques, mainly provided in space laboratories. In this lecture, I will discuss both techniques and I will then focus more on the most promising ones, i.e. indirect DM detection techniques.

In fact, the annihilation or the decay of DM particles provide a way to downgrade their elusive nature and hence to set up and observational strategy aimed to set constraints to their physical nature, or even to detect them in cosmic structures. The viable candidates for a cosmologically relevant form of DM (i.e., neutralinos, sterile neutrinos and axions) have, in fact, very different astrophysical signatures provided by their annihilation (for the case of neutralinos) and by their decay (for the case of sterile neutrinos).

Specifically, I will discuss here a multi-frequency astrophysical strategy to search for the electromagnetic signals produced by neutralinos and by sterile neutrinos in cosmic structures of the universe, from galaxies to galaxy clusters. I will first discuss the expected signals, and then the optimal laboratories (cosmic structures) suitable to probe their nature. I will finally discuss the experimental detectability of these DM signals in the light of the existing, coming and planned astrophysical experiments for the next decade, an epoch when astronomical, underground and fundamental physics efforts will synergically contribute in the challenge to unveil the elusive nature of Dark Matter.

Direct N-body Modelling of the Galactic Stellar Clusters Shape Parameters Evolution

Peter Berczik, M.I. Petrov, N.V. Kharchenko, A.E. Piskunov, S. Roser, E. Schilbach, R.D. Scholz

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We carry a set of high resolution ("star by star") N-body dynamical investigations to study the complex evolution of the stellar clusters dynamical shapes with different initial angular momentums on different galactocentric distances in our Milky Way.

We use for our high resolution N-body simulations the specially developed "phi-GRAPE" code (Harfst et al., 2007). The program was already well tested with different N-body applications, including the high resolution, direct study of the galactic center dynamical evolution with Binary (or Single) Black Holes (Berczik et al., 2005, 2006, 2007).

The present version of the code will be publicly available from the FTP site:
ftp://ftp.ari.uni-heidelberg.de/pub/staff/berczik/phi-GRAPE-cluster/

The serial and parallel program written from scratch on ANSI-C and using the standard MPI library for communication. For the integration of the star cluster dynamical evolution inside the galactic potential task we use the parallel GRAPE systems developed in ARI (GRACE - year 2005) and MAO (GRAPE/GRID - year 2007).

All the models lost more when $\approx 50\%$ of the cluster initial mass during the first 1 Gyr of the cluster evolution in the external gravitational field of Galaxy. The shape of star clusters during his dynamical evolution is usually oblate with typical semi axis ratios $[b/a] \approx 0.8 - 0.9$ and $[c/a] \approx 0.6 - 0.7$. All the models show the quite strong tiraxiality features. The most models have the average triaxiality parameter $T \approx 0.4$.

Observations of High-Altitude Atmospheric Discharges in Europe

Anna Odzimek

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In Europe, scientific research on high-altitude atmospheric discharges known also as Transient Luminous Events (TLEs) began on a larger scale with the start of the EU "Coupling of Atmospheric Layers" project (CAL), in 2002. These phenomena interested scientists working in various fields of science including atmospheric and ionospheric physics, meteorology, or gas discharge physics. The CAL scientists implemented the EuroSprite observation campaigns in successive years in collaboration with and support from a number of meteorological, geophysical and astronomical institutions from Europe and beyond. This lecture presents briefly the history and organization of the EuroSprite and other TLEs observation campaigns in Europe to date, run both by institutions and individuals, and summarizes their results, to the best knowledge of the author. The aim of the lecture is to attract attention to the topics related to the TLEs phenomena and encourage expanding TLEs observations over Europe.

Why to Study Shape and Orientation of Galaxy Structures

Piotr Flin

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My talk is presentation of the problem from the point of view of an observer. I point out close connections between these parameters and cosmology. The main subject will be discussion of the origin and evolution of galaxies and structures formed from galaxies. The influence of different factors on determination of structure shapes and orientation will be shown.

Clusters of Galaxies in Infrared Domain

Bogdan Wszołek

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Jagiellonian University Astronomical Observatory in Cracow, Poland

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Far infrared emission (FIR) of the sky is generally thought to originate mainly in cold dust grains distributed in the space. The FIR emission of galaxy clusters may be considered therefore as a tracer of the dust constituent of the intracluster medium. The presence of dust distributed in the intergalactic medium of galaxy clusters is of considerable interest for several studies.

Based on IRAS and COBE/DIRBE sky surveys we found excess far infrared emission from the sky area occupied by galaxy cluster ZW5897. Very good positional and extensional coincidence between infrared source and ZW5897 may suggest intracluster origin of the emission.

We studied the distribution of stars and galaxies in the cluster area using Palomar Survey data to check whether these distributions are affected by local dust. We found that a foreground obscuring cloud, overlapping accidentally the distant cluster ZW589, may be responsible for some part of the detected far infrared emission.

On the Energy Accumulation for Solar Flare

Valery Kryvodubskyj

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The mechanism of solar flare which provides an accumulation of energy in the form of electric charged particles in a region of reduced turbulent conductivity of solar plasma had been considered. It is known that turbulent motions lead to decrease of the plasma conductivity [Vainshtein S.I., Zel'dovich Ya.B., Ruzmaikin A.A.: 1980, Turbulentnoe Dinamo v Astrophizike, Moscow; Krause F., Radler K.-H.: 1980, Mean Field Magnetohydrodynamics and Dynamo Theory, Berlin]. Therefore, the macroscopic turbulent (eddy) conductivity, σ_T, in the photosphere and the convective zone (where the turbulent motions are developed in enough degree) is considerable smaller (by 2-4 orders of magnitude) than the usual (gaskinetic) conductivity, σ ($\sigma_T \approx 10^9 - -10^{11}$ CGSE, ($\sigma \approx 10^{11} - -10^{15}$ CGSE [Krivodubskij V.N.: 1982, Soln. Dannye 7, 99; Krivodubskij V.N.: 2005, AN 326, 61]). Next the significant process, which we taken into account, is well known magnetic suppression of turbulent motions. Since the strong magnetic field suppressed the intensity of turbulence in most degree, the favourable conditions in the solar plasma for turbulent decrease of conductivity must be in the places with weak magnetic field (e.g., near the neutral magnetic field lines in the points of magnetic reconnection). Essential local decrease of the turbulent conductivity in this place causes the decreased density of electric currents $\vec{j} = \sigma_T \vec{E}$, circulated in the vicinity of active centre. An electric field $\vec{E}$ firstly excites due to the convective motions (with velocity $V \approx 10^3$ cm/s) across the weak large-scale magnetic field $B \approx 3$ G: $E = VB/c \approx 10^{-7}$ CGSE. For electric current density in vicinity of the active centre (where $\sigma_T \approx 5 \cdot 10^{10}$ CGSE) we had derived estimation $j = \sigma_T E \approx 5 \cdot 10^3$ CGSE, that matches with current estimations by Severnyj [Severnyj A.B.: 1965, Izv. CrAO 33, 34] ($j \approx 3 \cdot 10^3$ CGSE) who had investigated the gradients of magnetic fields in sunspots. This current leads to the accumulation of the electric charges at the boundaries of the limited region with decreased turbulent conductivity, $\sigma_T \approx 3 \cdot 10^9$ CGSE. As a result, the electric field amplifies here to the critical value, $E \approx 6 \cdot 10^{-6}$ CGSE. Subsequent electric breakdown in this region, in accordance with the Giovanelli's discharge model of solar flare [Giovanelli R.G. 1947, MNRAS 107, 338; 1948, MNRAS 108, 163], will be serve as a trigger mechanism for releasing of the accumulated energy. For comparatively short time (about a week) the accumulated space charge voltage may be as large as 10^6 volts ($\approx 3.3 \cdot 10^6$ CGSE), sufficient for the breakdown in the plasma region.

This paper was supported partly under grant F25.2/094 of The State Fund for Fundamental Research of Ukraine.

HIGH-ENERGY ASTROPHYSICS

Monte-Carlo Simulation of SS433 spectrum

Yuri Krivosheyev[1], G.S. Bisnovatyi-Kogan[1], A.M. Cherepashchuk[2], A.K. Postnov[2]

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We present our results of Monte-Carlo simulation of SS433 spectrum. In this massive binary system a supercritical regime of accretion onto the relativistic object, which is most likely a black hole, is maintained. It leads to the formation of a supercritical accretion disk with two strongly collimated relativistic jets. Observations of INTEGRAL in 2003 and INTEGRAL/RXTE in 2004 provided us with experimental data, in particular, the spectrum in X-ray. A model of the object, based on the observational data, was created, and Monte-Carlo simulation was used to obtain spectrum, suggested by this model. Comparison with the experiment allowed us to define physical parameters of SS433. Results of simulation for various angles of observation and for two slightly different models are presented and their properties are discussed

Surface brightness distribution of Synchrotron Emission of Supernova Remnants in X-rays

Vasyl Beshley[1], O. Petruk[2]

[1] *Lviv National University, Lviv, Ukraine*
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Nonthermal emission of supernova remnants (SNRs) in X-rays are quite important source of information about physical processes related to electron acceleration on the strong nonrelativistic shocks. Amplification of the interstellar magnetic field (ISMF) by strong shock, properties of particle injection, the role of nonlinear acceleration effects are besides the actual tasks stressed by the scientific community.Electrons accelerated to their maximum possible energies radiate synchrotron emission in X-rays. The surface brightness distribution of such emission from SNR in uniform interstellar medium (ISM) and uniform interstellar magnetic field is modeled. The model accounts for properties of electron injection (evolution of injection in time and its dependence on obliquity of the shock) and electron radiative losses. Profiles of surface brightness are calculated for different photon energies, different values of maximum energy and different projection angles. The limitations on theory coming from our calculations are discussed.

X-ray Pulsars with Space Observatories

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We present the results of broad band observations of X-ray pulsars with INTEGRAL and RXTE observatories. It is shown that the pulsed fraction dependence on the energy has an obvious feature near the cyclotron energy. Moreover, the pulse fraction is highly dependent on the pulsars luminosity.

X-ray production in the Supernova remnant RX J0852.0-4622 (Vela Jr.)

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RX J0852.0-4622 (Vela Jr) is a shell-type SNR with a radius of 1o located in the Galactic plane in projection on the larger Vela SNR. It was discovered in X-rays with ROSAT and in VHE gamma-rays by the HESS. Till now the common opinion was that Vela Jr is young (about 1000 yrs) SNR at the free expansion stage, located within the older larger Vela SNR at distance of about 250-300 pc. But the recent investigations indicate that the more promising scenario corresponds to distance to Vela JR of about 1 kpc (Berezhko et al., astro-ph/0707.4661) . For the "distant" solution the hydrodynamical model is considerably different: SNR should be at adiabatic or even radiative stage and till now we do not have a self-consistent model of Vela Jr. Therefore the main goal of our work is the building up the self-consistent model of SNR Vela Jr, including observable fluxes of hard X- and gamma-ray radiation.

To this end we use the new approximate analytical method for description of transition from adiabatic to radiative stage in 3D Supernova Remnants (SNRs), developed in works of Dr. Hnatyk B. and Telezhynsky I. Conditions that are formed at the end of this stage lead to X-ray fluxes, considerably different from the case of free expansion or adiabatic stages of SNR evolution.

A Study of the Science Potential of the 'Lobster-Eye Wide Field X-ray Telescope

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The 'Lobster-Eye' Wide-Field X-ray Telescope (LWFT) is a novel telescope proposed for inclusion as a core payload element on the Russian-German space mission Spectrum-RG. The proposed instrument has a huge instantaneous grasp (collecting area * field-of-view solid angle). Relative to other instruments configured as All-Sky Monitors (ASM) LWFT offers an order of magnitude improvement in both point-source sensitivity and angular resolution, providing a very impressive capability for studying time-variable phenomena and surveying the sky in the soft X-ray band. Presenting results of simulating the type of science data possible to be obtained with the LWFT and using this to study the feasibility of different science projects such as identifying clusters of galaxies and studying the variability of supermassive black holes.

Statistics of Local Hard X-Ray Selected AGNs: Clues for the CXB and Unification Model

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We determine the cumulative spectral energy distribution of local AGN in the 3-300 keV band and compare it with the spectrum of the cosmic X-ray background in order to test the widely accepted paradigm that the CXB is a superposition of AGN and to place constraints on AGN evolution.

Vela Supernova Remnant Evolution in the Inhomogeneous Interstellar Medium

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Vela supernova remnant (SNR) has some peculiarity in the shape, especially in the X-ray brightness contrast between North-East (NE) and South-West (SW) of Vela SNR. In our work we propose the new hydrodynamical model of Vela SNR based on the dominated role of ISM cloud evaporation in the evolution of SNR. We show that evaporation of clouds has an important influence on shock dynamics. A new self-consistent model of Vela SNR correspond to new value of explosion energy $E = 10^{51}$ erg and uniform intercloud medium with density $n = 0.05cm^{-3}$. Brightness and radius difference between NE and SW parts of SNR are explained by enhancement concentration of clouds in NE region (close to the Gum Nebula boundary).

Pecularities of Centaurus X-3 X-ray Radiation in 6.4-7.5 keV Region and Some Characteristics of Iron Emission Lines

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We analyzed XMM-Newton observation of high mass x-ray binary system Cen X-3. The observation were carried out at 27.01.2001 with the duration of 68 kiloseconds. This time corresponds to orbital phases between -0.03 to +0.33 (end of eclipse). Iron lines Fe I K alpha, Fe XXV and Fe XXVI at energies 6.41 keV, 6.69 keV, 6.98 keV were founded out in the spectrum of our source. Intensity variation of these lines during orbital motion was also detected. The largest variation was detected for Fe I K alpha line, what agrees with the results of other authors (Ebisawa at al. 1996). This results agrees with the model in which Fe I K alpha line appears in hot plasma in accretion disc and highly ionized iron lines in outer regions of binary system.

In our report the review of Ukrainian Virtual Roentgen and Gamma-ray Observatory VIRGO.UA work results since 2006 will also be presented.

VARIABLE STARS

The Investigation of Light Variations of the Active Post-Nova CP Lac in 2006-2008 yrs

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We present multicolor photometry of the Nova Lacertae 1936 = CP Lac in 2006-2008. Observations have been carried out in the Crimean astrophysical observatory in the primary focus of the 2.6-m Shajn telescope and with the Cassegrain 38-cm (K-380) telescope. We study shot-term and long-term light variations on the time scale of minutes - years. CP Lac showed small-amplitude outbursts of dwarf nova-type. We found that CP Lac in 2006 was brighter on 1^m in comparison with 2007-2008. The amplitude of the light variations in 2006 is growing with decreasing of the wave-length. The most significant period in 2006 is 0.011 day (16 min). We present the result of investigations of the quasi-periodic and periodic light variations connected with different sources in the binary system.

Multicolor investigation of the microquasar V4641 Sgr in 2007

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The microquasar V4641 Sgr is the brightest object from the family of known microquasars that most of time spends in quiet state but unpredictably could display the outbursts. The CCD multicolor monitoring of the microquasar V4641 Sgr has been carried out with 38-cm telescope of the Crimean astrophysical observatory in VR Johnson Cousins system. The data covered several orbital (2.817 day) cycles over 28 nights in 2007. The light and color curves are presented and analyzed. The data display the strong ellipsoidal brightness modulation with orbital period. Comparing the ellipsoidal light curve with these published in literature we found both similarities and some distinction. We found some evidence on the presence of the bright spot on accretion disk surrounding the black hole in the binary system that was not detected earlier. No possible outbursts were registered during the time of observations.

Statistically Optimal Polynomial Approximation of Time Series. Application to Variable Stars

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The algorithm of determination of the statistically significant degree of the mathematical model (and of the corresponding degree of polynomial) is discussed using 4 different statistical criteria: ANOVA (ANalysis Of VAriances) with a corresponding Fischer's criterion; "3-sigma" limit for the last coefficient; maximum of the "signal-to-noise" ratio and minimum of the error estimate of the smoothing function. The algorithm is realized in the computer programs "Variable Stars Calculator" (VSCalc) and ZTShServer. In the VSCalc, the optimal polynomial

fitting was applied for determination of the best fit and of the parameters of extrema (minima or maxima). In the ZTSh server, this algorithm is used for smoothing of the values of background and comparison stars during photometric or photopolarimetric observations. The method was applied to magnetic variable stars AM Her and BY Cam. VSCalc is freely available from the Internet site of the Ukrainian Association of Variable Stars Observers (http://uavso.org.ua) and the author's sites (http://uavso.org.ua/breus, http://uavso.pochta.ru/breus).

Ultra-High Gravity Darkening in the oEA Star RZ Cas

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We report on first results obtained in the framework of modeling oEA stars. oEA stars are a recently established class of Delta Sct like pulsators where the pulsating components are the primaries of semi-detached Algol-type systems. Input to the models is delivered by photometric and spectroscopic observations as well as by 3D-hydrodynamic simulations. We investigated an extended time series of 498 high-resolution spectra of the oEA star RZ Cas taken in 2006 to determine its system and atmospheric parameters. Radial velocities and orbital solution were obtained from cross-correlation techniques. Starting values for vsini, stellar radii, and the atmospheric parameters like Teff, logg, limb darkening and gravity darkening were obtained from uvby photometry and mean disentangled spectra taken from the out-of-eclipse phases. The disentangled spectra also delivered the elemental abundances. A fine tuning of the model was done using the Shellspec code which was modified according to the special needs. In the result we determined an unusual large gravity darkening exponent of 0.5 for the secondary of RZ Cas which value is far above the theoretical limit given by the von Zeipel law. The derived anomalous high correlation of surface brightness to surface gravity is in a very good agreement with previously obtained results measured from the ellipticity effects in the light curve of RZ Cas and be explained by the enthalpy transport associated with the mass-outflow from the secondary filling its Roche lobe.

Variable Stars in the Field of Open Clusters NGC 457

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The results of a recent CCD photometry survey of variables in a $72' \times 48'$ field covering the open cluster NGC 457 are presented.

Results of Radial Velocity Measurements for Pulsating Stars

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We present examples of radial velocity measurements done with the Poznan Spectroscopic Telescope (PST). Observations on PST are run on regular basis since August 2007. The PST is a binary telescope with two 40 cm mirrors of a Newtonian focus, connected by an optic fiber with an echelle spectrograph. Radial velocity measurements are done for δSct, βCep, classical cepheids, eclipsing binaries and other types of variable stars. Echelle spectra reduction and radial velocity measurement are performed with Image Reduction and Analysis Facility (IRAF). Final results are obtained from cross-correlating of stellar spectra either with radial velocity standards or the object star itself using IRAF-fxcorr procedure.

Photometrical Study of the Microquasar SS 433 over Full Precessional Period in 2007

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The microquasar SS 433 remains to be one of the puzzling object in the Universe since its discovery in 1977. On the basis of the Crimean astrophysical observatory we had been carried out the continuous photometric observation of SS 433 in BVR Johnson-Cousins system with 38-cm telescope in 2007. We observed this object over 120 nights and thus covered full precession period. The dense row of homogeneous observations allowed us to calculate more precisely the values of orbital and nodal period and perform the mean profile of light and brightness curves for the orbital, nodal and precessional periods. The peculiarities of the orbital profile in different precessional phases are analyzed and discussed. We also detected a few events connected with outbursts of SS 433.

STELLAR ASTROPHYSICS

How do We Observe a Birth of Planetary Nebula? The Example of V886 Her

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Photometric and spectroscopic observations of V886 Her during the last century led to the conclusion that the star belongs to a group of post-AGB objects. Such objects are low-mass stars in a state of transition between asymptotic giant branch (AGB) and planetary nebula (PN) phases, surrounded by a great amount of matter expelled during AGB.

Our photometric $UBV(RI)_C$ observations of V886 Her in 1998-2004 show a gradual decrease in m_V brightness and irregular changes with amplitudes up to 0.4 mag in V. We notice a significant blueing of (U-B) index and a reddening of (B-V) index which are affected by a substantial hydrogen emission continuum. Our prismatic spectra also show the increase in $H_/alpha$ flux which is almost twice as big as in 1997. It suggests a rapid growth of the ionized volume of hydrogen and the beginning of a fast transition of V886 Her between a protoplanetary and a planetary phase.

The Models of MgH Lines in Arcturus Atmosphere

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Synthetic spectra are computed in the framework of the LTE (local thermodynamic equilibrium) for PDK model atmosphere (Petreman et al. 1996). The research is based on Visible and Near Infrared Atlas of the Arcturus Spectrum by Hinkle et al. (1994) in the wavelength range 4925-5225$\AA$ & 5375-5625$\AA$. To simulate theoretical spectra we use line lists computed by Hill at (2006), Kurucz (1995) and Weck(2004). The goal of our work is to determine of most appropriate MgH line list for studing absorption spectrum of Arcturus. The method is:

a) computation of MgH absorption in Arcturus atmosphere;
b) instrumental profile normalization;
c) comparison of calculated theoretical and observed spectra;
d) determination of the best model.

Theoretical and observed spectra of Arcturus with marked MgH lines are presented in plots.

Population of the Be Stars in the Young Open Clusters

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High and medium resolution spectroscopy of the Be star and double stellar system in the young open clusters NGC 869 and 884, NGC 6913, NGC 6871, NGC 7160 and NGC 7419 were carried out. High resolution spectroscopy of 53 stars in the Hα region and 29 stars in the region 4400-4960 $\AA$ with the medium resolution were obtained. Spectra of 54 B and 52

Be star were studied. Teff, log g and Vsini were determinate using medium resolution spectra. One new Be star was found, some star showed complex variability of the Hα line profile, which is characteristic to be a close binary systems. The others demonstrates long term V/R variability of the emission peaks that can be easy described by the one arm oscillations in theirs envelopes. Our clusters survey confirm approving that classical Be stars appear at an age of 10 Myr, and reach the maximum abundance in the age interval 14-25 Myr.

Rotational Studies in the Orion Nebula Cluster

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Variability studies are an important tool for investigating physical properties of young stellar objects. In particular, the rotational period of young late-type stars and brown dwarfs (BDs), can be obtained from photometric light curves, due to the rotational brightness modulation by surface features (i.e. magnetic cool spots).

We report on the first results of a rotational period study of young low-mass stars and brown dwarfs in the Orion Nebula Cluster (ONC). This study is based on a deep photometric monitoring campaign, over 19 nights, using the Wide Field Imager (WFI) camera on the 2.2 meter telescope in La Silla, Chile (field size 34 x 33 arcmin).

Accurate photometry in the I band of about 3000 stars in the field was performed, within a magnitude range between 13 and 21 mag. Time series data with about 90 data points were obtained. Power spectral analysis using both Scargle periodogram and the CLEAN algorithm was performed to search for evidence of periodic variability. False-alarm probabilities, using different techniques have been calculated.

489 objects present detectable periodic light modulations. Besides the periodic variable stars, many of the studied objects present high level non-periodic brightness modulations in their light curves. The χ^2 variability test performed on all the monitored stars resulted on 808 objects found to be variable although non-periodic. The spatial distribution of the variable objects was analyzed. In addition, we studied the dependence of the periodic brightness modulation on the magnitude (mass) of the objects and performed a comparison of the found period distribution with those of higher-mass objects in the ONC (Herbst et al.2002).

Determining Effective Temperatures of Evolved Stars

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There are various ways of determining the temperature of stars. Using high resolution spectra allows one to determine a star's spectral type, luminosity class, metallicity and temperature with high precision. However, this method consumes both time and resources, especially with respect to the large sample of stars. On the other hand, photometry is less precise, yet easier to obtain. With the availability of BVJHK magnitudes from Tycho and 2MASS catalogues, combined with information about parallaxes and proper motions, one can easily estimate temperature in a quick and efficient manner. The ongoing project " PennState/Torun Centre for Astronomy Search for Planets around evolved stars" requires a sample of a few thousand southern FGK giant stars. In this report, I will show how to select these types of stars using publicly available data.

PHYSICS OF INTERSTELLAR MEDIUM

New Methanol Maser towards the Supernova Remnants Kes79

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The new methanol maser was detected at 95 GHz (8_0 - 7_1 A^+ transition) towards the Supernova remnants (SNR) Kes79. The detected maser is placed in the region of SNR interaction with the ambient molecular cloud. Complex multi-peak form of the spectral line of thermal radiation of CS molecule in maser direction is an evidence of active processes in this region. This can be the reason of maser further "disappearance".

Search for New Spectroscopic Families among Diffuse Interstellar Bands

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Using relatively high resolution optical spectra of many bright, hot and reddened stars we have measured spectral parameters of ten prominent Diffuse Interstellar Bands (DIBs) at: 5705, 6367, 6376, 6379, 6597, 6614, 6661, 6699, 6702 and 6770 angstroms. Searching for the mutual correlations between intensities of different DIBs we tried to classify them into spectral families, i.e. into groups of bands originated by the same carrier. Limited quality of observational data allowed us to achieve reasonable results only for the strongest DIBs.

Magnetic Helicity from ISM Polarized Maps

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We try to detect magnetic helicity of interstellar magnetic fields from observations of radio continuum emission - radio polarization maps and Faraday rotation measures. An interstellar medium model is constructed for magnetic fields with driven magnetic helicity value and spectral properties. Several artificial distributions of random and helically twisted magnetic field components, thermal and relativistic electron densities are considered in a data cube with 256^3 mesh points.Polarized intensity and Faraday rotation measures are calculated for various input model parameters. We evaluate relation between magnetic helicity and correlation degree of radio maps (Faraday rotation measure and polarized intensity map). The analyzes of model results shows, that obtained effect is mostly determined by a large-scale magnetic field component.

Doppler Broadening of Diffuse Interstellar Bands

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For few dozens of hot reddened stars we have measured half widths and equivalent widths of the interstellar sodium D1 line and of the narrow and relatively strong diffuse interstellar band at 6196 $\AA$. We have searched for mutual correlations between intensities of the both lines and we found that the widths of the diffuse band does not follow the corresponding widths for D1 line.

SOLAR SYSTEM

Dynamics of Cometary Shells of the Comet 17/P Holmes during Its Outburst

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Photographic observations of the comet 17/P Holmes with the usage of 500-mm telescope (Voronezh, Russia) were performed. 13 observations of the comet during first 8 nights after its outburst are analyzed. Typical brightness distribution in the coma and expansion velocity of the cometary shells are estimated. Four jets are detected. Original methods for estimation of brightness of the images and size of shells are proposed.

Polarimetry of Jupiters Poles

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Since Lyots observations, many authors have considered that polarization of Jupiters north and south poles was positive. It means that the direction of electric vector is at right angle to scattering plane. But in 1988 Chigladze has found that at very small phase angles (less then 1°) turning of polarization plane took place, and polarization became negative. We examined this effect in July 2007. Polarimetrical observations of Jupiters poles were carried out at phase angles of 0°.330°.62. In this work we present results of these observations confirming the fact of turning of polarization plane of Jupiters poles at very small phase angles. Mechanism of the phenomena is discussed.

Polarimetry and Photometry of comet 17/P Holmes

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Photometry and polarimetry of short-period Jupiters family comet 17/P Holmes (period of rotation near 10 year) were carried out from October 27 to November 5, 2007. Comet was observed with 0.7-m telescope of Institute for Astronomy of Karazin Kharkiv National University. The telescope was equipped by a single-channel photometer-polarimeter. Continuum narrow-band filters and emission filters of C3 and C2 species were used. Linear polarization of the comet was observed in blue continuum through aperture of 20 arcsec and in red continuum (WRC filter) through aperture of 20 and 88 arcsec. Aperture dependence of polarization in WRC showes changes from -0.78% to -1.10% for 88 and 20 arcsec, respectively. Spectral gradient of polarization dP/dl equal to 0.16% per 1000Å. From the photometric observations we calculated gas and dust production rates of the comet. Gas production rates equal to log $Q(3)$ = 24.00mol/s, $logQ(2)$ = 25.08 mol/s and $logQ(3)$ = 24.07 mol/s, $logQ(2)$ = 25.10 mol/s under the delivered to comet distance delta=1.62 .u. the diameter of diaphragm log p equal to 4.59 km and 5.02 km, respectively. The obtained values are close to usually observed for dust-rich comets. Dust production rates Afp in three band of continuum are:

$log(Afp(3650\mathring{A}))$ = 4.70 cm, $log(Afp(4845\mathring{A}))$ = 4.80 cm, $log(Afp(6840\mathring{A}))$ = 4.74 cm and $log(Afp(4845\mathring{A}))$ = 5.10 cm, $log(Afp(6840\mathring{A}))$ = 5.06 cm for diaphragms of $33''$ and $88''$, respectively. The obtained values are about of one and a half degree value bigger then for well known dust-rich comet Halley ($log(Afp(6840A)) = 3.45cm$). The color UC-BC of comet 17/P Holmes is $0^m.22$.

Computer Modeling of Light Scattering Using by Mie Theory

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The purpose of the given paper is to model the light scattering on separate spherical particles or in a system of interacting particles, based on the classical Mie theory. As it is known, analytical expressions are found for the derivatives of commonly used Mie scattering parameters, in particular for the absorption and the scattering efficiencies, and for the angular intensity function. They are based on the analytical derivatives of the Mie scattering amplitudes and with respect to the particle size parameter and complex refractive index. These derivatives are given with respect to the total number density, to the medium radius and spread of the distribution, and to the refractive index. In the case of the system of interacting particles - this is a random, but densely packed medium. It is supposed that it is practically impossible to get an analytical solution to this problem of scattering in a medium, therefore, it is essential to find the solution by using the Mont-Carlo method, i.e. by launching many separate waves in the medium, and calculating the scattering of each wave on each particle and its re-scattering on each subsequent particle. Calculations under the standard Mie formulae undergo two modifications in this case:

1. In contrast to approximation in the far-field zone, which is what is usually done by scientists, we should use a suitable common solution in the near-field zone.
2. Mie formulae should be rearranged in the form most effective for calculations with multiple computations (reducing expenditure of computer computation time). The final purpose of this modeling of light scattering on spherical particles based on Mie theory is to compute radial and angular intensity dependence and to construct a method for the acceleration of the computation process.

Dust Tail Modelling for Comet Hale-Bopp

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Comet Hale-Bopp is one of the most known comets of 20th century. It showed a wide bright dust tail. Modelling, that is fitting of structure of a dust tail, is carried out on the basis of acceptance of some physical, chemical and dynamic properties of the dust particles. The used model of a dust tail is dynamic, based on a Monte-Carlo method. To simulate the dust tail the trajectories of each individual particle are traced. The system of the differential equations is solved for this purpose. Also fragmentation processes are considered in the model. Then obtained cometocentric coordinates of particles are projected on the sky plane. The simulated tail was compared with an image of the tail of the comet, obtained with a dust continuum filter centered at 647nm (FWHM=10nm). The best model parameters and a set of modelled isophotes are the result of our investigation.

Detection and Analysis of the Jupiter Ionosphere Radiation

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In the presented paper the technical documentation of the RJ 1.1 Receiver radiotelescope and a short description of the antenna is given. Additionally, example of the Jupiter ionosphere radiation measurement is also included.

EXTRASOLAR PLANETS

Expected Number of Accessible for Observation Circumsubstellar Discs in the Local Stellar System

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At present time, important characteristics about Local stellar system have being obtained (LSS). The star clusters catalogue belonging to the LSS, Kharchenko N.V. et al (2005), mass function of stars and substars which are located in the Solar environment, Zakhozhay V.A. (2007) are obtained. Star and substar formation rates for the last 60 million years, Zakhozhay V.A. (2007) and substars cooling-down rates with different mass, Pisarenko A.I. at al (2007) are evaluated. Using this data in the frame of star and substar uniform distribution in LSS, the expected circumsubstellar discs maximum number in the few kiloparsec radius as a function of distance and age were calculated. Obtained results will be use for the analysis of existing observed data about circumsubstellar discs abundance.

Integration of ODEs by Means of High-Order Taylor Method. Dynamics of γ Cephei Binary System

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Taylor series method is the oldest and one of the most efficient and accurate methods of numerical integration of Ordinary Differential Equations (ODEs). Its modern and very useful implementation is the *Taylor* package by Á. Jorba and M. Zou. In this work, we compare the Taylor series algorithm with other integration methods, such as the Bulirsh-Stoer-Gragg extrapolation scheme (`BSG`) or the Everhardt integrator (`Ra15`). We test the standard and user-defined step size control. The Taylor series method is applied to study the N-body dynamics of Jupiter-like planets in the extrasolar γ Cephei binary system. The equations of motion are expressed with relative Poincaré variables. The results of our simulations demonstrate that the Taylor method usually may compete with the standard methods of integrations of ODEs. It is especially useful for integrations which require extended arithmetic precision.

The Formation of Terrestrial Planets in a System with Jupiter

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Is there any terrestrial planet around Sun-like star? This question still has no definite answer. Hence, should we wait till someone discovers such objects? Of course, no! With appropriate formation theory and computer codes, we can simulate the origin of such planets. With accord to current planet formation theory, Jovian planets form rapidly, while the creation of Earth-like and terrestrial planets takes much longer time. It is believed that this process relies on a "coagulation" of relatively small planetesimals. Hence, we can predict which extrasolar planetary systems with already detected Jupiter planet may also emerge Earths in

stable orbits. In this talk, I would like to present and discuss the results of many simulations performed with the help of the Mercury code by John Chambers (1999). These simulations concern the τ^1 Gruis system with Jupiter planet of 1.2 M_J mass, and on 2.5AU quasi-circular orbit.

Kepler Mission: Detecting Extrasolar Planets via Eclipses Timing

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The area of research in extrasolar planets appears to engender a great deal of interest nowadays and numerous observations continue to be conducted in this field. It seems that it is only a question of time before the second Earth is discovered. Timing and eclipses have been well known for years, but when combined with exoplanets and recent space missions, new possibilities arise. In my presentation the potential of the method as well as a special case of the satellite mission Kepler are elaborated on.

Exploring Extrasolar Planets with Photometry

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Searches for and follow up studies of exoplanets are among the hottest topics in astrophysics of last 15 years. In spite of what is usually meant not only the world largest telescopes are suitable for this kind of research. In my presentation I will review possibilities for smaller telescopes to deliver important observations. I will focus on photometry of transiting exoplanets with millimagnitudo precision using amateur-size optical telescopes. I would like to analyze it on the example of 20 cm SAVS telescope of Torun Center for Astronomy in Piwnice (Poland).

Gravitational Instability in Protoplanetary Disks

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It is well known that outskirts of accretion disks may be gravitationally unstable. Gravitational instability (GI) in a Keplerian disk sets in where the sound speed c_s, the rotation frequency Ω, and the surface density Σ satisfy Toomre criterion.There are two possible and interesting outcomes of GI:

1. *Highly unstable case.* When the disk forming gas cools fast enough the disk fragments and forms clumps, which may lead to direct gaseous planets' formation. Moreover, the interaction between gas and dust particles causes the latter to drift towards the peaks of density and pressure. High concentration of planetisimals may become gravitationally bound and form protoplanets.

2. *Self–regulatory case.* The observational data proves that accretion disks are likely to maintain $Q \sim 1$. Therefore a *feedback loop* may exist. When GI sets in, the disk can attempt to regain stability by rearranging its mass or by heating through dissipation of shocks. The resulting self–sustained state of gravitoturbulence is an interesting case, while it provides high efficiency of angular momentum transport with respect to α–disks theory.

I will hereby present the results of numerical simulations of GI performed during "Supercomputing & Numerical Techniques In Astrophysics Fluid Flow Modeling" winter school in Evora, Portugal 2008. We used the *Pencil* code to follow the evolution of GI into the gravitoturbulent state or planetary formation as described by Gammie (2001, ApJ).

Application of Heuristic Optimization Algorithms to Multiple-planet Radial Velocity Data

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We present our work on application of some heuristic optimization algorithms to radial velocity data from multi-planet extrasolar systems. The aim is to find an optimum fit for the whole system simultaneously, thus avoiding any assumptions about the correctness of previously found planets. In this form, the fitting procedure translates to a global optimization problem with a large number of degrees of freedom. Complexity of the parameter space rules out the standard methods of optimization, but heuristic algorithms were found to perform efficiently on this problem. The algorithms in question are the genetic algorithm and the Metropolis algorithm. These algorithms are following the principles of nature that are known to be working from experience, but there is no rigorous mathematical proof that they will be successful in any particular run. We investigated which control variables could be adjusted to optimize the performance of the algorithms. Several modes of operation were identified using artificial data of various quality and with various planetary system configurations. Some new options were implemented to further increase efficiency, and the algorithms were mixed to utilize the specific advantages of each algorithm. The programs were then used on previously published radial velocity data, to demonstrate their applicability to real data analysis.

EXTRAGALACTIC ASTROPHYSICS

The Star Formation in dSph Galaxies of M81 Group Stimulated by Tidal Action

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The influence of gravitational tidal action on the star formation history of dwarf spheroidal (dSph) galaxies is investigated. For this research the galaxies of M81 group are taken due to well defined distance and dynamical parameters of group.

Magnetic Reconnection in Astrophysical Disks

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Evolution of many astrophysical phenomena involve disk structures confined in magnetic fields. If we also consider topology of magnetic field lines it is plausible that it may come to configuration where current sheets may rise and magnetic reconnection may occur.

In theory of a fast galactic dynamo proposed by Parker (1992) magnetic reconnection is required as dissipation process transforming small-scale magnetic structures into large-scale magnetic field configurations. Moreover, it has recently been proved that sufficient enough reconnection of magnetic field lines may also prevent magnetorotational instability in accretion disks, which is believed to be main process of angular momentum transfer.

During my talk I will present results of resistive MHD simulations of Parker and Balbus-Hawley instabilities using Piernik-MHD code that is developed in NCU.

Oxygen Abundances in High Luminosities Star Forming Galaxies

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We search the oxygen abundances in high luminosities star forming galaxies at redshift $z < 0.4$. Determination of metallicity based on SDSS spectra of HII region in 150 galaxies. The abundances determinations are based on ff relation between auroral and nebular oxygen line fluxes and Te method. We found the maximum value of the oxygen abundance in star forming galaxies to be 12+log(O/H) 8.5.

Galaxy Pairs in Compact Groups

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The effect of galaxy interaction on star formation in dense environment through the far-infrared emission (FIR) of galaxies has been investigated using data of Hickson Compact Groups (HCGs). We have identified 470 galaxy pairs with proximity criterion $cr \leq 390$, and 358 galaxy pairs with (rp) less than 100 Kpc and $V \leq 350$ km/s. We identified 41 close galaxy pairs with projected separations (rp) less than 25Kpc and difference in velocity $V \leq 100$ km/s. The star formation rate (SFR) of galaxies in galaxy pairs is found to be enhanced for close galaxy pairs. The large fraction of star formation activity is probably due to the activity in the exchange of matter between the companions. The catalogue of galaxy pairs in HCGs has been established.

Dynamics of the Intergalactic Medium in Rich Clusters of Galaxies

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The catalogue of clusters of galaxies with cooling flows (CF) is composed. The statistical analysis of the catalogue is realized. The following anticorrelations are found: $log(L_{\mathrm{H}\alpha}/L_0) = 12.73 \pm 4.09 - (0.48 \pm 0.36) log(L_{\mathrm{x}}/L_0)$, for a case, when $log(L_{H\alpha}/L_0) > 7$, and $log(L_{\mathrm{H}\alpha}/L_0) = 8.19 \pm 0.85 - (0.19 \pm 0.08) log(L_{\mathrm{x}}/L_0)$, for a case, when $log(L_{\mathrm{H}\alpha}/L_0) < 7$, here L_{x} x-ray luminosity, $L_{\mathrm{H}\alpha}$ optical luminosity, L_0 luminosity of the Sun. Appearance of border $L_{\mathrm{H}\alpha} = 10^7 L_0$ is probably connected by that the contribution to luminosity $L_{\mathrm{H}\alpha}$ areas of star formation in CF with characteristic mass $10^6 - 10^7$ mass of the Sun can give. The quantitative analysis of a hypothesis convection mixed inhomogeneous intergalactic gas, which is heated by infrared irradiation galaxies in core of cluster, is realized. This mechanism of heat functions for a long time and with help this mechanism it is possible to explain both existence of hot plasma, and its slow convective mixing in clusters. Convective cells heated in environment core of cluster, drifting to periphery of cluster and emit thermal energy. This energy is source of observed x-ray luminosity L_{x} and heating environment plasma. The gravity forces convective cells to drift to the centre of cluster. Recombination irradiation sells used for the check conformity this model heating intergalactic gas of the observations. The basic equations of this model are given. The solution as the profile of temperature displaced along radius is found.

The 2D Wavelet Analysis of Galaxy Distribution in Coma Cluster

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The paper reports about the 2D analysis of galaxy distribution in a search for long-range correlations between galaxies positions in Coma cluster, based on the use of the wavelet transform. The wavelet method is an objective, multi-scale technique, which gives the position and dimension for each individual feature detected. It is currently performing the analysis on data from A Catalogue of magnitudes, colours, ellipticities and position angles for 6724 galaxies in the field of the Coma cluster (Godwin J.G., Metcalfe N., Peach J.V., Mon. Not. R. Astron. Soc. 202, 113 (1983)). The catalog presents galaxies in a field 2.63 degrees square to a magnitude limit 21. In this work the image of the cluster is transformed in flat manifold of points with Cartesian coordinates: Θ is the angle distance of a galaxy from the cluster center, φ is the pole angle of a galaxy. The flat manifold is analyzed by means of the 2D wavelet, called Mexican Hat. The main result of this analysis is the discovery of the substructures in the distribution of galaxies. This substructures consist of local densities in the galaxy distribution and approximately make fragmental rings.

The Connection between the Morphological Types and the Spectra-Morphological Properties of Galaxies with UV-Excess

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The correlation between morphological types and spectral-morphological (SM) properties of galaxies with UV-excess was found. The distribution of the mean geometrical angular diameters of galaxies by the morphological types was determined. It is shown if the mean geometrical diameters of galaxies increase then the relatively quantity of spectral morphology "d" increases. By the same rate of the UV-excess radiation intensity the grouping morphological classes of galaxies are as follows: St+C, E+Sph, S+L and Ir. It is found that the mpg/$\square''$ and mJ/$\square''$ with high UV-excess is more than the same value for galaxies with low UV-excess. It is shown, that the mpg/$\square''$ and mJ/$\square''$ of galaxies with a spectra morphology of type "s"+"sd"+"ds" is more than that for the type "d".

Supermassive Binary Black Holes in the AGNs

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It is believed that most galaxies have supermassive black holes at their centers. Since large galaxies are the result of frequent mergers, supermassive binary black holes (BBHs) with a sub-parsec scale separation are inevitably formed in the Universe. The robust signature of BBH in the AGN is the periodic synchronous flux variations in different bands - from radio to X- and gamma-ray range. As an example, the blazar OJ 287 - candidate for a supermassive BBH - shows periodic light variations on a timescale of 11-12 yrs. In our work we investigate the three candidates for supermassive BBH: OG 287, 3C 66A, 3C 273 and analyze the existing observational data in optic and X-ray range in order to estimate possible correlations between light curves in both bands.

COSMOLOGY AND GRAVITATION

Lower Bounds on the Mass of Dark Matter Particles

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The recent data on dwarf spheroidals (dSph) implies much stronger lower bounds, compared to the original Tremaine-Gunn limit. We generalize the previous results for the DM models with non-thermal primordial velocity distributions and obtain the lower bounds on masses in various models, using the available observational data on dSph's.

How Many Dark Matter Does Spiral Galaxies Need?

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Last years Λ-CDM hypothesis seams to be good proved not-bayronic component of Universe mass-energy density. Standard models of distribution and evolution mater in Universe implies that spiral galaxies should be surrounded by large CDM halo. None the less distribution of CDM in galaxies halo implies many difficulties in explaining that properties and origin.

We test an hypothesis of spherical symmetry of CDM distribution in spiral galaxies and found that 17% of galaxies fail that test. Subsequently we obtain mass distribution by applying Iterative Spectral Method. We also take into consideration HI distribution and He to total mass distribution. The results reveal that for 3 galaxies with full data distribution mass-to-luminosity ratio in K-band is lower than 4. This seams to suggest that in spiral galaxies amount of CDM might be smaller (if any) than predicted by classical models.

Rotation Curves of Spiral Galaxies in the Models with a Variable Cosmological Term

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The Newtonian limit of the Einstein equations with a variable cosmological term, which is linearly dependents from the Ricci scalar, is considered. The results are equations for Newtonian potential and effective particle gravitational acceleration. It is shown, that in such model the equation for acceleration of particle in gravitational field has additional term, which is proportionate to logarithmic derivation of matter density that allows describing observational data of galaxies rotation curves without recourse of dark matter with a satisfactory result. The possible generalizations of linear dependence are reviewed.

Constraining Cosmological Parameters with VIRGO Data of Galaxy Clusters

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Clusters of galaxies are powerful cosmological tools. Several independent methods can be used to constrain the cosmological parameters Ω_m and σ_8 from cluster X-ray observation. XMM-Newton observations are used for obtaining X-ray cluster surveys, measuring of cluster space density and X-ray luminosity function. I propose to unify and enlarge different XMM data sets of galaxy clusters with Virtual Roentgen and Gamma-ray Observatory VIRGO.UA. Cosmological parameters estimated from X-ray clusters data could be compared with the same parameters derived from peculiar velocities of spiral galaxies.

Dynamical Detection of the Milky Way Dark Matter Halo Particles Mass Distribution

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We carry out the high resolution (few million particle) dynamical N-body simulation to investigate the charecteristic of "dark matter" particle mass distribution in our Galaxy. With such a resolution we are able to study the galactic disc artificial dynamical "heating" and determine the upper limit for the mass of possible dark matter particles. We also present our new GRAPE-TREE code which we use for the simulation on our GRAPE/GRID cluster: http://mao.kiev.ua/golowood/.

Clustering and Velocities of Quasars from SDSS

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We present a method of determination of the cosmological parameters using the local isotropy of quasar clustering. Using the Fifth Data Release of the SDSS we obtained the following estimation of the quasars peculiar velocity dispersion $v_{pec} = 762 \pm 221$ km/s for the slope of the real-space correlation function $\gamma = 1.9$.

Trajectories of Test Particles around Three Types of Black Holes

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In this study we use the Euler-Lagrange formulism to find the trajectories of test particles around three types of black holes, and solve the equations numerically. In classical mechanics we find the Lagrangian easily by subtracting the potential energy from the kinetic energy. But in GR we do not have a potential energy and the curvature of the space time determines the motion of the particles. Here the Lagrangian can be found from the kinetic energy, and the kinetic energy is obtained from the metric. We have used three types of metrics (Schwarzschild, Kerr and Kerr-Newman) to find the Lagrangian and then solve the Euler- Lagrange equations by the numerical method in Maple 10 and plot the results.

Reduced Description of Stellar Dynamics by the Moments of Gravitation Field

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Because of absence in action of the nonrelativistic gravitating system of time derivatives from scalar potential φ, as the generalized co-ordinate of the gravitation field (GF), application of the Hamilton method for description of the GF mechanics is impossible. In the paper is proposed transformation of the generalized co-ordinate of the GF, that is based on equation of continuity $div\vec{j} + \partial_t \rho = 0$ and is similar to fixing of Hamilton gauge of the electromagnetic field. For association of consideration of the systems of charges and the masses a charge proper to mass is introduced $\sqrt{G}m$. $\int dVdt \left(div\vec{j} + \partial_t \rho \right) \lambda = 0$ is subtracted from action, with condition $\partial_t \lambda = \varphi$, and a potential vector is introduced $\vec{A} = \nabla\lambda$. Transformed action for the GF is $S = \int dVdt \left(\rho\upsilon^2/2 + \vec{j}\vec{A} - \left(\partial_t \vec{A}\right)^2 /8\pi \right)$. Bogolyubov reduced description method of nonequilibrium systems allowed to build time equations for the GF strength $\vec{E} = -\partial_t \vec{A}$, vector potential $\vec{A}$ and their second correlation moments. Equation $\partial_t \vec{E} = 4\pi\vec{J}$ gives the zeroing equilibrium solution, unlike the Poisson equation, that removes mathematical troubles of the Jeans theory (Jeans swindle). Expressions for kinetic coefficients through the Green function of the currents are found. As main Hamiltonian of GF $H_0 = \frac{1}{8\pi} \int d\vec{x} \left(-\vec{E}^2 (\vec{x}) + \int d\vec{x}' \omega^2 (\vec{x} - \vec{x}') \vec{A}^2 (\vec{x}') /c^2 \right)$ is chosen, that gave the known spectrum of eigen frequencies of the system ω_k, in particular, in approximating of Maxwellian gas and long waves - Jeans increment. Perturbation of the system by a current with mentioned increment is studied. Integral dispersion equation for the GF in the case of the homogeneous and isotropic nonstationary system is found, when Maxwellian gas of stars is characterized by a temperature, and GF - by the second correlations. Increment of correlations at such perturbations is $\omega \approx 2\Omega$. Equilibrium value of the GF correlations is $(EE)(k) = -4\pi T$.

SPACE GEOPHYSICS

SPARTAN Sprite-Watch Campaign 2007

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Nine PhD students and SPARTAN (Centre of Excellence for Space, Planetary and Astrophysics Research Training and Networking) fellows implemented and participated in the SPARTAN Sprite-Watch campaign to observe Transient Luminous Events (TLEs) and contribute to the EuroSprite 2007 observation campaign. One SPARTAN Sprite-Watch team installed an observation system at the IMWM High-Mountain Meteorological Observatory at Mount Sniezka (50.73 N, 15.74 E, 1603 m) to run first optical observations of TLEs from Poland during two weeks in July 2007. A second team made observations during four weeks in July/August 2007 in Leicester, UK, using two remotely controlled systems installed by the Danish National Space Centre/Technical University of Denmark at two locations in France. The observations made at Sniezka resulted in the first video recordings of red sprite phenomena from Poland on the night 20/21 July 2007. The Sprite-Watch teams have been supported by the Polish Institute of Meteorology and Water Management (IMWM) who provided continuous information on the meteorological conditions over Poland and Europe and hosted the Polish campaign at Sniezka.

Geometry Of Bow Shocks In The Solar Wind

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Coronal mass ejections (CMEs) are powerful eruptions that can blow up to 10 billion tons of the Sun's atmosphere into interplanetary space. Traveling away from the Sun at speeds of approximately 1000 km/sec.CMEs can create major disturbances in the interplanetary medium and trigger severe magnetic storms when they collide with Earth's magnetosphere. CMEs change the parameters of plasma and magnetic field and generate shock waves. We find characteristic parameters of bow shocks, such as spatial size, normal to front, speed of distribution etc. Solar ejections are the most powerful drivers of the Sun-Earth connection. The purpose of work is research of properties of CMEs by measurings of spacecraft STEREO, ACE, CLUSTER, WIND and GEOTAIL.

Propagation of the Fast MHD Wave in the Earth Magnetosphere Generated by Sudden Impulses in the Solar Wind

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A planetary magnetic field provides an effective barrier for the solar wind plasma. The solar wind and Earth magnetic field system interaction changes dipole magnetic field configuration to a magnetospheric cavity with antisunward magetotail. The solar wind is supersonic plasma flow (solar wind velocity is more then alfvenic and magnetosonic waves velocity) therefore the bow shock (standing shock wave) is observed around Earth. The solar wind plasma dynamic pressure and pressure of the magnetosphere magnetic field are in dynamic equilibrium. During interaction with solar wind inhomogeneous Earth magnetopause became a source of MHD waves. We study propagation of fast MHD wave generated by sudden impulses in solar wind parameters (SI). The numerical simulation of wave front propagation is carried out. Fast MHD wave forms 3D propagation configuration. Results of the numerical simulation were verificated by observations of spacecrafts in the Earth magnetosphere (Goes, Cluster, Polar, and Geotail) and in the solar wind (Wind and ACE). Parameters of fast shock waves in the solar wind and of the fast MHD wave in the magnetosphere (velocity and pitch angle) were determined with using of minimum variance analysis of magnetic filed (MVAB), de Hoffmann-Teller analysis and timing technique.

The Near-Earth Magnetosphere Fluctuations Statistical Analysis by Interball Satellite Measurements

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The Sun wind global processes of interaction with geomagnetosphere can be successfully described by numerical magneto-dynamical model. However small scale plasma instability, triggering substorms and big-scale processes interaction in different magnitosphere domens, which have significantly different physical characteristics, are quite difficult to describe. The non-linear theory of magnetosphere-ionosphere interaction should be used to describe these processes. Investigation of probability density function features for magnetic field fluctuations in the Earth's magnetosphere on different time scales from data of satellite Interball is carried out. Changes of shape and parameters of probability density function for the periods before and during the rapid change of magnetic field were studied. As an evolution characteristic on the different time scales the changes of maximum probability density function values P(0) were investigated. The data obtained from Interball satellite during 1996 and 2001 were used to investigate the peculiarities of the Earth magnetosphere tail's magnetic field fluctuations probability density function. The presented data resolution varies from 0.03 to 0.02 s and from 0.062 to 0.063 s. The proposed approach is universal and can be used for the analysis of fluctuations of other parameters being of other nature.

The project: ELF/VLF interferometer observations of the thunderstorm activity influence on the radiation belt of the Earth proposed by Prof. Umram Inan for realization partly at Vernadsky Ukrainian Antarctic Station

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The establishment of the ELF/VLF receiver system at the Vernadsky Station (Ukraine) and the Palmer Station (U.K.) for interferometry measurements of ducted whistlers and other magnetospheric waves (e.g., mid-latitude hiss and chorus during disturbed times) is realized by Stanford University. An experimental study is proposed of thunderstorm coupling to the radiation belts, characteristics of lightning flashes which lead to upward electrodynamic coupling, ionospheric variability and parameters, and global lightning and climatology. Precipitation of radiation belt particles by whistler waves launched by lightning discharges will be measured via the associated localized and transient disturbances of the lower ionosphere, which are sensed remotely by means of their effect on the phase and amplitude of very low frequency (VLF) signals propagating in the nearby earth-ionosphere waveguide. Broadband ELF/VLF radio atmospherics measurements are proposed to be used for the measurement of characteristics waveforms of spherics associated with upward electrodynamic coupling phenomena such as sprites and terrestrial gamma-ray flashes. Recent results indicate that such measurements can be uniquely useful as a proxy measure for occurrence of intense upward coupling phenomena on a global scale.

The 2003 December 26 Bam Earthquake (SE Iran) Inferred from the Aftershock Distribution Obtained from IGUT Data

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On 26 December 2003 at 1:26 UTC a large earthquake Mw 6.6, (seismic moment 6-910 18 Nm) struck the city of Bam in the Kerman province, southeast Iran. USGS reported that its hypocenter was located at 29.004°N, 58.337°E (IIEES was located at 29.08°N, 58.38°E) and depth 10 km. Teleseismic focal mechanism from several groups show a steeply - dipping right lateral strike-slip fault. This earthquake caused catastrophic damage to Bam city and neighboring villages about 40000 people were killed and about 30000 people injured. The historical citadel Arg-e-Bam which is the biggest adobe complex in the world and the world heritage site by UNESCO, was damaged by this earthquake. We investigate the hypocenter of aftershocks of the Bam earthquake by using a temporal seismic network in and around the city of Bam. A seismic network consisting of 7 temporal stations was installed on 12/28/2003 by a team of geophysics institute of the University of Tehran, and continued until 2/26/2004. Each station was equipped with digital PDAS seismometer. In this study, we obtained the distributions of aftershocks by Hypo71 software. The hypocenters have distributed linearly over about 16-20 Km in parallel with a line 3-4 km west of the geological Bam fault and extend from the south of Bam city(southeast railway station) to the heavily damaged area in the eastern part of the city including the historical mud brick citadel Arg-e-Bam. The aftershocks show that the Bam earthquake occurred not in the Bam fault, but in the new fault parallel geological Bam fault with distance 3-4 km at west. The relation of the active fault plane to the surface features is still a matter of debate. Some authors suggest the Bam-Baravat scarp is the only active fault. Other authors suggest the co-seismic slip occurred on 2

different faults, a vertical strike-slip fault located west, beneath the co-seismic surface breaks, and a reverse fault dipping 60° westward that reaches the surface 4 km to the east, beneath the Bam-Baravat escarpment. In this study the aftershocks distribution don't confirm the evidence of two distinct faults. In this study, we determined focal mechanism of mainshock using world stations that were read the polarity of first P motion on vertical components well.

Analysis of Spread and Dissipation of Inner Gravity Waves in Earth's Atmosphere

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Upper Earth's atmosphere represents a very difficult dynamical and photochemical system, which works under strict solar control. The solar activity is a basic but not alone factor, which disturbs a state of the near Earth space. At the present it is known observational data about an existence of the lithosphere-troposphere-atmosphere connection: the troposphere phenomena, anthropogenic influences and tectonic processes become locally apparent in both the neutral atmosphere and ionosphere.

The most possible mechanism of energy transmission from below to up is atmosphere gravity waves (AGW). This work is devoted just to spread and dissipation of AGW. Amplitudes of the AGW were analyzed at different characteristics of both the wave itself and neutral atmosphere parameters. We considered the AGW spread in non-isothermal atmosphere with taking into account dissipation processes (viscosity, heat conductivity). In the analysis the atmosphere had been divided onto a range of thin isothermal layers and the solutions between those were combined by means of condition of equality of vertical shifts on the bounds of layers. The temperature changes were determined using the model MSIS'90.

The dissipation of AGW at altitudes of 100-120 km was found. This altitude depends significantly on the coefficients of viscosity and heat conductivity, which are connected in its turn with the temperature of atmosphere.

On Selected D-day and Q-day in the Magnetosphere

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Disturbed day (D-day) and quiet day (Q-day) are deduced from the diurnal variation of cosmic ray intensity. Results show that all solar parameters, solar activity indices as well as proton fluxes except total interplanetary magnetic field (IMF-Btot) are inversely related with amplitude of cosmic ray intensity during D-day and quiet day Q-day respectively. Solar wind plasma speed accompanied by Bz component of IMF changes the direction of the effects of solar activity and rectified IMF (Btot) during D-day and Q-day. Polarity of IMF is the source which may be availed to examine the differences between D-day and Q-day. The highest D-day is associated with ground level enhancement. Neglecting some exceptions, it can be noted that cosmic ray intensity follows usual anti-correlation with sunspots much better during D-day than during Q-day. Solar wind and temperature are in higher magnitude during D-day than Q-day whereas the case of Solar wind density is different. The Solar wind temperatures ordered serially from the highest to the lowest ones are found mostly associated with cosmic ray decreases referring occurrences during D-day. Most of the D-days are occurred before evening and after evening time while Q-days are occurred before and after evening time spontaneously. Ground level enhancements coincide with the highest High Amplitude Event (HAE) but Forbush decreases do not with the lowest Low Amplitude Event (LAE). Phase shifts are not regular but phase shifts are oppositely active during D-day and Q-day respectively.

SOLAR PHYSICS

Magnetic Field Measurements in a Weak Solar Flare by Photospheric and Chromospheric Lines

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The solar C4 flare of July 28, 2004 was investigated using spectral data obtained with Echelle spectrograph of horizontal solar telescope of Astronomical Observatory of Kyiv Taras Shevchenko National University. Stokes I±V profiles of FeI 6302.5 and H lines were studied to measure the magnetic field strength B in area of the flare and near-placed regions. The following line ratios B(6302.5)/B(Hα) were found: about 1.4 in area of bright flare knot and of 3-4 outside flare. First line ratio may be explained as a result of the essential magnetic line inclination ($\sim 55^\circ$) to the line of sight by negligible vertical magnetic field gradient ($\partial B/\partial B \approx 0$). Second ratio indicates the negative ($\partial B/\partial B < 0$) gradient. As to theory, we can expect of $\partial B/\partial B < 0$ due to rapid decreasing of the gas pressure from photospheric to chromospheric levels. From this point of view, obtained data give an evidence to possible local magnetic field amplification in area of the flare. Similar effects were found also by other authors in other more powerful flares. Such local magnetic field peculiarities present a very interesting problem for theory of flares.

NLTE Formation of Solar Silicon Spectrum in Hydrodynamical 3D-model of Solar Photosphere

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We present the second part of our investigations of the solar silicon spectrum. We have theoretically studied the formation of silicon lines of major astrophysical interest. Computations were performed in a realistic 3D hydrodynamical model of the solar photosphere in the so-called 1.5D approach, i.e., neglecting the horizontal transfer. As a major result, solar Silicon abundance was also retrieved. We found that departures from LTE influence the abundance value of Silicon. Since Silicon is a reference point in the most recent review of solar abundances, our results suggest that this scale may be shifted.

Solar Corona Photometry Observations

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We present the primary results of photometric observation of Solar corona. The observational data obtained during the Solar eclipse of March 29, 2006, using Canon EOS-1 Ds Mark II.

Magnetic Field in the Solar Corona during the Total Solar Eclipse on March 29, 2006

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Magnetic field in the solar corona during the total solar eclipse on March 29, 2006 was calculated using a potential model. Photospheric magnetic fields observed at the John M. Wilcox Observatory at Stanford were used. Source surface radius was varied in the range from 2 to 4 solar radii. Coronal magnetic field charts at the source surface were plotted. Positions of coronal magnetic neutral lines at the solar limb during the eclipse were determined and compared with coronal streamer positions. Three-dimensional structure of the calculated coronal magnetic field was analyzed and compared with observed coronal structure during the eclipse.

Time Delay of Forbush Decreations after Solar Flares

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The times of powerful solar flares and Forbush effect arising moments were compared. We studied the variations of delay time of Forbush decreasing during 23th solar activity cycle. It was shown that average delay time is 3 days for solar activity minimum and 6 days - for maximum. We conclude that sharp decreasing of cosmic rays intensity can be caused due to shake wave in solar wind. From our investigations follows that dimension of area of intensive modulation for cosmic rays with energy from 500 MeV to 20 GeV varies in range from 2 a.u.(minimum activity) to 4 a.u. (maximum). This conclusion agrees with results of spacecraft measurements on dimension changes of whole heliosphere during solar cycle.

ASTROMETRY AND METHODS OF ASTRONOMY

Investigation of Differences in Realizations of Celestial Reference Frames Obtained by VLBI Analysis Centers

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Various VLBI analysis centers which participate in ICRF-2 IVS/IERS Working Group provided their results of source coordinates estimation as well as time series of sources positions variations. In this presentation we discuss results of a comparison of these catalogs.

New Permanent GNSS-Station Controlling Software

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Recently at Main Astronomical Observatory a new GNSS-station controlling software NovaRS has been developed. This program works with OEMV3 based GPS/GLONASS NovAtel receivers (ProPak-V3, DL-V3). Software controls receiver operation mode and converts on-the-fly raw data to RINEX format. Now two permanent GNSS-stations GLSV (Kiev-Golosiiv) and PRYL (Prylyky) powered by NovaRS.

The VLTI Transfer Function: A Preliminary Study Of The AMBER+FINITO Case

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Long-baseline interferometry plays an important role in a stellar astronomy, because it enables observations with high angular resolution. Its success and accuracy depends on a careful calibration of both interferometer response and atmospheric properties. This requires observations of calibrator stars (with known parameters) among observations of scientific target stars. The comparison of the observed and theoretical parameters of the calibrators provides reliable properties of the targets. We worked on two instruments mounted on ESO/VLTI: the beam combiner AMBER and the fringe tracker FINITO. The considered parameter was the transfer function of the interferometer, which gives the information about the quality of the observed fringes. We analyzed the interferometric data carried out from January to July 2007. Our results emphasize the necessity of very frequent calibrations and observations of transfer function variations through each night. The more stable the transfer function is, the more reliable scientific results can be obtained. The correlation between the transfer function of our instruments and the ambient conditions (seeing, coherence time, wind intensity and directions, as well as airmass), occurred to be difficult to carry out in a convincing manner. More observations in the FINITO+AMBER configuration are of great importance for further study. Nevertheless our results can become useful in development of the second generation of interferometric instruments.

The author acknowledges funding by the European Interferometry Initiative (EII) and OPTICON (an EU funded framework program, contract number RII3-CT-2004-001566)

Calibration of Photometric System of the RTT150 Telescope

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The research is based on observations made at the Russian-Turkish telescope RTT 150 (D=150 cm). It is a part of photometric processing of the CCD images of asteroids obtained earlier. Calibration of instrumental photometric system of the telescope was made using measurements of stars in Landolt Standard Fields and SDSS catalogue, observed from 2005 till 2007. Color factors for transformation of brightness from the instrumental into the VRI bands of Johnson-Cousinse system and ugr bands of SDSS are calculated.

Determination of Atmospheric Extinction for Photometry Observations at the RTT-150

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The purpose of the research was to determine the contribution of atmospheric extinction into absolute photometry at the Russian-Turkish Telescope (RTT-150). The telescope of a diameter of 1.5 m is situated at the height of 2490 m (Bakyrlytepe mounting) in the Southern Turkey. Landolt standards specially observed at different zenith distances during different seasons of 2005-2007 were used for the research. The results, as extinction coefficients of the first and second order, were calculated using classical γ-method for the standard R and V bands.

Photometric Field Nonuniformity of ST-8 CCD Camera

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We present the results of our investigations of the CCD matrix of AZT-8 telescope. This telescope is placed at Lesniki Observatory, which is an out-of-town station of Astronomical Observatory of Kyiv National Taras Shevchenko University. Investigations were carried out in the following way. We used two stars HD 241495 and TYC 1283-699-1 in the star-cluster NGC1817. They were moved along the matrix field in two dimensions and the difference of their magnitudes as a function of coordinates on the matrix was measured. The obtained results reveals the presence of such dependence with the amplitude of about $0.^m10 - 0.^m15$. The map of matrix sensibility was plotted.

Possibility of the Near Earth Objects Distance Measurement with Laser Ranging Device

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The orbit perihelion of a majority of minor planets is nearer from the Sun than the Earth's orbit. Observations are possible only in a small part of the orbit. Orbital elements of them cannot be determined accurately because we have only angular coordinates. The use of a laser ranging device for distance measurements will greatly improve the precision of determining orbital elements.

Determination of the Station Coordinates Using GPS Satellite Single Frequency Doppler Signal

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We used data from GPS satellite for determination of object motion using Doppler effect. The change of coordinates of Terskol observatory was obtained.

Table of Contents