GAMOW MEMORIAL
INTERNATIONAL CONFERENCE

"THE UNIVERSE OF GAMOW:
ORIGINAL IDEAS
IN ASTROPHYSICS AND COSMOLOGY"

ABSTRACTS

Odessa, August 16-22, 1999

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ABSTRACTS

Международная мемориальная конференция памяти Г. А. Гамова
"ВСЕЛЕННАЯ ГАМОВА: ОРИГИНАЛЬНЫЕ ИДЕИ В АСТРОФИЗИКЕ И КОСМОЛОГИИ"

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ТЕЗИСЫ

В настоящем сборнике представлены абстракты пленарных и секционных устных и постерных докладов, присланных на первую часть "Gamow Memorial International Conference", проходящей в Одессе с 16 по 22 августа 1999 года под названием "The Universe of Gamow: Original Ideas in Astrophysics and Cosmology". Вторая часть конференции под названием "Early Universe: Cosmological Problems and Instrumental Technologies" пройдет в Санкт-Петербурге с 23 по 26 августа 1999 года. Данная конференция является вторым, проводимым раз в 5 лет, научным форумом, посвященном Г. А. Гамову — выдающемуся физику, астрофизику и космологу XX столетия. Конференция по традиции проводится в двух городах бывшего СССР, с которыми связаны жизнь и деятельность Г. А. Гамова: в Одессе, где он родился, вырос, стал мироведом и начал трудиться, и в Санкт-Петербурге, где он получил высшее образование и к нему пришли крупные научные успехи. Абстракты докладов расположены по тематике секционных заседаний. При поиске нужного абстракта следует пользоваться указателем секций и авторским указателем. После окончания конференции предполагается опубликовать труды конференции в издании "Odessa Astronomical Publication", v. 12, 1999.

У даному збірнику подані абстракти пленарних і секційних усних і постерних доповідей, що надіслані на першу частину "Gamow Memorial International Conference", яка проходить в Одесі з 16 по 22 серпня 1999 року під назвою "The Universe of Gamow: Original Ideas in Astrophysics and Cosmology". Друга частина конференції під назвою "Early Universe: Cosmological Problems and Instrumental Technologies" відбудеться в Санкт-Петербурзі з 23 по 26 серпня 1999 року. Дана конференція є другим, що проводиться раз у 5 років, науковим форумом, присвяченим Г. А. Гамову – видатному фізику, астрофізику і космологу XX століття. Конференція за традицією проводиться в двох містах колишнього СРСР, з якими зв'язані життя та діяльність Г. А. Гамова: в Одесі, де він народився, виріс, став світознавцем і почав працювати, і в Санкт-Петербурзі, де він здобув вищу освіту і до нього прийшли значні наукові успіхи. Абстракти доповідей розміщуються за тематикою секційних засідань. При пошуку потрібного абстракту слід користуватись покажчиком секцій і авторським покажчиком. Після закінчення конференції передбачається опублікувати праці конференції у виданні "Odessa Astronomical Publication", v. 12, 1999.

PLENARY SESSION

MULTI-TIME-SCALE VARIABILITY OF STARS

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Physical mechanisms and corresponding mathematical models for different types of stellar variability are reviewed with applications to concrete stars. Special attention is attributed to the following topics:

Cataclysmic variables:

synchronous and synchronizing magnetic: variability at the time scale of seconds ("boiling column"), dozens of seconds ("shot noise", flare), hours (spin), days (spin-orbit beat, switches between a high and low states), years ("swinging dipole" and other mechanisms); $10^2 - 10^5$ years - spin period variations of the white dwarf;

non-magnetic nova-like: seconds to dozens of minutes (red noise); minutes to hour (quasi-periodic oscillations); hours (positive and negative superhumps, orbital variations); days (superhump-orbit beat); years (luminosity switches);

non-magnetic dwarf novae: cycle-to-cycle and season-to-season changes of characteristics of outbursts;

magnetic activity of the red companion (?): year-scale variations of the luminosity of systems with magnetic (polars and intermediate polars) and non-magnetic (nova-likes of VY Scl and UX UMa subtypes) white dwarfs; brightness variations at low states in dwarf novae and old classical novae; smooth variations and abrupt switches of the seasonal outburst cycle length in dwarf novae;

additional/alternative mechanism: third body around (?): the variations of the mass transfer rate may be additionally modulated by minor variations of the distance between the components owed to a presence of a third low-mass body near the cataclysmic binary.

Pulsating variables:

additional classification criteria of variability; multi-parameter correlation analysis of the characteristics of the *mean* light curves of groups of long-period stars;

multi-parameter correlation analysis of the *individual* characteristics of long-period stars; classification of semi-regular stars according to *stability* of their (multi-periodic) components of variability; *switches* of pulsation mode in semi-regular variables.

Mathematical models:

The software package has been elaborated to study *multi-periodic* variations with possible *trends* in the data and *shifts* between the sets owed to difference in the instrumental systems or run-to-run slow changes; *mono-* and *multi- cyclic* variations of low coherence and the *mode switching* stars; aperiodic variability, e.g. corresponding to the *"shot noise"* and *"red noise"* types; secular period variations.

The algorithms are based on the extension of the method of least squares to the case of *unequal weights* of the data and an additional weight *(filter)* function making the models wavelet-like, being both dependent on time and a characteristic time scale. *Non-parametric* periodograms are extended to a case of unequal weights. These algorithms are compared according to a statistical significance of the results.

Key words: stars: cataclysmic variables; stars: pulsating: Mira, semi-regular; stars: individual: AM Her, BY Cam, TT Ari, MV Lyr, EM Cyg, AF Cyg

THE BIG BANG MODEL: ITS ORIGIN AND DEVELOPMENT

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It has been more than 50 years since the alpha-beta-gamma (Alpher, Bethe and Gamow) paper on prestellar nonequilibrium nucleosynthesis was published, and since the late Robert Herman and I predicted a consequent present cosmic background radiation at about 5 Kelvin. Herman and I worked closely with Gamow from the late 1940s until his death, and we much say that he was at least a spiritual guide eveen in research in which he did not participate. A day does not go without my remembering Gamow, and his love for physics and cosmology.

QUANTUM GRAVITY AND PHYSICS OF THE EARLY INFLATIONARY UNIVERSE

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We discuss the possibility of testing predictions of quantum gravity within the present day observational status of the early inflationary Universe. Quantum gravity and cosmology serve as a theoretical framework for modelling initial conditions for inflation that lead to particular values of the main cosmological parameters – density parameter and anisotropy of microwave background radiation. This framework is based on the idea of quantum origin of the early inflationary Universe from the no-boundary or tunneling quantum states. The theory of this phenomenon, incorporating beyond the tree-level approximation loop effects of quantum fields, leads to a fundamental conclusion – quantum birth of the Universe can be a low-energy process (rather than belonging to the Planckian scale) and, therefore, it can be rationally studied by perturbative methods of semiclassical quantum gravity and indirectly tested by observations. In the model with a strong non-minimal coupling of the inflaton field to curvature we calculate the energy scale of inflation by finding the mean value of the corresponding Hubble constant $H \simeq 10^{-5}m_P$ and its quantum width $\Delta H/H \simeq 10^{-5}$. These parameters belong to the GUT scale, rather than the Planckian one, and generate the number of inflationary e-foldings compatible with the present value of the density parameter. We show that these conclusions are applicable for both closed and open models (via Hawking-Turok mechanism) and discuss their implications for the particle physics phenomenology.

ACCRETION DISCS AROUND BLACK HOLES: DEVELOPEMENT OF THEORY

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Accretion disc theory was first developed as a theory with the local heat balance, where the energy produced by a viscous heating was emitted to the sides of the disc. The important new invention of this theory was a phenomenological description of a turbulent viscosity, known as ”alpha” prescription, when the component of the stress tensor was taken proportional to the isotropic pressure. Sources of turbulence in the accretion disc are discussed, including nonlinear hydrodynamic turbulence, convection and magnetic field role. In parallel to the optically thick geometrically thin accretion disc models a new branch of the optically thin accretion disc models was discovered for the same total luminosity. The choice between these solutions should be done of the base of a stability analysis. Farther development of the theory is connected with account of advection, which take into account non-local effects. The present status of the solution for a low luminous optically thin accretion disc model with advection is connected with discussions around solution describing advection dominated accretion flows (ADAF), which is characterized by a very low efficiency of the accretion. Limitations on ADAF imposed by the presence of magnetic field are analyzed, connected with heating of electrons during magnetic field reconnection in the flow. It is concluded that account of magnetic field does not let to decrease the efficiency much below its standard value.

BLACK HOLE X-RAY BINARIES

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Masses of black holes in 13 X-ray binary systems determined by different authors are summarized and compared with those of WR stars in close binary systems, which can be considered as progenitors of relativistic objects.

Average mass of CO cores of WR stars is $\sim (8-12)\ M_\odot$ which is close to that of black holes $\sim (8-10)\ M_\odot$. Distribution of masses of CO cores of WR stars ($M_{CO} = 2 \div 50\ M_\odot$) is continuous bat not bimodal in contrast with distribution of masses of neutron stars ($M_{NS} = 1.35 \pm 0.15\ M_\odot$) and black holes ($M_{BH} \approx 8 \div 10\ M_\odot$).

QUANTUM FIELD THEORY OF QUASARS

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1. Models of gas accretion onto black holes are capable of explaining only the soft part of the quasar energetics (up to Roentgens), but they do not explain: (a) the dominance of the energetics in the hard part of the spectrum; (b) quick variability; (c) relativistic jets; (d) jet collimation and stability even with considerable bending; (e) "superluminal" motions within parsec-distance vicinity; (f) the nature of luminous "knots" and "hot spots"; (g) the mechanism of ultrarelativistic particle generation at considerable distances from the centre.

2. These problems are solved quite naturally by the quantum field theory model of quasars which is based on the idea of generation of bunches of quantized vortices in the vacuum quark-gluon condensates by a rotating black hole. These vortices can be identified with the hadronic "dual strings." Two bunches of vortices directed opposite to each other are generated in the ergosphere of a Kerr black hole at the epoch of its origin as a responce of the condensates to "dragging of inertial frames." They grow further in two opposite directions along the rotation axis at the expense of energy and momentum transfer from the black hole via generation of relativistic waves of torsion that propagate along the vortex bunches. During this process the vortex bunches are twisted in a manner of a cord what provides their collimation and stability during bending.

3. Quantized vortices are topologically stable and are invisible themselves. The phenomenon of visible relativistic jets arises as a result of collisions of vortex jets with dense gas and dust clouds and with stars. If the surrounding matter is distributed asymmetrically around a black hole then one of the jets may be significantly brighter then the opposite one although originally two bunches of vortices are alike.

4. Energy and momentum outflow from a twisted bunch of vortices can proceed in two possible ways: 1) as a result of direct hydrodynamical dragging of gas by such a bunch in a way similar to the "Archimedean screw" (thus one can explain the gas acceleration in the jets of SS433); 2) at the expence of branching of closed loops (CL) off the vortices as a result of "turbulization" and self-crossing of vortices during their collisions with the matter of gas and dust clouds and of the stars. Such loops (closed "dual strings") afterwards annihilate in a relativistic cascade of mesons and leptons:

$$CL \longrightarrow \begin{cases} \pi^{\pm} \longrightarrow \mu^{\pm}\nu \longrightarrow e^{\pm}\nu\bar{\nu} \\ \pi^0 \longrightarrow 2\gamma \end{cases}$$

Synchrotron radiation of fast $e^{\pm}$ in magnetic fields gives birth to the phenomenon of "knots" and "hot spots."

References

Swarup G. and Kapahi V. K. (Eds.): 1985, *Quasars.* Proc. of the 119 Symp. of IAU, (Reidel Publ. Company).

Fomin P.I.: 1991, *Ukr. Phys. J.* 36, No. 12, 1785.

Key words: quantum gravity; quasars; black holes

COSMOARCHEOLOGY: ASTROPHYSICAL PROBES FOR NEW PHYSICS IN THE EARLY UNIVERSE

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The original Gamov's Big Bang cosmology has evolved for the last decades to the inflational cosmology with baryosynthesis and dark matter, which lost the direct relationship with the experimentally proven physical laws. It is the aim of cosmoparticle physics to study the fundamental relationship of micro- and macro- worlds in the complex cross-disciplinary investigation of the combination if its indirect cosmological, astrophysical and physical effects. Cosmoarcheology is the important branch of this research, tracing in the astrophysical data the reflections of the existence of new physical effects in the early Universe. It considers the set of observational data about Universe as the experimental sample from the Gedanken Experiment cosmoarcheology undertakes to illuminate the cosmological signatures for the new physics, underlying the modern cosmology. In the modern cosmology its main parameters find their physical origin in the hypothetical processes in the early Universe: the total density is related to the result of inflation, the baryon density – to baryosynthesis and the dark matter – to primordial particles and/or fields generated before the 1 s of cosmological expansion. The physical mechanisms for these processes are based on predictions of particle theory. To specify the particular model for the physical origin of the cosmological parameters one needs the additional model-dependent cosmological effects, that can be referred as the hidden parameters of the modern cosmology. Cosmoarcheological analysis found the spectrum of primordial black holes, inhomogeneous baryosynthesis and multicomponent dark matter as important signatures of the new physics in the early Universe, related to a wide class of physical realisations of cosmological models. In particular, the exciting possibility of the existence of macroscopic antimatter in baryon asymmetrical Universe follows from this analysis, so that even the halo of our Galaxy can contain up to 100000 antimatter stars. Cosmoarcheological chains link the processes in the early Universe to the effects after the first second, which can be tested by the observed spectrum and isotropy of the thermal background, baryonic matter space distribution and chemical composition, non-thermal electromagnetic backgrounds and cosmic rays. The important role of cosmoarcheological methods is illustrated on the example of the model of horizontal unification. Extension of the standard particle model by the broken gauge symmetry of quark-lepton generations, reproducing the observed mass hierachy and mixings of fermions offers the unique physical basis for inflation, baryosynthesis and multicomponent dark matter. The model proves that in no case the physically self-consistent realisation of inflation, baryosynthesis and dark matter can be reduced to these three phenomena only. Cosmoarcheological analysis of the additional cosmological consequences, following from such realisations, provides the principal possibility to reproduce the physics of early Universe in all its nontrivial complexity.

References

Khlopov M.Yu.: 1999 *Cosmoparticle physics* World Scientific

Sakharov A.S., Khlopov M.Yu.: 1994, *Phys. Atom. Nucl.* 57, 651.

Khlopov M.Yu.: 1998, *Gravitation & Cosmology*, 4, 69.

Key words: cosmology: early Universe; elementary particles; baryosynthesis; dark matter; antimatter; black holes

SYSTEMS OF FERMION AND BOSON FIELDS IN GRG: THE PARTICLE-LIKE MODELS

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The self-graviting particle-like models contaning fermion and boson fields are investigated in the situation when all the angular contributions of partial fields in the total energy-momentum tensor of the model completely compensate one another and the gravitational field of the system is spherically symmetric. The situation may occure when the angular parts of Dirac (or Weyl) equation wave functions for fermion field in spherically symmetric space-time are the eigenfunctions of Laplace operator on $SU(2)$ group (Vilenkin, 1991). Furthermore under some additional conditions the same eigenfunctions may be retained in the situation when fermion field interacts with gauge fields. These assumptions permit to reduce the system of Einstein-Dirac-Yang-Mills equations for the model to the system of ordinary differential equations which is much easier for investigation.

The compositions of fields in the models under studies are chosen in agreement with properties of leptons (Yang-Mills field of $SU(2)$ symmetry) or hadrons (Yang-Mills field of $SU(3)$ symmetry). Some results of those studies are presented.

References

Vilenkin N. Ja., 1991: *Special Functions and the Theory of Group Representations.* Nauka, Moscow (*in Russian*).

Key words: field theories; gravitational field; elementary particles

MAGNETIC FIELD OF STARS

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Method and results of magnetic field measurement in different type stars are discussed.

Key words: Stars: magnetic fields: measurement

CURRENT STATUS OF THE COSMOLOGICAL MODEL: OBSERVATIONS AND THEORY

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Modern trends in observational and theoretical cosmology are reviewed: the nature of dark matter, cosmological parameters, formation of the structure in the Universe, CMB anisotropy.

Key words: cosmology; dark matter; cosmic microwave background

TRANSPORT PROCESSES IN STARS

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The physical process of transportation inside the stars is an important part of the problem of internal structure. A brief historical review of the problem is presented. There are physical transport processes of energy, momentum, angular momentum, chemical elements. Inside the Sun, theoretical considerations have to be in agreement with observational data. The presentation of the present problem of the solar neutrinos is given in conclusion.

Key words: stars: stellar structure, stellar interiors

GAMOW AND AGNs

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G.Gamov was the first who feel the possibility of some "new astrophysics" in the very centra of galactic nuclei. His intuition tell him that the concentration of star's orbits in the central parts of galaxies can lead to interesting events. We shortly discussed the work of Belzer, Gamov, Keller (1951y) on this subject an shortly reviewed the following development of the AGNs investigations.

Key words: active galactic nuclei

OBSERVABLE EFFECTS FROM EXTRA DIMENSIONS

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It is supposed that a multidimensional manifold M undergoes a spontaneous compactification $M \rightarrow M^4 \times \prod_{i=1}^{n} M_i$, where M^4 is the 4-dimensional external space-time and M_i are compact internal spaces. It is shown that for any multidimensional theory with compactified internal spaces, conformal excitations of the internal space metric can be observed as massive and massless scalar fields (gravitational excitons) in the external space-time. These excitations contribute either to dark matter or to cross section of usual particles.

References

Günther U., Zhuk A.: 1997, *Phys. Rev.*, D 56. 6391, (gr-qc/9706050).
Günther U., Zhuk A.: 1998, *Class. Quantum Grav.*, 15, 2025. (gr-qc/9804018).
Günther U., Starobinsky A., Zhuk A.: 1999, *Interacting gravitational excitons from extra dimensions*, in preparation.

Key words: field theories; gravitation theory

COSMOLOGY
AND
GRAVITATION

WEAK-FIELD LIMIT OF CONFORMAL GRAVITY AND GALACTIC ROTATION CURVES

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In the recent past, Mannheim and Kazanas strongly advocated the locally conformally invariant theory of gravity as an alternative to Einstein's General Relativity. Having obtained exact static spherically symmetric vacuum solutions of this theory (previously also obtained by Riegert), they used the extra term in the gravitational potential, which is linear in distance, to account for the flat galactic rotation curves without having to invoke the concept of dark matter. However, solution of the purely gravitational conformal theory is not quite relevant to the observations, since it is obtained without regard of the matter part of the theory that includes the mass generation mechanism for the elementary particles and thereby for test bodies such as stars and planets. Such a feature of the solution is reflected in the unrestricted freedom of choosing the conformal factor of the metric which clearly affects the timelike geodesics, but which is totally undetermined in the purely gravitational conformally invariant theory. In contrast with the previous studies, we consider the physically relevant case where the scalar field that breaks conformal symmetry and generates fermion masses is nonzero. We obtain the weak-field limit of the static spherically symmetric solution of such a theory. In the physical gauge, in which the scalar field is constant in space-time, our solution reproduces the weak-field limit of the Schwarzschild–(anti) De Sitter solution modified by an additional term that, depending on the sign of the Weyl term in the action, is either oscillatory or exponential as a function of the radial distance. Such behavior reflects the presence of, correspondingly, either a tachion or a massive ghost in the spectrum, which is a drawback of the theory under discussion. The issue of whether the solution obtained can be used for the account of the galactic rotation curves without invoking dark matter still remains to be investigated.

References

Riegert R.J.: 1984, *Phys. Rev. Lett.* **53**, 315.
Mannheim P.D. and Kazanas D.: 1989, *Ap. J.,* **342**, 635.
Mannheim P.D.: 1998, *Phys. Rev.* D **58**, 103511.
Barabash O.V. and Shtanov Yu.V.: 1999, astro-ph/9904144.

Key words: cosmology: gravitation theory; dark matter

BLACK HOLES IN SCALAR-TENSOR THEORIES: EXISTENCE, STRUCTURE, STABILITY

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The possible existence of neutral and charged black holes in the Bergmann-Wagoner class of scalar-tensor theories (STT) of gravity is studied. The existence of black holes is shown for anomalous versions of these theories, with a negative kinetic term in the Lagrangian. The Hawking temperature of these holes is zero, while the horizon area is (in most cases) infinite. As a special case, the Brans-Dicke theory is studied in more detail, and two kinds of infinite-area black holes are revealed, with finite and infinite proper time needed for an infalling particle to reach the horizon; among them, analyticity properties select a discrete subfamily of solutions (parametrized by two integers) which admit an extension beyond the horizon. The causal structure and stability of these solutions with respect to small radial perturbations is discussed. As a by-product, the stability properties of all spherically symmetric electrovacuum STT solutions are outlined.

Key words: black holes

AHARONOV–BOHM EFFECT AND COORDINATE TRANSFORMATIONS

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Resorting to a *Gedankenexperiment* which is very similar to the famous Aharonov–Bohm proposal we will show that a non–inertial observer moving in a Minkowskian spacetime may obtain, using a quantum particle, geometric information of regions that are, to him and to his particle, forbidden. This shows that the outcome of a quantum process is determined not only by the features of geometry at those points at which the process takes place, but also by the geometric parameters of regions in which the quantum system can not enter. From this fact we could claim that geometry at the quantum level plays a non–local role. Indeed, the measurement outputs of some quantum experiments are determined not only by the geometry of the region in which the experiment takes place, but also by the geometric properties of spacetime volumes which are, in some way, forbidden in the experiment. The possible generalization of this result to the case of curved manifolds is also considered, as well as its relation to a possible violation at the quantum level of the Strong Equivalence Principle, which could be one of the factors behind the recently claimed incompleteness of the general–relativistic description of gravity at the quantum level.

Key words: general relativisty; quantum theory

SPATIAL CORRELATION FUNCTION OF QUASARS AND POWER SPECTRUM OF COSMOLOGICAL MATTER DENSITY PERTURBATIONS

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We examine the dependence of the spatial two-point correlation function of quasars $\xi_{qq}(r,z)$ at different redshifts on the initial power spectrum in flat cosmological models. Quasars and other elements of the large-scale structure of the universe are supposed to form in the peaks of the scalar Gaussian field of density fluctuations of appropriate scales. Quasars are considered as a manifestation of short-term active processes at the centers of these fluctuations; such processes set in when dark matter counterflows and a shock wave appear in the gas. We propose a method for calculating the correlation function $\xi_{qq}(r,z)$ and show its amplitude and slope to depend on the shape of the initial power spectrum and the scale R of the fluctuations in which quasars are formed. We demonstrate that in the CDM models with the initial power spectrum slope $n = 0.7 \div 1$ it is possible to explain, by choosing appropriate values of R, how the amplitudes and correlation radii of $\xi_{qq}(r,z)$ may either increase or decrease with increasing redshift z. In particular, the correlation radii of $\xi_{qq}(r,z)$ grow from $6 - 10h^{-1}$ Mpc when R grows from $0.45h^{-1}$ to $1.3h^{-1}$ Mpc. The H+CDM model at realistic values of R fails to account for the observational data according to which the $\xi_{qq}(r,z)$ amplitude decreases with increasing z.

Key words: cosmology: cosmological models; dark matter; quasars

RELATIVISTIC REFERENCE FRAMES IN POST-NEWTONIAN APPROXIMATION

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We consider Relativistic Reference Frames of a Local Observer in an Arbitrary Weak Gravitational Fields and for Observer with Arbitrary Acceleration and Rotation. Such Coordinate Systems is considered: Riman's Normal Coordinates, Fermi Coordinates and Optical Coordinates. Transformation Formulae from Initial Coordinates to New System are obtained for this coordinates as a result of integration of equations of space-like and light-like geodesics. There are found an Expressions for Metric Tensor in Optical and Fermi Coordinates for Accelerated and Rotated Observer and for Inertial Observer. As an Illustration we consider an Inertial Observer with Arbitrary Speed in Initial System and a Gravitational Field produced by a Static Point Mass in Post-Newtonian Approximation. A case of a Slow Motion of Observer is considered individually. We also describe a Metric Tensor in Fermi and Optical Coordinates for this case.

Key words: relativity theory; reference systems; gravitational field

CMB ANISOTROPIES FROM PRIMORDIAL MAGNETIC FIELD

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We investigate microwave background anisotropies in the presence of primordial magnetic fields. We show that a homogeneous field with fixed direction can amplify vector perturbations. We calculate the correlations of $\delta T/T$ explicitly and show that a large scale coherent field induces correlations between $a_{\ell-1,m}$ and $a_{\ell+1,m}$. We discuss constraints on the amplitude and spectrum of a primordial magnetic field imposed by observations of CMB anisotropies (Durrer, Kahniashvili and Yates, 1998).

We derive an expression for the angular power spectrum of cosmic microwave background anisotropies due to gravity waves generated by a stochastic magnetic field and compare the result with current observations; we take into account the non-linear nature of the stress energy tensor of the magnetic field. For almost scale invariant spectra, the amplitude of the magnetic field at galactic scales is constrained to be of order 10^{-9} Gauss (Durrer, Ferreira and Kahniashvili, 1999).

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References

Durrer R., Kahniashvili T., and Yates A., 1998, *Phys. Rev. D*, **58**, 123004

Durrer R., Ferreira P., and Kahniashvili T., 1999, *Phys. Rev. Lett*, in press

Key words: cosmic microwave background; magnetic field; gravity waves

D-DIMENSIONAL P-BRANE COSMOLOGICAL MODELS ASSOCIATED WITH A TYPE A_M LIE ALGEBRA

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A D-dimensional cosmological model on the manifold $M = R \times M_0 \times \ldots \times M_n$ describing an evolution of $(n+1)$ Einstein factor spaces M_i in the theory with several dilatonic scalar fields and differential forms admitting an interpretation in terms of intersecting p-branes is studied. The equations of motion of the model are reduced to the Euler-Lagrange equations for the so called pseudo-Euclidean Toda-like system. We suppose that the characteristic vectors related to the configuration of p-branes and their couplings to the dilatonic scalar fields may be interpreted as the root vectors of a Lie algebra of the type $A_m \equiv sl(m+1, C)$. In this case the model is reducible to the open Toda chain and integrable by the known methods. The resulting metric is presented in the Kasner-like form. The particular model describing the Friedman-like evolution of the 3-dimensional external factor space M_0 (in the Einstein conformal frame) and the contracting of the internal factor spaces $M_1, \ldots, M_n$ is singled out.

Key words: cosmology: cosmological models

GENERALIZATION OF THE CENTRAL-SYMMETRICAL HARMONIC SOLUTIONS IN GR AND OBSERVED EFFECTS

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The exact static central-symmetrical solution of the Einstein's equations in vacuum in harmonic coordinates with a second constant (dependent on the structure of central body and its radius) has been considered. Ordinary harmonic Fock's interval in GR is only the asymptotic of the exact solution at infinite radius, and can not represent the external field of a real source. All of the observed effects with light and particles obviously depend from this second constant, so that it can be experimentally determined in a strong as well as in a weak fields.

Key words: cosmology; general relativity

INTERACTING GRAVITATIONAL EXCITONS FROM EXTRA DIMENSIONS

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Multidimensional inhomogeneous cosmological models are investigated under dimensional reduction to effective D_0-dimensional models. In the Einstein conformal frame small scale factor fluctuations of the internal compactified factor manifolds have the form of scalar fields (gravitational excitons) propagating in the external D_0-dimensional space-time. Specific interaction features of gravitational excitons with gravitons, scalar fields and abelian gauge fields are considered.

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References

U.Günther, A.Zhuk: 1997, *Phys.Rev.* D 56 6391.

U.Günther, A.Zhuk: 1998, *Hadronic Journal* 21 279.

U.Günther, A.Zhuk: 1998, *Class.Quant.Grav.* 15 2025.

U.Günther, A.Zhuk: 1999, *e-print* gr-qc/9905109.

U.Günther, A.Starobinsky, A.Zhuk, in preparation.

Key words: cosmology: cosmological models; gravitation theory

ON THE INTERPRETATION THE QUANTUM COLLAPSE OF SELF-GRAVITATING DUST SHELL

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The spherical dust shell is one of the simplest models of collapsing configurations. This model was quantized in various nonequivalent methods (Berezin: 1990, 1998; Visser M.: 1991; Kraus P: 1995). The natural approach was proposed in (Hajicek: 1992), it was consider in (Dolgov: 1997) too. The classical Hamiltonian H follows from the action

$$S = -\int (mcds - \gamma m^2/2r\, dt) = -\int (mc\sqrt{(cdt)^2 - (dR)^2} - \gamma m^2/2r\, dt), \qquad (1)$$

where ds^2 is a metric of the special relativity, m is a bare mass of the shell.

The Newton version $2S^{(N)} = \int (mr_t^2 + \gamma m^2/r)dt$ of the system (1) gives the energy spectrum $E_n = -\gamma^2 m^5/8\pi\hbar^2 n^2$ with quantization by Bohr-Sommerfeld $\oint P_r dr = 2\pi n\hbar$, $(n = 1, 2, ...)$. In the case (1) we have the diverging integral. Therefore we suppose that the shell is in the S-state of some system with the classical action (1), but in which the angular degrees of freedom are admissible. Than P_φ, $L^2 = P_\theta^2 + P_\varphi^2/\sin^2\theta$ are the integrals of the motions. The quantum conditions $I_\varphi = 2\pi\hbar n_\varphi$, $I_\theta = 2\pi\hbar(n_\theta + 1/2)$, $I_r = 2\pi\hbar(n_r + 1/2)$ (Landau: 1963) are giving $P_\varphi = n_\varphi\hbar$, $L = (n_\theta + n_\varphi + 1/2)\hbar$ where I_φ, I_θ, I_r are the adiabatic invariants ($n_\varphi, n_\theta, n_r = 0, 1, 2, ..$). It follows the S-state spectrum

$$\varepsilon = \mu\{1 - \mu^4[2n_r + 1 - \sqrt{1 - \mu^4}]^{-2}\}^{-1/2}, \qquad (2)$$

when the conditions $\mu\sqrt{1 - \mu^4} < \varepsilon < \mu < 1$ are implementing. Here $E = \varepsilon m_{pl}c^2$, $m = \mu m_{pl}$. Note that $\varepsilon < \mu$ is the ellipcity condition . The inequality $\mu < 1$ follows from the demanding that relativistic "centrifugal energy" should be more than potential energy. The inequality $\mu\sqrt{1 - \mu^4} < \varepsilon$ is the existence condition of the "potential well". The spectrum (2) may be obtained from (1) in the exact theory (Hajicek: 1992) also, when the angular coordinates are fixed at the classical level. Thus, the stationary states are stipulated by zero oscillations of the angular degrees of freedom. In case of $\mu > 1$ the repulsion are becoming less than the attractions. The shell loses stability and the "falling on the center" takes place.

References

Dolgov A.D., Khriplovich I.B.: 1997, *Phys.Lett.*, **B400**, 12.
Berezin V.A.: 1990, *Phys.Lett.*, **B241**, 194.
Berezin V.A., Boyarsky A.M., Neronov A.Yu.: 1998, *Phys.Rev.*, **D57**, 1118.
Hajicek P., Kay B.S., K.Kuchar K.: 1992, *Phys.Rev.*, **D46**, 5439.
Kraus P., Wilczek F.: 1995, *Nucl.Phys.*, **B433**, 403.
Landau L.D., Lifshitz E.M.: 1963, *The Quantum Mechanics*, M.GIFML
Visser M.: 1991 *Phys.Rev.*, **D43**, 402.

Key words: interstellar dust; collapse

ON SOME CLASSICAL AND QUANTUM COSMOLOGICAL MODELS WITH P-BRANES

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Multidimensional classical and quantum cosmology with p-branes (Grebeniuk et al., 1997) for some special cases is considered. The Riemann tensor squared is calculated in general case and its behavior is investigated for a number of special solutions. The solutions of the multidimensional analog of the Wheeler-De Witt equation with p-branes are obtained for some special cases with appropriate p-branes configuration. It should be noted, that we made the whole quantization of the model, i.e. we quantized the fields of forms too. This approach leads to the additional term with the scalar curvature in the energy condition. The problem of a ground state of the model arised in this case is also disscused for the case of Hartle-Hawking and Vilenkin wavefunctions.

As it is known, the Hartle-Hawking wavefunction of the Universe, Ψ, is given by a path integral over compact Euclidean geometries. In practice, the calculation of Ψ is performed without evaluating the path integral, solving the Wheeler-De Witt equations with a boundary condition, which has been specified using the semiclassical approximation of the path integral (Hawking, 1984).

This method has been used in Zhuk (1992) and Bleyer et al. (1994) to obtain the pure cosmological solution for the ground state wavefuction of the Universe. Here we will also use this approach to evaluate wavefunction of the Universe for miltidimensional cosmology with p-branes.

References

Bleyer U., Ivashchuk V.D., Melnikov V.N. and Zhuk A.I., 1994: *Nucl. Phys.* **B429**, 177.
Grebeniuk M.A., Ivashchuk V.D. and Melnikov V.N. , 1997: *Grav. and Cosmol.* **3**, 3, 243.
Hawking S.W., 1984: *Nucl. Phys.* **B239**, 257
Zhuk A., 1992: *Class. Quant. Grav.* **9**, 2029.

Key words: cosmology; cosmological models

GRAVITATIONAL WAVE TRACK IN THE EARTH'S ELECTROMAGNETIC FIELD

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At present the idea of the extracting of the frequences in the Earth's electromagnetic field spectra corresponding to the gravitational radiation frequences of the double star systems is based equally with the traditional approaches to solve the task of gravitational wave fields recording.

In the theoretical plan of this task solving the known possible mechanisms of the electromagnetic fields of the ELF range in the Earth-ionosphere cavity being affected with the gravitational wave radiation of the astrophysical source were analized and the two-level model of the excitation oscillatoins in the near by Earth's layer with the gravitational wave field is suggested.

The catalogues of the spectra allowing to extract the frequences assotiated with the global geodynamic processes and to analyse the type of the spectrum near by the grequences of the astrophysical sources are arisen from the long-term continious records of the Earth's electromagnetical field with the multiple-response receiving complex of 1997 and 1998 enlisting the correlational and cpectral analyses methods and the up-to-date ones of the simulation of the non-linear dynamical processes.

The addition of the known methods of the direct recording of the gravitational wave radiation of the astrophysical objects to the suggested electromagnetic fenomena are very useful on account of the theoretically predicted low intensity gravitational wave radiation for the solving of the fundamental problem of the modern physics-the gravitational wave detection.

Key words: Earth: magnetic field; gravity waves

MULTIDIMENSIONAL GRAVITATIONAL MODELS

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Multidimensional model describing the spherically symmetric and "cosmological" configurations with $(n+1)$ Einstein spaces in the theory with several scalar fields and forms is considered. When electro-magnetic composite p-brane ansatz is adopted, n "internal" spaces are Ricci-flat, one space M_0 has a non-zero curvature, and all p-branes do not "live" in M_0, a class of exact solutions is obtained if certain block-orthogonality relations on p-brane vectors are imposed. A subclass of non-extremal p-brane black holes is considered. Post-Newtonian parameters are calculated and some examples are considered.

Key words: cosmology: cosmological models; gravitation theory

FRACTAL UNIVERSE

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The model of the Universe is considered in which background of the Universe is not defined by the matter but is a priori specified as a homogeneous and isotropic flat space. The scale factor of the Universe follows the linear law. The scale of mass changes proportional to the scale factor. This leads to that the Universe has the fractal structure with a power index of 2.

Key words: cosmology; Universe: fractal structure

DARKNESS AT NIGHT

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A simple derivation of the formula for the flux of light at a point from cosmic light sources is given. Both the obscuration of distant sources by nearby ones and the expansion of the Universe are taken into account. The explanation of the dark night sky is mainly that the distance travelled by a light particle is much smaller than the mean free path for a photon. Both the obscuration and the expansion are relatively unimportant. We live in a young Universe with little energy.

Key words: Universe: cosmic rays

PHYSICAL PROPERTIES OF A CLASS OF SPHERICALLY SYMMETRIC PERFECT FLUID DISTRIBUTIONS IN NONCOMOVING COORDINATES

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The physical properties of an exact solution of Einstein's field equations are examined. This spherically symmetric perfect fluid solution contains expansion, acceleration and shear. There exist models with regions of space-time where the pressure and the density are positive and the dominant energy condition and the causality condition are also fulfilled. Moreover, the pressure and the density gradients are equal. The mass function is zero at the origin where there is Lorentz-Minkowski geometry and no trapped surface exists.

These solutions are of interest both for the early stages of gravitationnaly collapse and for Big Bang cosmology.

Key words: cosmology; special relativity; gravitational collapse

THE MODELS OF VOIDS IN THE FRIEDMAN UNIVERSE

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The astronomical observations of last years show that there are the regions in the Universe with much lower density of matter, than their surroundings. Theoretical studies of these regions (voids) in the models of the expanding Universe are carried on different directions (Bonnor & Chamorro, 1990). In this paper the voids have been built by means of matching two Tolman's solution. The Lichnerovich-Darmois matching conditions are used. It is shown that in expanding Universe with flat space the voids can not exist. In the Friedman Universe with positive and negative spase curvature the little voids can not exist also. The model of void in the Friedman Universe has been built.

References

Bonnor W.B., Chamorro A., 1990: *Astrophys. J.*, **361**, 21.

Key words: cosmology: cosmological models

GENERATION OF THE GRAVITATIONAL FIELDS IN THE QUANTUM GAUGE THEORY OF GRAVITY

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A generation mechanism of the gravitational gauge fields in the gauge theory of gravity is investigated. We show that the gauge gravitational fields ensuring the local Poincare invariance of the theory of gravity are generated at the quantum level only. It is demonstrated that the generation of these fields are related to nonsmoothness of the scalar phases of the fundamental spinor fields, but not to simple requirement of gauge symmetry locality. The expressions for gravitational gauge fields in terms of the nonsmooth scalar phases are obtained. From the viewpoint of the described scheme of the gauge gravitational field generation, the gauge principle is an "automatic" consequence of field trajectory nonsmoothness in Feynman path integral.

Key words: gravitation theory: quantum gravity

QUASISTATIONARY STATES OF THE FRIEDMANN QUANTUM UNIVERSE

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In this contribution we consider the quantum model of the Friedmann universe filled with the scalar field ϕ with the potential $V(\phi)$ and radiation. The radiation is used to define a reference frame allowing to remove an ambiguity concerning the choice of time coordinate. We show that in this case the wave function Ψ of the universe satisfies the Schroedinger-type equation

$$2\,i\,\partial_T\Psi = \left(\partial_a^2 - \frac{2}{a^2}\partial_\phi^2 - a^2 + a^4\,V(\phi)\right)\Psi,$$

where T is the time coordinate fixed by the coordinate condition $g^{00}(dT/dx^0)^2 = 1/a^2$, a is the scale factor. If the rate of change of scalar field is small in comparison with the rate of expansion (contraction) the quantum universe can be found in quasistationary states. The position and width of such states and the probabilities of transition between quantum states are calculated. There is a nonzero probability of transition of the universe to the states with higher values of quantum numbers by means of interaction between scalar and gravitational fields. The singularity problem does not arise and the quantum universe can evolve in the region before the barrier with small probability of tunneling through the barrier. The values of energy density of matter and radiation are calculated.

References

Kuzmichev V.V.: 1998, *Ukr. Fiz. J.*, **43**, 896
Kuzmichev V.V.: 1999, *Yad. Fiz.*, **62**, No. 4.

Key words: cosmology: cosmological models

DARK MATTER FROM AFFLECK-DINE BARYOGENESIS

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Fragmentation of the Affleck-Dine condensate into Q-balls could fill the Universe with dark matter either in the form of stable baryonic balls, or LSP produced from the decay of unstable Q-balls. The dark matter and the ordinary matter in the Universe may share the same origin.

Key words: cosmology: dark matter: baryogenesis

THE KINEMATIC OF RELATIVISTIC MOTION IN ASTROPHYSICAL OBJECTS – THE KEY TO THE VERIFICATION OF THE TIME – COORDINATE TRANSFORMATIONS IN INERTIAL SYSTEMS

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On the basis of an independent interpretation of Mickelson-Morley experiment the not Lorenz transformations were suggested. Astrophysical data on kinematic for the relativistic outflows in galactic sources was investigated. It was shown that the differences between standard relativistic transformations and the suggested ones occur at the v3/c3 power. That doesn't allow to accept or to reject this or that kind of transformations. Peculiarities of the observational data being the result of suggested transformations were enumerated.

Key words: relativity theory: stellar kinematics

THE LYUTY-KOTOV EFFECT: THE NEW COSMOLOGICAL INVARIANT?

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The analysis of the complete variation for the global constants was carried out using the world model on basis of radio astronomical data with the positive cosmological constant. It was shown that the simultaneous variations of the global constants are fulfilled in the limits of the self-conformed solution, and a new cosmological invariant T=l/c appears. This allows to explain naturally the existence of the 160-minite period of the active galactic nuclei and quasars intensity variations independent of the redshift.

Key words: cosmology: cosmological constants, cosmological models

THE DEPENDENCE OF CMB AUTOCORRELATION FUNCTION ON COSMOLOGICAL PARAMETERS

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The properties of the Cosmic Microwave Background Radiation autocorre lation function in Friedmann Universe with negative curvature are investigated. The dependence of the spectral index of autocorrelation function on the density parameter of the Universe is studied numerically.

Key words: cosmology: cosmic microwave background

COSMOLOGICAL MODELS WITH MIXED DARK MATTER

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An analysis of cosmological models in spatially flat Friedmann Universe with zero Λ-term is presented. The number of parameters is equal to 5, they are

- the slope of the density perturbation spectrum n,

- the dispersion of the density contrast in the sphere with radius $8h^{-1}Mpc$ σ_8,

- the density of hot dark matter Ω_ν,

- the density of baryons Ω_b, and

- Hubble constant $H_0 = 100h\ km\ sec^{-1}\ Mpc^{-1}$ in h units.

Our analysis is based on two tests. The first of them is the number of clusters of galaxies at the scale 10-20 Mpc, the second one is a large scale Cosmic Microwave Background Anisotropy. The implication of Press-Schechter formalism allowed us to constrain $\sigma_8 = 0.52 \pm 0.01$. Calculated normalization of the spectrum of density perturbations was used to simulate numerically the value of the CMB anisotropy $\Delta T/T|_{10^0}^m$ and the relative contribution of the cosmological gravitational waves T/S. Assuming that T/S $\leq$ 3 and taking into account data on the amplitude and location of Doppler peak of Sakharov oscilations we constrained the parameters of model.

Key words: cosmology: cosmological models; dark matter

ON NONINERTIAL FRAMES OF REFERENCE WITHIN THE FRAMEWORK OF SPECIAL RELATIVITY

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There is no the unique answer to question about the possibility of the description of noninertial frames within the framework of Special Relativity (see, for example, V.A.Fock "Theory of space, time and gravity").

In present report is examined in detail: 1) concept of frames of reference as a two ingredients concept: a body of reference and coordinate system; 2) concept of noninertial frames of reference by two examples: rotating frame of reference and accelerated frame of reference (Moller's transformations).

These examples show that introduction of the concept of noninertial frames of reference is meet with the difficulties. This puts in an embarassing position the physical sense of the principle of general covariance.

Key words: cosmology; general relativity

BEST-FIT COSMOLOGICAL PARAMETERS FROM OBSERVABLE CHARACTERISTICS OF THE LARGE SCALE STRUCTURE OF THE UNIVERSE

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The possibility of determining cosmological parameters by means of comparison of observable data on the Abell-ACO power spectrum, their mass function, peculiar velocities of galaxies, $Ly\alpha$ clouds and CMB temperature fluctuations with corresponding model predictions is analysed. It is shown that such data set determines quite certainly the values of spectral index n of primordial power spectrum, baryon and massive neutrino content Ω_b and Ω_ν respectively, Hubble constant $h \equiv H_0/100 km/s/Mpc$ and positive Λ-constant when tensor mode is absent. The χ^2 minimization method was used for their determination. If all these parameters are under searching then this observable data set prefers tilted MDM+Λ model with three species of massive neutrino. The best-fit parameters are following: $n = 1.15 \pm 0.08$, $\Omega_b = 0.06 \pm 0.02$, $\Omega_\nu = 0.15 \pm 0.10$, $h = 0.55 \pm 0.10$ and $\Omega_m = 0.71 \pm 0.23$ ($\Omega_m + \Omega_\Lambda = 1$). When Hubble constant is fixed at its higher values the lower best-fit values of Ω_m, Ω_b and Ω_ν are found. So, for $h = 0.72$ they are $\Omega_m = 0.51 \pm 0.08$, $\Omega_b = 0.04 \pm 0.004$, $\Omega_\nu = 0.13 \pm 0.05$ and $n = 1.18 \pm 0.08$. Massive neutrino component disappears in the scale-free primordial power spectrum model with fixed low matter content ($\Omega_m = 0.3$) and in the scale-invariant one with cosmological constant.

If amplitude of tensor mode is search parameter also then n and Ω_ν are worse determined: $n = 1.37 \pm 0.51$, $\Omega_\nu = 0.23 \pm 0.23$ with best-fit value of S/(S+T)=0.57$\pm$ 0.75. Tensor mode vanishes when COBE constraint on tilt of primordial power spectrum is used.

Key words: Cosmology: theory; dark matter; galaxies: clustering

VARIOUS DETERMINATIONS OF TIME IN COSMOLOGY

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The homogeneous and isotropic interval is written usually in the forms

$$ds^2 = c^2 dt^2 - a^2(t)(d\chi^2 + \Sigma^2(\chi)(d\theta^2 + \sin^2\theta d\phi^2))$$

or

$$ds^2 = a^2(\eta)(d\eta^2 - d\chi^2 - \Sigma^2(\chi)(d\theta^2 + \sin^2\theta d\phi^2)),$$

where

$$\Sigma = \begin{cases} \sin\chi & \text{for } \sigma = +1, \\ \chi & \text{for } \sigma = 0, \\ \sinh\chi & \text{for } \sigma = -1, \end{cases}$$

σ is the curvature index.

According to Misner et al. (1973) there are three natural choice of time in cosmology: intrinsic time t, the coefficient of expansion $a(t)$, the time parameter η. It is supposed that the time variable t is apparent time of all physical process. However idea of time arose by comparing pace of different physical process. Thus physical process (periodic, atomic) are determinate of time. If curvature of the space-time of universe influence to physical phenomenons consequently the time t is inhomogeneous during of evolution. We suggest another determination of time as time τ of the embedding pseudo-Euclidean space ($n = 5$ and signature $+ - - - -$ for isotropic cosmology solutions). Preferences of such choice are discussed. In particular for positive space curvature ($\sigma = +1$) we have

$$d\tau = \sqrt{1 + a'^2(t)/c^2}dt, \quad d\tau = \frac{1}{c}\sqrt{a^2 + a'^2(\eta)}d\eta.$$

Now $a'^2(t)/c^2 << 1$ and therefore $d\tau \approx dt$. The "velocity" of increasing of the coefficient a is

$$\frac{da}{dt}_{a\to\infty} = \infty \quad \text{and} \quad \frac{da}{d\tau}_{a\to\infty} = c$$

for all reasonable state equation at the beginning of evolution.

Let us assume the time τ is apparent physical time. Then Universe is older than it is supposed usually. We obtained the ratio $\tau/t = 4/\pi$ and $\tau/t = \pi/2$ for dust model and ultrarelativistic ones accordingly, where τ and t is the universe time of life according to various determination of time (physical and intrinsic).

References

Misner C.W., Thorne K.S., Wheeler J.A.: Gravitation, 1973, W.H. Freeman and Company, San Francisco.

Key words: cosmology: Universe; time: detrmination

STOCHASTIC DISTRIBUTION OF GRAVITATIONAL FIELD IN THE FRACTAL STRUCTURE OF THE UNIVERSE

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Assuming the self-similar (fractal) distribution of matter in the Universe, we study the gravitational force distribution in space. A distinguishing feature of the fractal gravitational systems is that an appreciable contribution to the stochastic gravitational field comes from not only neighboring masses but also from clustered masses spreading over a wide range of distances.

Using bifractal simulation of mass distribution, we have analyzed the dependence of the field distribution function on fractal dimension of the system. The generalisation of Holtsmark equation for fractal case is given.

Key words: cosmology; general relativity

THE ONLY NON-CONTRADICTORY MODEL OF THE UNIVERSE

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The Friedmann equations of isotropic and homogeneous relativistic universe dynamics – without introducing any supplementary restrictive assumptions – describe the infinite number of the Friedmannian models of universe. The consistent and distinguished relativistic, classical-mechanical, quantum-mechanical and logical analyse of the Friedmannian universe models leads to a surprising and unexpected conclusion: The Friedmannian model of the flat expansive non-decelerative isotropic and homogeneous relativistic universe with the zero gravitational force state equation is the only model of universe, which does not contradict to the:

(1) Einstein general theory of relativity (and its special partial solutions: the Einstein special theory of relativity and the Newton theory of gravity);
(2) quantum mechanics;
(3) four fundamental formal principles of logical thinking;
(4) observations.

Key words: cosmology: cosmological models

ABOUT ONE SUPPLEMENT OF THE "HARMONY OF UNIVERSE" BY J.KEPLER

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In book of J.Kepler "Welt Harmonik" (Munich-berlin 1939,Verlag R. Oldenbourg) musical proportions are amalgamated with geometrical by means of building Platoon's right bodies, enter and described figures. By the physical sense of such association may serve total wave nature those construction. Proportions, received by J.Kepler, are possible in the case of formations of standing waves in the space of Solar system, when the regions of the formation of planets (as to J.Kepler constucted Platoon's figures) conform the surfaces to nodes of standing waves having as an the source of central luminary Solar system. By likeness image in experiments of Chladny at the formation of standing wave on the planes of oscillation plate scatter about along it particles collect together, sack from dots, which oscillation with maximal amplitude, on dots, the amplitude of fluctuations is equal to zero, fill in nodes lines. Coordinates, count off from the source of wave, must correspond to the distances of planets from Sun, as explaining the physical sense of rule Bode. So, shall adopt the length of base gravitational wave ("basic tone") L = 0,52 AU. Then planets the orbits of Solar system must distribute in nodes lines in dots, be away from next on multiple L/2 numeral's. From such condition it may be receive the "theoretical" distances of planets from Sun. In Table are presented such distances in compare with true distances.

Planet	True distance planets from Sun, AU	Calculated through the aplication of the length of gravitational wave L the distance of planet from Sun, AU
Mercury	0.39	0.39
Venus	0.72	0,39 + 0,50L = 0,65
Earth	1.00	0,39 + 1,50L = 1,17
Mars	1.52	1.00 + 1,00L = 1.52
Main belt of asteroids	2.90	1.00 + 4,00L = 3.08
Jupiter	5.20	1.00 + 8,00L = 5.16
Saturn	9.54	1.00 + 16,00L = 9.32
Uranus	19.20	1.00 + 35,00L=19.20
Neptun	30.10	1.00 + 56,00L=30.12
Pluto	39.50	1.00 + 74,00L=39.48

As visible from Table, with the distance increasing from central body, scale filling of "nodes surfaces" in space, or dots in viewed one-dimension accident, grows almost in geometrical progression. Obviously, here tell on mechanics of "gold section", ensuring the harmonious building of this natural formation.

Key words: cosmogony: Solar system; planets: orbits; gravity waves

VACUUM POLARIZATION EFFECTS IN THE BACKGROUND OF A SINGULAR MAGNETIC d − 2-BRANE IN d-DIMENSIONAL SPACE

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We study the influence of the configuration of an external static magnetic field in the form of a singular brane on the vacuum of quantized scalar field in a space of arbitrary dimension. The method of zeta function is used to regularize ultraviolet divergence, and the expression for the effective action is obtained. It is shown that the energy and stress densities as well as the current are induced in the vacuum, being damped exponentially at large distances from the brane. We discuss the analytic properties of the vacuum characteristics, regarding them as functions of the complex value of the space dimension.

Key words: cosmology: cosmological models

PRIMORDIAL CHEMICAL COMPOSITION OF UNIVERSE: HELIUM-4 ABUNDANCE BY RADIO RECOMBINATION LINES (RRL).

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It's shown the measuring of helium abundance, $N(He^4)/N(H)$, by RRL observation is one of reliable way under optimum wave lengths ~ 1 cm. This method is more straight because one more less depends on model presentations than, for example, optics and IR observations.

For exact helium abundance determination it is necessary to know a concrete ionization structure (IS) of HII region. At first it was shown that correction for IS could be not only positive (zone $He^+ < H^+$ one) but and negative (zone $He^+ < H^+$). Mainly, commensurability of He^+ and H^+ zones depends on an concrete effective temperature of ionizing star; critic effective temperature lays in the interval 37 000 - 39 000 K. Calculation of IS correction should account [1] for a hardening of the ionizing radiation, the ionization of helium atoms through the metastable quantum level (2^3S), and the influence of dust.

Measured Primordial helium abundance was obtained in the interval $Y_p = 23.8 - 28.4\%$ (by mass). This interval agrees else with the frame of Standard Cosmological Model (SCM) calculations, but it however allows a deviation from SCM - f.e. existing of unknown light particles; from other side it excludes cosmological models with the number neutrinos species, $N_\nu < 2.7$.

References

Gulyaev S.A., Sorochenko R.L. and Tsivilev A.P.: 1997 *Astronomy Letters.*, **23**, 165.

Key words: Universe: abundance; H II regions.

THE UNIVERSE ACCELERATION AS A PROPERTY OF GRAVITATION

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Analysis of the recent observations data gives evidence that the deceleration parameter $q_o = -\ddot{a}(t)\, a(t)/\dot{a}(t)$ in cosmology (a is the scale factor) is negative at the moment (Riess 1998 , Perlmutter 1998) . It means that $\ddot{a} > 0$ i.e. the expansion is accompanied with acceleration, while according to classical insights the gravity force must retard the expansion. We consider a simple model of the self-graviting expending dust-ball with the radius R and show that from the viewpoint of our gravitation equations (Verozub 1991) the supermassive dust ball expands with acceleration from $R = 0$ up to some radius R_{cr} depending on the physical parameters of the model.

The radial differential equations of the motion of the ball surface particles are given by

$$\dot{R}^2 = \frac{c^2 C}{A}\left[1 - \frac{C}{\bar{E}^2}\right],\qquad(3)$$

where $A = r^4/f^4(1 - r_g/f)$, $C = 1 - r_g/f$, $f = (r_g^3 + R^3)^{1/3}$, $r_g = 2GM/c^2$, G is the gravitational constant, c is the speed of light, M is the dust-ball mass $\dot{R} = dR/dt$, $\bar{E} = E/m_p c$ and E is the energy of the specks of dust. Let us assume, for definitness, that $\rho = 10^{-28} gm/cm^3$, R at the moment is equal to $3 \cdot 10^{27} cm$, the Habbl constant is 10^{-17} and the constant $\bar{E}^2$ is equal to 0.60 .

It follows from the numerical calculations summarized in the plots that the acceleration is negative at $R/r_g > 1.3$. However, according to the properties of gravity force in the considered theory it is a positive value at $R/r_g < 1.3$. At the density $\rho = 1 \cdot 10^{-28} gm/cm^3$ the magnitude $R/r_g = 1.8$ at the present time and , therefore, the acceleration is negative. However, at the density $\rho = 2 \cdot 10^{-28} gm/cm^3$ $R/r_g = 0.9$ and the acceleration at the time is positive . It is equal to $1 \cdot 10^{-8}$ cm/s^2 which is half as large as this magnitude resulting from the value of $q_0 = -1$ that was found in (Riess 1998).

With increasing the parameter $\bar{E}$ and decreasing the density ρ the value of R_{cr} increases.

Thus, we have an alternative to the introduction of the cosmological constant into the Einstein equation in order to explain acceleration at the present time.

References

Verozub L.V.: 1991, *Phys. Lett. A.,* **156**, 404.

Riess A. et al.: 1998, *A. J.,* **116**, 1009.

Perlmutter S. et al.: 1998, In: *"Abstract of 19th Texas Symposium on Relativistic Astrophysics and Cosmology"*, Dec.14-18.

Key words: Cosmology: theory.

GRAVITATIONAL LENSING BY GLOBULAR CLUSTERS
I. THEORY

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In earlier works Baryshev et al. (1993, 1998) and Yushchenko et al. (1998) showed, that cores of globular clusters have a remarkable lensing properties - the irradiance of background galaxies can be magnificated by 5-10 magnitudes. This level of magnification can explain the quasar-galaxy associations (Arp's objects) as gravitational lensing of background nuclei of active galaxies by cores of globular clusters.

We proposed that significant part of quasars can be gravitationally magnified images (Yushchenko & Raikov, 1998) and discuss the observational tests of this hypothesis.

References

Baryshev Yu.V., Raikov A.A., Yushchenko A.V., 1993: *31 Liege Astrophys. coll.*, 307.

Baryshev Yu.V., Ezova Yu.L., 1997: *Astronomy reports*, 74, 497.

Yushchenko A.V., Baryshev Yu.V., Raikov A.A., 1998: *Astron. Astrophys. Transactions*, 17, 9.

Yushchenko A.V., Raikov A.A., 1998: Proc. of the II conf. Selected problems of astronomy and astrophysics, Lviv, Ukraine, p.185.

Key words: gravitational lenses; quasars; quasar-galaxy associations

GRAVITATIONAL LENSING BY GLOBULAR CLUSTERS
II. OBSERVATIONS

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We analyzed the catalogues of galaxies and quasars, and perfomed new photometrical observations of selected regions for testing the hypothesis, that quasars are gravitationally lensed nuclei of active galaxies.

We showed, that observational data confirm the predictions of this hypothesis. We selected the list of objects which must show high red shifts in their spectra. Spectral observations of these objects will be desirable.

Key words: gravitational lenses; quasars; quasar-galaxy associations

ETERNAL BLACK HOLES IN EXACTLY SOLVABLE MODELS OF 2D DILATON GRAVITY

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New approach to exact solvability of dilaton gravity theories is suggested which appeals directly to structure of field equations. As a result, the wide class of exactly solvable models is found which embraces all previously known exactly solvable models. It is shown that black holes regular at the horizon are static and their metric is found explicitly. Quantum corrections to the Hawking temperature vanish and, moreover, for a wide subset of these models a metric itself does not acquire quantum corrections. It is shown that among models under discussion there exist quantum black holes with geometry regular everywhere including infinity.

Key words: gravitation theories; black holes

THERMODYNAMICS OF BLACK HOLES AND ACCELERATION HORIZONS

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Basic concepts of black hole thermodynamics connected with the role of a finite size of a system are reviewed (boundary data in the action formalism, canonical ensemble and partition function for black holes, etc.). This formalism is applied to nonextreme black holes near the extreme state and ut us shown that due to a proper allowance for boundary data there exists such a limiting transition that a black hole in a cavity can achieve the extreme state with a zero surface gravity but a finite temperature on a boundary, the proper distance between the boundary and the horizon being finite. This approach is applied to either static or rotating black holes, geometrical and thermal properties of the limiting state are discussed. The Lorentzian counterparts of limiting metrics are shown to be free from singularities. Generalization of the approach to distorted holes and systems with simultaneous black hole and cosmological horizons is suggested.

The role of boundary in black hole thermodynamics is discussed also for one-loop effects and simple formula for entropy of Hawking radiation and quantum correction to temperature are obtained in terms of the stress-energy tensor.

Key words: black holes: thermodinamics

ON TURBULENCE IN SELF-GRAVITATING SYSTEMS

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As it is generally known (Larson, 1979; Larson, 1981; Oqulchansky, 1989) interstellar medium, molecular clouds, gas-dust disks round protostars, atmospheres of stars and planets are subject to turbulent motions. The turbulence in astronomical systems differs greatly from that observed in scientific laboratory. Its spectrum is influenced by self-gravitation, magnetic field and total differential rotation. In the systems linked by gravitation the turbulence spectrum is defined with virial theorem:

$$\Delta\nu \approx \left(\frac{6GM}{5L}\right)^{1/2}, \qquad (4)$$

where M, L - mass and dimensions of a system, G - constant of gravitation.

Formula (1) is correct in the systems of slow rotation. When the velocity of rotation is considerable (spiral galaxies), the greater part of the kinetic energy of matter has average motion, which leads to the change in turbulence spectrum. Here we come across the problem of interaction of average motion and turbulent motion.

The change in time of the kinetic energy of average motion was investigated for the study of interaction mentioned above:

$$\frac{\partial E_c}{\partial t} = -\frac{\partial}{\partial x}[(E_c - \langle P\rangle)\langle\nu_k\rangle - \langle\nu_i\rangle\langle\sigma_{ik}\rangle + \rho\langle\delta\nu_i\cdot\delta\nu_k\rangle\langle\nu_i\rangle] - \qquad (5)$$
$$-\frac{\eta}{2}\left(\frac{\partial\nu_i}{\partial x_k} + \frac{\partial\nu_k}{\partial x_i}\right)^2 - \rho\langle\delta\nu_i\cdot\delta\nu_k\rangle\frac{\partial\nu_i}{\partial x_k},$$

where $\langle\sigma_{ik}\rangle = \eta\left(\frac{\partial\nu_i}{\partial x_k} + \frac{\partial\nu_k}{\partial x_i}\right)$.

Turbulent motions of small scale are suppressed by the viscosity of matter and a part of the kinetic energy is transformed into heat.

According to (2) the turbulence is maintained by the differential rotation of the system and its internal processes, thus a part of the kinetic energy of average motion is transmitted to turbulent motion.

The evolution of angular moment in self-gravitating systems is influenced by turbulent viscosity. Some properties of turbulent sources generate the effect of negative viscosity.

References

Larson R.B., 1979: *Mon. Notic. Roy. Astron. Soc.*, **186** 479.
Larson R.B., 1981: *Mon. Notic. Roy. Astron. Soc.*, **194**, 809
Oqulchansky Ya.Yu., 1989: Preprint **1989**, ITP-88-167E.

Key words: gravitation ·

THE NEW STATIONARY MODEL OF THE UNIVERSE

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Because of field statement of a general relativity the new stationary model of the Universe is developed. The single-error corrections to all basic laws of physics responsible for global gravitational correlation of all natural phenomena are found. The identity of inert and gravitational masses is proved. Are open gravitational viscosity and geodesic curvature of the universe. The shielding properties of a substance are detected.

The circuit of experimental installation on confirmation of a new cosmological model is offered.

Key words: cosmology: cosmological models; general relativity

QUASARS
AND
ACTIVE GALACTIC NUCLEI

THE RESULTS OF THE VERY HIGH ENERGY GAMMA-RAY OBSERVATIONS OF THE GALAXY MK 501 AT THE CRIMEAN ASTROPHYSICAL OBSERVATORY

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The results of observations of very high energy ($\sim 10^{12}$ eV) gamma-ray flux from active galactic nucleus (AGN) Markarian 501 carried out in Crimean Astrophysical Observatory with GT-48 ground-based atmospheric Cerenkov detector during two years are under consideration. It is shown that the flux was variable within the wide range. The integral flux value averaged over the 1997 year was equal to $(5.0 \pm 0.6) \times 10^{-11} \mathrm{cm}^{-2}\mathrm{s}^{-1}$ and in 1998 year it was $(3.7 \pm 0.6) \times 10^{-11} \mathrm{cm}^{-2}\mathrm{s}^{-1}$ above 1.0 TeV. The errors are statistical. The average value of the gamma-ray power is about 3×10^{44} erg/s if radiation is assumed to be isotropic.

Key words: active galactic nuclei: gamma-ray

QUIESCENT SPECTRA OF SOME EXSTRAGALACTIC RADIO SOURSES

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In compact extragalactic radio sourses (quasars, blasars and activity galaxies nucleuses), take place occurrenses separation very much energy during radio flares. This energy transform to the various frequensies and may be detected of the ground padiotelescopes.

It's very interesting investigation of such objects at the various frequensies because it allow to build spectra and draw a conclusion about nature of them. Because very important observations at the single antenna at millimeter and centimeter diapason wavelength because at this band objects more optically thin.

In the Crimean Astrophysical Observatory on the radiotelescope RT-22 there is program of collaboration with Radio Laboratory of Helsinki University of Technology for observation of the group obgects possess considerable variable radio flux density. There are date observation at frequency 12,22,37,77 and 87 GHz.

In this work have been presented of spectra 8 radio sourses. They was built with help of method division quiescent and variable parts emission for date observation in 1985-1995.

For this specta was obtained average spectral indexies high of frequency bend spectra. The resalts was compared with resalts that obtained earlier. On the basis comparison may draw a conclusion that spectra of quasar 3C 273 become more steeper, NRAO 150, OH 471, 3C 279 more flat. The spectra of sourses 0735+178, 4C 39.25 don't change.

Key words: radio sourses: radio spectra: spectal indices

CATALOGUE AND ATLAS FOR DEEP OBJECTS IN SOME GAMMA-RAY ERROR BOXES

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We present basic information about creation the Catalogue and Atlas 114000 objects up to 19.8^m in 30 gamma-ray bursts error boxes.

Our Catalogue consist of right ascension and declination for objects in system 2000.0, star magnitude, and cross-identification with other catalogues. Middle mistakes for objects coordinates - $0".2$ and $0^m.2$ for stars magnitudes.

Atlas include 270 maps with dimension 1010 angle minutes, at 9 maps for each for 30 gamma-ray bursts fields. In Atlas appendix presented 30 images with objects which were identified from other catalogue.

For 79 objects (galaxies, IR- and radiosources) was found the optical candidates for identification.

Key words: gamma-ray bursts; catalogues

POLYGONAL ARM PATTERN IN SPIRAL GALAXIES

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The phenomenon of polygonal arms is a new problem in galactic physics which has roots in Vorontsov-Vel'yaminov works of the early 1950s. Using the galaxy M51 as a typical example of a grand design spiral, I discuss the geometry and physics of its spiral structure and demonstrate that multiple staight segments can be recognized in two major arms of the galaxy. Two polygonal patterns made by the segments are similar and comprise a significant part of the lengths of both arms. The lengths of the segments increase almost linearly with distance from the center of the disc. They intersect one another at an angle about $2\pi/3$. The phenomenon of polygonal arms provides an important insight into the complex and robust interplay of gravity and gas-dynamical effects in giant galactic discs.

Key words: spiral galaxies: galactic structure

SUPERNOVA LIGHT CURVES

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The calculations of light curves of core collapse and thermonuclear supernovae are carried out by a method of multi-group radiation hydrodynamics. The effects of spectral lines and expansion opacity are taken into account. The predictions for $UBVI$ fluxes are given. For core collapse supernovae the calculated monochromatic and bolometric light curves are compared with observations shortly after shock breakout, during the plateau, and during the earliest phase of the radioactive tail. Using the light curve modeling, we have find constraints on the explosion energy, on the presupernova and the extent of mixing in the ejecta. In particular, we determine the most likely range of E/M (explosion energy over ejecta mass) and R_0 (radius of the progenitor). For thermonuclear supernovae, it is shown that the mode of nuclear burning influences drastically the light curve decline in the B band and, to a lesser extent, in the V band. It is argued that the recent results on positive cosmological constant Λ found from the high red-shift supernovae observations could be wrong in the case of possible variations of the preferred mode of nuclear burning in the earlier Universe.

Key words: supernova remants: light curves; cosmology: nuclear burning

OPTICAL OBSERVATIONS GRB 981220 AND GRB 981226

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We present observations the field of GRB981220 (54 hour after burst) and field of GRB981226 (55 hours after burst) with using the 0.7-metre telescope at the N.D.Kalinenkov's astronomical observatory of Nikolaev's State University with CCD SBIG ST-7. Total integration time was 1440-s (8x180s) in V-band for GRB981220 and 1800-s (10x180s) in R-band for GRB981226 fields. No new object brighter than about V=19.1 and R=17.8 was identified in or near the GRB981220 and GRB981226 fields in comparisons with the Digital Sky Survey.

Key words: gamma-ray bursts

INFLUENCE OF DIRECT URCA-PROCESSES IN A STRONG MAGNETIC FIELD ON DYNAMICS OF COLLAPSING STAR ENVELOPE

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Direct URCA-processes in a collapsing star envelope with a strong magnetic field are investigated. Expressions for the neutrino emissivity and transferred momentum asymmetry along the field direction (the force density along the field strength) due to these processes are obtained. The analysis of the asymmetry is performed for URCA-processes, neutrino-nucleon scattering and neutrino reemission processes in relativistic electron-positron plasma. It is shown that in the toroidal magnetic field background all these processes can develope a torque which rapidly unwinds the envelope. A possible influence of a "neutrino unwinding" effect on a dynamics of the collapsing star envelope is discussed.

Key words: stars: stellar envelopes; stars: collapse

BVRI CCD PHOTOMETRY OF OBJECTS IN THE FIELD OF QSO 3C 66A

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In this work we present the results of BVRI photometry of 29 objects in the field of quasar's 3C 66A. We used the 702-mm telescope (ZTS-702) of the N.D.Kalinenkov's astronomical observatory (Nikolaev's State Pedagogical Institute) with CCD SBIG ST-7. Basic characteristics of the system ZTS-702+ST-7: - focal length - 2804 mm (primary focus); - field of view - 5.2*7.4 arcmin^2; - limiting magnitude - 19. CCD observations of objects was obtained in 1998 august 20. Three images in each band's were received for an estimation of accuracy of definition of stars magnitudes. The finding chart for 3C 66A and galaxy UGC 1832 with identification of the investigated objects, BVRI magnitudes for all objects and surface photometry for UGC 1832 are present in this paper.

Key words: CCD photometry.

THE CENTRAL BLACK HOLE MASS OF GAMMA-RAY LOUD BL LACERTAE PKS 2155-304

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In this paper, the method (Cheng et al., 1999) is used to determine the central black hole mass of PKS2155-304, and a mass of $6.4 \sim 9.4 \times 10^6 M_\odot$ is found for the central black hole, which is consistent with that estimated from the periodicity (Fan 1998). The GeV gamma-rays are from a distance of $\sim 17 R_g$, where R_g is the Schwarzschild radius.

References

Cheng, K.S., Fan, J.H., Zhang, L.: 1999, *A&A* submitted
Fan, J.H.: 1998, *A&A*, submitted

Key words: black holes: masses, gamma-rays

THE IMAGES OF EXTRAGALACTIC RADIO SOURCES IN THE DIFFUSION MODEL

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Within the framework of the diffusion model (DM) were constructed images of extragalactic radio sources (ERS) at various frequencies and visual angles. There was used the analytical solution of the kinetic equation (KE) for the distribution of relativistic electrons suffering synchrotron losses and diffusing from the moving hot spot (HS) — the region where the electrons are accelerated (Gestrin, Kontorovich, Kochanov, 1987). The images were calculated from the transport equation and they demonstrate the structure elements and the shape observed in real ERS. The velocity of the HS and that of diffusion of electrons determine the shape of the radio lobes: the ratio of transverse to longitudinal dimensions and the position of the HS. The observed changes in dimensions of ERS and in the shape of the lobes at various frequencies accord with the DM. The consideration of the reabsorption leads to asymmetry of radio lobes at various visual angles.

References

Gestrin S.G., Kontorovich V.M., Kochanov A.E. : 1987, *Kinem.& Fiz. Neb. Tel*, **3**, No 4, 57.

Key words: radio galaxias; quasars

SHOCK WAVE THEORY OF "SUPER-LUMINAL" OUTBURSTS FROM AGN

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The analysis of ultra-relativistic blast wave shows that in the vicinity of compact massive object ("black hole"), to which corresponds the inverse cubic law of density distribution, lorenz-factor of strong shock from noncentral explosion yields to the non-depending on time asymptotic determined by the whole explosion energy. This corresponds to the observed correlation (Babadjanjanz, Belokon, 1985, 1993, 1994 and reference there) between optical (X- and/or gamma ray) burst in the nucleus and the emerging of the superluminal radio components (outbursts). We also discuss the possible link of observed double structure of the bursts with the formation of a collimated jet.

The relativistic explosion in a nonuniform media with reference to the phenomenon of cosmological gamma-bursts is also discussed.

References

Babadjanjanz M.K., Belokon' E.T.: 1985, Astrofizika, 23, 459.

Babadjanjanz M.K., Belokon' E.T.: 1993, Astron. Zh., 70, 241.

Babadzhanyants M.K., Belokon' E.T.: 1994, In Multi-wavelength Continuum Emission of AGN, Eds T.J.-L. Courvoisier, A. Blecha, Kluwer AP, P. 390. (Proceedings of the IAU Symp. N 159, Geneva, 1993).

Key words: active galactic nuclei; shock waves: relativistic effects; quasars

THE PROBLEM OF A COSMOLOGICAL OSCILLATION OF AGN'S

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Photometric observations of rapid variability of the nucleus of the Seyfert galaxy NGC 4151 were performed in 1985 – 1996 at the Crimean Astrophysical Observatory and the P. K. Sternberg State Astronomical Institute. Less than half nights showed significant, > 0.03 mag, intranight variability of the AGN. But the most interesting is the presence of the periodicity $P_0 = 160.010$ min during active nights. Quiet nights however did not reveal any noticeable P_0 signal. The mean harmonic amplitude of the P_0 oscillation during active state of the nucleus is about 0.01 U-mag, whereas it is found to be less than 0.001 U-mag at quiet state. The nature of such strange modulation is unknown.

The statistically significant P_0 oscillation is detected also in rapid luminosity variations of the quasar 3C 273 and nucleus of NGC 3516. The mean value of the period, $P_0 = 160.0104 \pm 0.0005$ min, well coincides with the period 160.0101 ± 0.0001 min discovered earlier in global oscillations of the Sun (that solar oscillation has been predicted by E. Sevin in 1946). The arguments are given favouring cosmological origin of the P_0 oscillation. Attempts to get reasonable explaination of this new astrophysical phenomenon force us to doubt standard model of the Universe.

Key words: cosmology: active galactic nuclei: oscillation

GEMINGA PULSAR AS A JOSEPHSON PULSAR

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First results of the interpretation of the main quantities and peculiarities of radio emission for the pulsar in Geminga by the Josephson pulsar model are discussed. The observational data presented by V. Malofeev at this conference are compared with characteristics of the model developed earlier for the radio and high frequency emission of the Crab pulsar (Kovalev, 1980). The mechanisms of radio and HF-emission of both pulsars can be similar. The radio emission of the Geminga pulsar may be generated in the mantle of a neutron star by the Josephson effect. Radio emission propagates along a jet as polarized normal modes of a magnetized plasma wave guide, like along a quasi-vacuum feedhorn. The jet flows from the mantle into the magnetosphere through cracks in the crust. The very steep radio spectrum, its fine structure and variability are explained by the small number of first strong harmonics of the Josephson frequency, by a variation of the frequency and currents in the mantle.

References

Kovalev, Yu.A.: 1980, Astrophys. Space Sci., 67, 397.

Key words: radiation mechanisms: nonthermal sources; pulsars: individual: Geminga

JETS IN SOME AGNS WITH STRONG LONG-TERM VARIABILITY OF 1-22 GHZ SPECTRA

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Results of fitting the Hedgehog jet model to multifrequency observations are presented. The behavior of BL Lac and OJ 287 (for the 20 years), 3C 345, 3C 454.3, 0528+1 (Nimfa) and CTA 102 is analyzed. Instantaneous 5-7 frequencies spectra were measured at the RATAN–600 over the period from 1979 to 1999. The procedure of model fitting is taken from Kovalev and Larionov (1994). Spectral fluxes varied up to 7 times for BL Lac and more than 2 times for the other sources. The strong long-term variability of the spectra of all objects is explained by variability of a single component, which is a continuous VLBI-compact relativistic jet with variable ejection from an active nucleus in quasi radial magnetic field. All spectra have a low frequency component also, which can be a lobe or an envelope connected with and caused by the jet.

References

Kovalev, Y.Y., Larionov, G.M.: 1994, *Astron. Lett.*, 20, 3.

Key words: galaxies: active; galaxies: jets; BL Lacertae objects; quasars; radio continuum: galaxies

FIRST RESULTS OF SIMULTANEOUS SIX FREQUENCY RADIO OBSERVATIONS OF THE IDV SOURCES 0716+714 AND 0917+624

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We report the first results of the simultaneous observations of the well known intraday variable sources (BL Lacertae object 0716+714 and quasar 0917+624, see e.g. Wagner & Witzel, 1995) at 1.4, 2.7, 3.9, 7.7, 13 & 31 cm. The observations were carried out over the period from 15 June to 10 August, 1998, at the radio telescope RATAN–600, Russia. The rapid variability of the multifrequency broad band spectra is revealed for both sources. We duscuss characteristics of the variability, which significantly differ for two sources, and consider various models as the possible explanations.

References

Wagner, S.J., Witzel, A.: 1995, *Annu. Rev. A.&A.*, 33, 163.

Key words: BL Lacertae objects: individual: 0716+714; quasars: individual: 0917+624; radio continuum: galaxies

FIRST MEASURMENTS AND ANALYSIS OF INSTANTANEOUS 1–22 GHZ SPECTRA OF 120 NORTHERN COMPACT EXTRAGALACTIC OBJECTS

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We report the first results of measurments of simultaneous radio spectra of 120 compact extragalactic sources. Observations were done in July and September, 1998, at six wave lenghts of 1.4, 2.7, 3.9, 7.7, 13 & 31 cm, using the radio telescope RATAN–600 (the Southern sector). The observed sample is selected from the Preston et al. (1985) VLBI survey and includes all objects located north of declination +49° with the correlated flux density at 13 cm more than 0.1 Jy. Thus the total sample investigated by our group amounts up to 700 sources located north of declination −30° (see the paper by Kovalev et al., 1999). Statistical analysis of data is made for the total sample. In particular, the earlier results of the analysis of the sample from −30° to +43° are confirmed.

References

Kovalev Y.Y., Nizhelsky N.A., Kovalev Yu.A., Berlin A.B., Zhekanis G.V., Mingaliev M.G., Bogdantsov A.V.: 1999, *A.&A. Suppl.*, in press.
Preston R.A., Morabito D.D., Williams J.G., Faulkner J., Jauncey D.L., Nicolson G.D.: 1985, *A. J.*, 90, 1599.

Key words: galaxies: active galaxies: compact; BL Lacertae objects: general; quasars: general; radio continuum: galaxies; radio continuum: general

CCD PHOTOMETRY OF THE GRAVITATIONALLY LENSED QUASAR Q 0957+561

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We present photometry of the gravitationally lensed quasar Q 0957+561. We have used data from La Palma archive for the period 1986 - 1991. Gravitational lensing time delay between the images has been estimated, as well as night-to-night variability rate. We also comment the possible variability of the comparison stars. We get time delay evaluation 410–430 days, which gives H0 values in the expected ranges.

Key words: quasars; gravitational lensing; photometry

SIMULATIONS OF ACCRETION FLOWS ONTO BLACK HOLES

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We review time dependent simulations of unviscous and viscous accretion flows onto black holes. Simulations refer both to ideal gas, without cooling, and to bremsstrhalung and Local Thermal Equilibrium cooled flows.

Unviscous subkeplerian flows show a parameter space (angular momentum and internal energy) region for which steady shocks can be produced close to the black hole. The post shock temperatures may be extremely high. This result is relevant since it shows that shocks can be a persistent mechanism to produce the high energy emission from black holes and not a transient episode.

Moderate viscosity flows may also produce shocks, although for viscosity larger than a critical value only keplerian disk solutions are obtained with a short transonic zone close to the black hole.

It is also shown that the shocks can oscillate around their average steady location in may different ways. There are pure fluid dynamic oscillations, cooling induced oscillations, and also azimuthal shock deformations in the r-phi plane.

We argue that in this large variety of oscillation mechanisms it should be feasible to explain QPO oscillations in Black Hole candidates.

References

Molteni D., Lanzafame G., Chakrabarti S.: 1994, *Ap. J.*, **425**, 161.
Chakrabarti S. and Molteni D.: 1995, *MNRAS*, **272**, 80.
Molteni D., Toth G., Kuznetsov O.: 1999, *Ap. J.*, **516**, 411.

Key words: black holes: accretion; quasi-periodic oscillations

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ON THE POSSIBILITY FOR MEASURING THE HUBBLE CONSTANT FROM OPTICAL-TO-NIR VARIABILITY TIME DELAY IN AGNS

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The Optical-to-Near-infrared variability time delay have already been reported for a small number (6) of AGNs and has been firmly established only for 4 of them. The time delay is probably increasing with the IR wavelengths. The most naturally this time delay can be interpreted by the model where IR emission is attributed to circumnuclear dust heated by the nuclear radiation. In given model a suggestion on narrowness of the near-infrared (NIR) emission region is quite natural, as far as the dust can be not saved on distances from the

nucleus closer then some critical value, on which it is reached the sublimation temperature for graphite particles (Barvainis, 1987). For NGC 4151 case it has been shown that the NIR region has a form of thin ring or torus, moreover the radius of this ring increases when the luminosity of the nucleus increases (Oknyanskij et al. 1999). This dependency of radius of the NIR emission region from luminosity reveals itself as under object variability (as in the case of NGC4151), and also when objects with high and low luminosity are considered. We assume that the observed time delays allow us to derive a redshift independent luminosity distances to AGNs and estimate a Hubble constant.

Some problems of using this strategy for the Hubble constant determination are discussed.

Key words: active galactic nuclei; Hubble constant: determination

OBSERVATIONAL MANIFESTATIONS OF GENERAL RELATIVITY EFFECTS IN THE SPECTRA OF NUCLEI OF SEYFERT GALAXIES

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Recent observations of Seyfert galaxies, carried out by ASCA and RXTE seem to indicate that broad iron K_α line (6.4 keV) takes its origin in the innermost field of accretion disk around a supermassive black hole. In the region $(1.5 - 3)r_g$, where the line is assummed to arise, the effects of General Relativity should be taken into account.

For the line profile simulation the dense enough system of the isotropic geodesics has been constructed in Kerrian metrics with prescribed parameters at the infinity, where all the geodesics become parallel to each other. The accretion disk is assummed to be described by Novilov-Thorne model and the linear velocity of disk rotation is defined by standard GR procedure. Under these assumptions the problem is reduced to a numerical integration of the peculiar functions. To avoid the numerical difficulties the original system has been replaced with higher order system without peculiarities and integrated numerically. This way substantially increases the precision and decreases the amount of computations.

The profile of the spectral line has been simulated for different values of the specific moment $a = J/M$. radial coordinate r and the inclination angle i of the disk to the sky plane. The comparison of the simulated line profile with the X-ray observations of MCG-6-30-15 and MCG-5-23-16 leads to a conclusion that the most probable value of inclination angle is close to $i = 30°$. The analogous simulation, carried out under the assumptions of Newtonian theory leads to the results, which are in appreciably worse agreement with the observations.

Key words: general relativity; galaxies: Seyfert galaxies: galactic nuclei

TWO COLOUR CCD PHOTOMETRY OF QSO 0957+561 A, B in 1987-1991 USING THE LA PALMA ARCHIVE

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We present the results of the CCD photometry of QSO 0957+561 A,B, the first gravitational lens obtained on the base of La Palma archive. We have used 38 CCD frames in V band and 35 - in B band and have got out of them 31 points in V band and 26 - in B band for both images A and B.

The new photomerical data can supply to the known light curves and help in variability and time delay investigations as well as in the study of possible microlensing cases. We have compared our light curves with the published ones and have found a very good correlation with them and an absence of any significant difference for the overlapping parts. There is only systematical shift connected with the difference in the color system. The night-to-night variability found is about or less than the standard deviation of our estimates - 1-3cross-correlation analysis using only our new data and have found the time delay between image A and B to be about 420 ± 20 days. The analysis of the combined light curves for the period 1987-1991 has given the same result but with much higher significance compared to the one made out by using only our photometry or only published data. So, our photometry of QSO 0957+561 A, B has given additional independent confirmation of the time delay value being about 420 days.

Key words: galaxies: gravitational lensing: CCD photometry; individual: QSO 0957+561

RADIO SPECTRA OF THE COMPLETE SAMPLE OF THE GALACTIC SUPERNOVA REMNANTS

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We present radio continuum spectra for 192 Galactic supernova remnants (SNRs) from 220 known and included in Green's (1998) catalog and 8 new ones. These spectra include most of the measurements available in literature, as well as multi-frequency measurements of 130 SNRs with the RATAN-600 radio telescope.

The measurements have been placed on the same absolute flux density scale. The presented compilation has given a possibility of plotting adequate spectra accounting for the thermal plasma free-free absorption in fitting the spectra.

An analysis of 190 spectra showed that 70 SNRs (37%) have clear low frequency turnover caused, apparently, by absorption in the thermal foreground of the Milky Way. Fig.1 shows the distribution of the maximum flux frequency ν_{max} for these SNRs. These frequencies ν_{max} do not correlate with the Galactic coordinates.

The catalog of SNR spectra has ten cases of clear turn-up at low frequencies. It is interesting that five (50%!) such SNRs contain radio pulsars (Kaspi, 1998).

We did not find considerable correlation between spectral index and Galactic coordinates l and b of SNRs.

The spectra plotting is an "on–line" procedure of the CATS database (http://cats.sao.ru/). There is a collection of the 1000 SNR images in radio, optical and X-ray band in CATS also.

References

Kaspi V.M. 1998. *Advances in Space Research*, 21, 167.

Green D.A. 1998, A Catalogue of Galactic Supernova Remnants (*1998 September version*), MRAO. UK (available on the WWW at "http://www.mrao.cam.ac.uk./surveys/snrs/").

Key words: supernova remnants: radio spectra

RECENT MULTI-FREQUENCY MONITORING OF THE GALACTIC X-RAY BINARY WITH RELATIVISTIC JETS

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The non-thermal variable radio emission from Galactic X-ray binaries is the trace of the jets creation near of acrection disks.

We present results some sets of long daily monitoring program with RATAN-600 radio telescope such sources: SS433, Cyg X-3, LSI +61 303, GRS 1915+10 and some other ones.

The some strong opticaly thin and thick flares of the Cyg X-3 were detected at six frequencies (0.96-21.7 GHz) in May-August 1997. We concluded that flaring radio emission correlated with hard X-ray emission (BATSE, 20-100 keV) and anti-correlated with soft X-ray emission (RXTE, 2-12 keV) during a strong radio flare (3 Jy).

During two orbital periods we investigated radio light curves of remarkable X-binary LSI +61 303 (GT 0236+61). Two flaring events nearly formerly 26.5 day period phase 0.6 were firstly detected at four frequencies sumultaniously. We detected eventual steepening of the spectrum during some days after the moment maximum of flux.

We discussed the spectral properies of the different radio flares in Galactic X-ray binaries with relativistic jets.

Key words: stars: X-ray binaries: jets; relativistic effects

MULTI-BAND IDENTIFICATION OF IRAS OBJECTS SHOWING LOW FREQUENCY RADIO EMISSION: IRAS F02044+0957 - AGN?

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In result of cross-identifications of infrared IRAS catalogues and Texas radio low frequency (365 MHz) catalogue has been obtained a list of about 750 objects with the CATS database.

Radio continuum spectra of the sources has been plotted using other radio catalogues. Two samples of steep spectra sources with (SSS) with $\alpha < -0.9$ (128 objects) and inverse spectra sources with $\alpha > 0.0$ (28 objects) have been obtained.

We carried out a search of optical counterpart of the most confident sources (difference of IRAS and Texas coordinates within 3″) with APM (POSS I).

One SSS object IRAS 02044+0957, seems to be interacting or pair galaxies, one of them is probably AGN, absent in the current lists.

Complete radio spectrum at four frequencies (2.3, 3.9, 7.7 and 11.2 GHz) with RATAN-600 observations is obtained in April 1999. Spectral index is equil $\alpha = -0.84$ for fitting this spectrum.

We present the radio (NVSS) map, optical (POSS) and infrared (IRAS) images.

Key words: radioastronomy: catalogues, radio maps; active galactic nuclei; individual: IRAS F02044+0957

CCD PHOTOMETRIC OBSERVATIONS OF THE NGC188

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We present CCD photometry for stars in field centered on the open cluster NGC 188. Extensive photometric observations of stars in NGC 188 have already been carried out by Sandage (1962), Medvedev (1985), and Caputoanda (1990) leading to V and R 19 stars magnitudes. The present investigation intends to extend the previous results by the use of modern CCD detectors. Observations have been performed at the N.D.Kalinenkov's astronomical observatory of Nikolaev's State Pedagogical Institute using the prime focus of the 702-mm Cassegrain Telescope with SBIG ST-7 CCD camera. Observations were made on five nights of summer and autumn 1998. Frames have been observed in both V and R colors, covering the cluster central region NGC 188. We obtained photometrical values for 50 stars in NGC 188. We investigated the photometrical system of the telescope ZTS-702 with CCD SBIG ST-7 in the V and R bands. As a result, we obtained coefficients for transformation our observations to the standard system. In this work we presented the study of photometric system ZTS-702 with CCD SBIG ST-7, equations for transformation instrumental V and R magnitudes to standard system and V and R magnitudes for 50 stars in NGC 188.

References

Caputoanda F., et all: 1990, *AJ.*, **99**, 122.
Medvedev V.G., Pavlenko E.P., Prokof'eva V.V.: 1985, *Izv. KrAO*, **73**, 122.
Sandage A.: 1962, *Ap.J.* **135**, 333.

Key words: stars: CCD photometry

STARS

AND

STELLAR ATMOSPHERES

TT ARIETIS: UNPRECEDENTED SWITCHING FROM NEGATIVE TO POSITIVE SUPERHUMPS

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Photometric period of TT Ari has been recently switched from its usual "negative superhump" value from $0\overset{d}{.}1326$ to $0\overset{d}{.}1331$ (Andronov et al., 1999) to the "positive superhump" value $P = 0\overset{d}{.}14926$ (Skillman et al., 1998), which is in an excellent agreement (within 0.3%) with the value predicted by Tremko et al. (1996) based on the empirical "orbital period - superhump period" relation by Andronov (1990).

Such switch from a negative to a positive superhump without significant luminosity change is an unprecedented one, and the star should be carefully monitored to study details of such process. Next campaign is being announced for 1999.

In this report, we present results of the international observational campaign "TT Ari-98". Altogether 11 336 observations have been obtained during 18 runs in 6 observatories, partially in UBV, UBVR (switching filters). During one night, 1027 simultaneous UBVRI data have been obtained. No significant shifts between the times of extrema in different colors have been found. The asymmetry is 0.44±0.01 is present showing more abrupt brightness increase than a decrease. The smoothed U-B color varies from $-0\overset{m}{.}65$ to $-0\overset{m}{.}86$, whereas the B-V=$0\overset{m}{.}03$ is remarkably constant. Sometimes the maxima have larger amplitude and a sharp shape corresponding to flares with a duration of ~ 5 minutes. One may note a significant decrease of the mean magnitude by $0\overset{m}{.}35$ on JD 2251069.

The period is $P = 0\overset{d}{.}14970 \pm 0\overset{d}{.}000014$ for the maximum brightness from 11 best defined maxima, the initial epoch $T_0 = BJD2451112.123 \pm 0\overset{d}{.}002$; for 7 minima $T_0 = BJD2451122.386 \pm 0\overset{d}{.}002$. This is in an excellent agreement with the period for the 1997 data obtained by Skillman et al. (1998).

References

Andronov I.L.: 1990, Astr. Tsirk., 1535, 15.
Andronov I.L., Arai K., Chinarova L.L., et al.: 1999, A. J., 117, 574.
Skillman D.R., Harvey D.A., Patterson J., et al.: 1998, Ap.J., 503, L67.
Tremko J., Andronov I.L., Chinarova L.L., et al.: 1996, As. Ap., 312, 121.

Key words: stars : cataclysmic variables; stars: individual: TT Ari

ISOTOPIC ANOMALIES IN CP STARS

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Elemental abundances of about 15% of atmospheres of main sequence stars of spectral classes B5–F5 are anomalous. Generation of these anomalies in quiescent atmospheres of CP (chemically peculiar) stars are ascribed to elemental diffusion due to radiative acceleration (Michaud 1970). In the present paper we analyze the anomalies in mercury–manganese (HgMn) star atmospheres. The HgMn stars have T_{eff} between 10 000 and 16 000 K. Their abundance anomalies include both overabundances (Mn, Sr, Pt, Hg, Ga et al.) and underabundances (Al, Ni, Co et al.). Recent observations show strongly anomalous isotopic composition for Hg, Pt, Tl (overabundancy of heavier isotopes) and He (overabundancy of He³). The HgMn stars have low rotational velocities ($v\sin i$ 1–20 km s⁻¹) and no magnetic fields.

In general the theory describes adequately the observed abundances of elements. However the isotopic anomalies in CP star atmospheres cannot be well explained by the mechanism of radiative acceleration.

About a decade ago Atutov and Shalagin (1988) proposed a new diffusion mechanism called light-induced drift (LID). This mechanism, added to the traditional radiative acceleration, successfully explains the observed isotopic anomalies. Due to asymmetries of overlapping isotope spectral line profiles there appears asymmetry in the excitation rates of atoms and ions with different Doppler shifts of thermal velocities. The excited ion species have larger impact cross-sections and therewith smaller mobilities. So appears the drift which is oppositely directed for different isotopes with overlapping spectral lines, giving upwards drift to isotopes with red-shifted spectral lines. As a result, in CP star atmospheres the most overabundant isotope for a light element is the lightest isotope and for a heavy element — the heaviest isotope.

We have refined the theory of LID and applied it to CP star atmospheres. Corresponding computer codes to calculate elemental diffusion including isotopic effects have been elaborated. In the computations we used the modified codes by R. Kurucz for model atmospheres and synthetic spectra. The results of computations confirm the important role of LID for diffusive segregation of isotopes.

References

Michaud G.: 1970, *Ap.J.*, **160**, 641.
Atutov S.N., Shalagin A.M.: 1988, *Sov. Astron. Lett.*, **14**, 284.

ONE-DIMENSIONAL TRANSFER EQUATION EXACT SOLUTION AND ITS ANALYSIS FOR STELLAR SPECTRA THEORY PROBLEMS SOLVING

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Exact solution of one-dimensional transfer equation, obtained in paper (Bakut & Shumilov, 1998), has been investigated mostly in terms of return signal. Analyzing of problems, connected with radiation propagation through stellar atmospheres (Charles & Cowley, 1970) has led to the necessity of transfer equation solution detailed exploration in terms of passed radiation, which can be expressed as:

$$P(i\omega, z) = A_{n+1}e^{\lambda_{n+1}z} + B_{n+1}e^{-\lambda_{n+1}z}, \tag{1}$$

where

$$A_{n+1} = \frac{\tilde{\varepsilon}_{n+1} + \lambda_{n+1}}{\sigma_{n+1}} C_{n+1},$$

$$B_{n+1} = \frac{\tilde{\varepsilon}_{n+1} + \lambda_{n+1}}{\sigma_{n+1}} D_{n+1},$$

$$\tilde{\varepsilon}(i\omega, z) = \frac{i\omega}{V(z)} + \varepsilon(z),$$

$i = \sqrt{-1}$; z – distance from the source of radiation, $V(z)$ – velocity of radiation propagation through stellar atmosphere, ω – circular frequency of radiation, n – numbers of stellar atmosphere layers, $\varepsilon(z)$ – radiation attenuation coefficient, $\lambda^2 = \tilde{\varepsilon}^2 + \sigma$, σ – reflection index, C_{n+1}, D_{n+1} are not simple in form and given completely in (Bakut & Shumilov, 1998). CH Cyg observation results in the range $\lambda = 10.0$ mkm with noticeable dust envelope radiation and results of binary Per first observation in the same range can be analyzed newly in more details using based on inversed Fourier transformation of (1) calculations, offered in the report. The results of the calculations let us to recommend the solving method for astrophysical information analyzing.

References

Bakut P.A., Shumilov Yu.P., 1998: *Optic of the Atmothphere and Ocean*, **11**, N 11, 1158 (in Russian).
Charles R. Cowley, 1970: *The theory of stellar spectra*. Gordon and Breach Science Publushers. New York, London, Paris.

THE NEW METHOD OF DETERMINATION OF EFFECTIVE TEMPERATURES, SURFACE GRAVITIES AND METALLICITIES OF COOL STARS

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The stellar fundamental characteristics – effective temperatures T_{eff}, surface gravities logg and metallicities [Fe/H] (abundance of elements of iron group in star relatively to the Sun) have always been of great astrophysical importance. They are necessary for any abundance analysis. The new method of determination of these parameters was developed at Odessa Astronomical Observatory. The energy flux distribution of a star depends upon its atmospheric parameters. Therefore the fitting of synthetic to observed flux distribution in wavelength region from $\lambda320$ to $\lambda830$ nm have been used to obtain values for the atmospheric parameters.

The observed flux distribution was taken from Catalogue of Komarov et al. (1995). The random errors of results of the catalogue are nearly equal to 2-3% (to 5%) in the visual range of a spectrum and 5-10% at the edges of the spectral bands - near ultraviolet and near infrared regions.

The synthetic flux distribution was taken from Kurucz (1993) and was calculated accordingly to the software system of Tsymbal (1995).

The method of minimization of three parameters function "discrepancy" is used for 103 wavelength points. The sensitivity of the flux distribution to the various atmospheric parameters was investigated by the use of the first derivative from flux distribution. The primary fundamental characteristics for ∼100 stars of spectral types G, K, M were obtained. The T_{eff} is determined rather exactly with this method. Unfortunately, logg and [Fe/H] aren't received reliably without using special region of wavelength. The overabundance of sources obscuring in UV-region of cool stars which is discribed in new table of Kurucz may be the cause. The synthetic fluxes was decreased in this wavelength region and, therefore, the metallicities for cool stars were received that equal to nearly -1.0 dex. The new fundamental characteristics must be used to determine abundances of chemical elements with using model atmospheres of Kurucz (1993). The new values of masses M, radii R and luminocities L were determinated.

References

Komarov N.S., Dragunova A.V., Belik S.I., Karamysh V.F., Zakozhurnikova N.N., Orlova L.F., Kantsen L.E., Cherkass A.G., Depenchuk E.A., Shevchuk T.V., Golubovskiy V.V.: 1995, *Odessa Astron. Publ.*, 8, 115pp.
Kurucz R.L.: 1993, *CD-ROM N 18, Smithsonian Astrophys.Obs. (Cambridge, MA)*.
Tsymbal V.V.: 1995, *ASP Conference Ser.*, 108, 198.

Key words: stars: late type; stars: effective temperatures, surface gravities, metal contens; stars: catalogue

SPECTRAL INVESTIGATION OF FIELD BLUE STRAGGLERS

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Field blue stragglers are counterparts of cluster blue stragglers. They was selected by Olsen in base of specific Stromgren indices among bright metal-deficient early F dwarfs.

For some stars from this list was obtained high-resolution and high S/N CCD spectra. Synthetic spectrum technique was applied for the specification of rotational velocities and chemical composition of program stars. Special attention was payed on FBS with high rotation and broad shallow lines with aim of comparison of their chemical abundances and rotation and broad shallow lines with aim of comparison of their chemical abundances and abundances of λ Bootis type stars calculated with the same methodics. In general, 18 chemical elements were investigated. All metals show moderate deficiency. Most of the stars show normal abundance of sodium. With the exception of HD35863 the "normal" lithium abundance also was found in HD27523, HD45042 and HD88923.

Main question was "What is FBS?" We discussed three hypothesis that could be applied for explanation of their nature:
1) they are really blue stragglers with prolonged evolution;
2) they are normal stars wich were born in metal-deficient medium;
3) they are an extention of λ Boo stars towards lower temperature.

References

Andrievsky S.M., Chernyshova I.V., Ivashchenko O.V.: 1995, *As. Ap.*, **297**, 356.
Andrievsky S.M., Chernyshova I.V., Kovtyukh V.V.: 1996, *As. Ap.*, **310**, 277.
Olsen E.H.: 1980, *As. Ap. Suppl.*, **39**, 205.

Key words: Stars: abundances; Stars: blue stragglers

KICK ASYMMETRY ALONG A STRONG MAGNETIC FIELD IN THE PROCESS OF NEUTRINO SCATTERING ON NUCLEONS

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Neutrino-nucleon scattering in a collapsing star envelope with a strong magnetic field is investigated. The neutrino mean free path and the transferred momentum asymmetry along the magnetic field direction are obtained. It is shown that, although neutrino-nucleon scattering is not affected on neutrino mean free path in the envelope, it gives a comparable contribution to the asymmetry with direct URCA-processes. Thus, neutrino-nucleon scattering should be taken into account in estimations of a possible influence of neutrino reemission processes on collapsing star envelope dynamics.

Key words: stars: envelope: collapse; neutrinos

VARIATIONS OF THE OUTBURST CHARACTERISTICS OF THE DWARF NOVA RU PEG

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The photometric variability RU Peg was studied based on 15 498 visual observations from the AFOEV and VSOLJ databases in 1934 - 1999 yrs. (JD 2427762-51202). The scalegram analysis by using the method of "running parabolae" (Andronov, 1997) has determined the optimal value of the filter half-width $\Delta t = 11.6^d$ corresponding both to the outbursts and the inactive state. However, for the outbursts only, we have adopted slightly smaller value $\Delta t = 11^d$. The characteristics of 117 outbursts have been determined. The brightness for 108 more pronounced maxima varies from 9^m9 to 11^m8, with a mean value $\langle m_{max} \rangle = 10^m75$, r.m.s. deviation $\sigma = 0^m39$. The asymmetry is rather high (0.40) indicating a deficiency of large outbursts. Its value is 0.45 for the luminosity.

The brightness outside the outbursts is 11^m9-13^m5 with a mean value 12^m65. Thus the amplitude of the outbursts may be very small, practically undetectable, despite its mean value is 1^m9.

By using the extension of the wavelet analysis to irregular time series (Andronov, 1998), we have analyzed the brightness variations of the peak outburst brightness. The largest mean semi-amplitude 0^m36 corresponds to a period $P \approx 23000^d$, comparable with the duration of the observations and may be attributed to much weaker outbursts at the beginning of the run. Second peak (0^m24) corresponds to $P \approx 740^d$. However, the coherence of this peak is very low. A smaller peak at 1800^d corresponds to a smaller amplitude of 0^m18.

One may note a long-term wave of the brightness at the inactive state with comparable periods, however, the 13000^d peak is relatively stronger.

The interval between the successive outbursts varies from 30^d to 151^d with a mean $P = 80^d8 \pm 2^d9$, and a r.m.s. deviation $\sigma = 26^d3$. The wavelet analysis shows peaks if taking into account a low frequency resolution in the wavelet analysis.

Thus one may conclude that there are long-term variations of the cycle length, brightness at maxima and minima, which are usually attributed to changes of the accretion rate possibly caused by a magnetic activity of the secondary.

Acknowledgements. The authors are thankful to 205 amateurs from AFOEV and VSOLJ who observed RU Peg.

References

Andronov I.L.: 1997, *As. Ap. Suppl.*, **125**, 207.
Andronov I.L.: 1998, *Kinem. Fiz. Neb. Tel.* **14**, 490.

Key words: stars: cataclysmic variables; stars: individual: RU Peg

WHY DID THE OUTBURST OF A0535+26 OCCUR IN OPTICAL REGION?

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The energetic and statistic characteristics of the optical outburst (Johnson's B band) of recurrent transient X-ray pulsar A0535+26 are presented. The outburst consisted of a great number of transitory individual pulses. Duration of one pulse was about 10 - 20 sec. only which is comparable to the 10 sec. integration time. The bottom brightness level between the pulses was stable and equivalent to the level of a quiet stage for the system. The amplitude of single pulse at the maximum of the outburst's intensity amounted to 1.73 mag. The possible reasons of its appearance in optical band are discussed.

Key words: Stars: Binaries, X-ray pulsars: Individual: A0535+26=V 795 Tau

ON AMPLITUDE VARIATIONS OF THE δ SCUTI STAR VW ARIETI

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The data set of 164.9 hours with time spanning of 16 days obtained for δ Scuti type star VW Arieti in multisite, multichannel photometric campaign of 1993 was analyzed with Fourier and wavelet techniques. The temporal behavior of five modes over time scale of a few days is compared. It is shown that mode coupling and amplitudes variations are possible for this star. These features evidently occur due to rather high rotation velocity of VW Ari. Further observations with wide time spanning are needed for this star.

Key words: stars: δ Scuti: oscillations; star: photometry; Individual: HD 15165, BDS1269A, VW Ari

THE PERIOD CHANGES IN THE GROUP OF ALGOL-TYPE BINARY SYSTEMS WITH ASYNCHRONOUS ROTATION OF COMPONENTS

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Algols are product of the mass transfer process and they display various kinds of activity including the period changes. Some of these period variations are implied by the evolutionary processes during the mass exchange,but the observatios suggest that additional mechanisms are needed in most cases. Evolution period changes caused by mass transfer from one star onto its companion often determinent for the case conservative mass transfer. Matter just flows from the loser to the gainer – both total mass ratio and angular momentum of the binary are constant. In this case for Algols, matter is flowing from the less massive loser onto the more massive gainer, dominant increase of the length of P should be therefore observed. Such a monotonous period change would be most easily distiguishable. However, large mass transfer rate ($\dot{m} = 10^{-6} M_\odot yr^{-1}$) is needed for producing an O-C change detectable on the time scale of decades.This value of $\dot{m}$ would have to be even larger for the non-conservative transfer which could, in principle, lead to more complicated course of O-C. Large $\dot{m}$ occurs only in the initial phase of the mass transfer before the mass ratio reversal. It means that the number of Algols with $\dot{m}$ still high enough for producihg observable period changes is expected to be small.

The group of Algols with asynchronous rotation of components (19 systems, Glazunova 1999) is differ from other Algols having higher mass transfer rate and more rapidly rotatingt main stars than necessary for synchronous rotation. Investigation of the period changer can help understand the nature of this asynchonism in this systems and them distinction from other Algols. The period changes for four systems of this group RW Tau (Simon,1998), SW Cyg and U Sge (Simon,1997a,b), U Cep (Olson et al.,1981) are studied in detail. The O-C diagrams of these Algols have diferend shapes, but they have a general similiaryties such as monotonous increase of period with a short-term jumps. The possible reasons of such a behaviour of O-C diagrams (the third body, the Applegate theory, modification of O-C diagrams.

We heve been continued the study of period changes of other systems of this group (RX Gem, S Cnc, RW Per) wiht large value of the asynchronism factor. The kind of the O-C diagrams have a complicate character, but as a whole is similar to the diagrams of the four above menntioned systems.

References

Glazunova L.V.: 1999, *Letters in Astronomical Journal*, 6, 1.
Simon V.:1998,*Proceedings of the 29th Conference on Variable Star Refsearch*, 7-9 November 1997, Brno, 193.
Simon V.: 1997a, *As. Ap.*, **319**, 886.
Simon V.: 1997b, *As. Ap.*, **327**, 1087.
Olson E.C., Crawford R.C., Louth H., Markworth N.L., Piirola V.: 1981, *Publ. Astron. Soc. Pac.*, **93**, 464.

Key words: stars: binary: period changes

ABUNDANCES OF HEAVY ELEMENTS IN SIRIUS

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The abundances of heavy elements ($Z_i 29$) were investigated in the atmosphere of Sirius A. The Copernicus UV spectral atlas were used. Careful comparison of calculated and observed spectra permit us to identify the lines of heavy elements, which was not investigated in Sirius spectrum earliar. The abundances of these elements were determined with the automatic spectrum synthesis method.

Our results, and results of earliar investigations of this star permit us to claim that the abundance pattern for Sirius consist of 43 chemical elements – the highest level of completeness for Am type stars.

Key words: stars: abundances; individual: Sirius

CP SB2-TYPE SYSTEM 66 ERI REVISITED

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We report the preliminary results of abundance determination of A and B components of SB2 star 66 Eri from 5 high resolution CCD echelle spectra with $S/N_i 100$ in the wavelength region 3700-9600 A taken with 2.7-m telescope of McDonald observatory. We found new orbital elements of the system.

The identifications of spectral lines was made on the basis of comparison of observed spectra with synthetic spectra of the components, calculated for the whole observed region. Atmospheric parameters of the components were determined on the base of analysis of equivalent widths of iron lines. NLTE corrections were taken into account. We found the values of atmospheric parameters of components.

The abundances of elements were determined with the method of spectrum synthesis. Hyperfine and isotopic spliting was taken into account for several elements of iron group and for barium. The components of 66 Eri are very similar in any physical parameters, exept the chemical abundances of their atmospheres. One of the components is peculiar star with large overabundances of heavy elements.

Key words: stars: binaries; stars: Am; stars: abundances

BLOB PARAMETERS FOR ACCRETION STREAMS IN MAGNETIC CATACLYSMIC VARIABLES

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We describe a study of the shorttime optical and X-ray variability some AM Her stars. Optical observations in WR and UBVRI bands was obtained on Shain Mirror Telescope and AZT-11 of Crimean Astrophysical observatory accordance. X-ray data was retrieved via Internet from HEASARC, NDADS, MAST and HST databases. This observations cover wide energy range and allow to investigate different sources and mechanisms as product of accretion in magnetic cataclysmic variables. Except quasi-periodic oscillations, this observations best described by shot noise with an exponential decay. This shot noise interpreted as the product by inhomogeneous blob accretion (Kuijpers, Pringle 1982; Beardmore, Osborne 1997).

In order to investigate this effects, the orbital and other long-time-scale variability were removed from the light curve. This was done by smoothing the light curve by polynomial fit. The parameters that describe the emission are the shot rate, λ, the initial shot height, h, and the shot decay time, τ. The last can be determined from the $1/e$ time-scale of the autocorrelation function (ACF) of the detrended data.

If the shot time-scale τ represents the characteristic emitting time of a blob of length L, then τ is just the time it takes the blob to fall through the emitting region. Thus we can estimate L from

$$L \sim v_{ff}\tau/4 \tag{1}$$

where v_{ff} is the free-fall velocity at the shock front, and the factor of $1/4$ arises from the strong shock conditions. The shot height, h, is related to the volume emission measure of the emitting material in the blob. Emission measure of

$$S \sim n_e^2 V \tag{2}$$

Thus a knowledge of the electron number density, n_e, would allow an estimate of the volume, V, of the emitting material per blob to be made.

In the full report we will compiled and compared results for blob properties as phase-, brightness- and polarization rate- depended functions for magnetic cataclysmic variables with different values of the magnetic field, accretion rate, distances between components and many over properties.

References

Kuijpers J., Pringle J.R.: 1982, *As.Ap.*, **114**, L4.
Beardmore A.P., Osborne J.P.: 1997, *M.N.R.A.S.*, **290**, 145.

Key words: stars: close binaries: magnetic field; accretion: accretion discs; stars: cataclysmic, X-ray sourses

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ON EVOLUTION EFFECTS IN INTERRELATION OF MASS STARS OF CLOSING BINARY SYSTEMS

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We have considered the correlations of mass ratios of the binary system components with component's masses M1 and M2. It was found that contact and semi-detached eclipsing binary system stars show the reliable correlations of mass ratios q with the masses of components M2. For more massive stars, the ratio of q-value decrease with M2 decreasing is slowing down, similarly for both groups binary systems.

Key words: stars: binary: stellar evolution

SPECTROSCOPIC INVESTIGATION OF IRAS 20004+2955 (V1027 Cyg)

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Spectral investigation of IRAS 20004 + 2955 source identified as variable star V1027 Cyg (R = 13000 and R = 35000, S/N > 100) obtained based on high-resolution observations (R = 13000) and PFES (Panchuk et al., 1998) with an echelle spectrometers LYNX (Panchuk et al., 1993) of 6-m telescope of Special Astrophysical Observatory of RAS has been carried out. The atmospheric parameters, radial velocities, abundances of 16 elements were derived. The estimation of vsini value was performed. Obtained value of the carbon abundance, some overabundance of Zr, Y, Ce, Eu and results of the analysis of polarimetric data allow to make a conclusion that this star could be a semiregular variable object (Arkhipova et al., 1997), probably in the AGB stage. Its large IR excess is likely due to its position within Galaxy plane.

References

Panchuk V.E., Klochkova V.G., Galazutdinov G.A. et al.: 1993, *Pis'ma v Astron. Zhurn.*, **19**, 1061.
Panchuk V.E., Najdenov I.D., Klochkova V.G., Ivanchik A.B.,
Yermakov S.V., Murzin V.A.: 1998, *Bull. Spec. Astrophys. Obs.*, **44**, 127.
Arkhipova V.P., Esipov V.F., Ikonnikova N.P., Noskova R.I,
Shugarov S.Yu., Gorynya N.A.: 1997, *Pis'ma v Astron. Zhurn.*, **23**, 794.

Key words: stars: atmospheres; stars: abundances; AGB stars

NUCLIDES AND THEIR EVOLUTION

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The problem of explanation of the "earth" Mendeleev's table or of abundances of nuclides in other objects of Universe must be accounted with theory of the origin and evolution UNIVERSE. The precise determination of chemical abundances in various objects of the Universe is the key for our uderstanding of evolution of all objects in the Universe after Big Bang. A problem of determination of abundances of chemical elements and their isotopes in atmospheres of stars by the model atmosphere method is discussed briefly. The methods of determination of fundamental characteristics of cool stars (the effective temperatures T_{eff}, surface gravities $\lg g$, metallicities [Fe/H] are discussed. The chemical composition of these objects was formed in the result of evolution of all nuclidies heaver ^{4}He (with the exception, possibly, of most ligth nuclidies - ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B. In the analysis of the results of chemical abundances in the atmospheres of cool giant stars of oxygen sequence it is necessary to take into account the belonging of stars to various stages of starformation (Korotina et al., 1989, Korotina et al., 1992, Komarov et al., 1996) and evolution. The evolutionary status of a star can be determined from its' position on the H-R diagram but at the same locus of H-R diagram can be located stars proceeding different stages. The evolution is affected by distinctions in masses and initial chemical composition of protostar matter. The best position seem to have those stars that belong to the open clusters or dynamical groups.

The abundances of ~100 of cool giant stars in vicinity of Sun have been determined.

The new data of temperature, gravity, microturbulent velocity, radius, mass and total luminosity of ~1500 G-, K-, M giant stars were obtained (Korotina et al., 1989, Korotina et al., 1992, Komarov et al., 1996). The metallicities of giant stars belonging to 27 open clusters and moving groups of various ages were determinated. The dispersion of metallicities for old stars amounts from 0.0 to -0.5 dex, but for young stars amounts from 0.1 to -0.1 dex. It is assumed that the division of giant stars in vicinity Sun into two groups corresponds to their division into two ages' groups or into two star formation flashes localized in time. The processes of mixing in interstellar medium have been increased in the course of its evolution. It should be noted that T_{eff} of these stars for the same spectral type increases with the growth of metallicity. It is shown that their luminosities increase with the growth of metallicity too. The masses depend neither of the spectral type nor on metallicity. The most *impressive result* is that cool giant stars in the spectral region from G5 to K5 have masses statistically less then solar one, and consequently, these have the ages compared with that of a globular clusters.

References

Komarov N.S., Korotina L.V., Shevchuk T.V.: 1996, *Kinematika i fizika nebesnykh tel*, **26**, 3

Korotina L.V., Dragunova A.V., Komarov N.S.: 1989, *Astrophysika*, **21**, 539.

Korotina L.V., Komarov N.S.: 1992, *Astron. Zhurnal*, **69**, 1188.

Key words: stars: abundances; stellar evolution

THE DISTRIBUTION OF COOL GIANT STARS WITH VARIOUS KINEMATICS AND METALLICITIES IN VICINITY OF THE SUN

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On the basis of our catalogue some characteristics for roughly 1500 disk giant stars with various metallicities [Fe/H]= $\lg$(Fe/H)*-$\lg$(Fe/H)$^\odot$ of spectral types from G0 to M4 and their space distribution have been examinated in order to investigate the dependenses between their location, spectral type and metallicities.

The distribution of stars with metal deficiency have maxima in the region of spectral type from G7 to K0 and from M1 to M4. Stars with solar metallicity are observed in the region of spectral type from K1 to K5 with some maximum in spectral type K3.

It is assumed that the division of giant stars in vicinity of Sun into two groups corresponds to their division into two ages' groups or into two star formation flashes localized in time. The processes of mixing in interstellar medium have been increased in the course of its evolution. The goal of this work is studying of kinamatic and morphologic characteristics of groups of giant stars with various metallicities and spectral types.

The kinematic characteristics of cool giant stars of oxygen sequence in vicinity of Sun was determined for these groups.

The distribution of stars of various metallicities and various space velocities V_{sp} was studied. It was received that slow velocitiy stars $V_{sp}<60$ kms^{-1} - the stars of Galactic disk- have maximum in distribution of [Fe/H] near -0.2 dex. The stars with $V_{sp}>60$ kms^{-1} -the stars of Galactic galo- have nearly even distribution. The space distributions of stars from rectangular galactic coordinates and from distance from center of solar disk are nearly indentical and symmetrical. There are no systematical errors between the parallaxes in the systems of Komarov et al. (1996) and HIPPARCOS. But, in some stars the considerable random errors was observed and they can't be explained by interstellar absorption.

We have to believe that cool giant stars in vicinity of Sun don't belong to one group. Therefore, the abundances of chemical elements in their atmospheres must be studied by the same method, same observable material, same input physics and same physical approximations. The conclusion about evolution of chemical elements and their isotopes in stellar stage of evolution may be made only in this a case.

References

Komarov N.S., Korotina L.V., Shevchuk T.V.: 1996, *Kinem. i fizika nebesnykh tel*, **12**, 1.

Key words: stars: cool; stellar kinematics

THE NEW SPECTROPHOTOMETRIC STAR CATALOGUE

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The new energy distributions E_λ in spectra of 435 stars in wavelength region from λ 325 to λ725 nm are obtained. The observations for "absolute" stellar spectrophotometry have been obtained at mount astronomical station "Terskol" (height 3100 m, Caucasus) in 1973-1988 years. The method of "relatively-absolute" spectrophotometry was used to obtaine the spectral energy distribution. The stars of comparison were α Lyr, β Ari, γ Ori, α Leo, η Uma, α Aql, α Peg, β Cmi, θ Leo and α Oph. The E_λ of all stars of comparison were in the same system as α Lyr (except for β CMi and θ Leo which spectral distributions were in the system of stars β Ari and α Leo respectively). The analysis of various mistakes was made and it was took in account. The comparison with other Catalogues E_λ of the former USSR was made. It should be noted that both the observational technique and E_λ measuring in our work are similar to that in the above catalogues. The same optical and mechanical systems were used as well as analogous procedures of observations of stellar radiation and subsequent calculations. Only the register electronic devices were modified. The random errors of the results of all Catalogues are nearly equal 2-3% (to 5%) in the visual range of a spectrum and 5-10% at the edges of the spectral bands - near ultraviolet and near infrared regions. However, the of spectrophotometry results of various authors has large disrepances (up to several dozens (!) per cent sometimes).

The energy distributions in spectra of stellar radiation are reduced to the OAO Vega system (Komarov et al. 1978) In order to exclude any systematic discrepancies of data of new Catalogue relatively to other Catalogues (Komarov et al., 1983,Komarov et al.,1995) for wich one system of primary and secondary standards was used.

The graphic method has been used for preliminary analysis before averaging all data calculation. Obviously erroneous data have been excluded, namely: "springing out"- dots, "tails", displacements of some parts in the wavelength or in stellar magnitudes etc.

The resulting catalogue has been recorded on diskettes and comprises 435 stars. No systematic divergences from initial catalogues are found.

The Catalogue will be published in the next issue of the Odessa Astronomical Publications".

References

Komarov N.S., Karamysh V.F., Pozigun V.A.: 1978, *Astron. Zhurn.*, **55**,1208.
Komarov N.S., Pozigun V.A., Belik S.I., Dragunova A.V., Gopka V.F., Zakozhurnikova N.N., Kantsen L.E., Karamysh V.F., Mishenina T.V., Orlova L.F., Pereverzentsev A.F., Russo T.A., Cherkass A.G.: 1983, *The spectrophotometry of stars in the region $\lambda\lambda$ 550-900nm*, Kiev, Naukova Dumka, 312pp.
Komarov N.S., Dragunova A.V., Belik S.I., Karamysh V.F., Zakozhurnikova N.N., Orlova L.F., Kantsen L.E., Cherkass A.G., Depenchuk E.A., Shevchuk T.V., Golubovskiy V.V.:1995, *Odessa Astron. Publ.*, **8**, 115pp.

Key words: stars: spectrophotometry; stars: catalogue

THE ATTEMPT TO TEST THE VARIABILITY IN TIO-BAND IN COOL GIANT

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Accordingly calculation of synthetic spectra cool giants by using of various grids of model atmospheres and various of fundamental parameters was shown that dissipation of acoustic energy and bombardement of high energy particles of TiO molecules can be sources of temperature "inversion" and nonstability of outer layers this stars. These effects and large relaxation time of TiO molecule leds to non-LTE values of their partial pressures. The various types of variable stars among cool giant have been caused correlation between periods of pulsation and relaxation molecules in their atmospheres. In 1993 the testing observations on variability of outer layers of cool giant HD73665 was made at the Mt. Dushak-Erekdag station of Odessa Astronomical Observatory. For simultaneous observations in TiO-band and Johnson V-band was used a split prism in dual-channel photometer. The observations showed quasi-periodical variations at time scale of 2-12 min.

Key words: stars: cool; stars: giants

THE EFFECTIVE TEMPERATURES OF K-GIANTS

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The spectral classification of stars based on the ratios of the line depth which are sensible to the temperature changes. Such calibrations were used for various stars (Gray, 1994; Kovtyukh et al., 1998). From the high resolution spectra of K-giants, we selected 20 pairs of atomic lines and derived 20 analytical relations for the determination of effective temperature. Our calibrations constructed for $5000 < T_{eff} < 4000$ K and for abundances from 0 to -1 dex. The abundance dependence is taken from the Kurucz's (1993) models.

We determine T_{eff} for Arcturus on the high resolution high dispersion spectra obtained at different times.

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References

Gray D.F.: 1994, *P.A.S.P.*, **107**, 120.
Kovtyukh V.V. Gorlova N.I., Klochkova V.G.: 1998, *Pis'ma v Astron. Zhurn.*, **24**, 438.
Kurucz R.L.: 1993, *CD ROM*, N **13**.

Key words: stars: effective temperatures; stars: atmospheres; stars: population I

ON THE PHENOMENON OF NONVARIABLE SUPERGIANTS IN THE CEPHEID INSTABILITY STRIP

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The discovery of great number of nonvariable stars (NVSs) within the Cepheid instability strip by Fernie and Hube (1971) and, independently, by Schmidt (1972) was a great surprise for researchers. Since then several attempts have been undertaken to detect some anomalies in NVSs that would explain their peculiar behavior. No differences of significance are found in the element abundances (Schmidt et al., 1974; Luck and Lambert, 1985; Andrievsky and Kovtyukh, 1996). In the latest work the following possible reasons of NVSs constancy have been analysed: low helium content, duplicity, dissipation of pulsation energy. Conclusion made is that none of the above mechanisms can be responsible for the existense of a great number of NVSs in the instability strip.

Meanwhile, a simple and rather natural explanation of the "phenomenon" can be suggested. Indeed, it has long been known that in the frequency-period distribution of galactical Cepheids there exists a minimum located at the resonance period of ≈ 9 days. The progenitors of Cepheids is O-B8 MS dwarfs. Cepheids with $P \approx 9^d$ have masses of 5-6 $M_\odot$. However, mass function of B-stars dose not show any significant minimum in the 5-6 $M_\odot$. Therefore, the 9 day gap in the Cepheids frequency-period distribution can't be explained by the lack of 5-6 $M_\odot$ B-dwarfs.

As is known from the theoretical modelling of Cepheids pulsations, a resonance between the fundamental mode and the second overtone occurs at about 9 days. Nothing remains but to suppose that the resonance is not only capable of amplitude decreasing but may also completely suppress pulsation (see Butler, 1998). These would-be "Cepheids" we observe as NVSs in the instability strip.

Thus, the first mechanism acts near the critical period of 9 days and is caused by the destabilizing effect of the 2-nd overtone on the fundamental cycle ($P_2/P_0 = 0.5$).

The second mechanism deals with the instability of the fundamental pulsations with small ($< 0.^m5$ V) amplitudes.

Thus, two mechanisms that suppress pulsationsq have been suggested to explain the existence of nonvariable stars within the Cepheid instability strip. It is concluded that nonvariables may be situated everywhere throughout the instability strip but preferably in the vicinity of P_2/P_0 resonance.

The analysis of the observational data confirms the explanation.

References

Andrievsky S.M., Kovtyukh V.V.: 1996, *Astroph. and Space Science*, **245**, 61.
Butler R.P.: 1998, *Astrophys. J.*, **494**, 342.
Fernie J.D., Hube J.O.: 1971, *Astrophys. J.*, **168**, 437.
Luck R.E., Lambert D.L.: 1985, *Astrophys. J.*, **298**, 782.
Schmidt E.G.: 1972, *Astrophys. J.*, **172**, 679.
Schmidt E.G., Rosendhal J.D., Jewsbury C.P.: 1974, *Astrophys. J.*, **189**, 293.

ISOTOPIC ABUNDANCES OF MAGNESIUM – ^{24}Mg, ^{25}Mg, ^{26}Mg IN THE ATMOSPHERES OF G-K – GIANTS

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Isotopic abundance ratios are regarded to be a powerful tool in the application to the stellar evolution studies. Especially it refers to the investigation of late giants, where obtained abundances of isotopes for some elements can much say about physical processes operating inside these stars and their evolutionary stage.

For the present study we selected the following giants having the different level of chromospheric activity: BS 165 (K3 III), BS 168 (K0 IIIa), BS 2990 (K0 IIIb), BS 3705 (K7 IIIab), BS 4301 (K0 IIIa), BS 4932 (G8 IIIab).

RETICON spectra have been odtained with AURELIE spectrograph on the 1.52-m telescope of the Haute Provence Observatoire (France) in 1999. The resolving power $\lambda/\delta\lambda$ $\sim 66,000$ and signal-to-noise ratio ≈ 500 for all the spectra. The observed wavelength region was 510.5 - 516.5 nm. Preliminary reduction of the spectra has been done using IHAP and DECH20 packages.

The synthetic spectra were calculated using STARSP code described by Tsymbal (1994, 1995). Special attention was paid to accurate modelling of the isotopically shifted MgH lines in the vicinity of 513.4 nm. For this purpose we specially calculated the oscillator strengths for corresponding transitions in MgH molecule and these oscillator strengths were also tested using observed solar spectrum.

An accurate estimate of the isotopic abundance ratios, as well as reliable determination of the chemical composition strongly depends upon the adopted atmospheric model parameters. Effective temperatures T_{eff}, surface gravities logg and metallicities [Fe/H] for the program stars were derived using various methods (in particular, we applied the new method developed by Komarov et al. (1996)).

Obtained results on isotopic Mg abundances in program stars are briefly discussed.

References

Komarov N.S., Korotina L.V., Shevchuk T.V.: 1996, *Kinem. i Fizika Nebesnykh Tel*, **12**, 1.
Tsymbal V.V.: 1994, *Odessa Astron. Publ.*, **7**, 146.
Tsymbal V.V.: 1995, *ASP Conference Ser.*, **108**, 198.

TRANSCENDENTAL NUMBER π AND CLOSE BINARY SYSTEMS

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An existence of monochromatic gravitational wave (GW), with frequency ν_G, in Universe might be established by its influence upon close binary systems (CBSs). The relative number of such systems, revolving in resonance with $\nu_G/2$ (and harmonics) must be smaller than expected for random frequencies. And vice versa, frequencies which are "perfectly" non-commensurable with $\nu_G/2$ (and harmonics), might show a substantial excess of binaries. The π-number is supposed to be a factor which can ensure such a perfect anti-resonance for CBSs.

It is found that revolution of 273 super-fast systems (CV's and LMXB's) is indeed modulated by a frequency of 103 ± 3 μHz. This effect can easily explain the presence of the famous "gap" in distribution of CV's (for periods $P \approx 160$ min) and maxima for $P \approx 102$ min and ≈ 205 min. This result is supported by analysis of 4330 binaries which reveal modulation by a hidden period $P_G = 159.5 \pm 0.8$ min. The frequency of a hypothetical quasi-GW, therefore, equals 104.5 ± 0.5 μHz. It coincides fairly well with frequency $\nu_0 = 104.16$ μHz, previously detected in oscillations of the Sun, and later on – in luminosity variations of several AGN's. These facts strongly support cosmological significance of the ν_G (ν_0) oscillation. The latter might represent a relic quasi-GW emission of the Universe, or just small-amplitude periodic fluctuations of the Newton constant G.

Key words: stars: close binaries; cosmology; gravity waves: oscillations

MODELING OF VISIBLE SPECTRA OF TWO M DWARFS GJ51 AND GJ111

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This paper deals with modeling of optical spectra of two M dwarfs GJ51 (M5) and GJ111 (M6.5). The sensitiveness of spectra on the effective temperature was studied as well the influence of log(g) on models of atmospheres was verified. Models with chromospheric-like structures were considered also. Effective temperatures obtained from the fit of the optical spectra of GJ51 and GJ111 are 3300K and 2900K, respectively. Spectral regions $\lambda\lambda$ 8106-8146A, 6688-6728A and 6083-6123A were simulated using both the just overlapping (JOLA) and line by line approximations (for the Plez, 1998 line list). We show, that these aproximations give very similar results for the optical spectra of late M-dwarfs.

Key words: stars: late: M-dwarf; stars: spectra

INVESTIGATION OF THE NON-STATIONARY ACCRETION DISKS PROBLEM

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The non-stationary accretion disk equations are solved analytically as applied to the disk with the fixed outer radius. Two principle cases are considered: standard alpha-disk and the advection dominated accretion flow (ADAF).

The first case implies a non-linear diffusive type equation which is solved by separating variables. As a result the power-law variations of accretion rate with time are obtained for the standard disks. The vertical structure of the disk with different opacity regimes (Thomson scattering and free-free absorption) is involved. The transition between these two regimes during the source evolution is investigated.

The ADAF case yields a linear diffusive-type equation and the exponent–law variations of accretion rate with time.

The model can be applied to the flaring binary sources such as cataclysmic binaries and soft X-ray transients.

Key words: accretion: accretion disks; binaries: close; novae, cataclysmic variables

RELATIVISTIC STELLAR CLUSTERS

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Star clusters with very high density may play an important role in QSO and nuclei of particular galaxies. This role is strongly influenced by relativistic instability which can be reached at different critical densities under particular conditions (e.g. the formation of massive black holes in AGNs). On the other hand it exists the possibility to have stable relativistic clusters with arbitrarily large central red-shift (and density). The equilibrium relativistic clusters described by a Maxwellian DF with a cutoff in phase space is discussed. The results are compared and contrasted with ones existing in literature and stability of relativistic clusters.

Key words: stars: clusters; quasi stellar objects; active galactic nuclei

STRONG CHANGES IN PHOTOMETRIC BEHAVIOUR IN THE CARBON MIRAS

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In our work cycle-to-cycle changes in the light curves parameters of C and S Miras are analysed. We have used amateur observations from AFOEV and VSOLJ databases to obtain the long time series. Methods of the analysis are analogous to ones described by Andronov and Marsakova (1998).

All C and S stars show greatest scatter of the individual cycles characteristics as a periods etc. Significant changes in the amplitude and shape of light curves have been found. For example, Y Per shows 3-rd degree changes of O-C till J.D. 2448000. Then light curve became like to semiregular and the half-period waves appear. In the some stars a strong variations of mean brightness like to S Cep (Marsakova, 1999) were detected.

There are some moments where photometric behaviour changes radically also exist. In these moments double maxima appeare, amplitude and O-C behaviour change abruptly but the mean period not vary strong.

Correlation analysis show that light curve changes are interrelated between themselves but the correlation differ from ones calculated for the M-Miras (Marsakova and Andronov, 1997a; Marsakova and Andronov, 1997b; Andronov and Marsakova, 1998).

These peculiarities may be used as one of the experimental tests of theoretical models of the pulsations.

References

Andronov I.L., Marsakova V.I.: 1998, *Astrophys. Space Sci.,* **257**, 49-61.
Marsakova V.I.: 1999, *Journal AAVSO,* in press.
Marsakova V.I., Andronov I.L.: 1997a, *Cinematics & Phys. Celestial Bodies,* **13**, N6, 49-62.
Marsakova V.I., Andronov I.L.: 1997b, *Odessa Astron. Publ.,* **10**, in press.

Key words: stars: AGB; stars: carbon: Mira stars: period changes, light curves

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OXYGEN ABUNDANCES IN HALO STARS FROM OI TRIPLET

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Oxygen abundances for 15 halo stars through the O I 7774 triplet from high resolution spectra (R = 25,000; S/N>100) obtained with echelle-spectrometer (Panchuk et al., 1993) of 6-m telescope of Special Astrophysical Observatory of the Russian Academy of Sciences have been derived. The effective temperature, metallicity and other parameters have been examined. For example, the effective temperature was found from the line spectroscopic analysis (Fe I lines and H_α line wings) and photometric indices. The abundance analysis was carried out using both LTE and non-LTE conceptions. For this aim we have specified the oxygen atomic model. The average [O/Fe] value was +0.52 ± 0.33 from non-LTE determinations. The trend of oxygen abundance increasing with the iron abundance decreasing was found. In addition to the sample of our program stars we also involved in the analysis 24 targets from Cavallo et al. (1997). For their original results we found the necessary non-LTE correction. The comparison of our data with the results of other works (Tomkin et al., 1992; King and Boesgaard, 1995).

References

Panchuk V.E., Klochkova V.G., Galazutdinov G.A et al.: 1993, *Pis'ma v Astron. Zhurn.,* **19**, 1061.
Cavallo R.M., Pilachowski C.A., Rebolo R.: 1997, *P.A.S.P.,* **109**, 226.
Tomkin J., Lemke M., Lambert D.L., Sneden C.: 1992, *A.J.,* **104**, 1568.
King J.R., Boesgaard A.M.: 1995, *A.J.,* **109**, 383.

Key words: stars: abundances; stars: atmospheres; stars: population II

MASS TRANSFER IN BETA LYRAE AND V1315 AQL = SS 433

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We present 2D-numerical simulations of the mass transfer in two very famous close binary systems: β Lyrae and SS 433. The simulations were performed using the 'big-particles' code by Belotserkovskii and Davydov and the stellar atmosphere models from Kurucz's grid to set up the initial model of the upper layers of the mass losing star (the secondary) near one Lagrangian point (L_1). We used also the standard binary model in calculations: the Roche approach of the gravitational mass, the circle orbit in binary system, the synchronous rotation in binary. The grid and the average cell size are 300×600 $5 \cdot 10^{-4}$ (here and afterwards all the distances will be given in units of the orbital separation) respectively for both binary system.

The main results corresponding the β Lyrae binary is great stream radius in this binary which is equal to more than 55% from the average radius of the secondary Roche lobe. The stream moving in the mass gaining star (the primary) Roche lobe does not change the stream radius that is corresponding to Lubow and Shu model. The stream orbit around the primary and form the accreting disk. The density and temperature in one point amount to $10^{14} \mathrm{cm}^{-3}$ and 55,000 K. These values in the stream are in the average equal to $10^{13} \mathrm{cm}^{-3}$ and 45,000-50,000 K. The density and temperature in the accretion disk are equal to $10^{12..13} \mathrm{cm}^{-3}$ and 40,000-50,000 K. The velocity in the internal domain of the accretion disk is close to the Kepler values.

The simulations in the case of SS 433 were conducted for two cases of mass: massive and low-mass binary variants. In these cases the mass of the secondary and the primary amount to 0.60 and 3.0, 10 and 12.1 in units of solar mass. These two variants of SS 433 system distinct a each other by the mass transfer rate value. For low-mass SS 433, it's magnitude amounts to $2 \cdot 10^{-6}$ solar mass per year and 10^{-4} for massive SS 433 binary. Since the observed mass transfer rate amounts to the value of 10^{-4} solar mass per year we may choose the massive variant as real. By such the way the it allows to conclude that compact subject in SS 433 system is black hole. The stream behavior in SS 433 binary system are distinct from the β Lyrae system. The stream radius are decreased by 3..4 times from L_1 to the primary. The stream orbit the primary and moves towards L_1-point. The place of the interaction between the stream and the stream orbiting the primary is hot spot with the temperature equal to 570,000 K. The density in the stream and the stream orbiting the primary equal to $10^{13..14}$ cm^{-3}. The temperature in the stream orbiting the primary is equal to 100,000 K.

Key words: stars: binary: mass transfer; hydrodynamics simulations

VARIATIONS OF THE PARAMETERS OF THE Hα LINE OF EM CEPHEI AT 1986, 1990-93 AND 1996-98

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The results of study of high-resolution CCD-spectra of the variable EM Cep (HD 208392, B0.5V, P=0^d.806187) obtained at the 2.6-m telescope of the Crimean Astrophysical Observatory are present.

We measured the equivalent width and central depth of the Hα line.

Hα was in emission in 1986 and showed rapid variability from emission to absorption in 1990-93 and 1996-98 attached to severally smaller the line equivalent width.
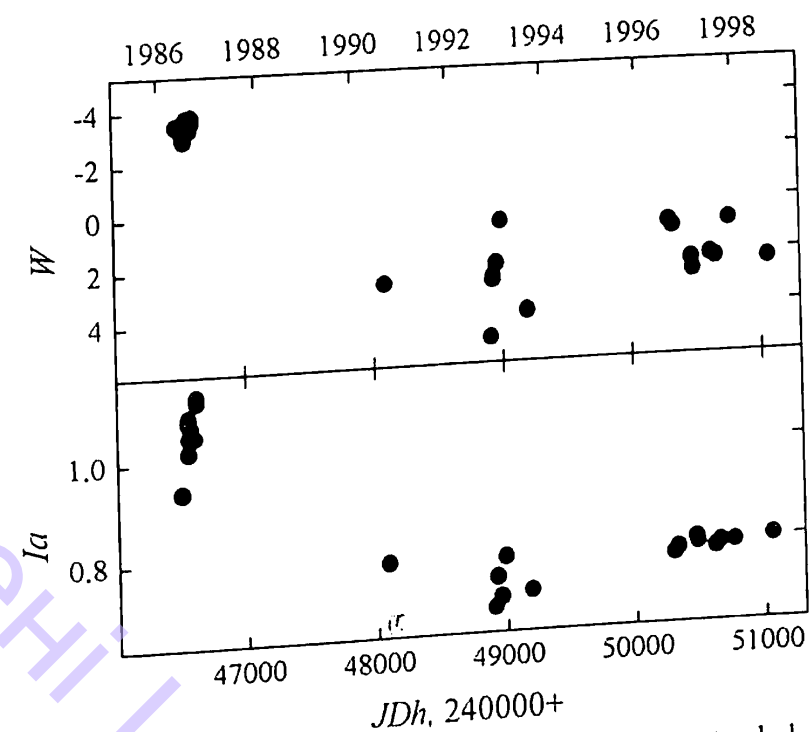
Figure 1: The Hα line equivalent width and central depth changes

Key words: spectral lines: profiles; stars: activity; stars: emission lines; Be-stars; individual: EM Cephei

VARIATIONS OF THE PARAMETERS OF THE Hα LINE OF β CEPHEI AT 1994 – 1998

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The last emission episode of the well-known pulsating star β Cep (HD205021, HR8238, B2III) began in 1990 (Mathias at al, 1991).

We use high-dispersion CCD spectrograms obtained at the 2.6-m telescope of the Crimean Astrophysical Observatory between 1994 and 1998 to study the long-term variability of the emission parameters.

Over the entire observing period, the line was in emission with a pronounced two-component structure and a small intensity above the continuum level. The equivalent weight of the emission component kept meaning near $W=-1$Å. The intensity of the Hα emission feature gradually decreased, while the profile shape remained essentially unchanged.

Variations of the ratio of the violet and red intensity peaks V/R of the full Hα line profile show strong correlation with pulsation radial velocity of β Cep with r=0.95. The radial velocities of the Hα absorption component and CII doublet are very close and systematic differ from the emission component radial velocity. The difference between the meanings of the radial velocities of the emission and photospheric components in one pulsation cycle (JD=2450411.3) is equal 40 km/s at zero pulsation velocity. Thus, the radial velocity of the Hα line emission component does not connected with the star pulsation. Probably, the Hα line emission component does not connected with the star pulsation. Probably, the envelope became around the β Cep companion and we observe superimposition β Cephei primary photospheric profile and companion envelope line.

We show also the star radial velocity measured on CII doublet and corrected for pulsation (P=0^d.1904852, Pigulsky and Boratyn, 1992) decreases quickly than it ensues from orbital moving ephemeris. It is possible, the system periastron passage will come earlier than ensues from the present significance of the orbital period. (Pigulsky and Boratyn, 1992).

References

Mathias P., Gillet D., Kaper L. :1991 . *"ESO Workshop on Rapid Variability of B-Stars: Nature and Diagnostic Value." Ed. by D. Baade.- ESO Conference and Workshop Proceedings 36.* Munchen. 193

Pigulsky A., Boratyn D.A.: 1992. *Astron. and Astrophys.*, **253**, 178

Key words: spectral lines: profiles; stars: Be-stars: emission lines; individual: β Cephei

OBSERVATIONS OF TYPICAL, RARE AND UNIQUE PHENOMENA IN CLOSE BINARIES WITH EXTREMAL MASS RATIO

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The new photometric observations of low-mass X-ray binaries, containing Black Holes (V404 Cyg in quiescence and J0422+32 in mini-outburst), as well as of dwarf novae V503 Cyg and V1504 Cyg in different brightness states are presented. All these close binaries have an extremal mass ratio $q = M_{primary}/M_{secondary} > 3$. According to the modern theories they should show the common (or positive) superhumps – light variations, which a several per cents exeed the orbital period during a course of superoutburst (in SU UMa-type dwarf novae) and during a nova outburst decline. Our observations show the appearance and evolution of common superhumps in dwarf novae, the existence of a rare "negative" superhumps in these systems, and also the existence of peculiar periodic light variations of unknown nature in both low-mass X-ray binaries and dwarf novae.

Key words: stars: photometry: close binaries, X-ray binaries

MODEL ATMOSPHERES AND SPECTRA OF THE SAKURAI'S OBJECT (V4334 SAGITTARII)

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Theoretical distributions of energy in a spectrum of Sakurai object for several effective temperatures are computed for a grid of hydrogen-defient and carbon-rich model atmospheres of T_{eff} in the range of 5000-6200 K and log g =1.0 - 0.0 by technique of the opacity sampling with account of molecular and atomic absorption. Observed and computed energy distributions in the Sakurai object spectrum are compared for a wavelengths interval 300-1000 nm. We show, that:

- The shape of the theoretical spectra shows a strong dependence on T_{eff} .
- In the red part of a spectrum the main role belongs to molecular bands absorption, in a blue part an atomic absorption plays an important role.
- Comparison of the observed and computed spectra allows us to estimate $T_{eff} \approx 5250$-5500 K of Sakurai object for April, 1997.

Key words: stars: atmosphere; stars: spectrum; individual: V 4334 Sgr

OPTICAL SPECTRA OF L-DWARFS

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Theorertical spectra of L-dwarfs ($T_{eff} < 2200$ K) for a grid of the "dusty" model atmospheres of Tsuji (1998) were computed. To fit the observed spectra of L-dwarfs we used two additional suggestions:

- there are some *extra* depletions of molecular species absorbed in the visible region of L-dwarw spectra;

- There are (a few) additional opacity κ sources in their atmospheres;

A few kinds of $\kappa=f(\lambda)$ dependences were used to get "the better fit" of observed spectra. We show:

- Strictly speaking, there a few possibilities to get the reliable fits of the observed spectra.

- Additional (evristic) constraints shold be used to get the solution in the frame of the conventional paradigma.

- We may fit observed sequence of L-dwarf spectra using in the frame of our simple model.

- At firt time, the region of 860 nm contained CrH bands are well fitted.

- Observad sequence of the L-dwarf spectra is *the temperature* sequence.

- In the frame of our approah we have found the solution even for the most complicate case of Gl229B.

Key words: stars: spectra; stars: L-dwarfs

PRELIMINARY ANALYSIS OF THE SPECTRA OF THE "SPOTTED" ROAP STAR HD83368 IN THE LII 6708Å REGION

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It is first attempt of spectra roAp star HD83368 study in spectral region 6680-6730Å.

- The quantitative analysis of spectrum star was carried out by the method synthetic spectra using Tsymbal's code STARSP(1994).

- The problem identification of variable spectral feature 6708Å by Li line and identification RE lines, especialy (Nd III, Pr III, Ce II, Ce III, ...) in this spectral region was investigated.

- Observed modulation of Li line profile with rotation phases, permit to use the method direct modelling of spectrum for calculations oflocation of two Li spots and abundance Li in spots.

Key words: Stars: abundances; Stars: roAp; Individual: HD83368

CURRENT PROBLEMS OF GRAVATION WAVE DETECTION

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At present there are five cryogenic bar detectors through the world in continious operation (three at 2K and two below 0,1K) with sensitivity for long harmonical GW signals up to 10^{-22} and $5\,10^{-19}$ for burst type signals. Besides there are three free mass interferometers with few tenth meters base and the burst sensitivity 10^{-19}. This provides a possibility to search for GW radiation from sources in our Galaxy and close environment in the radius $10 \div 30\,Mpc$. The accepted programs of searching include a development of optimal detection algorithms for special cases, between them: "chirp"-signals from binary coalescence, pulsar's radiation and joint neutrino-gamma-gravity radiation from relativistic catastrophes with unclear nature. Detales of such algorithms are discussed in the talk and as well as correspondent recent experiments. Astrophysical sequences of possible negative results of GW detection on the level 10^{-21} are also undo discussion.

Key words: gravity: garavitation wave: detection

LITHIUM IN COOL MAGNETIC AP STARS.
I. SOME NEW RESULTS OF OBSERVATIONS USING THE CAT(ESO), 2.6M (CRAO) AND NOT (LA PALMA) TELESCOPES

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The problem of lithium in spectra magnetic Ap-stars have been the subject of much debate. In the framework project "lithium in cool Ap stars" were carried out observations of some Ap-CP stars in LiI 6708Å line region.

In present paper are shown first important results of these observations:

- Unique variations of LiI 6708 Å line profile with rotation period showed the observations of oscillating Ap stars HD 83368 and HD 60435

  The cause of variations of lithium line profile and position is the presence of two diametrically opposite and contrast Li spots on the surface of star

- There is good coincidence the position of lithium spots with magnetic poles of magnetic dipole position.

- Discovery of lithium spots allowed to find explanation of the phenomena light oscillations of HD 83368 star:

  a) increase of amplitude of oscillations – at the moment of crossing by lithium spots of center of visible hemisphere of star.

  b) "jump" oscillations phase – both Li spots on limb of star, splitting of Li line 6708 Å for two components, magnetic field Heff in crossover phases, oscillations are disappear.

- Some roAp stars: 33 Lib, HD 166473, HD 134214 show strong Li line 6708 Å, no variable

- The explanation of different behaviour of lithium line 6708Åin spectra Ap stars by model of "spotted" oblique magnetic rotator, individual for every star was proposed.

- The results of observations in Li 6708Å line of oscillating Ap stars and discovery lithium spots are good agree with prediction of Babel theory, concern ambipolar diffusion in Ap stars with dipole structure of magnetic field.

Key words: stars: abundances; stars: magnetic Ap

EVIDENCE ON HOT SPOT IN THE CONTACT BINARY VW CEP

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We study the nature of asymmetry and the intrinsic variability in the light curves of VW Cep. We analyze our own B,V light curves as well as the other data from literary sources. In view of the presence of significant intrinsic brightness variations at a level of $0^m.01 - 0^m.03$ on time scales comparable to the orbital period we deal only with *individual* light curves sampled possibly in one-two consecutive orbital cycles. The evidences for the presence of the small hot spot region close to the neck connecting both components will be summarized: a) displacements of the brightness maxima from the predicted epochs of the hot chromospheric elongations suggestive of an additional energy input supposedly of the hot chromospheric origin, b) the overall pattern of asymmetry in brightness maxima and minima, c) systematic colour changes with the orbital phase, d) the presence of significant cosine first harmonics in truncated series of the observed light curves, e) small dips close to the first contact in secondary minima. We find that the hot spot with a characteristic size of $R \sim 0.7 - 1.2 10^{10} cm$ located on the surface of a more massive and the temperature contrast $\Delta T/T = 1.3 - 1.4$, whereas model light curves based on our star can explain the afore-mentioned peculiarities. The possible physical nature model give rather good fit to the observed data studied so far. The possible physical nature of the hot spot in the light of our results confronted with the spectroscopic data (specifically Mg II resonance doublet) and flare activity signatures are briefly discussed.

Key words: stars: W UMa binaries, close binaries; starspots; individual: VW Cep

THE OPTICAL POLARIZATION AND MAGNETIC FIELDS IN THE JETS OF BLASARS

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The main characteristics of optical radiation of blasars (BL Lac – type objects and optically active quasars) is a high brightness and strong variability of the polarized continuum.

It is explained by a high collimation of their synchrotron radiation while observing them from the direction of the relativistic jet. Thus the development of variable sources of radiation, responsible for separate brightness outbursts, is connected to their movement in the jet. The high – up to 30-40 per cent – degree of polarization argues for a relative uniformity of a magnetic field in the region of generation of optical radiation. All this creates an opportunity to investigate a geometry of a magnetic field in jet on reasonably dense and long series of polarimetric observations. Our observations of two blasars – PKS 0735+178 and OJ 287 – give the obvious proofs of presenci in their jets of a spiral twirled magnetic field.

In PKS 0735+178, based on the observations obtained in 1975-80, is revealed a strong correlation between complete and polarized flow, which indicates a constancy of a degree of polarization of a variable source with a variable position of a polarization plane. In OJ 287, during a strong flare in 1994-96, the cyclic changes of a positional angle of the polarization plane are found, which can be interpeted as monotonic rotation of a vector of polarization at a rate of 5 degrees per day.

Key words: blazars: jets; blazars: polarization; blazars: magnetic field

THE APPROXIMATE METHOD OF THE REDUCTIONS OF SPECTROPHOTOMETRIC MEASUREMENTS IN THE REGION OF THE BALMER JUMP

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It is well-known that the region of Balmer jump is the most difficult one for the spectrophotometric measurements. We propose for the mass catalogue measurements in this region the simplest approximatte method. It is based on two simplefy suppositions. First, we accept that the curve of spectral sensibility of the spectrometers in the region 3700-4000A changes linearly with wave length. Second, we suppose that the coefficient of the transparency of the earth atmosphere varies with time in the identical proportion for all wave lengths inside the considered interval. The method of observations remains differencial, while the reductions are carry out by absolute (calibrate) method. Although our method is not quite correct, it guarantee the uniqueness and homogeneity of the reductions, which is very important for the catalogue observation.

Key words: spectrophotometry

ACCRETION ONTO A MAGNETIC DIPOLE: RESULTS OF 2D NUMERICAL SIMULATIONS

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Different regimes of accretion to a star with a dipole magnetic field are investigated using 2D numerical axisymmetric resistive MHD simulations. Spherical accretion of matter without angular momentum to a non–rotating magnetic dipole is investigated in depth. In this simulation set previously unknown stationary accretion flow with two polar columns inside the Alfvén surface is formed. The accretion rate to the dipole in the axially symmetric side the Alfvén surface is formed. The accretion rate to the dipole in the axially symmetric flow (without sicking of filaments accross the magnetic field lines due to Rayleigh-Taylor or interchange instability) is always smaller than in the Bondi accretion to a corresponding non–magnetized star. The flow geometry and the accretion rate to the non–rotating dipole $\dot{M}_{dip}$ are found to depend on the magnetic momentum $\vec{\mu}$, on the density of surrounding medium ϱ_∞ and on the magnetic diffusivity η_m. Specifically, $\dot{M}_{dip} \propto (\varrho_\infty / \mu^2)^{0.5} \cdot \eta_m^{0.38}$ and $R_A \propto (\varrho_\infty / \mu^2)^{-0.3} \cdot \eta_m^{0.07}$, where R_A is the equatorial Alfvén radius. Also, we simulate spherical accretion of matter onto slow and fast rotating dipoles. For the first time formation of non–stationary "propeller type" outflow during accretion onto fast rotating magnetized star is observed. Preliminary results of simulations of a cylindrical accretion onto a magnetic dipole is also presented.

Key words: accretion; magnetic field

INFLUENCE OF THE PHASE TRANSITION IN SUPERDENSE MATTER ON THE SPHERICAL COLLAPSE AND BOUNCE SHOCK WAVE

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Using worked out in Astronomical Observatory of Kyiv Shevchenko University so-called absolutely conservative numerical scheme for relativistic hydrodynamics we investigate numerically homologous collapse of a spherical liquid drop, which is analogue of neutron star. Equation of state involved is piecewise linear equation that is simplest variant of bag model for quark-hadron plasma. We show that amplitude of bounce shock wave depends strongly upon size of phase transition region on pressure-energy density plane. Particularly it increases with this size. Such fact may play great role in the theory of supernovae and collapse of neutron stars because it help the bounce shock to take energy as it needed in these theories.

Key words: stars: supernovae; stars: neutron: collapse; shock wave

SPECTROSCOPIC INVESTIGATIONS OF THE SMALL-AMPLITUDE CEPHEID SU CASSIOPEAE AND THE MAIN-SEQUENCE STARS IN THE ASSOCIATION CAS OB2

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New high-resolution CCD spectra of association Cas OB2 members: DCEPS SU Cas (F6 IIb - F8 IIb) and main-sequence stars HD 17327a (B8 III) and HD 17327b (A2 Vn), HD 16893 (A3 V) and HD 17443 (B9 V) had been obtained by the using of echelle-spectrometer "LYNX" (6-m telescope SAO RAS), for determination of their atmospheric parameters and chemical composition. The resolving power is near 24000 and S/N $\approx$ 100, obtained in the spectral regions 4400-7700 Å and 4700-8600 Å respectively. The main aim of this work was to make a comparative analysis of the elements abundances in the atmospheres of these Cas OB2 members. The analysis has been carried out using our implementation of Kurucz's WIDTH9 code and the following results have been obtained:

1) HD 16893 (T_{eff} = 8500 K; $\log g$ = 4.0; V_t = 3.0 km s^{-1}) has a carbon deficient, solar-like nitrogen abundance and small deficient of oxygen, [Na/H] = +0.29 dex, [Al/H] = +0.92 dex. Ca and Sc as the other α - and Fe-group elements have a solar-like chemical composition, exepting Co (+1.1 dex) and Mn (+0.65 dex). All s-process elements have significant overabundance (exepting barium).

2) HD 17327a (T_{eff} = 11700 K; $\log g$ = 3.2; V_t = 1.0 km s^{-1}) is a primary component of visual binary ADS 2142. On the HR-diagram it lie in "turn-off" point of Cas OB2. It was found as HgMn - star ([Mn/H] = 1.91 dex; [Hg/H] = 4.57) with the highest helium content among HgMn- stars (near +0.17 dex). [C/H] = 0.78 dex and [O/H] = -0.39 dex; [Al/H] = -0.56 dex, [Mg/H] = -0.36 dex and [Si/H] = -0.63 dex. Another α- and Fe-group elements shows overabundance, especially Sc, Ti and Cr (+1.25 dex, +0.71 dex and +0.47 dex, respectively). The [Y/H] value is near +2.51 dex.

3) HD 17327 is a binary system with indefinite orbital period, and the main component HD 17327a is similar with objects of "Searl - Sargent subgroup", which containes the primary HgMn- components in spectral binary stars ($\log(Mn/Fe)$ ratio near -1.0 dex). From another hand, from its position on the "T_{eff} - $\log(Mn/Fe)$" and "$\log(Fe/H)$ - $\log(Mn/Fe)$", HD 17327a is very similar to the classical HgMn- stars.

4) SU Cas (T_{eff} = 6100-6450 K; $\log g$ = 1.8-2.0; V_t = 2.7-3.2 km s^{-1}) has [C/H] = -0.35 dex, [N/H] = +0.41 dex and [O/H] = -0.4 dex. Odd-elements: [Na/H] = +0.23; [Al/H] = +0.18 dex, α- , Fe-group and s-process elements shows solar-like content. Following from these data, SU Cas is not crossing the instability strip for the first time.

5) M_V values, derived from equivalent widths of Ba II lines $\lambda\lambda$ 5853 Å and 6141 Å gives the mean one near -2.^{m}4. This value is agree well with distance value 258 pc from (Turner & Evans, 1984) and mean radius values, corresponded to pulsation in fundamental tone.

References

Turner D.G. & Evans N.R. : 1984, *A.J.*, **107**, 1796.

CYCLOTRON EMISSION FROM THE CORONAE OF MAGNETIC WHITE DWARFS

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Coronae — hot upper parts of stellar atmospheres — are well known for the Sun and main-sequence stars. There were occasional reports (Arnaud et al., 1992; Fleming et al., 1993) on detection of X-ray bremsstrahlung corona emission from white dwarfs. Such reports turned out to be controversial for the star GR290 (Cavallo et al, 1993). Fortunately the presence of the strong magnetic field at several white dwarfs puts forward the cyclotron radiation as alternative effective emission mechanism of the corona. The estimated cyclotron radiation flux in the IR band exceeds photospheric continuum at least by an order of magnitude if typical corona parameters deduced from the X-ray observation are assumed (Zheleznyakov & Serber, 1995).

We calculate the complete set of Stokes' parameters for cyclotron emission of the hot white dwarf atmosphere with dipole magnetic field. The electron distribution over the Landau levels and thus radiation transfer coefficients in white dwarf coronae are determined by radiation of two modes at the cyclotron fundamental (Serber, 1990). Up to five cyclotron harmonics can contribute to the observed spectrum of GR290. The spectral features at the cyclotron fundamental are primarily determined by the ordinary mode radiation. Its intensity nearly equals the blackbody one with the high corona temperature (Zheleznyakov & Serber, 1995). The extraordinary radiation becomes rather weak in upper layers of the corona due to strong resonance cyclotron scattering. The mentioned effects combined with the specific narrow-belt geometry of the emitting region on the star surface lead to the high degree of polarization ($\sim$50%) of the observed radiation.

We find the constraints on corona temperature imposed by the balance of the cyclotron radiation pressure and gravity. The temperature should be less than $6 \cdot 10^6$ K for the magnetic fields 10^7-10^8 G.

The results of numerical simulation provide solid justification in favor of detection of intense, strongly polarized cyclotron emission rather than X-ray one, magnetic white dwarf coronae by their.

References

Arnaud K.A., Zheleznyakov V.V., Trimble V.: 1992, *P.A.S.P.*, **104**, 239.
Cavallo R., Arnaud K.A., Trimble V.: 1993, *J.Astrophys.Astr.*, **14**, 141.
Fleming T.A., Werner K., Barstow M.A.: 1993, *Astrophys.J.Lett.*, **416**, 79.
Serber A.V.: 1990, *Sov. Astron.*, **34**, 291.
Zheleznyakov V.V., Serber A.V.: 1995, *Adv.Space Res.*, **68**, 275.

GALACTIC OBJECTS
AND
INTERSTELLAR MEDIUM

ON ANOMALOUS DIELECTRIC FUNCTION OF INTERSTELLAR GRAIN IN FAR INFRARED

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One of the basic methods of investigation of properties of interstellar grain is the study of its emission spectra in far infrared. At the analysis of the latters it is assumed that the measured intensity of the grain radiation is described by the Kirchhoff law $I_{meas} = Q(\lambda)I_0(\lambda)$, where $I_0(\lambda)$ is the black body radiation and that in the infrared region $I_{meas} \propto Q(\lambda)\lambda^{-4}$, where the absorption factor $Q(\lambda) \sim \varepsilon''/\lambda$ (Bohren & Huffman, 1983). In this case the imaginary part of the dielectric function of the grain matter is $\varepsilon'' \propto I_{meas}\lambda^5$ that at the measured dependence $I_{means} \sim \lambda^{-5}$ leads to $\varepsilon'' \approx const.$

However, according to the results of (Hansen & Campbell, 1998; Altman, 1999) the measured intensity of the grain radiation should be described not by the Plank law but by the Wien law that leads to the dependence $I_{means} \propto Q(\lambda)\lambda^{-5}$ and, correspondingly, $Q(\lambda) \approx const$ and $\varepsilon'' \propto \lambda$. Such an anomalous spectral dependence of the imaginary part of the dielectric function of the grain particles can be explained by the electronic mechanism of light absorption but not by the phonon one as it is usually assumed when describing the interaction of the radiation with the grain. It could be realized if the concentration of conductivity electrons in the medium of the grain appears to be sufficiently high.

The present work gives the analysis of reasons that lead to such anamalous properties of the grain. As the basic hypothesis we assume that the induced photo-conductivity may account for the effect in question. The numerical estimations show a principle possibility of such a hypothesis.

We also consider the influence of the discussed dependence $Q(\lambda) \approx const$ on the interpretation of the known experimental curves for interstellar absorption.

References

Altman I.S.: 1999, *Phys. Lett. A*, in press.
Bohren C.F., Huffman D.R., Absorption and Scattering of Light by Small Particles, Wiley, New York, 1983.
Hansen K., Campbell E.E.B.: 1998, *Phys. Rev. E.*, 58, 5477.

Key words: Interstellar grains; absorption

THE CYCLOTRON EMISSION OF ANISOTROPIC ELECTRONS IN THE X-RAY PULSARS

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The spectrum of cyclotron radiation is calculated for anisotropically distributed relativistic electrons with a nonrelativistic velocity scattering across the magnetic field. It is shown that if such electrons are responsible for a formation of the "cyclotron" line in the spectrum of Her X-1, then the value of its magnetic field $(3-6) \cdot 10^{10}$ Gs following from this interpretation is in a good agreement with some other observations and theoretical estimations. Observations of a time dependence of the energy of this "cyclotron" line in the spectra of several X-ray pulsars is explained by a variability of the average longitude energy of the electrons, decreasing with increasing of the liminocity due to radiational braking of the accretion flow.

Key words: X-ray pulsars: cyclotron radiation

INVESTIGATION OF THE IONIZED COMPONENT OF THE LOCAL INTERSTELLAR MEDIUM (THE INVESTIGATIONAL RESULTS, MODEL STRUCTURE, PROBLEMS OF INVESTIGATION)

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At present an alaborated model structure of local interstellar medium (LISM) is available. On the other hand, there is a greate number of observations of extragalactic radiosource scintillation at frequencies less than 1 GHz wich cover a time scale for flax variation of the order of months.

Such flux variations are supposed to be related to inhomogeeity of an ionized component in LISM. In order to clarify this relation, observations made with radiotelescope DKR-1000 at 102 MHz in 1984-1993 are used as well as the published data on friquencies less than 400 MHz and preliminary results of supplementary observations.

The obtained model structure of an ionized component for local interstellar medium and the program for further ivestigation are discussed.

Key words: radio astronomy; interstaller matter

"MULTI - FRAGMENTED" SPH CODE FOR EVOLUTION OF GALAXIES

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We present a new series of Chemo - Dynamical Smoothed Particle Hydrodynamic (CD - SPH) models of disk galaxy formation and evolution. The star formation (SF) process, SNII, SNIa and PN events as well as chemical enrichment of gas have been considered within the framework of model proposed in Berczik (1998) and Berczik (1999).

The galaxy is presented as a "Multi - Fragmented" multiphase gas and star system embedded into the cold dark matter halo. As a first step approach, we assume that the dark matter halo of total mass 10^{12} $M_\odot$, has a Plummer density profile distribution with 25 kpc scale.

The gaseous component of galaxy is assumed to be initially a two phase, compose of hot (10^6 K) and cold (10^4 K) components system. The hot phase is smoothly distributed in a volume of initial triaxial structure (100 kpc × 75 kpc × 50 kpc) with initial solid body rotation and with additional random velocity component $\Delta V \approx 100$ km/s. The mass of this component is $5 \cdot 10^{10}$ $M_\odot$.

The cold phase is presented initially as a system of a number of separate triaxial clouds (10 kpc × 7.5 kpc × 5 kpc) inside the hot phase having initial solid body rotation and additional random velocity component $\Delta V \approx 10$ km/s. The total mass of this component also is $5 \cdot 10^{10}$ $M_\odot$.

The developed model provide the realistic description of dynamical and chemical evolution of typical disk galaxies over the Hubble timescale.

References

Berczik P., 1998: astro-ph/9807059.
Berczik P., 1999: *As.Ap.*, submitted.

Key words: galaxy formation; galaxy evolution

EVOLUTION OF DWARF GALAXY IN STRONG TIDAL FIELD

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We consider the evolution of dwarf galaxy in the external gravity field of Milky Way - like disk galaxy. The host galaxy potential is taken as a rigidly fixed one which defined as three component potential distribution proposed by Douphole & Colin (1995). The mass of the first bulge - component is taken to be $\approx 1.4 \cdot 10^{10}$ $M_\odot$, the mass of the disk one is $\approx 7.9 \cdot 10^{10}$ $M_\odot$ and the halo mass is $\approx 7 \cdot 10^{11}$ $M_\odot$.

Initially the dwarf satellite is modelled as a cold gas cloud (10^4 K) of radius 2 kpc and total mass of $2 \cdot 10^8$ $M_\odot$. The satellite initial orbit is resides in the YZ plane and maximal distance from the center of host galaxy doesn't exeed 50 kpc. The velocity field of the satelite is defined by its initial solid body rotation of around its own Z axis and by orbital motion around host galaxy.

The evolution of this system is described using the our Chemo - Dynamical Smoothed Particle Hydrodynamic (CD - SPH) code. The star formation (SF) process, SNII, SNIa and PN events as well as chemical enrichment of gas is considered within the framework of model proposed in Berczik (1998) and Berczik (1999).

The developed model provide a realistic description of dynamics and chemical evolution of typical dwarf satellite galaxy.

References

Berczik P., 1998: astro-ph/9807059
Berczik P., 1999: *As.Ap.*, submitted
Douphole B., Colin J., 1995: *As.Ap.*, **300**, 117

Key words: galaxy evolution; gravitation field

ON THE CROSSING OF THIN SHELLS

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The crossing of two dust shells is considered as a simplified model for shell crossing during the spherically symmetric collapse of dust. Israel formalism is applied to study the gravitational collapse of two thin shells in the case of schwarzschild space ($r > 2m$) and Kruskal coordinate ($r < 2m$).

Key words: intertellar dust: gravitation collapse

THE EVOLUTION OF TURBULENCE IN THE COLLAPSING PROTOSTELLAR CLOUDS

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The observations show that the interstellar turbulence attenuates in the fragments and dense cores of molecular clouds (Goodman et. al. 1998). The massive fragments and molecular clouds have the nonthermal supersonic turbulence. The low mass dense cores (protostellar clouds) have the quite feeble thermal turbulence.

We try to explain the observations investigating the evolution of MHD turbulence in the rotating magnetized protostellar clouds during early stages of their collapse. In the frame of generalized turbulence model of Canuto (1997) we consider: a) acceleration of cyclonic rotation due to the compression, b) dissipation of turbulent energy (E_t) in the processes of viscous and ion-neutral friction, c) diffusion of E_t by the eddy mixing and Alfven wave propagation, d) decrease of base eddy size (L_t) due to stream compression and destruction. The equations for E_t and L_t are solved numerically together with MHD equations and equations for stationary ambipolar diffusion and nonstationary ionization taking into account the turbulent pressure. The numerical computations are performed with the help of 1D Lagrangian code based on the modified Lax-Vendroff scheme (Dudorov & Sazonov 1987).

The numerical simulations show that the turbulent energy dissipates mainly due to ion-neutral friction. Turbulent velocities decrease from envelope to the center of the cloud. The turbulent pressure gradient inhibits the collapse on the early stages only and increases the collapse time on the $\delta t < 0.2 t_{ff}$. The value of δt depends on the values of sound, turbulent and Alfven velocities and grows with increasing of initial base eddy size. Rotational oscillations of ions have spatial amplitude $\delta x < 0.4 L_t$. By the influence of turbulence on collapse of protostellar clouds it is may be neglected to the time of protostar formation.

References

Canuto V.M.: 1997, *Ap.J.*, **482**, 827.
Dudorov A.E., Sazonov J.V. 1987, *Nauch.Inform.Astrosoveta AN SSSR*, **63**, 68.
Goodman A.A., Barranco J.A., Wilner D.J., Heyer M.H.: 1998, *Ap.J.*, **504**, 223.

Key words: protostellar clouds: magntohydrodinamics

CLOUD STRUCTURE OF INTERSTELLAR MATTER. OBSERVATIONAL PARAMETERS

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The RATAN-600 radio telescope has greatly high sensitivity to low contrast details of emission observed on the bright complex background. That's why we were able to create the unique database of HI clouds on the base of HI RATAN-600 Survey. The angular resolution of this Survey was $2.4' \times 130'$, velocity resolution was 6.3 km/s, r.m.s. fluctuations of antenna temperature (T_a) was 0.25 K. All clouds with kinematical distances $r < 1.0$ kpc were rejected because their relative distance errors are very high. Moreover, clouds with $T_a < 0.75$ K (3 times r.m.s. errors) and line widths $\Delta V < 6.3$ km/s were rejected too. Diameters, masses, gas densities and velocity dispersions of about 7600 HI clouds were determined in the second and third quadrants of galactic longitudes in $180° < l < 260°$, $-15° < b < +15°$ $100° < l < 150°$, $-10° < b < +10°$. Some selection effects were discovered and our statistic results were corrected for them.

It is found that mean clouds linear diameters along Galactic plane are 2.5 times greater than in transverse direction. The cloud diameter spectrum has a bimodal power shape with spectral indexes of -1.9 ± 0.5 between $1 - 16$ pc, and -3.9 ± 0.5 between $16 - 45$ pc.

A HI gas density spectrum in the range of 1.0 to 300 cm^{-3} is not a power form, but it has a maximum at $n_H = 10 - 40$ cm^{-3} depending of galactic latitude.

The mass spectrum in the form of M·N(log M) was obtained in the mass range of 0.6 to $2.5 \cdot 10^4$ M$_\odot$. It consists of at least three parts. In the range of 2 to 600 M$_\odot$ the spectrum has a spectral index of 0.8 ± 0.1, in the range of 0.6 to 2 M$_\odot$ the spectral index is 3.0 ± 1, and in the range of 600 to $2 \cdot 10^4$ M$_\odot$ the spectral index is -0.7 ± 0.3. These data show that the process of coalescence in cloud-cloud collisions predominates in the middle mass range but the clouds with low masses are evaporated probably due to very hot ISM component. In the very high mass range the number of neutral gas clouds may be decreased because of gravitational instability or/and molecularization.

The relation between HI concentrations and cloud diameters is confirmed in the form of $n_H \propto d^{-1.25 \pm 0.01}$ regardless of selection effects. The correlation coefficient between $\log n_H$ and $\log d$ is equal $- 0.87$.

It is shown that other important dependence – velocity dispersion versus cloud diameters, that is well defined for molecular clouds – is completely absent in the case of HI clouds. Probably this is due to negligible role of intrinsic turbulence in the HI clouds. This fact demonstrates that molecular and atomic clouds may represent diferent populations.

It is found that 36% of HI clouds have systematic velocity gradients across cloud disks that is may be due to rotation of clouds. This phenomenon may explain rather high velocity widths of HI line profiles in the obsevable clouds. The mean value of clouds angular rotational velocity is about 10^{-13} s^{-1}, mean rotational energy is about 10^{48} ergs, that is comparable to the energy of random cloud motions. Observable quantities of clouds with opposite directions of rotation are equal within 5% in both galactic quadrants investigated.

Key words: interstellar matter: interstellar clouds: observations

INTERACTION OF SUPERNOVA BLAST WAVES WITH WIND-DRIVEN SHELLS: FORMATION OF "JETS", "BULLETS", ETC

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The origin of "jets", "bullets" and other peculiar structures observed in a number of supernova remnants (e.g. G 263.9-3.3 (Vela), G 320.4-1.2 (MSH 15-52), G 309.2-0.6, etc) is considered. It is suggested that these structures could arise due to the interaction of supernova blast waves with the circumstellar and interstellar medium reprocessed by the joint action of the ionizing emission and winds of massive stars, which are thought to be the progenitors of type II supernova stars. In particular, the origin of a variety of filamentary structures could be connected with the projection effects in Rayleigh-Taylor unstable shells of supernova remnants. The Rayleigh-Taylor instabilities result from the impacts of supernova blast waves with preexisting shells created by winds of supernova progenitor stars at different stages of their evolution. The shell deformations appear at radio, optical, and X-ray wavelengths as arclike, looplike and jetlike filaments when our line of sight is tangential to their surfaces. The optical and radio emission is expected to come from the outer layers of shells, where the transmitted shocks slow down enough to become radiative, while the X-ray emission represents the inner, adiabatic layers heated up to X-ray temperatures. The dense material lost by supernova progenitor stars during the red supergiant stage of their evolution, and subsequently reheated by supernova blast waves could introduce an additional contribution to the complex appearance of some middle-aged supernova remnants.

Key words: supernova remnants: jets, X-ray sources waves

UNIQUE RADIO PULSAR GEMINGA

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The measurements of flux density, integrated and individual pulses at 102, 87, 59 and 40 MHz have been made. Geminga shows unique character of radio emission: the most steep spectrum; the weakest luminosity; the large changes of pulse width and phases and the presense giant pulses. The model of co-axial rotator are discussed to explain some these peculiarities.

Key words: pulsars; individual: GEMINGA

INSTABILITY OF DETONATION FRONT OF THERMONUCLEAR BURNING IN PRESUPERNOVA SN Ia

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The problem of thermonuclear burning regime in degenerate matter of CO-core of pre-supernova SNIa is studied. The propagation of Chapman-Jouguet detonation wave is considered, the structure of detonation wave is defined according to the model Zeldovich-von Neuman. The spherically symmetric propagation of detonation wave is described by coupled equations of gas dinamics with kinetics of nuclear reactions. The nuclear reaction network containes 39 reactions with 12 nuclids from ^{12}C to ^{28}Si. The equation of state includes contributions from Boltzmann gases, from the electron-positron gas of the arbitrary degrees of degeneration and from photons. The different scheme of Godunov's type is used for numerical integration of equations with using the mobile settlement grid. The results of numerical simulation demonstrate the process of development of detonation front instability. This instability leads to decay of the detonation wave into the shock wave and the burning zone. The decay of detonation wave occurs regardless of place (the start point) and for very shot time. In such a way the regime of self-consistent detonation don't exist in the degenerated matter, and the thermonuclear burning passes in deflagration mode.

Key words: presupernovae: nuclear burning

MAGNITOROTATIONAL MECHANISM OF SUPERNOVA EXPLOSION.
RESULTS OF SIMULATIONS

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We present results of recent simulatons of magnetorotational mechanism of supernova explosion on the base of Lagrangian 2D MHD implicit code. Amplification of the toroidal magnetic component due to the differential rotation leads to the transformation of the part of the rotational energy of the star to the radial kinetic energy. We found that part of the matter of the envelope of the star gets kinetic energy, large than its potatial energy and can be thrown away to the infinity. Estimations of the ammounts of ejetted mass and energy are given.

Key words: supernova; magnetohydrodynamics

ON MAGNETIC FIELDS AND $\dot{P}$ – P-DIAGRAM IN RADIO PULSARS

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The analysis of known mechanisms of the rotation slowing down is carried out. It is shown that these mechanisms give very different $\dot{P} - P$-dependences and behaviour of characteristic ages $\tau = P/2\cdot\dot{P}$ (P is the rotation period). The braking index $n = (\ddot{P}/\dot{P}^2 - 2)$ for known models can have a value from 0 to 3. The characteristics age is not measure of a real age of a pulsar for some models. So in the case of neutrino emission inside a neutron star τ is equal to 0 in the definite moment and becomes negative after this point.

The observed diagram $\dot{P} - P$ can be devided into three parts: $P < 0.1$ sec, $0.1 < P < 1.25$ sec and $P > 1.25$ sec. Pulsars with short periods can not be described by any known mechanism of slowing down. Braking index $n = -1$ for this group, and processes can be found giving such unusual behaviour of these pulsars. Magnetic fields calculated for such objects on the base of magnetodipole model are wrong and must be recalculated after working out an adequate theory.

The distribution of pulsars with $P > 0.1$ sec can be explained in the frames of the hybrid model taking into account the magnetodipole torque and the emission processes inside a neutron star. Known magnetic fields for these pulsars can be corrected by factor $1/(1 + 5P^3)$.

The values of magnetic fields for sources of pulsed soft gamma-rays "magnetars" are equal to $(1.7 - 2.9)\cdot 10^{13}$ G, i.e. less than the critical magnetic field $4.4\cdot 10^{13}$ G.

Key words: pulsars: periods, magnetic fields

PROPAGATION OF RADIO WAVES IN THE MAGNETOSPHERES OF PULSARS

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Refraction of ordinary superluminous waves propagating in pulsar plasma is considered. The frequency dependence of the observed pulse width is found to be strongly influenced by this effect. In particular, refraction in the pulsar magnetosphere can account for the so-called "absorption feature" on the observed pulse width versus frequency curve. The circular polarization transfer in pulsar magnetosphere is investigated as well. The polarization resulting from the wave mode coupling in the polarization-limiting region is examined.

Key words: pulsars: magnetospheres: polarization

A POINT EXPLOSION WITHIN A CAVITY WITH P OWER-LAW DENSITY DISTRIBUTION

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The problem of propagation of a strong adiabatic shock wave (SW) from a point explosion within a cavity with density, increasing to the periphery, is investigated. We have considered the simplest case of power-law density distribution inside a cavity and uniform one outside.

$$\rho = \begin{cases} \rho_0 \left(\frac{r}{R}\right)^{\omega}, r < R, \omega > 0; \\ \rho_0, r > R; \end{cases}$$

here ρ_0 - characterical density, r - distance from the center of a bubble, R - radius of a cavity. An explosion occurs at a distance a from the center, $a < R$.

SW motion was studied in Kompaneets approximation (Kompaneets, 1960). To obtain the solution, the variables separation method and the conformal transformation, suggested by Korycansky (1992), were used. The exact analithycal solution of this problem was found.

Shifting of a explosion point in relation to the center of the cavity could be, in our opinion, the cause of deviation from spherical symmetry, which is observed in some supernovae renmants.

References

Kompaneets A.S.: 1960, *Doklady Akademii Nauk SSSR*, **130**, 5, 1001.
Korycansky D.G.: 1992, *Ap.J.*, **398**, 184.

Key words: supernovae; shock waves

ON THE POWER-LAW SPECTRUM OF THE BRIGHTNESS TEMPERATURE OF LINEARLY POLARIZED COMPONENT OF GALACTIC SYNCHROTRON RADIO EMISSION

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The polarization measurements of synchrotron radio emission of the Galaxy in the range $88 \div 1700$ MHz made in NIRFI revealed the power-law form of the spectrum of brightness temperature of polarized component of galactic radio emission toward the North celestial pole, the North galactic pole, the area of minimum radio brightness and in some other directions. The most studied area is the one centered on the North celestial pole. In the frequency range $200 \div 1407$ MHz the frequency dependence of the polarization brightness temperature is fitted by the formula

$$T_b^p(\nu) = (1.95\,\mathrm{K} \pm 0.05\,\mathrm{K}) \left(\frac{\nu}{300\,\mathrm{MHz}}\right)^{-(1.87 \pm 0.05)} \tag{1}$$

The fractional linear polarization of Galactic radio emission toward NCP is

$$P(\lambda) = (2.5\% \pm 0.6\%) \left(\frac{\lambda}{0.735\,\mathrm{m}}\right)^{-(0.73 \pm 0.11)} \tag{2}$$

The area of minimum radio brightness ($l = 190°$, $b = 50°$) is characterised by spectral index of linearly polarized component 2.13 ± 0.22 in the frequency range $290 \div 1407$ MHz. This value is very close to the spectral index of 1.87 ± 0.05 for NCP. The slow decrease of T_b^p with growing of wavelength is in a sharp contradiction with formula of Burn (B.J.Burn, 1966, *MNRAS*, **133**, 67).

Key words: Galaxy: radio radiation: polarization, spectral indices

EVOLUTION OF CLOSE BINARIES AFTER A BURST OF STARFORMATION AND APPLICATION TO THE OBSERVED GALAXIES

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We use "Scenario Machine" – the population synthesis simulator – to calculate evolution of populations of selected types of X-ray sources after starformation burst Results of calculations are normalized to have total mass in binaries $10^6 M_\odot$ during the first 20 Myr after the burst.

We used three values of the exponent α in the initial mass function: 2.35 (Salpeter's function), 1.35 and 1 ('flat spectrum'). The calculations were made for the following values of the upper limit of the mass function: 120, 60 and 40 $M_\odot$.

We examined evolution of 12 types of binary X-ray sources.

Results are applicated to several observed galaxies for which total mass and age of the starformation bursts were previously obtained from optical observations by different groups.

Acknowledgements. The authors are thankful to Konstantin Postnov for discussions.

Key words: stars: binaries: close; star formations; galaxies: X-rays

NEW RESULTS OF SECULAR RADIO FLUX DECREASE IN THE CAS A SUPERNOVA REMNANT AT LOW FREQUENCIES

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Since 1987 systematic observations of Cas A supernova remnant and Cyg A (as a comparison radiogalaxy source) have been carried out at 25 MHz with radiotelescope URAN-4 RIAN. The main aim of observations is to reveal the character of secular flux decrease in the supernova remnant at low frequencies. Observational results for 1987-1992, 1998-99 have been analyzed. Regular observations permitted to find season-day effect in the flux ratio variations Cas A and Cyg A for sources. The procedure of excluding season -day variations is considered as well as the possibility of discovering separeting secular flux decrease and its short-term variation. On the basis all the published observational data of flux rations Cas A / Cyg A at 38 MHz are analyzed. By taking into account the results obtained, the program for further investigations is proposed.

Key words: radio astronomy; supernova remnants; individual: Cas A

WHAT IS THERE IN THE GALACTIC CENTER ?

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Observations give evidence for existence in the Galactic Center of a compact supermassive object with mass $2.5 \cdot 10^6 M_\odot$ (Eckart,1997). Even more massive objects there exist in the other galactic centers (van der Marel 1998). The observations data do not allow to make a definite conclusion about the nature of the objects. For this reason they are identified, as a rule, with a supermassive black holes. Another possibility follows from the assumption of the existence of supermassive configuration of degenerated electronic gas without events horizon .(Verozub 1996 and this Conference).

We consider the simplest hydrodynamics model of such kind of objects in gas environment like the Galactic center starting from our gravitation equations. It is assumed that mass M of the central object is $2.5 \cdot 10^6 M_\odot$. The radius R of the object resulting from the equations of hydrodynamics equilibrium is about $4 \cdot 10^{-4} r_g$ where r_g is the Schwarzchild radius.

The Eddington's limit of the luminosity near the surface of the central object is given by

$$L_e = \frac{4\pi c}{\sigma} GM \left[1 - \frac{r_g}{(r_g^3 + R^3)^{1/3}} \right]. \tag{3}$$

where σ is the Stephan-Boltzman constant, G is the gravitational constant, c is the speed of light. For the used mass of the central object we obtain $L_e = 6.7 \cdot 10^{39} erg/s$.

The real luminosity of the central object in the absence of magnetic fields is of the order of

$$L = v^2(R) \, \dot{M}, \tag{4}$$

where $v(R)$ is the gas velocity at the surface of the object . For the object under consideration $v(R) = 2.3 \cdot 10^8 cm/s$. (The gas velocity v of a particle falling from the infinity increases up to the distances of the order of the Schvarzchild radius and after that decreases according to the peculiarity of the gravitation force in the theory under consideration). Therefore, at the accretion rate $\dot{M} = 10^{-6} M_\odot/year$ we obtain $L = 0.3 \cdot 10^{37} erg/s$. Thus, in spite of a sufficiently large accretion rate the object has a low luminosity.

The wavelength of the radiation maximum is about $400 \div 500$ Å and therefore, the level of X-ray radiation is low. There is an ionization zone around the central objects with radius about $10^{-3} pc$.

These results give a certain reason to suppose that the supermassive compact objects in the galactic centers are the supermassive compact objects without events horizon.

References

Verozub L.V.: 1996, *Astr. Nachr.*, **317**, 107.
Eckart A. and Gensel R. : 1997, *M.N.R.A.S.*, **284**, 576.
van der Marel R.P., Zeeuw T., Rix H-W.: 1998, *Ap.J*, 493, 613.

Key words: Galactic center: accretion.

STABLE SUPERMASSIVE CONFIGURATIONS

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Graviation equations which have no physical singularity in the center of the spherically symmetric field where proposed in the paper Verozub 1991. The physical consequencies from the equation are differ very little from the ones in general relativity (GR) at the distances r from the center which are much larger than the Schwarzchild radius r_g in the GR. With the available at the present time accuracy the motion of particles and photons is the same as in general relativity (Verozub 1996). It can be shown that the testing by binary sytems like the pulsar PSR1913+16 also does not contradict to observations data . However the physical consequencies are completely different at the distances of the order of r_g or less than that. The events horizon is absent. The velocity of the particles falling free from the infinity tends to zero when r tends to zero.

From the gravitational equations under consideration follows the existence of stable equilibrium configurations of the degenerated Fermi- gas, whose masses $M \gg M_\odot$ and sizes are less than $r_g = 2GM/c$ (G is the gravitational constant and c is the speed of light)(Verozub, 1996,1997). For degenerated electron gas the configurations can have masses $10^6 \div 10^{12} gm$ The relation "mass-radius" is of the form

$$\frac{R}{R_\odot} = 1.48 \cdot 10^{-6} \left(\frac{M}{M_\odot} \right)^{0.69}, \tag{5}$$

where $M_\odot$ and $R_\odot$ are the mass and radius of the Sun , respectively.

Particular attention is devoted to the proof of the stability of the configurations. The table show oscillations periods T for the first three mode of the configurations with masses $10^4 M_\odot$ and $2.5 \cdot 10^6 M_\odot$.

No	$M/M_\odot$	$R/R_\odot$	T_1, c	T_2, c	T_3, c
1	$1 \cdot 10^4$	$8.1 \cdot 10^{-3}$	$7.5 \cdot 10^{-2}$	$9.1 \cdot 10^{-3}$	$3.8 \cdot 10^{-3}$
2	$2.5 \cdot 10^6$	0.37	51	14	6.7

References

Verozub L.V.: 1991, *Phys. Lett. A.,* **156**, 404.
Verozub L.V.: 1996, *Astr. Nachr.,* **317**, 107.
Verozub L.V.: 1997, In: *The Identification of dark matter,* Ed. N.Spooner, World Sientific, p. 195.

Key words: compact objects; black holes; gravitation

ON THE EVOLUTION OF RADIO EMISSION OF SUPERNOVA REMNANT TYCHO BRAHE (3C10)

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Basing on long-term measurements at frequency 86 MHz the mean rate of the secular decrease of supernova remnant (SNR) Tycho Brahe flux density has been estimated. The decrease of Tycho Brahe flux density is not uniform in time. The rate of the secular decrease of this SNR flux density is frequency independent. The weighted mean value of the rate of the secular decrease of SNR Tycho Brahe flux density in the frequency range 86-5000 MHz (this paper, Ivanov et al., 1982; Dickel et al., 1979; Strom et al., 1982; Stankevich et al., 1997) is (0.41 ± 0.03)% per year.

References

Ivanov V.P., Bubukin I.T., Stankevich K.S.: 1982, *Pis'ma v Astronom. Zh.,* **8**, 83.
Dickel J.R., Spangler S.R.: 1979, *Astronomy and Astrophysics*, **79**, 243.
Strom R.G., Goss W.M., Shaver P.A.:1982, *MNRAS*, **200**, 473.
Stankevich et al.: 1997, XXVII Radio Astronomical conference, S.Peterburg, Theseses, v.**1**, 130.

Key words: supernova remnant: radio radiations

SUN,
SMALL BODIES
OF THE
SOLAR SYSTEM,
UPPER ATMOSPHERE OF THE EARTH

STUDY OF COMET HALE-BOPP (C/1995 O1) IN KYIV NATIONAL UNIVERSITY

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1. During July 1996 - April 1997 92 spectra of comet Hale-Bopp were obtained with the 6-meter BTA telescope of the SAO of the RAS at the Mount Pastukhov. The obtained spectra are three-dimensional which allows to receive energy distribution for each emissions along the slit and that of each individual slit point. Therefore we may obtain one of fragments of the general spectral map of the near-nuclear region of the comet. The hypothesis about unknown cometary spices near $\lambda = 620$ nm in the spectrum obtained July 10, 1996 is made. It is found effect which was observed for a real number of comets and is caused by contribution of fluorescent of cometary dust Churyumov et al. (1999c).

2. Some results of the preliminary study of the comet Hale-Bopp spectrum obtained April 17, 1997 by K.I. Churyumov and F.A. Mussayev with the help of the 1-meter Zeiss reflector and the echelle spectrometer, CCD and the long slit, oriented along the radius-vector ("Sun-comet" direction) are presented. Energy distributions for three selected regions including the C_3, C_2 (0-0) and CN (0-0) molecules emissions of the comet Hale-Bopp spectrum were built. Many rotational lines of the CN (0-0) were identified. The high emission peak near 402 nm in the C_3 band the cometary continuum of the nonsolar origin were detected Churyumov et al. (1999b).

3. Some results of narrowband electrophotometry observations of comet Hale-Bopp near perihelion which were made with the AZT-14 telescope at the station Lisniki of Kyiv University Astronomical Observatory are presented. The standard set of IHW cometary filters were used. Total numbers of cometary observations were more than 500 during the interval March 13 – April 29, 1997. The comet nucleus gas production rates Q of C_2 and C_3 and dust production were calculated on the basis of the star magnitudes of comet for these filters. The calculations were made with the help of the Haser model for neutral cometary atmosphere. The value Afp, which is characteristic of the dust nuclear production rate, were determined too. Mean values of the production rates near perihelion are $\log Q(C_2) = 28.4$; $Q(C_3) = 27.2$; $Afr(BC) = 6.0$ Churyumov et al. (1999a).

References

Churyumov K.I., Kleshchonok V.V., Kravtsov F.I., 1999a: *Earth, Moon and Planets,* (in press).

Churyumov K.I., Kleshchonok V.V., Mussaev F. A., Bikmaev I. F., Galazutdinov G.H., 1999b: *Earth, Moon and Planets* (in press).

Churyumov K.I., Kleshchonok V.V., Vlassyuk V.V., 1999c: *Earth, Moon and Planets,* (in press).

Key words: comets: spectra; cometary atmospheres; individual: Hale-Bopp comet

LUMINESCENCE CONTINUUM IN SPECTRA OF COMETS SCHAUMASSE (24P), SCORITCHENKO-GEORGE (C/1989 Y1) AND HALE-BOPP (C/1995 O1)

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The authors investigated spectra of four comets with the aim to determine the real level of the non-solar-origin continuum in the spectral region 350-500 nm. Spectra of three comets Schaumasse (24P), Scoritchenko-George (C/1989 Y1) and Hale-Bopp (C/1995 O1) were observed with the help of the 6-m BTA telescope and the spectrograph with the long slit at the Special Astrophysical Observatory of the Russian Academy of Sciences. Spectra of two comets Hyakutake (C/1996 B2) and Hale-Bopp (C/1995 O1) were obtained with the 1-meter Zeiss telescope and eshelle-spectrometer of the SAO RAS. As a result of processing the cometary spectra we obtained:

1) For comet Schaumasse (24P) March 14-15, 1993 the level of the non-solar-origin continuum equal to 44% of the sum continuum level at 430 nm;

2) For comet Scoritchenko-George (C/1989 Y1) February 27 , 1990 the level of the non-solar-origin continuum equal to 40% of the sum continuum level at 387 nm, 68% - at 430 nm (max) and 23% - at 480 nm;

3) For comet Hale-Bopp (C/1995 O1) April 17 , 1997 the level of the non-solar-origin continuum equal to 32% of the sum continuum level at 397 nm and 77% - at 438 nm;

4) For comet Hyakutake (C/1996 B2) March 25, 1996 the continuum of the non-solar origin was not detected. We suppose that in spectra of comets Schaumasse (24P), Scoritchenko-George (C/1989 Y1) and Hale-Bopp (C/1995 O1) we detected the real cometary continuum tied with the luminescence of the comet organic spices which are in comet dust particles.

Key words: comets: spectra

THE POSSIBILITY OF THE SATELLITE PHOTOMETRY USING THE LASER TELESCOPES NETWORK OF THE UKRAINE

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The construction of laser telescope's photometric channel is proposed, which allows evaluation of the impulse reflected by the satellite amplitude in the single-electronic mode, with the possibility of the signal obtaining.

As far as necessary, the equipment of the LT complexes can be used, after a certain modernization, on different problems, determining by the satellite observation theme.

If an object is detected, which is not catalogued, or if an object is controlled, which has no active onboard optic systems, the problem of its photometry becomes actual. When modernizing the LT's photometric channel for these purposes it is necessary to foresee the linearization of the signal reflected from a satellite, and its differentiation. Such a foresee allows to determine the hypothetical form and orientation using the height and the form of the registered impulse. There are systems, which allow obtaining the signal profile needed, with the height distribution in time evaluation. In particular, micro-channel receivers allow obtaining the output signal linear relation in analogue mode, from the intensity. The bending-around curve allows the reflection profile determining. We have proposed another way of the impulse height registration and the reflected signal profile obtaining, which allows the amplitude of the bending-around curve evaluation with an uncertainty to a few photons. The way lies in replacement of the photometric receiver with the modernized electronic-optic transformer, and in engaging in the receiver canal construction the nodes, allowing intensity evaluation obtaining in the photon counter mode: a TV camera and a computer. The time attachment signal is taken from the anode. For solving the problem of bending-around curve obtaining it is proposed to put the elements, allowing reducing the telescope lens' electronic view into the line parallel to the line sweep axis, and to move it along the shot sweep axis according to a periodic linear law. The points' quantity in a sweep line is the representation of the photons' quantity in a response impulse for the period while electronic line moving for a reading line, and the packet's thickness determines the reflected impulse total length. The transformation system for obtaining the bending-around curve impulse form requires additional engineer-constructor's guidelines. Without the transformation system, the points' quantity in the field of vision is proportional to the photons' quantity in an impulse, and the distribution on the field characterizes the front distortion by the atmosphere, giving the possibility of calculation correcting.

Key words: astronomical instruments; artificial satellites: photometry

THE CONCEPT OF CONSTRUCTION OF THE AUTOMATED SYSTEM FOR OBTAINING AND ANALYSIS OF THE INFORMATION AT CA OBSERVATIONS

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The basic aim of produsing the given automated system is the behaviour control on an orbit of any CA in wich FCC is interested. The control includes the following tasks:

1. Detection of a space vehicle;
2. Its tracking with maximum accuracy;
3. Obtaining comprehensive information on the object, dynamics of its motion in order to determine parameters which changes permit to find out extraordinary situations arising on board CA as a result of malfunctions or directed external influence.

To successfully solve the tasks set each observing station should be universal enough according to its capacities and consist of the following observant complexes: 1. Of the complex of coordinate-photometric CA observations, which represents a complex of photo-metric CA observations on the basis of the photometric channel mounted on the carrying installation providing sufficient accuracy of tracking, having a computer and extensive enough databank. 2. Of a complex laser-tracking CA, which is intended for definition of exact distances up to CA. 3. Of a complex of radar-tracking means of CA observations for making coordinate and not coordinate measurements to determine orbital data, sizes and density of the objects (and their changes), that in its turn allows to control a CA status on the orbit.

At work of the given automated system three variants of CA observations can be carried out:

1. The observation of CA launched for the first time and in which FCC is interested;
2. Regular observations of functioning CA with the purpose of revealing extraordinary situations onboard, and also determining parameters, especially those, whose changes may appear irreversible and result in hindering the performance of the tasks planned;
3. The observation of passive CA for determination of parameters of motion, properties of the surface and their changes for revealing situations, which can cause danger to the people and environment.

In all these cases the mode of transfer of the information from each of the observing stations to the FCC databank should be envisaged in real time at synchronous and quasisynchronous modes of observation for the subsequent operative timely taking a decision.

Key words: artificial satelites: photometry, laser ranging

LASER-LOCATING OBSERVATION FOR SATELLITES SYSTEM

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Laser-Locating Observation (LLO) for Satellites System elabo- rating by the Education Department of Ukraine will consist of 4 points located near Ukraine's boards in Odessa, Lvov, Uzhgorod, and Alchevsk Lugansk region. The parameters of all stations are according to the world level. By the means of this system satelli- tes used for survey of Earth surface and localization of LLO to- wards Earth's mass center with super exactness will be observed. Given information will be used for the number of exploration in Geophysics, and Geodynamics, as well as for creation of modern system of worldwide time for Ukraine. Satellites' coordinates des- tined for the observation of the Earth surface will be translated to the foreign space center for the exchange of information in En- vironmental Science, Geology, and Meteorology. Also we shall ob- serve NASA satellites for space Navigation and satellites Geodezy.

In present we have done 70% of work in the developing of the net of LLO. We look for sponsors for ending of this work. We are capable for examining of any conditions of cooperation.

Key words: artificial satelites: laser ranging

THE CONTROL OF CA BEHAVIOUR IN THE ORBIT FROM PHOTOMETRIC OBSERVATIONS

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The control of CA behaviour in the orbit can be carried out from determination of the following parameters.

1. From the CA light variation period. It is evident that angular rotational velocity of C may vary as affected by aerodynamic, gravitational, electromagnetic forces as well as at directed external influence and at the command.
2. From the variation in CA axis orientation in space. This variation is responsible for CA orbital motion, its drag in the atmosphere, CA lifetime. The variation in the CA axis orientation and that of light period are affected by the same factors although the axis orientation is steadier to their action (except the variation at the command).
3. From the variation in colour index, polarization and spectral characteristics of C. The given factors characterize reflective properties of the CA surface and their variation gives an essential information on the CA behaviour in the orbit.

Key words: artificial satelites: orbits

THE STRUCTURE OF THE CATALOGUE OF CO PHOTOMETRIC DATA

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Photometric observation of cosmic objects can serve as one of methods of space control. The photometric data obtained represent: CO light curves in the integrated light, the data on CO colorimetry, the data on the solar light polarization by cosmic objects.

The problem of CO identification from photometric data consists finally in development of certain attributes inherent to the photometric data of a cosmic object (a group of objects) indicating the conformity of these attributes to the properties of real cosmic objects (to the form, covering, dynamics of orbital motion and the rotation around the mass centre etc.). The given problem can be solved in some cases by a direct analysis of the photometric data on the cosmic objects.

But the most effective and comprehensive solution of the problem lies only in the catalogue of the photometric data comprising photometric information obtained, the results of physical and mathematical modelling of CO observations as well as all the available apriori information.

Based upon the structure of represented photometric data the catalogue of photometric data should consist of three parts: the catalogue of light curve in the integral light, the catalogue of colorimetric data and the catalogue of polarization data.

Key words: artificial satelites: catalogues; artificial satelites: photometry, polarimetry

ON THE POSSIBLE SPECTRUM OF PLASMA IRREGULARITIES IN THE LOWER SOLAR ATMOSPHERE

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In this report the formation of plasma irregularities (with scales smaller than 1000 km) due to turbulent mixing of weakly ionized gas in the lower solar atmosphere is discussed. The consideration of the process takes a background plasma density gradient and a uniform magnetic field into account. The relation between plasma density fluctuations and the random velocity field of neutral gas is derived from the 3-fluid equations. Restricting the consideration to the inertial range of scales, where the spectrum of turbulent velocity field of neutrals has the Kolmogorov power-law form, an analytic expression for the spectrum of plasma fluctuations is obtained. This expression predicts a power-law dependence for the spectrum of plasma irregularities in the lower solar atmosphere in general as well as some possible departures in detail of the spectrum from a simple power law with a constant power index.

Key words: Solar atmoshpere: spectrum; plazma; magnetic field

THE CONTROL OF EVOLUTION OF THE ORBITAL DATA CA ON OPTICAL SUPERVISION

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Bearing in mind that C while revolving around the Earth is influenced by various forces the parameters of its motion, do not remain constant, as it is the case with the nondisturbed motion, these vary in time. The study of these forces influence on the CA motion has shown that the Earth's nonsphericity and the drag in its atmosphere are basic disturbance factors for low CA whereas the influence of other celectial bodies is insignificant. For high CA, main disturbance factors are those caused by the Earth's nonspericity, the Moon and Sun influence, the light pressure and electromagnetic forces. The action of natural forces causes disturbances of CA elemental orbits of both secular and periodical character. The action of nongravitational forces results in CA spin around the mass centre and in its orientation change.

The control of CA orbital data evolution is one of the most important missions of space control service supposing the presence or creation of a ramified network of well-equipped observing stations, the organisation of carrying out versatile regular CA observations to update the data on their orbital and phisical characteristics, to study and control their variations, generate and replenish the catalogue. For this, a standing observation service is needed equipped with adequate software, able to make position, photometric, ideally, spectral and polarimetric observations of CA as well, in cooperation with Ephemeris service providing prediction of CA orbital motion and their behaviour in the orbit.

Key words: artificial satelites: orbits: perturbations

SOLAR CYCLE 23: THE MAIN FEATURES AND THE CYCLE EVOLUTION

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Evolution of the current solar cycle has shown that our knoledge of long-duration active processes in the Sun is insufficient to confidently predict the next 11-year solar cycle. The current cycle began in May 1996 and 30 month later the relative smoothed sunspot number reached 70.5 only. Compare this to previous cycle 22, when this value was reached already to 19 months, the cycle 21 to 23 months, and the outstanding cycle 19, when it was reached in 20 months. We discuss the characteristics of solar cycle 23 in comparisonwith the previous cycles.

Key words: Solar activity cycles

NICOLAY N.DONICH – THE ASTRONOMER

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The article is devoted to milestones of life and scientific activity of the eminent Astronomer Nicolay Nicolaevich Donich (Nicolae N.Donici) (1874-1956), the graduate from the Odessa (Novorossiyski) university. He was the wellknown expert in the field of research of objecs of Solar system. The person educated and highly cultered, constructing first in Bessarabia(present Republic of Moldova) observatory.

He was born in Kishinev (Chisinau) in the noble family of moldavian landersmen. N.D. graduated from the Richelieu lyceum in Odessa and afterwards, in 1897, graduated from the Odessa(Novorossiysky) University. A.K.Kononovich(1850-1910) headed the Chair of Astronomy and the Observatory at that time - a foremost authority in the field of astrophysics and stellar astronomy. Many of his disciples became eminent scientists of their time. N.Donich was among them. N.D. worked till 1918 in Pulkovo Observatory and became a master in the field of studying such phenomena as solar and lunar eclipses. To observe the Sun N.D. could afford to design and manufacture a spectroheliograph, the first in Russia, with the assistance of a famous Odessa mechanic J.A. Timchenko. This instrument enabled to obtain topquality photos of Sun's surface and prominences. It was mounted together with the coelostat in the private Observatory of N.D. built in the village Stariye Dubossary in 1908. Besides the heliograph, the Observatory was equipped with a five-inch refractor-equatorial with numerous instruments for various observations. Of the other instruments should be mentioned: " a comet triplet" - an instrument consisting of a guiding refractor, a photographic camera and a spectrograph with an objective prism. N.D. was lucky enough to observe rare astronomical phenomena. He observed the transit of Mercury on the disk of the Sun on November 14,1907 and shoved the atmosphere absence in this planet; observed Halley's comet in 1910, the bright Pons-Winnecke comet in 1927. In 1933 he was carrying out observations of Saturn and determined the rotational period of the planet. Eight scientific papers on the zodiacal light investigation were published by N.D. Through the H.Shapley's recommendation he obtained in his observatory a number of stellar sky photos.

N.N.Donich was a brilliant personality in the astronomical community of his time. He was a member of many scientific societies. Hard and sad times came to Donich during the last years of his life. At first he had to leave Bessarabia, then Romania for Germany, France, where he worked at Medona Observatory. At last he found himself under trying financial situation. According to same finding the last days he spent in the old people's houme near Nice and died in 1956.

Key words: history of astronomy; Solar system; Sun

THE VARIATIONS OF SOUTH-AMERICAN LOW-LATITUDE IONOSPHERE DURING CHILIAN EARTHQUAKE ON MAY 21, 1960

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The analysis was performed of the large-scale variations of F2-layer critical frequencies over extensive low-latitude ionosphere area of the south-american region on the basis of the data of four low-latitude vertical sounding ionosphere stations (the geomagnetic latitudes 6.5 N – 15.6 S) and two mid-latitude ones during the catastrophic earthquake in=20 Chili on May 21, 1960 ($M = 8.5$). It was shown that the anormal disturbances of foF2 have taken place over considered low-latitude ionosphere region under quite geomagnetic background, best manifesting themselves by pronounced decreasing of foF2 at pre-sunrise hours at a period from two days to some hours before the first forshock. The peculiar features of the disturbances during considered period were their successive displacements to the equator, the synchronism of their manifestations at pre-sunrise hours just before the earthquake at the stations Talara, Huancayo, La Paz and the equality of negative disturbance amplitudes at the low-latitude stations nearest to the epicentre and most remote from it. After the first forshock ($M = 7.2$) during the period of time up to the main shock ($M = 8.5$) and two days under high aftershock activity as far as the magnetic storm commencement (May 23, 1200UT) the anormal disturbances in foF2 variations were not observed.

Key words: Earth ionosphere

EXPEDITION FOR OBSERVATION OF A DEPLOYMENT OF THE AMERICAN SATELLITE ECHO II IN THE WINTER 1963

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One of the first cooperative projects USSR – USA in the field of a satellite astronomy was organization of observations of a brightness of a satellite – balloon Echo II in accordance with filling it by gas after an output satellite into orbit. The expedition was conducted under aegis of Astronomical Council of Academy of Science of the USSR, the coordinator of the program was V.M.Grigorevski - at that time the senior lecturer of Kishinev university. Four groups of the observers were directed to four points – Ufa, Vyatka (Kyrov), Syktyvkar, Norilsk – located under trajectory of the satellite on it the first orbits. The authors of the given message entered also in a staff of expedition. On weather conditions it was possible to execute the observations only in Ufa (V.G.Karetnikov) and Vyatka (O.E.Mandel). By results of observations V.Grigorevsky and G.Leikin have determined the period of rotation of the satellite about the axis and parameters of orientation. The expedition, except scientific value, has played the role and in becoming of process pdetente, in strenghtening of international cooperation in the field of space researches.

Key words: artificial satellite: orbits; individual: Echo II

PALEOASTRONOMY BETWEEN THE TWO GAMOW MEMORIAL CONFERENCES (1994-1999)

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One of the first talks dedicated to paleoastronomy was presented to the First Gamow Memorial Conference (Odessa, 1994). After that paleoastronomy in Russia have made a considerable progress. The first cooperative - astronomers and archaeologists workshop on archaeoastronomy of took place in the very 1994. The first National Conference on Archaeoastronomy took place as early as October, 1996 (Moscow, Institute of Archaeology of RAS). But the first session on archaeoastronomy in Russia took place at SAI, in March, 1996 and was attached to the conference "Our Galaxy". Later on the proceeding of the session were published in As.Ap.Tr.

After the 1996 session an interdisciplinary workshop on archaeoastronomy took place at SAI. Following the conference resolutions the works on archaeoastronomy were intensified and a special permanent interdisciplinary workshop on paleoastronomy was created. A large international conference on paleoastronomy ("Paleoastronomy: Sky and Mankind") was held as part of the scientific program of the IV General Meeting of EAAS in 1997. Presently the work on this field is being continued. The latest conference (SETI: Past, Present, and Future of Civilizations) took place at SAI on May 24-27 of this year at SAI.

Key words: archaeoastronomy; history of astronomy

NUMERICAL PARAMETERS OF KO LIGHT CURVE DETERMINING ITS CLASSIFICATION ATTRIBUTES

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For long-term photometric researches of CO carried out in Space research department AO OSU the extensive observational material as the bank of CO light curves has been gatered. On the basis of the versatile analysis of this material the alphabet of classes for interactive identification of a class of each light curve has been arranged. Thus the classes of light curves are a priori related to to the classes of corresponding observable objects, as their photometric properties directly determine allocation of the given classes of light curves.

The interactivity of the identification procedure within the framework of this alphabet is obviously its basic drawback. The automation of the given procedure motivates the creation of a high-grade system of identification of light curves and objects, appropriate to them, within the framework of existing classes and provides solving a number of problems on development of identification algorithm functioning on the basis of the dictionary of attributes, generated with the help of methods of performing light curves by their numerical parameters.

Key words: artifical satelires: light curves

BIBLIOGRAPHY OF SOLAR SYSTEM SMALL BODY INVESTIGATIONS IN ODESSA

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In work the researches of small bodies of Solar system published by the Odessa astronomers in 1944-1999 years are circumscribed. They include works on study asteroids, meteorites, meteors, comets and dust component of interplanetary medium. For its in Odessa the visual, photographic, spectroscopic, photoelectric and radar-tracking methods of observations were applied.

In Odessa were developed and the methods of meteor patroling, "instantaneous" exposition, methods of determination of rotation rate asteroids and position of their rotation axis, elements of meteor orbits and velocity of traffic and braking of meteors in atmosphere of the Earth are applied, the genetic connections meteor streams with parent bodies (asteroids and comets) are determined.

Key words: Solar system: orbits: comets, asteroids, meteors

MODIFICATION OF URAN-4 RADIOTELESCOPE INTERFEROMETRIC REGISTRATION SYSTEM

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Interferometric registration system of URAN-4 radiotelescope was originally based on the HO-67 tape recorder. Because of essential defects of this system there was create another registration system, which use cassette video recorders for register radiosources signals on the magnetic tape. In this system tape recording is carried out in digital form. Because of high discretization frequency of input signals this system is need in buffer RAM, that allow to get continuous data through ADC and simultaneously register it on the hard disc, which is used as an intermediate carrier.

In this work we suggest to modify interferometric registration system by using personal computer internal RAM instead of external buffer RAM, and also to combine interferometric and radiometric registration systems including systems of precise time and frequency. Such modification is possible because moderm personal computers have considerably large RAM (more then 128 Mbytes), and therefore allow to keep data of input signal, that have length equal to radiosource scan length. So, the necessity of external buffer RAM and of intermediate carrier is dropped, that can essentially reduce thy quantity of equipment.

Key words: radio telescopes; radio interferometry

INVESTIGATION OF THE RADIOTELESCOPE URAN-4 DIRECTION PATTERN

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Radiotelescope URAN-4 (Galanin et al, 1989) was used for observations of the bright cosmic sources on decametric radiowaves to study the variability of their flux density (Galanin et al, 1984). There are existed the strong effects of ionosphere in decametric range of radiowaves (Bridle & Purton, 1968). The ionospheric absorbtion, refraction and scintillations distort the form of the radiotelescope direction pattern. To get the value of the flux density of discrete radiosource it is necessary to smooth the output record by some way. From the theoretical views it is obvious to apply the fitting of the calculating direction pattern to observing data. Really it demands to investigate the conformity between observing and calculating direction pattern.

To study the limits of using the fitting program tested on simulation which included distortion the direction pattern due to time displacement and scintillations with several amplitudes and periods. The conformity was estimated by variance of the diffrence between corresponding data arrays. Resaults of the fitting program operating with simulation has showed that it available for observing data and permited to get such values as amplitude, time displacement of maximum and sidelobes distortion of the direction pattern record.

References

Bridle A.H., Purton C.R.: 1968, *Astron. J.*, **73**, 717.

Galanin V.V., Inyutin G.A., Kvasha I.M., Panishko S.K., Pisarenko Ya.V., Rashkovskij S.L., Ryabov M.I., Serokurova N.G., Tsesevich V.P., Sharykin N.K.: 1989, *Cinem. Phys. Celestial Bodies*, **5**, 87.

Galanin V.V., Panishko S.K., Pisarenko Ya.V., Ryabov M.I., Serokurova N.G.: 1984, *YERAC-84, Abstracts, Zelenchykskaya*, 15.

Key words: radio relescopes; data processing

BEHAVIOUR OF CA GROUP, LAUNCHED BY ONE CARRIER-ROCKET

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The solution of some important global problems requires arrangement on an orbit in circumterrestrial space of a group of specialized artificial satellites carrying out certain functions within the framework of a common large task and functioning during some long period of time.

It is best of all to create similar CA groupings, as the experience has shown, by using group launchings when several satellites are launched into the orbit at once with one carrier-rocket. However, a number of problems remain unsolved, the most important one is that on stability of large CA groupings such as, for example, a system of satellites "Global Star" that is equivalent to the problem of their lifetime and normal functioning. It is to this problem that the given work is devoted.

The consideration of the given problem has shown, that the stability of a grouping CA in an orbit depends on a type of the starting device determining a configuration, on the way the apparatus is separated and the direction of its discharge and on the orientation accuracy etc.

As the carriers intended for realization of group launches are equipped with various starting devices in the given work the following possible variants of putting CA into orbit are considered:

1. A consecutive launching without acceleration of each apparatus along a trajectory of flight of the base module with sometime interval;
2. A simultaneous putting into orbit without acceleration of two CA in opposite directions:
) perpendicular to the plane of local horizon;
) in the plane of local horizon;
(The cases 2 and 2 can take place and at the launches of four CA) 3. The launching of three CA (triangle), in the plane of local horizon;
4. The launching of four CA (tetragon), in the plane of local horizon.

The consideration of the above variants has shown, that in case 1 a steady chain of $n > 1$ AES appears. In case 2 the grouping will be unstable and it will decay very quickly, as these CA will have different orbits, and, hence, and revolution periods. In cases 2, 3 and 4 the apparatus will move in orbits crossing under small angles. Such orbits are characteristic of having dangerous sites near the interection, where the CA collisions are possible. By choosing a correct direction of CA discharge with respect to the trajectory of base module motion the threat of this collision is removed. A pentagon should be considered the best configuration of the CA group.

Correctness of the conclusions made CA behaviour is completely confirmed by results of multiple observations of groups of objects ("bundle") in observing seasons 1992 (1993 (objects 83-056-7; 84-012-1,2,3,4,5; 86-014-1,3,4; 90-050-1,2,3,4; 91-076-1,2,3,4,5), and also in February, 1997 (analogues of apparatus assumed to be launched according to the program "Global Star"). The objects, as a rule, were observed as a compact moving group ("bandle") of three CA, one of them slightly ahead the others, so the group formed acute triangle extended towards the motion. They displaced markedly respective to each other, and the rear CA changed their places which should be in moving in intersecting orbits.

Key words: artificial satelites: orbits

USAGE OF THE RADIOASTRONOMICAL METHOD FOR THE ANALYSIS OF TIDAL PHENOMENA IN THE UPPER ATMOSPHERE OF THE EARTH

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On the basis of survey results quoted of investigations of gravitational tides in the Earth's atmosphere, the degree of their influence on neutral and ionized components is considered. Since 1987 regular observation of powerful galactic and extragalactic radiosources have been carried out at radiotelescope URAN-4 of Odessa observatory RIAN. Variations in fluxes of cosmic radiosources at the decameter wavelength range are largely due to the state of upper layers of Earth's atmosphere. The sources of Cas A Cyg A, Vir A, Tau A were observed monthly in cycles 7-14 days long. The variations of radiosource fluxes are indicate of season-day and sporadic changes caused by wave's disturbence in upper atmosphere. In observation cosmic sources near the Moon at different angular distances, the effects of focusing, defocusing and intensive scintillation are noted. The character of tidal disturbances in the upper atmosphere was examined on the base of obtained data. The difference of their manifistation for neutral and ionised component is discussing.

Key words: radioastronomy; Earth atmosphere

CALCULATION OF DAMPING CONSTANT OF THE FRAUNHOFER'S LINES IN THE SOLAR ATMOSPHERE

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To define chemical contents of elements in stars' atmospheres we need reliable data on their damping in spectral lines. We have found distinct expressions for damping constant with consideration of several mechanisms that influence the expansion of spectral lines. We have calculated parameter of damping for some spectral lines under different temperatures with consideration of inelastic collisions by means of these expressions. Using the most correct and empirically tested method of investigation of spectral lines we have calculated parameter of damping for spectral lines of iron group in Solar atmosphere.

Key words: Solar atmosphere: spectral lines

EXPEDITION TO DJANKOI FOR THE OBSERVATION OF THE TOTAL SOLAR ECLIPSE ON FEBRUARY 15, 1961

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The expedition was organized by Odessa affiliation of All-Union Astronomical and Geodetic Society and astronomical observatory of the Odessa university. The chief was I.S.Astapovitch. The members of expedition: V.M.Nechaev and authors of the present paper. The city Djankoi is located almost on center line of a band of a full phase of an eclipse, it determined selection of a place of observations. Some more expeditions of different observatories have arrived in city. Immediately before the beginning of an eclipse scattering a cloud cover with the help of aircraft for the first time was on a large scale made. Cinematography of an eclipse was conducted, the moments of contacts of lunar shadow with an edge of the solar disk were determined, the measurements of light exposure were executed during a full phase with the help of luxmeter, a series of photos of phases of an eclipse with the help of camera "Zenith-C" with an objective prism was obtained. For the authors of the paper this expedition, among other things, has played the important role in purchase of experience of organization of astronomical observations in field conditions.

Key words: solar eclipse

NONLINEAR INTERACTION OF MHD WAVES AND SOLAR CORONA HEATING

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The nonlinear parametric interaction of Alfvén pump waves with magnetosonic and ion-acoustic waves is considered on the basis of two-fluid magnetohydrodynamics. A nonlinear dispersion relation describing three-wave interaction, instability growth rate have been calculated and estimated. The analysis of theoretical results shows that kinetic effects in the Alfvén waves (the finite ion Larmor radius) are essential for the parametric interactions of waves.

Nonlinear parametric processes studied in the paper could take place in the solar coronal loops, where plasma parameter ($\beta = 8\pi nT/B_0^2$) is small. The products of the decay - magnetosonic and ion-acoustic waves, can effectively heat the coronal plasma in consequence of rapid dissipation.

Key words: magnethohydrodynamic; plasma waves

ANALYTICAL ESTIMATE OF THE INFLUENCE OF THE LIMITED ANGULAR SIZE OF THE SUN IN A PROBLEM OF TWILIGHT SOUNDING OF THE ATMOSPHERE

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Nowadays scientists suppose that the near-earth cosmic space contains a great number of small size particles. Their influx to the Earth is being increased during the activity of meteoric flows. The method of twilight sounding of atmosphere is the one that is used to know the quantity of an aerosol in the upper atmospheric layers.

This method uses the brightness of single scattered light to detect the presence of an aerosol. However the brightness of scattered light is being influenced not only with a substance in a point of scattering, but also with a value of solar radiation, that has reached the same point. It appears that the value of radiation which has come depends on the angular size of the Sun. Calculation of the correction to a value of coming radiation, allows to determine the contents of an aerosol more exactly. Obtained analytical formulas allow estimating an area of atmosphere where it is necessary to take into account this correction, and to determine the association of this correction with the coordinates of a scattering point and the atmospheric parameters.

Present work contains the analytical formulas that permit to define with high precision the values of corrections at small optical depths of atmosphere and the character of their changes in deep layers of atmosphere. The model of extinction factor that is being decreasing with an altitude on the exponential law is considered as a special case.

Key words: Earth atmosphere; aerosols; Solar radiation

О ГАРМОНИИ СФЕР

Анатолий А. Шевченко

(Одесса)

Привлечение музыкальных закономерностей в общем процессе систематизации знаний и логического освоения мира, наряду с математическим аппаратом, изначально, по крайней мере от шумеро-вавилонских звездочетов, а в европейской традиции от Пифагора и вплоть до Кеплера, в значительной мере определило характер развития космологии. Это обусловлено не только спецификой музыкального искусства в плане социальном, идеологическом, психологическом, эстетическом, но и внутренними закономерностями музыкальных структур. Именно поэтому Пифагор полагал, что истину следует искать в сочетаниях музыкальных тонов и математических символов.

Сама идея мировой гармонии в космологии античности оформилась именно через музыку – как идея "музыки сфер" и была связана с физическими (акустическими) познаниями и выводами Пифагора и пифагорейцев (Архит) о числовой природе музыкальных звуков и интервалов и о пропорциях между ними. Согласно представлениям пифагорейцев, движение небесных тел создает прекрасную, совершенную музыку. Весь космос представляет собой гармонически устроенное и музыкально звучащее тело.

Корни этих космологических представлений пифагорейцев уходят еще глубже – в орфическую традицию:

> О, Всецветущий, ведь ты
>   кифарой своей полнозвучной
> Ладишь вселенскую ось,
>   то до верхней струны поднимаясь,
> То опускаясь до нижней струны,
>   то ладом дорийским
> Строя небесную ось, – и все, что
>   на свете живого,
> Ладишь, гармонию влив
>   во вселенскую участь для смертных.
>
> *(Орфический гимн Аполлону)*

Естественно, в дальнейшем, по мере развития космологии как науки, ее связь с музыкой становилась все более опосредствованной (от кифары Орфея до скрипки Эйнштейна), но тем не менее основной, фундаментальный принцип логического конструирования как в той, так и в другой сфере является все же неизменным. Аналогические умозаключения в космологии часто оказываются более плодотворными и верными, нежели данные астрономических наблюдений.

Так Аристарх еще в III в. до н.э. пришел к идее гелиоцентричности, которая была отвергнута из-за ее противоречия механике Аристотеля и вследствие отсутствия наблюдаемого эффекта параллакса. И наоборот, А. Эйнштейн, излишне положившись на результаты астрономических данных, пришел к ошибочному выводу о стационарности Вселенной. В то время как А. Фридман, создавая теорию нестационарной, расширяющейся Вселенной, апеллировал не к наблюдательным данным, а к структурной логике развития Метагалактики, и эта теория получила в дальнейшем убедительные подтверждения в астрономических наблюдениях. Аналогичная ситуация складывалась с корректировкой "постоянной Хаббла" и других идей, гипотез и концепций в космологии.

Таким образом очевидно, что взаимодействие между музыкой (музыкологией) и наукой о космосе происходило в сфере наиболее плодотворной методологии – логического конструирования основных принципов образования и функционирования Вселенной.

В настоящее время, определенная прямолинейность и схематичная упрощенность, лежащие в основе самой идеи "гармонии сфер", конечно же не соответствуют современному уровню знаний о космосе, но эта идея явилась весьма удобной моделью мироздания, отразившей характер космологических представлений на определенном этапе их развития.

Литература: 1. Платон. Государство. – М.: "Мысль", 1998. 2. Плутарх Херонейский. О музыке. – Пг., 1922. 3. А. Лосев. Античная музыкальная эстетика. – М., 1960. 4. Е. Герцман. Музыка древней Греции и Рима. – СПб.: "Алетейя", 1995. 5. Л. Бергер. Восточные традиции выразительности античной музыки и ее европейское композиционное мышление. – М., С. Х., 1980. 6. В. Шестаков. От этноса к аффекту. М.: "Музыка", 1975. 7. А. Шевченко. Завещание Орфея. – Одесса: "Астропринт", 1996.

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