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2016

Резюмета на публикации по научна тема I: Нелинейна динамика на астрофизични дискове.

(забел: Номерацията съответства на списък публикации от Раздел II.1 към Авторска справка)

1

Active states and structure transformations in accreting white dwarfs

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(Submitted on 16.12.2015; Accepted on 25.01.2016)

Abstract. Active states in white dwarfs are usually associated with light curve's effects that concern to the bursts, flickering or flare-up occurrences. It is common that a gas-dynamics source exists for each of these processes there. We consider the white dwarf binary stars with accretion disc around the primary. We suggest a flow transformation modeling of the mechanisms that are responsible for ability to cause some flow instability and bring the white dwarfs system to the outburst's development. The processes that cause the accretion rate to sufficiently increase are discussed. Then the transition from a quiescent to an active state is realized. We analyze a quasi-periodic variability in the luminosity of white dwarf binary stars systems. The results are supported with an observational data.

Key words: Accretion, accretion disks; (Stars): binaries: close; Hydrodynamics Waves

2

Emission properties of accreting binary stars by the polarization methods

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October 4, 2016

Abstract

We investigate the properties of emission lines in accreting binaries. Flares activity in two binary stars with accretion disc is considered. We present our modeling on the base of polarization methods. The modeling prediction gives the polarization degree according to their light curves and energy spectrum. Our analysis indicates that the polarization parameters show variations in their values during the flares activity and it mainly depends on radiation properties.

keywords: Accretion, accretion disks; Methods: polarization; (Stars): binaries: close;

Flares activity and polarization states of white dwarfs in binary star systems

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Abstract. We investigate flares activity and emission properties of white dwarf binary stars. We apply the polarization as a mechanism to probe the flares and the released resulting radiation. The polarization could appear as patterns in these cases, as it depends mainly on the properties of radiation and geometry of the source. The observational data of MV Lyr and CH Cyg are applied. A repeated variability in the brightness could affect the degree of polarization. Detectable variations in the polarization parameters of selected binaries for the flares activity period are shown in the result. The analysis may help us to establish more evidences of the close correlation between flares, flow structure transformation around the primary star and polarization? parameters variability.

The 19th Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun
 Edited by G. A. Feiden

Detecting Structural Transformations and Flares Activity in Binary Stars With a Cool Companion

Daniela Boneva

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Abstract

We investigate the flow's structure properties due to the mass transfer in binaries with a cool star. We study a possibility of activating flickerings and flares, in this kind of stars, in the result of dynamically unstable physical processes during the mass transfer between the components. A non-stable accretion disc configuration is then considerable. The relationship "flares - structure transformation" is established. We present a development of pattern formations throughout the binaries' connecting stream by the flow's fluctuations. We employ numerical computations and suggest a modeling of the flow's structure transformations. The observational data of two binaries are included into the calculations to analyse the quasi-periodic variability in the luminosity.

S E S 2 0 1 5
Eleventh Scientific Conference with International Participation
SPACE, ECOLOGY, SAFETY
 4 – 6 November 2015, Sofia, Bulgaria

MEASUREMENT THE POLARIZATION PARAMETERS OF HIGH - ENERGY PROCESSES IN BINARY STARS

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Keywords: Stars: Binary stars; Accretion; polarization;

Abstract: We presented high-energy processes in two binary stars. Flares are detected by analysing the corresponding light curves. The energy spectrum is received for the duration of active states in these stars.

We have studied the emission properties, as applying polarimetry methods on the high-energy events. The results reveal significant variations in the polarization parameters of selected binaries for the period of flares activity.

S E S 2 0 1 4
Tenth Anniversary Scientific Conference with International Participation
SPACE, ECOLOGY, SAFETY
 12 – 14 November 2014, Sofia, Bulgaria

METHODS FOR EXPLORING THE DYNAMICAL PROCESSES IN BINARY STARS SYSTEMS

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Keywords: Stars: Binary stars; Accretion; gas-dynamical simulations; light curves; polarization;

Abstract: We presented theoretical and observational methods on the investigation of the flow dynamics in accreting binary stars.

We have modeled the dynamical processes in the primary star and in the accretion disc around it on the base of the gas-dynamical calculations.

The results reveal flow structure transformation properties and their relation to the observational events as the quasi-periodic variability in the luminosity.

FLUCTUATIONS IN THE FLOW AND DEVELOPMENT OF FLARE-UPS IN COMPACT BINARY STARS

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Abstract. We study the relationship between the disc's structural transformations and the burst activity, which has an effect on the light curve shape's behavior. We present several methods for investigation of flare-up events in accreting compact binaries. The theoretical modeling explains the physical properties of flow unstable processes. It shows gas-dynamical mechanisms that are considered to be the most operative for the occurrence of flares in the binary star configuration. It is pointed to the changes in mass transfer rate that could also trigger bursts activity. We analyze the observational results of quasi-periodic variability in the luminosity of white dwarf binary stars systems.

Nonlinear physical processes of accretion flows - results and developments

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(Submitted on 16.11.2013. Accepted on 08.06.2014.)

Abstract. The theory of accretion and accretion discs takes a central place in the modern astrophysics. The main aim of our research is based on the exploration of the accretion flow dynamics through the application of theoretical and observational methods in compact objects. The applicability of hydrodynamical (HD) and magnetohydrodynamical (MHD) models and simulations on the study of accreting astrophysical objects evolution is analyzed. We develop numerical and analytical models to investigate the emergence of instability, wave propagation and structure formation in non-stationary accretion flows. A model able to provide the transition of 3-Dimensional turbulence to 2-Dimensional one is also proposed. The results show that during the evolution process, the accreting flow undergoes structural transformations and then they could be responsible for some known observational effects.

Key words: Accretion, accretion discs; Hydrodynamics; Magnetohydrodynamics; Waves; Methods: numerical; (Stars): binaries: close;

Евристичният потенциал на Вернадски днес

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Резюме. Важным этапом необратимой эволюции В. И. Вернадский считал переход в стадию ноосферы – разумное преобразование первичной природы Земли, исключение войн из жизни общества. В свободе научной мысли и научного искания, развитии научного знания и создании единой для человечества информационной системы он видел единственное доказательство существования прогресса. Живое и косное происходят из разных пространств, извечно находящихся рядом в Космосе. Особенности пространства живого вещества Вернадский связывал с его предполагаемым неевклидовым характером и как единство пространства-времени. Современное состояние его идеи являются предметом обсуждения.

Publ. Astron. Soc. "Rudjer Bošković" No 12, 2013, 113-120

3D NUMERICAL ANALYSIS AND STRUCTURES FORMATION IN ACCRETING WHITE DWARFS

DANIELA BONEVA¹, LACHEZAR FILIPOV², DEYAN GOTCHEV

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Abstract. The majority of accreting white dwarfs are dynamically bounded with a companion in a binary star configuration. We aim to examine structure's properties of the flow in accreting zone, surrounding the white dwarf star. We consider a gas-dynamical system that allows 3D modeling of physical processes in the close components. Multi-physics, multi-algorithm, adaptive numerical code is applied. The methods implied are both suitable for time-dependent, implicit computations and consist of a hydrodynamical module in their architectures. The results reveal the pattern formation character and dynamics of interaction in the binary star's flow. A density distribution model through the whole disc's structure is suggested.

On possible nature of Be/X X-ray luminosity

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Abstract. A new mechanism for the generation of X-ray luminosity in binary Be/X-stars is proposed. Using the model of the expanding envelope of optical component of binary Be/X-star it was shown that the rate of mass transfer through the vicinity of L_1 is sufficient to generate the observed X-ray luminosity of Be/X-stars. The relationship between the orbital period of the system and the magnitude of X-ray flux was discovered. The relationship between the orbital period of the system and the mass transfer rate, obtained from the simulation results, corresponds to the observed dependence of the maximum X-ray flux during the outburst on the orbital period for binary Be/X stars.

Keywords: Be-stars, Be/X, X-ray, binary stars, accretion

PACS: 97.10.Gz

THE FLOW EVOLUTION MODELS OF ACCRETING ASTROPHYSICAL OBJECTS

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Key words: *Astrophysical hydrodynamics; Stars and galaxies; Accretion discs.*

Abstract: *We present in this paper our recently results on the dynamics and structure of accreting flow in astrophysical matter. The research concerns the astrophysical objects, such as: binary stars with accretion discs and Active Galactic Nuclei. We make an analysis of the methods we have employed on the structure's evolution study. We investigate an accretion flow structure as a result of transitional processes dynamics. We develop a model, based on numerical codes and methods, which to explain the physical properties of the hydrodynamical matter in accreting astrophysical objects. The box-framed scheme is applied. The development of our theoretical models that aims to ensure the future application to the observational data analysis is presented. The results show that during the evolution process, the accreting flow undergoes through structural transformations, which could be responsible to the known observational effects.*

The results demonstrate of how the dense patterns and waves evolve in the studying astrophysical discs. An effect of their locally development in the inner disc's structure configuration is shown.

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Distribution of Patterns and Flow Dynamics in Accreting White Dwarfs

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Abstract. In the diversity of white dwarf stars population it is clear that the behavior of the disc flow is not common and uniform for all the close binary stars. It is quite affected both by the influences of mass transfer parameters: velocity and density, and by gravitational tidal effects. We aim to examine and compare the morphology of whole disc's flows, implying the data of DN and DA types of white dwarfs in the calculations. It is employed with two different numerical codes and box-framed schemes in the models are proposed. The results demonstrate of how the dense patterns and waves evolve in the studying types of white dwarfs. An effect of their development to the whole disc's shape and inner structure configuration is shown. We find a close relation between cooling–heating processes in the binary system and the patterns distribution there.

Density distribution configuration and development of vortical patterns in accreting close binary star system

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October 11, 2012

Abstract

We investigate the problem of structures formation in accretion disc zone, resulting from the tidally interaction in close binary star system. We aim to examine the area where the incoming flow meets the matter around secondary star and the resulting effects throughout the accretion disc. The research is based on employment of the fluid dynamics equations in conjunction with numerical simulations leading to the design of graphical models of accretion processes. For the simulation we propose box-framed sharing schemes. (i) The tidal transfer of matter through the inner Lagrangian point in close binary stars disturbs the flow in discs zones and outer disc area. Calculations on the perturbed parameters of density and velocity reveal formation of a thickened zone in the contact area of interacted flows. It appears to be stable for a number of periods and is unaffected by rotation and dissipation processes. (ii) The results also show development of undulations, which grow to vortical patterns in the accretion disc's zone. It is confirmed that under the influence of tidal wave the conditions of reconfiguring of accretion flow structure are generated.

Keywords: Accretion; accretion disks; Hydrodynamics; Waves; Methods: numerical; (Stars): binaries: close;

1 Introduction

Study of the flow structure in astrophysics is important, because the results could be used both for consideration of the evolution status of binary stars and for the interpretation of observational data. Therefore, when investigating close components, it is necessary to include physical essence

Options of applying of numerical codes for the study of transient processes in a binary star with a white dwarf

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(Submitted on 28.01.2012 Accepted on 08.02.2012)

Abstract. In this paper we present the idea of applying of numerical codes, particularly of the ZEUS, for the study of transient processes in the close binary stars during the interaction. As a transient processes they could be long- and short-lived and we take into consideration both of them in our survey, as we explained their behavior and connection with tidal influence in the binary configuration. Basic features of the code are revealed. Using the hydrodynamical possibilities of ZEUS 2D and applying our hydrodynamical system of examination, we show what kind of possible results we can derive. This solution gives the initial distribution of the wave after tidally flow of the matter through the contact point of the binary. It is compared to the results obtained with recently employed codes, the ability of working with ZEUS and other numerical codes capabilities to find out the most suitable code or their combination and to make the problem solvable.

Key words: Accretion, accretion disks; Hydrodynamics; Waves; Methods: numerical; (Stars:) binaries: close;

S E S 2 0 1 2

Eighth Scientific Conference with International Participation

SPACE, ECOLOGY, SAFETY

4 – 6 December 2012, Sofia, Bulgaria

„АНОМАЛНОСТ” - ГРАНИЧНА ИЛИ ПРЕХОДНА ОБЛАСТ?

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Ключови думи: аномалност, йерархия, изменчивост

Резюме: Представен е критичен интердисциплинарен анализ на причините за несъответствия в използването на основни концепции за Вселената. Коментирани са различни физически причини за синергетични сценарии.

THE “ANOMALITY”- A BOUNDARY OR TRANSITIONAL REGION?

Deyan Gotchev, Latchezar Filipov, Daniela Boneva

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Key words: anomaly, hierarchy, variability

Abstract: A critical interdisciplinary analysis of the causes for discrepancies in the use of basic concepts about the Universe is made. Different physical causes for synergetical scenarios are commented.

S E S 2 0 1 0
Sixth Scientific Conference with International Participation
SPACE, ECOLOGY, SAFETY
2-4 November 2010, Sofia, Bulgaria

WAVES AND INTERACTING FLOWS IN ACCRETION CLOSE BINARY STAR SYSTEMS

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Keywords: *binary stars; accretion discs; waves;*

Abstract: *The tidal interaction in binary star systems has been studied, as inflowing matter of donor star contacts with the forming accretion disc and circumdisc halo of the companion star. Numerical methods in the theoretical gas-dynamical calculations have been applied. The results reveal the appearance of wave structures with high density in the disc's area and in the rarefied gas around the accretion disc. The perturbations in the stellar component with disc and the velocity acceleration by the sound value have been estimated. The wave structures have been studied observationally by the method of Doppler Tomography.*

Spiral and vortical formations in accretion close binary stars due to the tidal waves

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(Conference poster. Accepted on 15.12.2009)

Abstract. The research of this survey is related to the formation of structures as a resulting effect of tidal interaction in close binary systems. As the tidal effects are taken into account, the thicken zone in the contact area of two flows is revealed. By applying of numerical methods, it is obtained the solutions, which show the appearance and development of spiral structure. Such spiral formation could be considered as a consequent of processes, caused from tidal waves. Depending on conditions in accretion flow, especially temperature, the spirals arise with one arm or with two arms. Considerations are performed, by applying a 2D numerical code on the perturbed values of the flow parameters. Thereafter another effect or structure appears in close binaries flow - a vortical configuration or simply - vortices.

Key words: accretion disc, Stars: binaries, shock waves;

Models of Vortices and Spirals in White Dwarf's Accretion Binaries

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Abstract. The main aim in the current survey is to suggest models of the development of structures, such as vortices and spirals, in accretion white dwarf's binaries. Numerical methods and simulations are applied on the bases of hydrodynamic analytical considerations. It is suggested in the theoretical model the perturbation's parameters of the accretion flow, which are caused by the influences of the tidal wave over the flux of accretion matter around the secondary star. The results of numerical code application on the disturbed flow reveal an appearing of structure with spiral shape due to the tidal interaction in the close binaries. Our further simulations give the solution, which expresses the formation of vortical configurations in the accretion disc's zone. The evolution of vortices in areas of the flow's interaction is explored using single vortex and composite vortex models. Gas in the disc matter is considered to be compressible and non-ideal. The longevity of all these structures is different and each depends on the time period of the rotation, density and velocity of the accretion matter.

S E N S 2 0 0 8

*Fourth Scientific Conference with International Participation
SPACE, ECOLOGY, NANOTECHNOLOGY, SAFETY
4–7 June 2008, Varna, Bulgaria*

DISTURBANCES IN THE DISC FLOW OF SELECTED LMXBs* AND THE VARIATIONS IN THEIR LIGHT CURVES

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Key words: *astrophysical discs; X-ray binary; Light curve*

Abstract: *Most stars in the Universe have a companion and they are known as binary stars. In the current survey, we focus on the special part binaries, Low-Mass X-ray Binaries (LMXBs)*. Using the mechanisms of hydrodynamics, we studied the behaviour of accretion disc flow after weak disturbances in velocity and density. We obtained that this causes some instability in the disc dynamics and has an effect on the shape of light curves. The observational data of the estimated objects is used to create light curves. We analyzed the variations in their shape, caused by different possible sources.*

S E N S 2 0 0 7
Third Scientific Conference with International Participation
SPACE, ECOLOGY, NANOTECHNOLOGY, SAFETY
 27–29 June 2007, Varna, Bulgaria

EFFECT OF THE ROSSBY NUMBER VARIATIONS ON DYNAMICAL FORMATIONS IN ACCRETION DISC FLOW

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Key words: *Accretion discs, Hydrodynamics, Binary stars*

Abstract: *Using the known formulation and properties of Rossby number, we estimate its range of possible values and we study the relation to the turbulent scales of the accretion disc flow. In this paper, it is shown how the variable values of Rossby number are associated with two- or three dimensional flow motions. We consider the behavior of basic equations of accretion disc with the presence of Rossby number. Finally, as a connection with presented considerations, it is accented on the arising of vortex formations and their dynamics. We show the indirectly influences on the light curve form of one selected binary star. We perform calculations of Rossby number based on binary star systems models with accretion disc.*

S E N S ' 2 0 0 6
Second Scientific Conference with International Participation
SPACE, ECOLOGY, NANOTECHNOLOGY, SAFETY
 14 – 16 June 2006, Varna, Bulgaria

AN APPRAISAL OF USING SOME ABLE OBSERVATIONAL METHODS FOR STUDYING BINARY STAR SYSTEMS WITH ACCRETION DISC.

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keywords: *binary stars, accretion discs*

Abstract

It is clear from observations that the most stars live with companion one and more of them are known as binary pulsars, Low-mass X-ray binary, cataclysmic variables, symbiotic stars and others. One of the phenomena, running in binaries, is accretion mass flow or accretion disc. In this paper we pay attention and give appreciation to the methods of distinctive observational techniques, which may help us to understand the essence of accretion flow structure and to prove the presence of formations locally in the disc. Then we may compare this evidence with our theoretical statements. Here we point our view on results of UV observatory or spectroscopy devices, X-ray telescopes, Doppler tomography and data of satellites.

Using Data of VO to Examine X-Ray Astrophysical Sources and Their Applying to the Theoretical Investigations

D. Andreeva, M. Dimitrova, L. Filipov, K. Yankova

Space Research Institute, Bulgarian Academy of Sciences,
 6 Moskovska Str., 1000 Sofia, Bulgaria

Abstract

In this paper we discuss how Virtual Observatories can help us in our investigations pointed to X-ray astrophysical objects in particular close binaries with accretion flows. It is known that emission from accretion discs irradiates by X-rays, which spectrum gives properties of the studying object. Due to analysis of the VO data we may compare the observational results with our theoretical research.

We explain here, the necessity of expanding a further VO toward X-ray observational data.

USING DATA OF VO TO EXAMINE X-RAY ASTROPHYSICAL SOURCES AND THEIR APPLLYING TO THE THEORETICAL INVESTIGATIONS

D. Andreeva, M. Dimitrova, L. Filipov, K. Yankova

In this paper we discuss how Virtual Observatories can help us in our investigations pointed to X-ray astrophysical objects in particular close binaries with accretion flows. It is known that emission from accretion discs irradiates by X-rays. which spectrum gives properties of the studying object. Due to analysis of the VO data we may compare the observational results with our theoretical research.

We explain here, the necessity of expanding a further YO toward X-ray observational data.

ВЪЗНИКВАНЕ НА РОЗБИ ВИХРИ КАТО РЕЗУЛТАТ ОТ ГРАДИЕНТНО-ЕНТРОПИЙНА НЕУСТОЙЧИВОСТ В АКРЕЦИОННИ ДИСКОВЕ

Д. В. Андреева

Абстракт

Получено е дисперсионното уравнение, което описва градиентно-ентропийната неустойчивост и свързаните с него условия за развитието ѝ. Представени са основните свойства, като следствие от това уравнение. Нелинейната еволюция на градиентно-ентропийната неустойчивост може да доведе до образуването на вихрови структури в акреционните дискове. Разгледан е механизмът на пораждането на Розби вихри.

Some features of α disc and advective-dominated accretion disc. Self-similar solutions and their comparison -II

Lachezar Filipov, Krasimira Yankova, Daniela Andreeva

Space Research Institute - Bulgarian Academy of Science

Abstract

Using the models from part I, we have derived the basic parameters, describing the discs. We have obtained the self-similar solutions of the evolution for both types - ADAD and α discs. The results are expressed also quantitative to be demonstrated our conclusion.

The influence of specific type of instability over structure formations in accretion discs

Daniela Andreeva, Lachezar Filipov, Maria Dimitrova
Space Research Institute, BAS

Abstract

When we investigate the different structures in accretion flows, we find out the relation between arising of any type of instability and the engines of structure formations, when all required conditions exist.

Here we present how some of the instabilities effect to the process of the structures appearing.

THE INFLUENCE OF SPECIFIC TYPE OF INSTABILITY ON STRUCTURE FORMATIONS IN ACCRETION DISCS

Daniela Andreeva, Lachezar Filipov, Maria Dimitrova

When we investigate the different structures in accretion flows, we find out the relation between arising of any type of instability and the engines of structure formations, when all required conditions exist.

Here we present how some of the instabilities effect to the process of the structures appearing.

УДК 524,532.59

ОСОБЕНОСТИ В ПОВЕДЕНИЕТО НА ХИДРОДИНАМИЧНИ НЕУСТОЙЧИВОСТИ В АКРЕЦИОННИ ДИСКОВЕ

Д. В. Андреева

Абстракт

Разгледан е диференциално въртящ се акреционен диск. Дискът е считан да бъде неосисиметричен и геометрично тънък. Направени са изводи за поведението на хидродинамични неустойчивости, които при определени условия стават източник на турбулентности и вихрови

структури в диска. За целта са използвани уравнения на хидродинамиката, изразени в необходимата им форма.

48

Some features of α disc and advection-dominated accretion disc. Self-similar solutions and their comparison -I

Lachezar Filipov, Krasimira Yankova, Daniela Andreeva
Space Research Institute, BAS

Abstract

A brief review of the features of Standard Shakura - Sunyaev Disc (SSD) and Advection - dominated Accretion Disc (ADAD) is discussed. In this paper, it is presented the physical bases, which we use to obtain the parameters, describing two models. The built theoretical systems are transformed in a suitably for operation view.

УДК 524,532.59

ВЪЗНИКВАНЕ НА ТЮРИНГ СТРУКТУРИ В ХИДРОДИНАМИЧНА СИСТЕМА - АКРЕЦИОНЕН ДИСК**Д.В. Андреева, Л.Г. Филипов, М.М. Димитрова****Абстракт**

Представено е при какви необходими условия могат да се образуват структури. Дадено е описание на Тюринг формациите и уравненията, на които се подчиняват. Разгледана е възможността за тяхната поява, свързана с процесите на реакция - дифузия. Като резултат от това е показано, че в хидродинамичната система - акреционен диск, съществуват условия такива структури да възникнат.

ВЪЗНИКВАНЕ НА ТЮРИНГ СТРУКТУРИ В ХИДРОДИНАМИЧНА СИСТЕМА – АКРЕЦИОНЕН ДИСК*Д.В. Андреева, Л.Г. Филипов, М.М. Димитрова*

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30 години организирани космически изследвания в България + 30 years of Organized Space Research in Bulgaria
Институт за космически изследвания – БАН + Space Research Institute – BAS
София + 1999 + Sofia

Особенности на адвективно- доминиращи акреционни дискове и тяхната устойчивост

Д. Андреева

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Резюме: Направен е преглед на акреционни течения с адвективно-доминиращ характер. Те се появяват при невъзможност на акретиращият газ да се охлажда ефективно и така по-голяма част от излъчената топлинна енергия е пренесена от акреционния газ като ентропия. Устойчивостта на дву-температурния адвективно доминиращ акреционен диск е изследвана под влиянието на локални топлинни пертурбации. В резултат на това се установява, че дискът е топлинно устойчив, ако той е оптично тънък и е топлинно неустойчив, ако е оптично плътен. Върху устойчивостта значително влияние има и топлинната дифузия. Адвективно-доминиращият акреционен диск се оказва конвективно неустойчив, което е следствие от конвективния енергиен пренос.

Резюмета на публикации по научна тема II: Използване на малки-, микро - и нано-спътници за извършване на физически експерименти за изследвания в Близкия космос.

(забел: Номерацията съответства на списък публикации към Раздел II.1 от Авторска справка)

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S E S 2 0 1 3
Ninth Scientific Conference with International Participation
SPACE, ECOLOGY, SAFETY
20 – 22 November 2013, Sofia, Bulgaria

APPLICATION OF NANOSATELLITES IN THE NEAR-EARTH SPACE INVESTIGATION

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Keywords: *Nanosatellites; Near-Earth Space; Zodiacal Light;*

Abstract: *We present based characteristics of the nanosatellites' equipment and we point to the advantages of their usage. The purpose of this paper is to survey the applications of nanosatellites as a new and advanced technology. It is reviewed the most employable of them in space science and technology. We present the conception of our new project that will investigate the polarimetry of the Zodiacal light on a Sun-synchronous low Earth orbit.*

Microsatellite Platform BALKANSAT and the challenges in Earth Observation

P. Getsov, L. Filipov, E. Roumenina, A. Pavlova, I. Nikolova, D. Andreeva,
D. Gotchev, N. Tomov, O. Petrov, M. Dimitrova, M. Zaharinoва
Space Research Institute -BAS

The huge progress in microsatellite performance improved satellites capabilities in the field of earth observation and, yet more precisely and cost-effectively, in imaging the earth surface.

The paper presents the characteristics of the *BALKANSAT* micro-satellite platform, the special challenges of the scientific programs, the expected results and their applications. The presented works make economical and scientific survey of the various microsatellite missions and their applicability to regional and national tasks related to monitoring of earth objects and atmospheric influence. Furthermore, the role and suitability of the proposed devices and the expected multispectral data in investigating environmental performance in various time periods is explained. The future objectives are related to establishing an economically and ecologically effective framework using microsatellite technologies to evaluate environmental issues, providing an objective, scientifically sound framework as a basis of the Earth's monitoring progress.

TABLE I

No.	NAME	BASE PLATFORM
1.	Total mass of the platform 40 kg	
1.1.	Mass of the scientific equipment	12.5 kg
1.2.	Mass of the office equipment	18.2 kg
1.3.	Mass of the structure and the thermal regulation system	9.3 kg
2.	Orbit type – circular, sun-synchronous	Height 480 km
3.	Platform life-time	Over 1 year
4.	Orientation and navigation systems	
4.1.	Electromechanic, magnetodynamic,	

MICROSATELLITE PLATFORM BALKANSAT AND THE CHALLENGES IN EARTH OBSERVATION

*P. Getsov, L. Filipov, E. Roumenina A. Pavlova, I. Nikolova, D. Andreeva,
D. Gotchev, N. Tomov, O. Petrov, M. Dimitrova, M. Zaharinoва*

The huge progress in microsatellite performance improved satellites capabilities in the field of earth observation and, yet more precisely and cost-effectively, in imaging the earth surface.

The paper presents the characteristics of the *BALKANSAT 1* micro-satellite platform, the special challenges of the scientific programs, the expected results and their applications. The presented works make economical and scientific survey of the various microsatellite missions and their applicability to regional and national tasks related to monitoring of earth objects and atmospheric influence. Furthermore, the role and suitability of the proposed devices and the expected multispectral data in investigating environmental performance in various time periods is explained. The future objectives are related to establishing an economically and ecologically effective framework using microsatellite technologies to evaluate environmental issues, providing an objective, scientifically sound framework as a basis of the Earth's monitoring progress.

SES ' 2005

Scientific Conference "SPACE, ECOLOGY, SAFETY" with International Participation
10–13 June 2005, Varna, Bulgaria

**PHYSICAL EXPERIMENTS ON BOARD OF MICRO-SATELLITES, RELATED
TO THE ECOLOGICAL MONITORING**

Daniela Andreeva, Nikolay Tomov, Maria Dimitrova, Krasimira Iankova

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Abstract

According to the priority of micro-satellites and our study in space physics, we present the possibility to perform physical experiments onboard of micro-satellites. We explain the essence of these experiments and how they may help for the investigation of the Space-Earth relation. It is shown the importance of the cosmic radiation flow influence over the environmental conditions. For a successful solution of the problems, we propose to use some kind of detectors.

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Резюмета на публикации по научна тема III: Екологично мониторингово изследване на атмосферните замърсявания на отделни региони в България на базата на спътникови и наземни данни.

(забел: Номерацията съответства на списък публикации от Раздел II.1 към Авторска справка)

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Екологично инженерство и опазване на околната среда, No 4, 2011, с. 72-78

ЕКОЛОГИЧНО МОНИТОРИНГОВО ИЗСЛЕДВАНЕ В РАЙОНА НА ПОЛИГОН ЗМЕЙОВО НА БАЗАТА НА СПЪТНИКОВИ И НАЗЕМНИ ДАННИ

Р. Недков, Пл. Христов, И. Иванова, М. Димитрова, М. Захарина, Г. Желев, Д. Бонева

WEB-BASED ECOLOGICAL MONITORING STUDY IN THE REGION OF A POLYGON ZMEYOVO, USING SATELLITE AND GROUND DATA

R. Nedkov, P. Hristov, I. Ivanova, M. Dimitrova, M. Zaharinoва, G. Jeleв, D. Boneva

Abstract: In this paper we describe the methodology and results of a web-based environmental monitoring study of air pollution in the region of a polygon Zmeyovo – Stara Zagora municipality. Monitoring is conducted by early 2010. The results are published daily in specialized web-page. The analyses of the results don't show atmospheric pollution in the region from polygon Zmeyovo.

Key words: web-monitoring, satellite images, ecological monitoring, air pollutions.

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Р. Недков, Пл. Христов, И. Иванова, М. Димитрова, М. Захарина, Г. Желев, Д. Бонева

In this paper we describe the methodology and re-sults of a web-based environmental monitoring study of air pollution in the region of a polygon Zmeyovo -Stara Zagora municipality. Monitoring is conducted by early 20 JO. The results are published daily in specialized web-page. The analyses of the results don't show atmospheric pollution in the region from polygon Zmeyovo.

S E N S 2 0 0 9

*Fifth Scientific Conference with International Participation
SPACE, ECOLOGY, NANOTECHNOLOGY, SAFETY
2–4 November 2009, Sofia, Bulgaria*

WEB- МОНИТОРИНГ НА АТМОСФЕРНИ ЗАМЪРСЯВАНИЯ В РАЙОНА НА ОБЩИНА БУРГАС НА БАЗАТА НА СПЪТНИКОВИ, НАЗЕМНИ И GPS ДАННИ

**Лъчезар Филипов, Пламен Христов, Румен Недков, Ива Иванова, Мария Димитрова,
Мариана Захаринаова, Георги Желев, Даниела Бонева, Дора Панайотова**

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Ключови думи: атмосферно замърсяване, еко- мониторинг, спътникови данни

Резюме: В настоящата статия е разгледан проблема с атмосферните замърсявания на територията на област Бургас. Резултатите от замърсяванията се основават на ежедневно еко-мониторингово изследване на Центъра за аерокосмическа информация, ИКИ-БАН. Анализът на резултатите от изследването на района сочи сравнително нисък брой на дни със замърсявания за периода от септември 2008 г. до септември 2009 г., като се забелязват разлики в отчетения брой дни със замърсявания през различните сезони

WEB-БАЗИРАН МОНИТОРИНГ НА АТМОСФЕРНИТЕ ЗАМЪРСЯВАНИЯ В РАЙОНА НА ОБЩИНА СТАРА ЗАГОРА НА БАЗАТА НА СПЪТНИКОВИ ДАННИ

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Отделянето на вредни газове при различни промишлени процеси предизвиква замърсявания в планетарния граничен слой. При производството на електроенергия от топло-електрически централи, разположени в региона на община Стара Загора, се емитира серен диоксид, което се дължи на изгарянето на нискокачествени въглища. Серният диоксид и другите малки компоненти при този процес (фини прахови частици, азотен диоксид, сероводород, въглероден оксид и др.), образуват кондензационни ядра и предизвикват атмосферни замърсявания в посочения по-горе регион.

В течение на три години се извършва ежедневен web-базиран мониторинг в региона на община Стара Загора на базата на данни от спътници, включени в системата MODIS (Terra, Aqua и Aura).

В настоящата работа е представена методиката и резултатите от мониторинга.

WEB-БАЗИРАН МОНИТОРИНГ НА АТМОСФЕРНИТЕ ЗАМЪРСЯВАНИЯ В РАЙОНА НА ОБЩИНА СТАРА ЗАГОРА НА БАЗАТА НА СПЪТНИКОВИ ДАННИ

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