

Резюмета на научни трудове

на гл.ас д-р Пламен Николов Тренчев

представени за участие в конкурс за академичната длъжност „Доцент“, обявен в Държавен вестник бр. 45 от 23.05.2023 г. от Института за космически изследвания и технологии - БАН в област на висше образование 4. Природни науки, математика и информатика, професионално направление 4.4. Науки за Земята; научна специалност „Дистанционни изследвания на Земята и планетите“ за нуждите на секция „Аерокосмическа информация“ при ИКИТ-БАН.

B4.1.

Trenchev, P.; Dimitrova, M.; Avetisyan, D. Huge CH₄, NO₂ and CO Emissions from Coal Mines in the Kuznetsk Basin (Russia) Detected by Sentinel-5P. *Remote Sens.* 2023, 15, 1590, ISSN: 2072-4292, <https://doi.org/10.3390/rs15061590>, SJR 1.136, Q1

Индексиране в Web of Science

Линк към публикацията: <https://www.mdpi.com/2072-4292/15/6/1590>

Abstract

The coal industry is the largest global emitter of carbon dioxide (CO₂). However, recent data suggests that coal mine methane (CH₄) emissions worldwide are higher than those of the oil and gas industry. Furthermore, the coal industry is less active in reducing methane emissions than the oil and gas sectors due to lower profitability. Although uncertainties remain in quantifying methane emissions from mines, the use of satellite observations is revolutionizing the process of monitoring and improving the accuracy of emission accounting. The methodology presented here allows us to determine background CH₄ concentrations and improve our ability to detect emission events using Sentinel-5P data. Knowing the background concentrations for the area of interest provides us the opportunity to track seasonal and annual variations and trends, as well as quickly detect periodic or accidental emissions from unregulated sources, etc. The methodology and systematic research applied in this paper for the period of May 2018 to the end of 2022 enables us to detect hundreds of large-scale emissions of CH₄, NO₂, and CO from the coal mines in the Kuznetsk Basin (the Kemerovo region), the largest coal mining area in Russia. We estimated that the amount of these emissions is significantly higher than the emissions reported by various authors for other coal mining regions such as Poland and Australia. We found that in cases of high methane quantity there is a positive correlation between NO₂ and CO emissions in time and location. The source of emissions in the study area is homogeneous, which allows it to be used as a benchmark for building models to estimate and track emissions in heterogeneous areas.

B4.2.

Trenchev, P.; Dimitrova, M.; Gochev, D. Increase of carbon dioxide and methane emissions over Bulgaria on the base of GOSAT satellite data. *Aerospace Research in Bulgaria*, 2023, v.35, pp. 34 – 40, ISSN: 1313-0927

Индексиране в Web of Science

Линк към публикацията:

http://journal.space.bas.bg/arhiv/n%2035/Articles/4_Trenchev.pdf

Abstract

Abstract The paper presents an assessment of the change in carbon dioxide and methane concentrations in the atmosphere over Bulgaria over the last 13 years. GOSAT data for the period April 2009 to the end of 2021 are used for this purpose. The data are presented as monthly averages with a spatial resolution of 2.5x2.5 degrees. The seasonal and spatial behavior of carbon dioxide and methane emissions in the respective regions of interest has also been investigated.

B4.3.

Trenchev, P.; Dimitrova, M.; Avetisyan, D.; Spasova, T. A fast and efficient method for calculation of background methane concentrations using Sentinel-5p satellite data. Proceedings SPIE, Ninth International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2023), ID 1074, (April 2023), SPIE, 2023, ISBN: 978-9963-697-44-1

Индексиране в Scopus

[Линк](#) към публикацията.

Abstract

Increased emissions and thus higher concentrations of greenhouse gases in the atmosphere as result of human activities are one of the main reasons for the observed rise in temperatures in recent years. Methane is the second most abundant greenhouse gas and plays a significant role in global warming. With the oil and gas industry and coal mining accounting for the majority of anthropogenic emissions, atmospheric methane concentrations are increasing at an accelerating rate. In this paper, using satellite data from the Sentinel-5P for the period of May 2018 to December 2022, we present an efficient and fast method to calculate background atmospheric CH₄ concentrations. The emission source in the study area is homogeneous, allowing the proposed method to be used as a benchmark for building models to estimate and track emissions in heterogeneous regions. The knowledge of background concentrations allows the tracking of seasonal and annual variations and trends, as well as the rapid detection of regular or accidental emissions from unregulated sources.

B4.4.

Dimitrova, M.; **Trenchev, P.**; Avetisyan, D.; Spasova, T. Spatio-temporal monitoring of air pollution over Bulgaria's largest industrial area using Sentinel-5p TROPOMI data. Proceedings SPIE, Ninth International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2023), ID 1073, (April 2023), SPIE, 2023, ISBN: 978-9963-697-44-1

Индексиране в Scopus

[Линк](#) към публикацията.

Abstract

Air pollution is one of the most significant environmental problems in the world nowadays. A considerable part of anthropogenic emissions is produced by industry and Bulgaria is no exception. The most important air pollutants that have a significant impact on the air quality and have a direct or indirect influence on climate change are nitrogen dioxide (NO₂), carbon monoxide (CO), methane (CH₄) and sulphur dioxide (SO₂). This paper reports on pollution monitoring results in Bulgaria's largest industrial area, located in the triangle between the cities of Stara Zagora, Haskovo and Plovdiv. Daily satellite data from the Sentinel 5P - TROPOMI instrument were used to study high levels of nitrogen dioxide, carbon monoxide, methane and sulphur dioxide emissions from October 2018 to December 2022. Validation of the results was carried out using ground data from the nearest Automatic Identification System (AIS) station. The monitoring results show that the study area has the highest levels of NO₂ pollution. However, many cases of SO₂ pollution have also been recorded.

B4.5.

Erokhin N., Zolnikova N., Shkevov R., Mikhailovskaya L., **Trenchev, P.** On the charged particles surfatron acceleration in space plasma. Comptes rendus de l'Académie bulgare des Sciences, v.60, No.9, Prof. Marin Drinov Publishing House of Bulgarian Academy of Sciences, 2007, ISSN:1310-1331, pp. 967-972. ISI IF:0.106

Индексиране в Web of Science

Линк към публикацията:

http://www.proceedings.bas.bg/index_old.html

Abstract

It is considered the highly relativistic acceleration of charged particles by finite amplitude electromagnetic wave in space plasmas (so-called the surfatron mechanism of charges acceleration). Using relativistic equations for accelerated charge the integral motion is obtained. Then the problem considered is reduced to the analysis of second order nonstationary, nonlinear equation for the wave phase at the particle trajectory which is solved numerically. The purpose of this paper is to study the influence of other wave mode with different phase velocity on charge capture and its following acceleration. It is shown that such influence may be negligible if some conditions on incoming wave parameters are fulfilled. So the strong particle acceleration by

electromagnetic wave will occur if the wave modes with comparable amplitudes have the phase velocity difference large enough.

B4.6.

Damgov, V., Erokhin, N., **Trenchev, P.** Class of inhomogeneously driven dynamical systems: general theory, regular and chaotic properties. Aerospace Research in Bulgaria, 20, Space Research Institute - BAS, 2005, ISSN:0861-1432, 360-364. JCR-IF (Web of Science):0.06

Индексиране в Web of Science

Линк към публикацията:

http://journal.space.bas.bg/arhiv/n%2020/Articles/58_Damgov.pdf

Abstract

A generalized model of an oscillator, subjected to the influence of an external wave is considered. It is shown that the systems of diverse physical background which this model encompasses by their nature should belong to the broader class of "kick-excited self-adaptive dynamical systems".

B4.7.

Damgov, V., Erokhin, N., **Trenchev, P.** Oscillator-wave model as an inhomogeneously driven dynamical system. Aerospace Research in Bulgaria, 19, Space Research Institute - BAS, 2005, ISSN:0861-1432, 119-134. JCR-IF (Web of Science):0.06

Индексиране в Web of Science

Линк към публикацията:

http://journal.space.bas.bg/arhiv/n%2019/Articles/12_Damgov.pdf

Abstract

A generalized model of an oscillator is considered, subject to the influence of external waves. It is shown that the systems of diverse physical background, encounter-passed by this model, should belong by their nature to the broader class of "kick-excited self-adaptive dynamical systems". The theoretical treatment includes an analytic approach to the conditions for emergence of small and large amplitudes, i.e. weak and strong non-linearity of the system.

The article also considers the presence of a small horseshoe in the dynamics of a particle under the action of two waves. Originally, the problem comes from the plasma physics despite the existence of some other applications of the differential equation studied here.

B4.8.

Damgov, V., Erokhin, N., Zol'nikova, N., **Trenchev, P.** Non-diffusive mechanism of charged particles acceleration under the action of an electrostatic waves package. Aerospace Research in Bulgaria, 19, 2005, ISSN:0861-1432, 135-143. JCR-IF (Web of Science):0.06

Индексиране в Web of Science

Линк към публикацията:

http://journal.space.bas.bg/arhiv/n%2019/Articles/13_Damgov.pdf

Abstract

A new non-diffusive mechanism of charged particles acceleration is considered. The latter is conditioned by the wave-particle interaction in the resonance of second order that corresponds to the nonlinear oscillator excitation by an external force. The calculations show that a leap of the accelerating particle can be observed in the process of the resonance interaction, from one potential well to another that moves with a greater velocity. A sequence of such leaps through out the separatrix leads to particles acceleration with multiple increasing of their kinetic energy. The mechanism of charged particles acceleration under consideration is realizing when the conditions are fulfilled as follows. For the charge that has been captured in the potential well of the wave package n -th harmonics with a frequency ω_n , wave vector k_n and amplitude E_n , a resonance of the second order with $(n+1)$ th harmonics should be fulfilled. The harmonics phase velocity ω_n/k_n is to increase with the increasing of n , i.e. $\omega_{n+1}/k_{n+1} > \omega_n/k_n$. The regions of the captured particles velocities must adjoin for neighboring harmonics. The wave amplitudes are sufficiently enough for nonlinear oscillator excitation and throwing it throughout the separatrix. In this way, a new mechanism has been found of non-diffusive charged particles acceleration by a package of electrostatic waves with small but finite amplitude. A procedure of parameters selection is formed for the sequence of harmonics in the package that take part in the charged particle acceleration process. The effect under consideration is of interest, particularly, for the problem of cosmic rays generation and interpretation of origin mechanisms of accelerated particles flows (of electrons and ions) that are observed in the space plasma.

B4.9.

Damgov, V., **Trenchev, P.** "Oscillator-Wave" Model: Multiple Attractors and Strong Stability. In: Abdullaev, F.K., Konotop, V.V. (eds) Nonlinear Waves: Classical and Quantum Aspects. NATO Science Series II: Mathematics, Physics and Chemistry, 153, Springer, Dordrecht, 2004, ISBN:978-1-4020-2190-9, pp. 163-171

Индексиране в Web of Science

Линк към публикацията:

https://link.springer.com/chapter/10.1007/1-4020-2190-9_15

Abstract

A generalized model of an oscillator, subjected to the influence of an external wave is considered. It is shown that the systems of diverse physical background, which this model encompasses by their nature, should belong to the broader, proposed in our previous works, class of “kick-excited self-adaptive dynamical systems” [1,2,3]. The theoretical treatment includes an analytic approach to the conditions for emergence of small and large amplitudes, i.e. weak and strong non-linearity of the system. Derived also are generalized conditions for the transition of systems of this “oscillator-wave” type to non-regular and chaotic behaviour.

B4.10.

Damgov, V., **Trenchev, P.**, Sheiretsky, K. "Oscillator-wave" model: properties and heuristic instances. *Chaos, Solitons and Fractals*, 17, 1, PERGAMON-ELSEVIER SCIENCE LTD, 2003, ISSN:0960-0779, DOI:[https://doi.org/10.1016/S0960-0779\(02\)00446-0](https://doi.org/10.1016/S0960-0779(02)00446-0), pp.41-60. SJR (Scopus):0.627, JCR-IF (Web of Science):2.78, Q1

Индексиране в Web of Science

Линк към публикацията:

<https://www.sciencedirect.com/science/article/abs/pii/S0960077902004460?via%3Dihub>

Abstract

The article considers a generalized model of an oscillator, subjected to the influence of an external wave. It is shown that the systems of diverse physical background, which this model encompasses by their nature, should belong to the broader, proposed in previous works class of “kick-excited self-adaptive dynamical systems”. The theoretical treatment includes an analytic approach to the conditions for emergence of small and large amplitudes, i.e. weak and strong non-linearity of the system. Derived also are generalized conditions for the transition of systems of this “oscillator-wave” type to non-regular and chaotic behaviour. For the purpose of demonstrating the heuristic properties of the generalized oscillator-wave model from this point of view are considered the relevant systems and phenomena of the quantized cyclotron resonance and the megaquantum resonance-wave model of the Solar System. We point to a number of other natural and scientific phenomena, which can be effectively analyzed from the point of view of the developed approach. In particular we stress on the possibility for development and the wide applicability of specific wave influences, for example for the improvement and the speeding up of technological processes.

Г7.1.

Damgov, V., **Trenchev, P.** Phenomenon of “Quantized” Oscillation Excitation. In: Abdullaev, F., Bang, O., Sørensen, M.P. (eds) *Nonlinearity and Disorder: Theory and Applications*. NATO Science Series, 45, Springer, Dordrecht, 2001, ISBN:978-1-4020-0192-5, pp. 397-409

Индексиране в Web of Science

Линк към публикацията:

https://link.springer.com/chapter/10.1007/978-94-010-0542-5_33

Abstract

A phenomenon of “quantized” oscillation excitation is presented and discussed. A class of kick-excited self-adaptive dynamical systems is formed and proposed. The class is characterized by nonlinear (inhomogeneous) external periodic excitation (as regards the coordinates of excited systems) and is remarkable for its objective regularities: “discrete” oscillation excitation in macro-dynamical systems having multiple branch attractors and strong self-adaptive stability. The main features of this class of systems are studied both numerically (on the basis of a general model of kicked pendulum) and analytically. General conditions are derived for excitation of stationary oscillations in nonlinear resonance systems subjected to the action of external harmonic force which is nonlinear with respect to the coordinate of the excited systems.

Г8.1.

Georgieva, E., Syrakov, D., Nedkov, R., Atanassov, D., Dimitrova, M., Spassova, T., Veleva, B., Prodanova, M., Kirova, Hr., Neykova, N., Neykova, R., Hristova, E., Gochev, D., **Trenchev, P.**, Petrov, A., Zaharinova, M. Satellite information downscaled to urban air quality in Bulgaria – results from the SIDUAQ project. COPE4BG 2020 2nd National Workshop with International Participation on EU Copernicus Programme, 28 July 2020, 6 October 2020 Sofia, Bulgaria, 2020, pp. 5-15

Линк към публикацията:

https://cope4bg2020.copernicus.bg/public/resources/proceedings/cope4bg2020_Proceedings.pdf

Abstract

The ESA funded project SIDUAQ made it possible, for the first time in Bulgaria, to use satellite data on atmospheric chemistry for improvement of air pollution modelling at national and local scale, and to use TROPOMI-S5p data for elaboration of maps for particulate matter (PM) concentrations at ground-level. We discuss the effect of satellite data assimilation in the Bulgarian Chemical Weather Forecasting System (BgCWFS) on different pollutants concentrations based on simulations for one summer and one winter months. We present results from downscaling of BgCWFS results for the territory of Bulgaria (9 km spatial resolution) down to city of Plovdiv (250 m resolution) by means of the Local Air Quality Modelling System (LAQMS). The performance of the models is evaluated based on comparison to observational data and to models from the Copernicus CAMS service. The results of models for converting TROPOMI –S5p aerosol data to PM concentrations over Bulgaria are also outlined.

Г8.2.

Гочев, Д., Недков, Р., Димитрова, М., **Тренчев, П.** Използване на радарни изображения за изследване на фазови преходи на водата в околполярен район. Proceedings

SES2017, Space Research Technology Institute - Bulgarian Academy of Sciences, 2017, ISSN:1313-3888, pp. 201-208

Линк към публикацията:

http://www.space.bas.bg/SES/archive/SES%202017_DOKLADI/3_Remote%20Sensing/6_Gochev.pdf

Abstract

Данните (около 1000 изображения са с два вида поляризации) за периода 01.12.2014г. - 03.04.2017г. са получени от апаратурата SAR (радар със синтезирана апертура) на борда на Sentinel 1A и 1B - две спътникови платформи на ESA-проекта "Copernicus". Наблюдавани са два района от Норвегия, които включват целогодишно неразтапящ се ледник на сушата, няколко фиорда с различна топография, която влияе на замръзването на океанската вода, океански район с преобладаващ целогодишно паков лед. Известно е, че за радарно изображение отражателната характеристика на подстилащата повърхност се влияе от електромагнитните свойства, включващи и фазовото състояние на водата в нея. Последното, освен от климатични фактори за околополярни райони, се влияе и от геомагнитната обстановка. При липса на локални данни за метео-параметри, това изисква особено внимание при in situ определяне чрез радарни изображения на хидро-параметрите на средата и прогнозиране на последващата ѝ динамика. В проведеното изследване бе установено наличието на комплексни зависимости между споменатите фактори. Освен, че се потвърждават основни теоретични постановки, експерименталният материал е полезен за детайлни и специфични проучвания на фазовите преходи на преохладена вода при геомагнитна буря. Някои възможни приложения са за определяне на надеждността на радарни изображения при екстремна динамика на електро-магнитния фон, както и за динамиката на материков ледник и на океански паков лед.

Г8.3.

Гочев, Д., Тренчев, П., Димитрова, М. Рискове за националната сигурност на Република България. „100 години авиационно образование в България“, НВУ "Васил Левски", 2014, ISSN:1314-1937, pp. 114-116

[Линк](#) към публикацията.

Abstract

The risks for Bulgaria due to the new geo-political situation are discussed. Some options for their minimization are offered.

Г8.4.

Димитрова, М., Велчева, Б., Гочев, Д., **Тренчев, П.** Физическо взаимодействие на променливо геомагнитно поле с радиовълните - ефекти върху комуникациите. Proceedings SES2013, Space Research Technology Institute - Bulgarian Academy of Sciences, 2014, ISSN:1313-3888, pp. 110-114

Линк към публикацията:

http://www.space.bas.bg/SES/archive/SES%202013_DOKLADI/1_Space%20Physics/15_Dimitrova.pdf

Abstract

В настоящата работа са разгледани физическите ефекти от промените в геомагнитното поле, предизвикани от слънчевата активност, върху разпространението на радиовълни в различни честотни диапазони.

Дискутирани са физичните процеси на разпространение на радиовълните в земната атмосферата от една страна, различните прояви на слънчевата активност от друга и резултатът от взаимодействието им върху комуникациите.

Г8.5.

Gochev, D., **Trenchev, P.**, Nedkov, R. The Future Of "Space" Military Operations. Сборник доклади от Университетска научна конференция 2013, НВУ „Васил Левски“, 2013, ISSN:1314-1937, pp. 71-76

[Линк](#) към публикацията.

Abstract

The presented skepticism about the future development of the military space research is focused on some of the main global goals' aberrations from scientific concepts.

Г8.6.

Gochev, D., **Trenchev, P.** The "Military" Space Facing Up Choices. Proceedings of SES 2012, Space Research and Technology Institute - BAS, 2013, ISSN:1313-3888, pp. 290-296

Линк към публикацията:

http://www.space.bas.bg/SES/archive/SES%202012_DOKLADI/2_Aerospace%20Technologies/17_Gotchev.pdf

Abstract

The presented skepticism about the future development of the military space research is focused on some of the main global goals' aberrations from scientific concepts.

Г8.7.

Гочев, Д., Тренчев, П., Димитрова, М. Влияние на геофизични пертурбации върху развитието на конфликта. Сборник доклади от Университетска научна конференция, НВУ „Васил Левски“, 2013, ISSN:1314-1937, pp. 67-70

[Линк](#) към публикацията.

Abstract

In the paper are presented some comments on possible applications of space physics' phenomena for influencing the development of a military-strategic confrontation. The natural or controlled activating of interconnected geophysical processes' elements and cycles are used. The local and temporary changes in the environment act as a camouflage noise or inhibits the weapons'systems performance. The relation "costs-obscurity-efficiency" is in the focus of attention. A brief discussion is made about the future regulation of the use of based-on-new-principles forms for influencing the space of conflict's development.

Г8.8.

Тренчев, П., Недков Р., Димитрова М., Христов П., Иванова, И., Захарина М., Гочев, Д. Интегрирани web-базирани системи за мониторинг на околната среда. Proceedings of SES 2012, Space Research and Technology Institute - BAS, 2013, ISBN:1313 – 3888, pp. 369-372

Линк към публикацията:

http://www.space.bas.bg/SES/archive/SES%202012_DOKLADI/3_Remote%20Sensing%20and%20GIS/13_Trenchev.pdf

Abstract

За да бъдат максимално ефективни, веб-базираните системи за мониторинг трябва да бъдат лесни и удобни за използване от широк кръг потребители, да осигуряват точен анализ и визуализация с помощта на взаимодействащи си инструменти и приложения чрез интернет.

Г8.9.

Тренчев, П., Димитрова, М., Недков, Р., Христов, П., Захарина, М. Модифицирани инструменти и алгоритми за работа с база данни. Уеб-базирани системи за мониторинг на околната среда. Proceedings of SES 2012, Space Research and Technology Institute - BAS, 2013, ISSN:1313-3888, pp. 367-368

Линк към публикацията:

http://www.space.bas.bg/SES/archive/SES%202012_DOKLADI/3_Remote%20Sensing%20and%20GIS/12_Trenchev.pdf

Abstract

За Съвременните уеб-базирани системи за мониторинг са динамични по своя характер. Те дават възможност за многопластово изпълнение на задачи благодарение на ефективно изградената архитектура, осигуряват взаимодействие между различни приложения и сложни структури от данни, предоставят удобен и бърз потребителски интерфейс.

Г8.10.

Gochev, D., **Trenchev, P.** Space Debris and Space Situational Awareness. Юбилейна научна конференция по повод 10 години от създаването на НВУ „Васил Левски”, НВУ „Васил Левски”, 2012, ISSN:978-954-753-095-9, pp. 152-157

[Линк](#) към публикацията.

Abstract

Over the past several years many scientists has offered possible solutions to the ever growing cloud of space junk circulating the Earth. The different ideas are commented with view of the possible use on purpose to influence a strategic decision making process. An accent on the risk due to the possible unpredictability of the outcome is made.

Г8.11.

Димитрова, М., **Тренчев, П.**, Гочев, Д. Сравнение на NDVI и NDWI индексите на широколистна гора за периода 1984-2016 г., получени по данни от спектрометрите TM, ETM+ и OLI. Proceedings SES2016, Space Research Technology Institute - Bulgarian Academy of Sciences, 2017, ISSN:1313-3888, 209-216

Линк към публикацията:

http://space.bas.bg/SES/archive/SES%202016_DOKLADI/3_Remote%20Sensing/8_Dimitrova.pdf

Abstract

В настоящата работа е направено сравнение между усреднените по години криви на отражението, NDVI и NDWI индекси на широколистна гора, получени по данни от Landsat 5, 7 и 8 за периода 1984 – 2016 година. Направен е анализ на различията в индексите, получени по данни от различните сензори и тяхното съвместно използване

Г8.12.

Gochev, D., **Trenchev, P.**, Sheiretsky, K. Comments on the Variability of Basic Concepts about the Universe. Proceedings of SES 2010, Space and Solar-Terrestrial Research Institute - BAS, 2011, ISSN:1313-3888, pp. 395-397

Линк към публикацията:

http://space.bas.bg/SES/archive/SES%202010_DOKLADI/5_Astrophysics/3_Gotchev.pdf

Abstract

A critical interdisciplinary analysis of the causes for imperfection and discrepancy in the created and tested concepts about the Universe is made. Possible future attempts are commented.

Г8.13.

Гочев, Д., **Тренчев, П.**, Шейретски, К. Информационни войни (ИВ) и реалността на необяснени аномални явления (НАЯ). Proceedings of SES 2010, Space and Solar-Terrestrial Research Institute - BAS, 2011, ISSN:1313-3888, pp. 167-168

Линк към публикацията:

http://space.bas.bg/SES/archive/SES%202010_DOKLADI/2_Aerospace%20Technologies/15_Gochev.pdf

Abstract

Коментирани са различни аномални физически явления и гледни точки за обяснението им с оглед на възможното им целенасочено използване за влияние върху вземането на стратегически решения. Акцентира се на риска от вероятната непредсказуемост на резултата.

Г8.14.

Шейретски, К., Гочев, Д., **Тренчев, П.** Нелинейни явления при колебанието на екваториален спътник. Proceedings of SES 2010, Space and Solar-Terrestrial Research Institute - BAS, 2011, ISSN:1313 - 3888, pp. 97-102

Линк към публикацията:

http://space.bas.bg/SES/archive/SES%202010_DOKLADI/1_Space%20Physics/14_Sheiretsky.pdf

Abstract

Разглежда се екваториален спътник като твърдо тяло. Анализирани са влиянието на сплеснатостта на планетата върху колебанията на спътника. Изведени са уравненията на движението в най-обща форма. Аналитично са изследвани резонансите при отчитане на нелинейността на системата.

Г8.15.

Gochev, D., **Trenchev, P.**, Sheiretsky, K. The catastrophic irreversibility of climatic engineering. Proceeding of SENS 2009, Space Research Institute - BAS, 2010, ISSN:1313 - 3888, pp. 278-281

Линк към публикацията:

http://space.bas.bg/SES/archive/SENS%202009_DOKLADI/4_Ecology/14_Gochev.pdf

Abstract

Different points of view on possible targeted climate regulation are commented with emphasis on the risk associated with the probable unpredictability of the outcome.

Г8.16.

Gochev, D., **Trenchev, P.**, Sheiretsky, K. The co-existence of 2 types of bodies' movement in the outer solar system. Proceedings of SENS 2009, Space Research Institute - BAS, 2010, ISSN:1313 - 3888, pp. 376-379

Линк към публикацията:

http://space.bas.bg/SES/archive/SENS%202009_DOKLADI/7_Astrophysics/8_Gochev.pdf

Abstract

Критично са анализирани представите за съществуващите обекти и движението им в граничната област на слънчевата система.

Г8.17.

Димитрова, М., Гочев, Д., **Тренчев, П.** ИЗПОЛЗВАНЕТО НА „БАЛКАНСАТ“ ЗА ИЗСЛЕДВАНЕ НА ВИСОКО-АТМОСФЕРНИ ЕЛЕКТРОСТАТИЧНИ РАЗРЯДИ (ВАЕР). Proceedings of SENS 2009, Space Research Institute - BAS, 2010, ISSN:1313-3888, pp. 403-404

Линк към публикацията:

http://space.bas.bg/SES/archive/SENS%202009_DOKLADI/8_Small%20Satellite/5_Dimitrova.pdf

Abstract

Обсъждат се възможностите за изследване на ВАЕР посредством мрежа от микроспътници. Споменават се възможни приложения на явлениято.

Г8.18.

Gochev, D., Sheiretsky, K., **Trenchev, P.** Critical Phenomena during Self-Organization in Astrosystems' Transition Regions. Proceedings of SENS 2008, Space Research Institute - BAS, 2008, ISSN:1313-3888, pp. 281-282

Линк към публикацията:

http://space.bas.bg/SES/archive/SENS%202008_DOKLADI/7_Astrophysics/4_Gotchev.pdf

Abstract

Представен е коментар за природата на явленията в преходни области на астросистеми и познавателния им потенциал.

Г8.19.

Gochev, D., Sheiretsky, K., **Trenchev, P.** The Hierarchy of Emerging Centers of Gravity in the "Space Vicinity of the Earth" Conflict Zone. Proceedings of SENS 2008, Space Research Institute - BAS, 2008, ISSN:1313-3888, pp. 255-256

Линк към публикацията:

http://space.bas.bg/SES/archive/SENS%202008_DOKLADI/6_Warfare/13_Gotchev.pdf

Abstract

Обсъжда се използването на особени точки във фазовото пространство на управляващите параметри на конфликт в ОКП.

Г8.20.

Тренчев, П. Геометрични елементи при числените симулации. Proceedings of SENS 2008, Space Research Institute - BAS, 2008, ISSN:1313-3888, pp. 31-32

Линк към публикацията:

http://space.bas.bg/SES/archive/SENS%202008_DOKLADI/1_Space_Physics/4_Trenchev.pdf

Abstract

Разгледани са трансформациите за конвертиране на вектора на състоянието в декартови координати в геометрични елементи, както и обратната задача – преобразуване на геометричните елементи във вектор на състоянието за тест-частица, движеща се около сплесната в полюсите си планета. Тези трансформации са прецизни до втори ред по отношение на ексцентрицитета и инклинацията. Това е полезно и може уверено да се използва при директни изчисления, например при числено изследване динамиката на пръстени.

Г8.21.

Тренчев, П. Фамилии от периодични решения в автономни хамилтонови системи. Приложения в динамично свързани групи в слънчевата система. Proceedings of SENS 2008, Space Research Institute - BAS, 2008, ISSN:1313-3888, 28-30

Линк към публикацията:

http://space.bas.bg/SES/archive/SENS%202008_DOKLADI/1_Space_Physics/3_Trenchev.pdf

Abstract

Разгледан е ограничения проблем на три тела в кръгова орбита. Той се описва посредством автономна хамилтонова система с две степени на свобода и един параметър $\mu \in [0, 1/2]$, който е масово съотношение на две масивни тела. Периодичните решения на този проблем формират дву-параметрични фамилии. Изследват се методи за пресмятане на симетрични периодични решения за множество стойности на параметъра μ .

Г8.22.

Sheiretsky, K., Trenchev, P., Lukov, St. Analytical Survey of a Satellite in the Regime of Synchronous Resonance Investigation of Secondary Proportion 1:n. Proceedings of SENS 2008, Space Research Institute - BAS, 2008, ISSN:1313-3888, 22-27

Линк към публикацията:

http://space.bas.bg/SES/archive/SENS%202008_DOKLADI/1_Space_Physics/2_Sheiretsky.pdf

Abstract

В статията е приложен методът на пертурбациите за анализ на вторичните резонанси на спътник, извършващ равнинно въртливо движение в резонанс 1:1 с орбиталното. Изследвана е структурата на фазовото пространство, като е направена и оценка на влиянието върху резонансното движение на членовете, разглеждани като смущение. Определена е ширината на хаотичната зона около сепаратрисата. Като пример е разгледан резонанса 1:2.

Г8.23.

Луков, Ст., Ерохин, Н., Томова, Д., Шкевов, Р., **Тренчев, П.**, Шейретски, К. За движението на заредени частици във външно ускоряващо поле. Proceedings of SENS 2008, Space Research Institute - BAS, 2008, ISSN:1313-3888, 33-37

Линк към публикацията:

http://space.bas.bg/SES/archive/SENS%202008_DOKLADI/1_Space_Physics/5_Lukov.pdf

Abstract

In a classical approach, accounting for radiation reaction, the movement of a charged particle in external accelerated field is considered. An approximate expression for this reaction, valid in the special case for constant acceleration, is recognised in the work to demonstrate that a charged particle's movement is regularly accelerated as in the case without presence of radiation reaction, but with another acceleration. The obtained results can be applied in numerical modelling of a particle's acceleration in space plasma.

Г8.24.

Луков, Ст., Ерохин, Н., Томова, Д., Шкевов, Р., **Тренчев, П.**, Шейретски, К. Прост фракталоподобен модел на порести среди. Proceedings of SENS 2008, Space Research Institute - BAS, 2008, ISSN:1313-3888, 276-280

Линк към публикацията:

http://space.bas.bg/SES/archive/SENS%202008_DOKLADI/7_Astrophysics/3_Lukov.pdf

Abstract

Разгледани A simple model of a certain type of porous media is considered – mainly activated carbon, based on the use of classical volume fractals. It is shown that the model provides satisfactory description of the main experimentally verifiable characteristics of the considered media. In short, the possibility for further improvement of the model is shown through introduction of random changes in the structure of the initial classical fractal.

Г8.25.

Trenchev, P., Sheiretsky, K., Gochev, D. Nonlinear Dynamical Processes in Extra-Solar Planetary Systems. Proceedings of SENS 2007, Space Research Institute - BAS, 2007, ISSN:1313-3888, pp. 81-83

Линк към публикацията:

http://space.bas.bg/SES/archive/SENS%202007_DOKLADI/1_Space_Physics/14_Trenchev.pdf

Abstract

Динамиката на системи от три или повече тела обикновено включва физически процеси, известни като резонанси на средното движение и секулярни пертурбации. Първите се появяват, когато двойка тела имат орбитални периоди, чието съотношение може приблизително да се представи като съотношение на две малки цели числа. Вторите са съществен фактор при изследване на дълговременната еволюция на системата. Динамичната еволюция на над половината от известните планетите в мултипланетарните извънслънчеви системи се доминира от секулярните резонанси. Най-често големите ексцентрицитети на планетарните орбити поставят под съмнение полезността на традиционната секулярна теория на Лагранж-Лаплас при анализа на движение. Тази теория може да бъде обобщена до четвърти порядък в ексцентрицитета, след което да се сравнява с числените резултати. Част от изводите, до които се стига в резултат на тези сравнения, са - Лагранж-Лапласовата теория на секулярната динамика е слаб индикатор (инструмент) за предсказване на секулярната динамика на извънслънчеви планетарни системи, но е полезен инструмент при прецизното определяне на дълговременната динамична еволюция на системи от малки тела с орбити, близки до кръговите.

Г8.26.

Erokhin, N., Filonova, E., Trenchev, P., Shkevov, R. Charged Particles Capture with Unlimited Acceleration Regime during Electromagnetic Wave Surfing in Magnetic Field. Proceedings of SENS 2007, Space Research Institute - BAS, 2007, ISSN:1313-3888, pp. 37-40

Линк към публикацията:

http://space.bas.bg/SES/archive/SENS%202007_DOKLADI/1_Space_Physics/4_Erokhin.pdf

Abstract

A particles capture and their following acceleration by an electromagnetic wave with finite amplitudes is studied, where the wave propagates in plasma across an external magnetic field, taking into account vortex component of the wave field. The analysis of charge acceleration is performed on the basis of the second order of nonstationary, nonlinear equation for the wave phase at the trapped particle trajectory. It is determined the range of wave phases in which the particle capture with their following acceleration takes place. It is studied the dependence of this

range boundaries on the external magnetic field magnitude for the wave phase velocity given. The temporal dynamics of accelerated particle impulse and its velocity is investigated.

Г8.27.

Sheiretsky, K., **Trenchev, P.**, Kirov, G. Chaotic Dynamic of Satellite Moving Along Circular Orbit in the Gravitational Field, Influenced by Magnetic and Tidal Moments. Proceedings of SENS 2007, Space Research Institute - BAS, 2007, ISSN:1313-3888, pp. 76-80

Линк към публикацията:

http://space.bas.bg/SES/archive/SENS%202007_DOKLADI/1_Space_Physics/13_Sheyretski.pdf

Abstract

Движението на спътник по кръгова орбита е задача, считана за позната и успешно изследвана посредством аналитични методи. Добавянето на приливния момент, както и отчитането на магнитното поле на спътника, могат да доведат до изненадващи качествено различни динамични явления. Наред с регулярните решения могат да се получат и решения, описващи стохастично поведение. В работата са определени условията, при които настъпва хаотично движение, в случай на произволно твърдо тяло, както и при сферично тяло.

Г8.28.

Дамгов, В., Ерохин, Н., **Тренчев, П.** Усукващите дисипативни изображения като обобщен модел на класа кик-възбудими самоадаптивни динамични системи. Proceedings of SES 2005, Space Research Institute - BAS, 2005, ISSN:1313-3888, pp. 61 - 66

Линк към публикацията:

http://space.bas.bg/SES/archive/SES%202005_DOKLADI/1_Space_Physics/a9.pdf

Abstract

We show that, with some simplification, the problem of kick-excited dynamical systems' behavior can be solved analytically in Poincare section, thus being reduced to a 2D discrete system of the radial dissipative twist map type. We consider the physical principles comparing our model of kick-excited self-adaptive system chiefly with Fermi-Ulam's and Zaslavsky's maps. We prove that the class of dissipative twist maps is the immanent tool for description and analysis of the wide class of systems and phenomena – Class of kick-excited self-adaptive dynamical systems and phenomena – that has been formed and proposed [1]. Except for being a generalizing model, this class is also remarkable for the fact that it reveals clearly the link of our models with the nearly-integrable Hamiltonian systems.

Г8.29.

Damgov, V., **Trenchev, P.** Class of dynamical systems with nonlinear excitation. Aerospace Research in Bulgaria, 18, Space Research Institute - BAS, 2004, ISSN:0861-1432, p.112-119

Линк към публикацията:

http://journal.space.bas.bg/arhiv/n%2018/Articles/16_Damgov.pdf

Abstract

The phenomenon of "quantized" oscillation excitation is presented and discussed. A class of kick-excited self-adaptive dynamical systems is formed and proposed. The class is characterized by nonlinear (inhomogeneous) external periodic excitation (as regards the coordinates of excited systems) and is remarkable for its objective regularities: "discrete" oscillation excitation in macro-dynamical systems having multiple branchy attractors and strong self-adaptive stability.

Г8.30.

Damgov, V., **Trenchev, P.**, Spedicato, E. Gravitational Waves Detection: Expectations for Revolutionary Discoveries. Quaderni del Dipartimento di Matematica, Statistica, Informatica ed Applicazioni, Universita degli studi di Bergamo, Italia, 2003, No.4, 1-19

Линк към публикацията.

Abstract

According to General Relativity Theory, from the waveforms, much can be deduced about the gravitational waves' sources: the directions to those sources, the distribution of black holes and neutron stars in the Universe and their masses and spins, the nature and nonlinear dynamics of gravity; and perhaps the equation of state of nuclear matter, etc. The information on the shape of the expected gravisignals is of special interest for Astrophysics. Hence, parallel to the detector sensitivity, the problem of realizing a wide band range recording is of special importance.

The paper's first part deals with the gravitational radiation problem and the nature of the signal, which we expect to detect.

The essential part of the present paper tackles the problem of future improvement of gravitational wave detectors, based on single mechanical oscillators, by increasing their band range along with increasing their sensitivity. A resonance gravitational waves detector is considered. A mechanical oscillator with a quality factor $Q_S \cong 10^7 - 10^{10}$ is supposed to be used as an aerial sensor, which provides a low level of the eigen fluctuation noises. The expected frequency range of the basic types of cosmic gravitational sources is $f \leq 10^4 \text{ Hz}$. The paper discusses the idea of eliminating the radical defect of the resonant-bar single-oscillator gravitational-wave detectors, that is, the detector extremely narrow frequency band, by performing a compensation of the differential elasticity of the gravitational sensor through a negative differential elasticity. The latter is to be created and introduced in the gravitational sensor by a 4-frequency electro-magnetic parametric system.

Г8.31.

Damgov, V., **Trenchev, P.** "Oscillator-wave" model: properties and heuristicity. 12th Annual Conference of Doctoral Students, WDS'3, Charles University of Prague, Faculty of Mathematics and Physics, 2003, Part III Physics, ISBN: 80-86732-18-5, pp. 538 – 543

[Линк](#) към публикацията.

Abstract

Our work considers a generalized model of an oscillator, subjected to the influence of an external wave. It is shown that the systems of diverse physical background, which this model encompasses by their nature, should belong to the broader, proposed in previous works class of "kick-excited self-adaptive dynamical systems". The theoretical treatment includes an analytic approach to the conditions for emergence of small and large amplitudes, i.e. weak and strong non-linearity of the system. For the purpose of demonstrating the heuristic properties of the generalized "oscillator-wave" model from this point of view is considered the mega-quantum resonance-wave model of the Solar system. We point to a number of other natural and scientific phenomena, which can be effectively analyzed from the point of view of the developed approach.

Г8.32.

Damgov, V., Neshkov, N., **Trenchev, P.**, Spedicato, E. Oscillator-wave model: Properties and heuristic instances. Quaderni del Dipartimento di Matematica, Statistica, Informatica ed Applicazioni, Universita degli studi di Bergamo, Italia, 2002, No.10, 1-18

[Линк](#) към публикацията.

Abstract

The works of Damgov et al. [1,2,3,4,5] present the class of kick-excited self-adaptive dynamical systems. We provide numeric and analytic proofs of dynamic systems subject to the influence of an external non-linear exciting force. Our considerations are based on a generalized pendulum model the non-linearity of the external influence being introduced through particularly selected functional dependencies.

Here we consider the generalized "oscillator-wave" model and show that the inhomogeneous external influence is realized naturally and does not require any specific conditions. Attempting maximal clarity of the sequence of presentation we consider the excitation of oscillations in a non-linear oscillator of the "pendulum" type under the influence of an incoming (fall) wave. We will show that under certain condition non-attenuated oscillations will arise with a frequency close to the system's natural frequency and an amplitude which belongs to a defined discrete spectrum of possible amplitudes. A second important quality also appears self-adaptive stability of the excited oscillations with given amplitude for a broad range of the incoming wave's intensity. Such results are applied to analyzing some features of the Solar system.