РЕЗЮМЕТА

НА ПУБЛИКАЦИИТЕ НА ДОЦ. Д-Р БОЯН КИРОВ

СЛЕД ЗАЕМАНЕ НА НАУЧНАТА ДЛЪЖНОСТ ДОЦЕНТ

1. Публикации в чужбина - общо 7 бр.

1.1. Публикации в списания в чужбина с импакт фактор – 3 бр.

1. **K. Georgieva, B. Kirov, Yu. A. Nagovitsyn, Long-term variations of solar magnetic fields derived from geomagnetic data, Geomagnetism and Aeronomy Vol. 53, Iss. 7, pp. 852-856, 2013**

   There are limited homogeneous instrumental observations of the sunspot magnetic fields, but the Earth is a sort of a probe reacting to interplanetary disturbances which are manifestation of the solar magnetic fields. We find correlations between some parameters of geomagnetic activity (the geomagnetic activity "floor"—the minimum value under which the geomagnetic activity cannot fall in a sunspot cycle, and the rate of increase of the geomagnetic activity with increasing sunspot number), and sunspot magnetic fields (the sunspot magnetic field in the cycle minimum, and the rate of increase of the sunspot magnetic field from cycle minimum to cycle maximum). Based on these correlations we are able to reconstruct the sunspot magnetic fields in sunspot minima and maxima since sunspot cycle 9 (mid 19th century

2. **B. Kirov, V. N. Obridko, K. Georgieva, E. V. Nepomnyashtaya, B. D. Shelting Long-term variations of geomagnetic activity and their solar sources, Geomagnetism and Aeronomy Vol. 53, Iss. 7, pp. 813-817, 2013**

   Geomagnetic activity in each phase of the solar cycle consists of 3 parts: (1) a "floor" below which the geomagnetic activity cannot fall even in the absence of sunspots, related to moderate graduate commencement storms; (2) sunspot-related activity due to sudden commencement storms caused by coronal mass ejections; (3) graduate commencement storms due to high speed solar wind from solar coronal holes. We find that the changes in the "floor" depend on the global magnetic moment of the Sun, and on the other side, from the height of the "floor" we can judge about the amplitude of the sunspot cycle.

3. **Georgieva K., Kirov B., Koucká-Knížová P., Mošna, Z., Kouba, D., Asenovska, Y., Solar influences on atmospheric circulation, Journal of Atmospheric and Solar-Terrestrial Physics Vol. 90 pp. 15-25, 2012**

   Various atmospheric parameters are in some periods positively and in others negatively correlated with solar activity. Solar activity is a result of the action of solar dynamo transforming solar poloidal field into toroidal field and back. The poloidal and toroidal fields are the two faces of solar magnetism, so they are not independent, but we demonstrate that their long-term variations are not identical, and the periods in which solar activity agents affecting the Earth are predominantly related to solar toroidal or poloidal fields are the periods in which the North Atlantic Oscillation is negatively or positively correlated with solar activity, respectively. We find further that solar poloidal field-related activity increases the NAM index, while solar toroidal field-related activity decreases it. This is a possible explanation of the changing correlation between the North Atlantic Oscillation and solar activity.

1.2. Публикации в списания в чужбина без импакт фактор – 4 бр.

1. **Georgieva K., Nagovitsyn Yu., Kirov B., Solar magnetic fields and terrestrial climate, Всероссийская ежегодная конференция с международным участием Солнечная и солнечно-земная физика – 2014, Труды, Санкт-Петербург 2014, pp. 99-104, ISSN 0552-5829**

   Солнечная радиация считается одним из основных естественных факторов, влияющих на земной климат, и ее вариации включаются в большинство численных моделей, оценивающих эффекты естественных по сравнению с антропогенными факторами изменений климата. Солнечный ветер, вызывающий геомагнитные возмущения, является другим агентом солнечной активности, чья роль в изменениях климата еще не полностью понята, но активно исследуется. Для целей климатического моделирования важно оценить и прошлые, и будущие вариации солнечной радиации и геомагнитной активности, которые тесно связаны с вариациями солнечных магнитных полей. Прямые измерения солнечных магнитных полей имеются за ограниченный период, но их можно восстановить из измерений геомагнитной активности. Мы представляем реконструкцию общей солнечной радиации, основанной на геомагнитных данных, и прогноз будущей радиации и геомагнитной активности, которые можно включить в модели ожидаемых климатических изменений.

2. **Kirov B., Asenovski S., Georgieva K., Obridko V.N., What causes geomagnetic activity during sunspot minimum? Всероссийская ежегодная конференция с**

международным участием Солнечная и солнечно-земная физика – 2014, Труды, Санкт-Петербург 2014, pp. 219-222, ISSN 0552-5829

В настоящей работе мы показываем, что средняя геомагнитная активность во время минимума солнечных пятен в последних 4 циклах последовательно убывает. Кроме того,мы показываем, что она не зависит от вариаций числа и/или параметров корональных выбросов массы и/или ударной волны связанной с высокоскоростными потоками солнечного ветра. Мы устанавливаем, что у фонового солнечного ветра две компоненты: одна со скоростью до 450км/с, другая выше 490 км/с. Источник медленного ветра – гелиосферный токовый слой, а более быстрой компоненты – полярные корональные дыри. Средняя геомагнитная активность во время солнечного минимума определяется не только толщиной гелиосферного токового слоя, но и параметрами этих двух компонент солнечного ветра, которые изменяются от цикла к циклу.

3. **Georgieva K., B. Kirov, Yu.A. Nagovitsyn, Long-term variations of solar magnetic fields from geomagnetic data, Труды Всероссийской ежегодной конференции по физике Солнца, Пулково 2012, стр. 431-436, 2012, ISSN 0552-5829**

Исследования магнитных полей в солнечных пятнах привели к противоречивым результатам. Penn and Livingston (2006, 2011) нашли длительное уменьшение макси-мальной напряженности магнитного поля в пятнах, но без вариаций в течение солнечного цикла, тогда как Pevtsov et al. (2011) показали, что среднее магнитное поле повышалось и понижалось с 11-летним циклом на протяжении последних четырех с половиной циклов, причем длительный тренд был не заметен. Здесь мы сравниваем наблюдения магнитных полей в солнечных пятнах с данными о геомагнитной активности и показываем, что магнитные поля пятен имеют как вариации в солнечном цикле, так и длительные изменения типа Глейссбергского цикла.

4. **Киров Б., В.Н. Обридко, К. Георгиева, Е.В. Непомнящая, Б.Д. Шельтинг, Вековые вариации магнитного поля Солнца и геомагнитной активности, Труды Всероссийской ежегодной конференции по физике Солнца, Пулково 2012, стр. 447-452, 2012, ISSN 0552-5829**

Еще в 1852 было установлено, что геомагнитные возмущения связаны с солнечной активностью [1]. Сначала считалось, что повышенная геомагнитная активность связана с солнечными вспышками, но в 1993 Gosling публиковал статью „Миф о солнечной вспышки” [2], в которой утверждал, что большие спорадические (нерекуррентные) бури вызваны выбросами коронального вещества. Выброс коронального вещества может сопутствовать солнечной вспышке, но может возникнуть и независимо от нее. Но на Солнце есть и другой источник геомагнитной активности – так называемые корональные дыры –

области открытых униполярных магнитных полей, из которых истекает квазистационарный высокоскоростной солнечный ветер. Возмущения, вызванные выбросами коронального вещества, имеют максимум в максимуме солнечных пятен, а вызванные высокоскоростным солнечным ветром – на фазе спада солнечных пятен. Это приводит к двум максимумам геомагнитной активности в 11-летнем солнечном цикле.

2.1 Публикации в сборници и поредици у нас – 3 бр.

1. **D. Bachvarov, A. Boneva, B. Kirov, Y. Boneva, G. Stanev, N. Baruh, Primary Information Preprocessing System for LP, DP devices-project "Obstanivka", Сборник доклади International Conference on Big Data, Knowledge and Control Systems Engineering, 5 November 2014, Sofia Bulgaria стр. 65-72.**

   The article presents Primary pre processing information system designed for using with Bulgarian devices LP and DP, working on ISS. There are described Bulgarian activities in the project "Obstanovka", the conversion process from telemetry to science data, LP and DP data structures, software solutions and system realisation. It is developed method for multi machine processing of big data areas. The article is illustrated by presentation of pre processed real science data of LP experiments

2. **Бъчваров Д., А. Бонева, Б. Киров, Й. Бонева, Г. Станев, Н. Барух, Система за обработка на първичната информация от прибори LP и DP - проект "Обстановка", Сборник от доклади от медународна конференция „ RAM 2013", стр.83-89, 17.10.2013, гр. София, ISSN 1314 –4634**

   The article presents Primary information pre processing system designed for using with Bulgarian devices LP and DP, working on ISS. There are described Bulgarian activities in the project "Obstanovka", the conversion process from telemetry to science data receiving, LP and DP data structures, software solutions and system realisation

3. **Климов С.И., В.А. Грушин, Л.Д. Белякова, Д.И. Новиков, В.Г. Родин, В.Н. Ангаров, Б.Б. Киров, Р. Недков, Г.А. Станев, Методика пространственно-временных измерений плазменно-волновых процессов в ионосфере с использованием инфраструктуры Российского сегмента Международной Космической Станции , Доклади на Юбилеен международен конгрес „40 години България – космическа държава", 2012, ISBN 978-954-577-636-6**

   Specific to the near-Earth space is a range of plasma-wave fluctuations (PWF) from DC fields until the first tens of megahertz, associated with the plasma cover of the Earth's

magnetosphere and ionosphere. The goal of space experiment (SE) "Obstanovka 1-st stage" (mid-2012) on board the Russian segment of the ISS (RS ISS) is long-term global monitoring of PWF. Research similar to SE "Obstanovka 1-st stage" are held on the microsatellite «Chibis-M", 25 January 2012 at the extracted orbit using the infrastructure of the ISS. SE "Obstanovka 2-nd stage" and the "Trabant", enshrined in the "Long-term programme on the ISS" in 2015-2020 timeframe. For single data analysis of these SE is the technique of spatio-temporal measurements of PWF. This work was partially supported by Russian Foundation for Basic Research, project-10 05-93107.

II Научни доклади - общо 19 бр.

II.1. Научни доклади в чужбина – 14 бр.

1. **Maris Muntean G., Besliu-Ionescu, D., Georgieva, K., Kirov, B.. Analysis of the Geomagnetic Activity during the SC 24 Maximum Phase in topic: Solar wind-magnetosphere interactions, VI Workshop "Solar Influences on the Magnetosphere, Ionosphere and Atmosphere", Sunny beach, Bulgaria, 26-30 May 2014**

   Geomagnetic storms are known to be of great importance to life on Earth through their impact on telecommunications, electric power networks and much more. Our study analyses the geomagnetic activity during the SC 24 maximum phase (July 2011 - October 2013) that has already passed. We present the variation of the Ap, aa indices in comparison with the intensity of high speed streams. The registered geomagnetic storms are classified by the Dst index and their main phase structure. We also analyze in detail two months of solar and geomagnetic activity after the SC24 maximum, these being March 2012 and March 2013. An ICME (Interplanetary Coronal Mass Ejection) is recorded on March 9, listed in the Richardson and Cane catalogue, correlated with a Halo CME (Coronal Mass Ejection) from the 7th. An intense geomagnetic storm (minimum Dst = в€' 131) was registered on March 9, 2012. Two ICMEs are also recorded on the 17th and 20th March 2013, the first one being correlated with a Halo CME from the 15th. March 17 is a day of intense geomagnetic storm (minimum Dst = в€' 132). We focus on these events, such that the interaction between fast solar wind and interplanetary magnetic field from the Sun to the Earth can be thoroughly described.

2. **Demetrescu C., Dobrica V., Georgieva K., Kirov B., Solar signals in long time series of the Danube discharge data, доклад на шестата международна конференция „Solar influences on the magnetosphere, ionosphere and atmosphere" – Слънчев бряг, България, 26-30 май 2014**

The analysis of a river flow can bring information on the climate evolution in its catchement basin, due to the integrating of precipitation and temperature effects over the basin in the discharge data. In this paper we analyze discharge data, available since 1840 from the Danube river, the second largest river in Europe, with the aim to infer solar signals – a result of the solar-terrestrial connection in the evolutioon of climate in the catchement area. Time series were analyzed, from four gauge stations along the Lower Danube segment. We first compare the discharge data recorded at the entrance on the Romanian territory (Orsova station) with precipitation data from the Upper and Middle Danube Basin, and discharge data at the end station (Ceatal) with precipitation in the Lower Danube Basin. Decadal variations with a period of ~11 years (amplitude of about 1500-2500 m3/s) and variations with longer periods, of 22 and 30 years (amplitude of about 500 m3/s), have been evidenced in discharge data. They are interpreted as solar signals at the Schwabe and, respectively, Hale cycles time scales.

3. **S. Asenovski, B.Kirov, Solar activity correlation with NAO and ENSO , Meeting of the ISSI team "Effects of Interplanetary Disturbances on the Earth's Atmosphere and Climate Bern, Sutzerland 24-28, March 2014 http://www.issibern.ch/teams/interplanetarydisturb/wp-content/uploads/2015/01/ Asikainen_03_2014.pdf**

4. **K.Georgieva, B.Kirov, P.Koucka-Knizova, G.Maris-Muntean, Solar wind influences on atmospheric circulation, 5th IAGA/ICMA/SCOSTEP Workshop on Vertical Coupling in the Atmosphere-Ionosphere System 11-18 August 2014 Antalya Turkey**

   General atmospheric circulation is the system of the large-scale atmospheric motions over the Earth which persist for a season and longer and are due to the Earth's rotation and the differential heating of the Earth's surface. Quantitative measures of large scale atmospheric are the indices of atmospheric modes of variability, like Northern and Southern Annular modes (SAM and NAM). We study the day-to-day variations in NAM and SAM indices as a result of impact on the Earth of solar flares, coronal mass ejections, and high speed solar wind streams.

5. **Kirov B., Asenovski S., Georgieva K., Asenovska Y.What Causes Geomagnetic Activity during Sunspot Minimum? 14th European Solar Physics Meeting (ESPM-14) Dublin Ireland 08-12 September 2014**

   Since the beginning of the geomagnetic measurements, the variations in the geomagnetic eld have been related to solar activity. It is now known that big sporadic (non-recurrent) geomagnetic storms are caused by coronal mass ejections. The coronal mass ejections are related to the solar toroidal eld whose manifestation are sunspots, so during sunspot maximum there is also a maximum in geomagnetic activity. Another source of geomagnetic activity are the coronal holes § open unipolar magnetic eld areas from which the high speed solar wind (HSS) emanates. Disturbances caused by HSS are

maximum during the sunspots declining phase, which leads to two geomagnetic activity maxima in the 11-year sunspot cycle. In sunspot minimum, even during long periods without sunspots and without low-latitude coronal holes, geomagnetic disturbances are still observed. In the present work we analyze the geomagnetic activity during sunspot minimum, its sources and the reasons for its cyclic variations.

6. **K. Georgieva, B.Kirov, Yu.Nagovitsyn, S. Asenovski , Solar magnetic fields: long-term variations and expected trends in the next decades, TOSCA workshop on future solar scenario 29.09-02.10 2014 Corfu, Greece**

   The long-term variations of the poloidal and toroidal solar magnetic fields have been reconstructed based on geomagnetic and sunspot data, and it is found that both have cyclic variations with a period of the order of a century. Extrapolating into the future, a forecast can be made that the solar poloidal field will be decreasing in the next few sunspot cycles, and the rate of increase of the solar toroidal field in the course of the sunspot cycle will be increasing. Based on the correlations found between the two components of the solar magnetic field and the total solar irradiance (TSI), it is expected that TSI will be decreasing in the following 30-40 years.

7. **Georgieva K., Nagovitsyn Yu., Kirov B., Solar magnetic fields and terrestrial climate, Всероссийская ежегодная конференция с международным участием Солнечная и солнечно-земная физика, Санкт Петербург, Россия, 20-25.10.2014**

   Solar irradiance is the main natural factor affecting the terrestrial climate, and its variations are included in a number of numerical models evaluating the effects of natural as compared to anthropogenic factors of climate change. The solar causing geomagnetic disturbances is another solar activity agent whose role in climate change is not yet fully understood but is a subject of active research. For the purposes of climate modeling, it is important to evaluate both the past and future variations of solar irradiance and geomagnetic activity which are closely related to the solar magnetic fields. Direct measurements of solar magnetic fields are available for a limited period, but they can be reconstructed from geomagnetic data. Here we present a reconstruction of total solar irradiance based on geomagnetic data, and a forecast for the future irradiance and geomagnetic activity, which can be included in models of the expected climate changes

8. **Kirov B., Asenovski S., Georgieva K., Obridko V.N. Что определяет геомагнитную активность в минимуме солнечных пятен?, Всероссийская ежегодная конференция с международным участием Солнечная и солнечно-земная физика, Санкт Петербург, Россия, 20-25.10.2014**

Since the beginning of the geomagnetic measurements, the variations in the geomagnetic field have been related to solar activity. It is now known that big sporadic (non-recurrent) geomagnetic storms are caused by coronal mass ejections. The coronal mass ejections are related to the solar toroidal field whose manifestation are sunspots, so during sunspot maximum there is also a maximum in geomagnetic activity. Another source of geomagnetic activity are the coronal holes – open unipolar magnetic field areas from which the high speed solar wind emanates. Disturbances caused by high speed solar wind are maximum during the sunspots declining phase, which leads to two geomagnetic activity maxima in the 11-year sunspot cycle. In sunspot minimum, even during long periods without sunspots and without low-latitude coronal holes, geomagnetic disturbances are still observed. In the present work we analyze the geomagnetic activity during sunspot minimum, its sources and the reasons for its cyclic variations.

9. **B.Kirov, K.Georgieva: "Secular variations of solar magnetic field and geomagnetic activity, WG2 workshop on the influence of interplanetary perturbations on the Earth's atmosphere and climate, Sunny Beach Bulgaria, 13-16 May 2013**

   The geomagnetic activity has doubled from the beginning to the end of the 20th century. As all geomagnetic activity is ultimately caused by agents of solar activity, and all solar activity agents are manifestations of the solar magnetic fields, geomagnetic activity records can be used to reconstruct the solar magnetic fields. The large scale solar magnetic field has two components – poloidal and toroidal, transforming into each other like kinetic and potential energy in a harmonic oscillator. We demonstrate that the poloidal component of the solar magnetic field can be reconstructed from the geomagnetic activity in the sunspot cycle minimum, and the toroidal one – from the rate of increase of geomagnetic activity with increasing sunspot number.

10. **K.Georgieva, B.Kirov: "Long-term variations of different geoeffective solar wind disturbances and their effects on atmospheric circulation",WG2 workshop on the influence of interplanetary perturbations on the Earth's atmosphere and climate, Sunny Beach Bulgaria, 13-16 May 2013.**

    Previous studies have found that the correlation between solar activity as measured by the number of sunspots and atmospheric modes of variability changes sign with a period of decades. However, solar activity has different manifestations, due to different physical processes. Some of them like solar flares and coronal mass ejections are related to sunspot number and proportional to it, others like high speed solar wind streams have different evolution in the course of the sunspot cycle and different effects on atmospheric circulation. In years with more high speed solar wind streams, atmospheric circulation is more zonal, while in years with more coronal mass ejections it is more meridional. We show that the sunspot related and not sunspot related manifestations of

solar activity have also different long-term variations, which can explain this changing correlation between solar activity and atmospheric circulation.

11. Asenovska Y., Asenovski S., Georgieva K., Kirov B.. Solar magnetic fields, sunspots and coronal mass ejections during the last sunspot minimum, Fifth workshop on solar influences on magnetosphere, ionosphere and atmosphere, Sozopol, Bulgaria, 3-6 June 2013

Coronal mass ejections (CMEs) are large outbursts of plasma and embedded magnetic fields from the solar corona. Their sources on the Sun are the active related to sunspots, and their number is therefore proportional to the number of sunspots. However, the relation is not linear: more CMEs per sunspot are observed in sunspot minimum than in sunspot maximum. Moreover, there is almost equal number of CMEs during the maxima of cycles 23 and 24 while the number of sunspots is drastically smaller in cycle 24 than in cycle 24. We study the possible instrumental effects and find that the increase in the number of CMEs is mainly due to the narrow and weak CMEs and one reason can be the increased instrument sensitivity, but the difference remains even for the widest and most powerful CMEs. An explanation is suggested.

12. Klimov S., Grushin V., Novikov D., Belyakova L., Getsov P., Nedkov R., Stanev G., Kirov B., Neychev S., Georgieva K., Batchvarov D.. "Interaction" and "Charge" projects. The first stage of realization of the "Obstanovka-1" spaceborne experiment, Fifth workshop on solar influences on magnetosphere, ionosphere and atmosphere, Sozopol, Bulgaria 3-6 June 2013

Одной из актуальных задач космического эксперимента (КЭ) «Обстановка 1 этап» является исследование «потоков энергии, поступающих в ионосферу снизу», или, что то же самое, «воздействий на ионосферу снизу». Наблюдение «воздействий снизу» естественным образом связано с необходимостью их селекции на фоне воздействий иной природы ~ «воздействий сверху». Но если последние широко исследуются в рамках программ по солнечно-земным связям и космической погоде, то по воздействиям снизу до сих пор не был реализован целенаправленный спутниковый проект. Вопрос о связи ионосферных возмущений с потоками энергии снизу ставится обычно специалистами в области распространения радиоволн и ионосферного зондирования. Осталась незаполненной определённая ниша, придающая КЭ «Обстановка 1 этап» определённую оригинальность и преемственность общей концепции.

Время от времени из короны Солнца выбрасывается облако горячей, но разреженной плазмы, которое со скоростью от 1 до $2\square 10^6$ км/ч распространяется через пространство солнечной системы. Примерно в 10 % случаев Земля оказывается на пути такого облака (имеющего размеры примерно $50\square 10^6$ км в поперечнике), что приводит к сильным возмущениям как в околоземном

пространстве (магнитные бури, полярные сияния и др.), так и на поверхности Земли (нарушения радиосвязи в арктических областях, перегрузки в линиях электропередачи, сильные токи в длинных трубопроводах и т.п.).

Именно такое событие произошло 6 - 11 января 1997г. В это время через околоземное пространство проходил задний край магнитного облака. Общая энергия, заключенная в таком сгустке плотной плазмы, была сравнима с общим количеством электроэнергии, которое все электростанции Земли вырабатывают за год. Этот процесс привел к резкому возрастанию уровня ионизирующего излучения в областях радиационных поясов Земли и, в частности, к мгновенному выходу из строя электронных компонент американского телевизионного ретранслятора Telstar-401 (стоимостью около 200 млн. долларов), который оказался в этот момент в зоне наиболее сильного ионизирующего излучения.

13. B. Kirov, K. Georgieva Solar Wind, Earth Rotation and Atmospheric Circulation Praha, COST Action ES1005 TOSCA Science meeting Prague, 30 September - 4 October 2013.

Earth rotation rate varies on different time-scales – from centuries to days. The seasonal nontidal variations in the Earth rotation rate, or the length of the day (LOD), are believed to be fully explained by large-scale atmospheric motions caused by the temperature differences between the summer and the winter hemispheres. A connection is also supposed between the decadal LOD variations and changes in atmospheric circulation. We demonstrate that the Earth rotation is different in positive and negative solar polarity cycles, therefore even on these time-scales the Earth-atmosphere system is not closed. The correlation between the decadal variations in LOD and atmospheric circulation changes in the beginning of the XX century, moreover it is opposite in the northern and southern hemispheres, so there is no direct relation between the Earth rotation and large-scale atmospheric circulation on decadal time-scales, rather they are both modulated by solar activity. We look for an explanation for the solar wind influences on the Earth rotation and on the atmospheric circulation in the two hemispheres.

14. K. Georgieva, B. Kirov, Are we entering the next grand solar minimum?, COST Action ES1005 TOSCA Science meeting Prague, 30 September - 4 October 2013.

The amplitude of the sunspot cycle is determined by the action of the solar dynamo transforming the poloidal magnetic field prevailing in sunspot minimum into toroidal field prevailing at sunspot maximum, and back into poloidal field of the opposite magnetic polarity during the following sunspot minimum. The regime of operation of solar dynamo is determined by the relative importance of supergranular diffusion and meridional flow. Earlier results have shown that in periods of grand minima the solar dynamo operates in a mode different from “normal” periods. We study the early

signatures of the mode of operation of the solar dynamo in solar cycle 24 to estimate the probability that the Sun is entering a new Grand Minimum.

2.2. Научни доклади у нас – 5 бр.

1. **S .Klimov, V. Grushin, D. Novikov, L. Belyakova, T. Grechko, D. Vavilov, P. Getsov, K. Georgieva, B. Kirov, G. Stanev, V.Korepanov, S. Belyaev, D. Dudkin, Cs. Ferencz, P. Szegedi, S cientific and methodological aspects of the implementation of the international experiment OBSTANOVKA (stage 1) on the Russian segment of ISS, Десета юбилейна научна конференция с международно участие „Космос, екология, сигурност", София, България 20-14.11.2014**

   Space experiment (SE) "Obstanovka (1st stage) is implemented through the plasma-wave complex - PWC developed on the basis of the devices previously used successfully by the SRI with the participation of international cooperation in basic research in space. The basis of wave measurements is combined wave diagnosis (CWD), which allows a wide frequency range, including constant fields, to explore the power of electromagnetic, electrostatic and magnetic fields, as well as the range of fluctuations of the plasma particles.

   The complex of physical parameters measured by PWC in the process of implementing SE, allows you to explore a wide range of physical phenomena in the ionosphere and in the surface area of the ISS. A significant portion of these phenomena is not enough investigated experimentally and is not defined clear criteria for their manifestation.

   The main objectives of SE:

   a) study of the dynamic characteristics of ionospheric disturbances caused by geophysical processes;

   b) detection of ionospheric manifestations of technogenic and anthropogenic activities;

   c) creating a database of electromagnetic effects associated with the interaction of the ISS with the surrounding ionospheric plasma.

   One of the main factors holding SE on the ISS, and not on automatic apparatus is maximising the benefits of the ISS as the bearer of the scientific equipment of a wide range of measurements. These advantages are:

   - engineering support experiments with the crew as during installation and commissioning of equipment, and in the process of long-term experiment in orbit;

   - sufficient energy resources, not limiting the speed and performance of the equipment;

   - stable orbit, enabling statistically be distinguished from long-term measurements of the components of geophysical origin.

Long-term monitoring of the parameters of the ionosphere and some regions of the magnetosphere on board the ISS can provide invaluable assistance, first, for consumers current information about the state of the ionosphere (radio and navigation system, GLONASS, GPS), as well as for researchers of solar-terrestrial physics.

The main scientific result at this stage thereof is that accumulated prior amount of information sufficient for a reliable methodological assessments of the ionospheric electromagnetic parameters of space weather.

The work is part of the Executive working group of RAS-BAN in the field of fundamental research project "Vzaimodeistvie" and "Zaryad".

2. **К.Георгиева, Б.Киров, В.Обридко, Ю.Наговицын, Проект Геоэффектив-ность - Исследование долгосрочных изменений солнечной активности и их земных проявлений X- ое заседание Российско-Болгарской Исполнительной рабочей группы по фундаментальным космическим исследования, 20.11. 2014**

Представлены основные результаты проекта за 2014 – научные и научно-организационные.

НАУЧНЫЕ

• Чем определяется геомагнитная активность в минимуме солнечного цикла

Установлено, что два фактора определяют геомагнитную активность во время минимума солнечных пятен: толщина гелиосферного токового слоя и параметры фонового солнечного ветра. Параметры фонового солнечного ветра (а значит и гелиосферного токового слоя) имеют вековые вариации, определяющие вековые вариации геомагнетной активности.

• Как можно восстановить общую солнечную радиацию по геомагнитным данным

Показано, что основное предположение в основе составления исторических рядов солнечной радиации, что поток радиации можно восстановить только по числу солнечных пятен, приводит к большие ошибки и что определение более точно по геомагнитным данным. Представлен метод определения и долгосрочные вариации солнечной активности.

НАУЧНО-ОРГАНИЗАЦИОННЫЕ

• Организация совещания проекта SEE (Solar Evolution and Extrema) научной программы SCOSTEP VarSITI

3. **Y. Asenovska, S. Asenovski, K. Georgieva, B.Kirov, Systematic deviations of the solar wind magnetic field from the Parker's spiral directtion. Ninth Scientific Conference with International Participation SPACE, ECOLOGY, SAFETY (SES 2013), 20-22 November, 2013, Sofia, Bulgaria**

Because of the rotation of the Sun, the magnetic field in the solar wind lies along an Archimedean spiral known as the Parker spiral. The short-term deviations of the direction of the solar wind magnetic field about the Parker spiral direction have been studied for years, and are found to be due to solar wind turbulence and disturbances like coronal mass ejections and corrotation interaction regions. Apart from these short-term deviations, we find also decadal variations, and investigate their dependence on the season and the solar magnetic cycle.

4. **S. Asenovski, B. Kirov, K. Georgieva, D. Bachvarov, S. Klimov, V.Grushin, First results from Langmuir Probe measurements aboard the International Space Station: First Results, Ninth Scientific Conference with International Participation SPACE, ECOLOGY, SAFETY (SES 2013), 20-22 November, 2013, Sofia, Bulgaria**

   The Langmuir probe is a classical instrument for plasma diagnostics, and among the first ones for in situ measurements in thermal plasma in the near-Earth environment. The parameters measured by Langmuir Probes are the electron and ion concentrations N_e and N_i, the electron temperature T_e and the satellite body potential U_S.

   In this paper the Langmuir probes are described included in "Obstanovka" experiment aboard the International Space Station which has been operating since April 2013. The adaptive algorithm for the probes' operation is outlined, and the first results are demonstrated.

5. **М.Адибекян, Б.Еремян, Н.Мартиросян, Г.Багдасарян, А.Сардарян, С.Калашян, С. Асеновски, Я. Асеновска, К. Георгиева, Б. Киров, Relation Between high speed solar wind streams and seismic activity in the Caucasus region. Ninth Scientific Conference with International Participation SPACE, ECOLOGY, SAFETY (SES 2013), 20-22 November, 2013, Sofia, Bulgaria**

   The Marie Curie "BlackSeaHazNet project (Complex Research of Earthquake's Forecasting Possibilities, Seismicity and Climate Change Correlations) is devoted to the creation of fundamentals of a Complex Program for investigation of the possibilities to forecast earthquake's time, hypocenter magnitude, and intensity using reliable precursors. As a part of this project, an investigation has been performed on the effects of high speed solar wind streams on the probability of earthquales occurrence in the Caucasus region. We find that on the day of arrival of high speed solar wind streams to the Earth and on the following day, a statistically significant increase of the number of earthquakes with M>2.5 is observed in the Caucasus region. As the arrival of high speed solar wind streams can be predicted with high accuracy, the possibility is explored to use them as an additional precursor for forecasting the seismic activity in this region.