РЕЗЮМЕТА НА НАУЧНИ ТРУДОВЕ

на ас. д-р Даниела Йорданова Аветисян

представени за участие в конкурс за академичната длъжност „Доцент“, обявен в Държавен вестник бр. 86 от 15.10.2021 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

Avetisyan, D., Nedkov, R., Borisova, D**.**, Cvetanova, G.. Application of spectral indices and spectral transformation methods for assessment of winter wheat state and functioning. Proc. SPIE 11149, Remote Sensing for Agriculture, Ecosystems, and Hydrology XXI, 11149, 2019, ISSN:0277-786X, DOI:10.1117/12.2538117, 1114929-1-1114929-10. SJR (Scopus):0.238 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2538117

ABSTRACT
As a commercial activity, agriculture is aimed primarily at production and relies on the availability of natural resources. The development of commercial activities has brought new environmental pressures on the natural capital stock. Technological progress and the desire to maximize returns and minimize costs have produced a marked intensification in agriculture over the last 40 years. Intensification can lead to degradation of soil, water and air. Water scarcity and related with it droughts have now emerged as a major challenge – and climate change is expected to make matters worse. In the last decades, Bulgarian agricultural sector is also negatively impacted by climate changes and water scarcity. Vegetation growing is limited by water scarcity and it is necessary to figure out the vegetation dynamic changes and responses to climate change to estimate the quality of ecosystems and maintain optimal ecosystem functioning. Water status can be effectively monitored by utilizing spectral indices and spectral transformation methods. Vegetation, water stress, and soil moisture indices are important to assess the crop state and its response of changing environmental conditions and to determine irrigation scheduling. The spectral transformation methods are very effective for interpretation and analysis of phenomena and processes related to the dynamics of change of the main components of the Earth surface. In the study Tasselled Cap model and obtained from its application Normalized Difference Greenness Index (NDGI) and Normalized Difference Wetness Index (NDWnI) will be applied. Microwave and optical satellite data, acquired by the sensors Sentinel 1 and Sentinel 2 of the European Space Agency Program for Earth Observation “Copernicus”, as well as climate data will be used.

B4.2

Borisova, D., Goranova, M., Hristova, V., **Avetisyan, D.**, Kisyov, A.. Spectral and petrophysical data for filling in thematic database in Earth observation over test site. Proc. SPIE 11174, Seventh International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2019), 11174, SPIE, 2019, ISSN:0277-786X, DOI:10.1117/12.2533480, 111740A-1-111740A-8. SJR (Scopus):0.238 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2533480

ABSTRACT
In the presented work the team of PhD students and post-docs aim to collect spectral and petrophysical data for filling thematic database in Earth observation. The spectral data are result of performed laboratory spectrometric measurements of collected rock samples from a test site in Bulgaria. The petrophysical data are result of performed measurements of the petrophysical properties of the collected rock samples from the same test site. The main result of the project work is collect information for filling thematic spectral database in remote sensing monitoring of land covers in a selected test site in Bulgaria. This activity is also in line with the Copernicus of the EC. Filling the database with additional information about collected rock samples such as petrophysical data will lead to upgrading of the measurement methods and in monitoring of different types of land covers and the creation of interdisciplinarity in different fields geosciences and Earth observations. The results will increase efficiency of research investigations in remote sensing monitoring of land covers, synergy between different fields of science, and shared information.

B4.3

Velizarova, E., Nedkov, R., **Avetisyan, D**., Radeva, K., Stoyanov, A., Georgiev, N., Gigova, I.. Application of remote sensing techniques for monitoring of the climatic parameters in forest fire vulnerable regions in Bulgaria. Proc. 11174, 11174, SPIE, 2019, DOI:10.1117/12.2533656, 111740E-1-111740E-12. SJR (Scopus):0.238 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2533656

ABSTRACT
Forest fires are among the most dangerous natural threats that cause significant changes in forest ecosystems. For the better management of the wildfire-prone territories, the fire weather components like temperature, precipitation and evapotranspiration predictions and monitoring within the extreme fire seasons are of great importance. Remote sensing has been identified as an effective tool for better understanding how forest ecosystems respond to these components. Respective spectral indices, like Normalized difference greenness indices (NDGI), Normalized Difference Vegetation Index (NDVI), Improved Modified Chlorophyll Adsorption Ratio Index (MCARI2) and Moisture Stress Index (MSI), derived from remote sensing methods (satellite data from different sensors - Landsat and Sentinel) as well

as the Geographical Information System (GIS) were applied for the monitoring of the climatic parameters in forest fire vulnerable regions in Bulgaria. The climatic parameters dataset from 2008 consisting of the ten-day period mean temperature and precipitation data were collected. The NDVI trends for the studied periods exhibited significant correlations with the mean precipitation and weak or no correlation with the temperature recorded. These results are largely linked to the relative air humidity. Different vegetation types were found to show distinct spatial responses to climatic changes.

B4.4

Kazaryan, M., Shakhramanyan, M., Nedkov, R., Borisova, D., **Avetisyan, D**.. Fractal presentation of space images during waste disposal sites monitoring. Proc. SPIE 11174, Seventh International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2019), 11174, SPIE, 2019, ISSN:0277-786X, DOI:10.1117/12.2532890, 111741O-1-111741O-7. SJR (Scopus):0.238 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2532890

ABSTRACT
While constructing a mathematical model of the space observation system for information processing of the data of monitoring the territories on the presence of the waste disposal sites (WDS), we have a stochastic process with a fractal structure. The physical processes of the WDS are formed under the influence of thermal, chemical, etc. factors. There are different methods and approaches for describing the scattering and radiating surfaces of the objects that make up solid household and industrial waste using single-scale and multi-scale correlation radii. With an increase in the order of multi-scale, the multi-scale of the correlation radius also increases, and this, accordingly, complicates the construction of a mathematical model of a space image. The transition to the fractal presentation of the image allows solving the problem of the space images processing. The paper proposes some algorithm for processing the aerospace images using a field of fractal dimension. The theoretical and experimental studies are being held with respect to improving the results of aerospace image classification results while monitoring for the WDS presence. An assessment of the size of the “window” and the magnitude of the “jump” on the parameters of the fractal dimensions is also made. The purpose of the work is to describe the system synergistic approach of multi-scale selection, which allows overcoming the problems of the image processing. This is due to incomplete knowledge of signals, non-stationarity, nonMarkov, noise singularity based on preliminary information about the spatial scales of the detected signals. While working with low-contrast images, the usual signal processing technique (contour-texture, spectral methods) does not adequate. There is a need to apply the theory of fractals in the study of processes occurring on the surface of the WDS through remote sensing. An experiment is carried out using the example of fractals, an image is decoded. The features of fractals are considered.

B4.5

Stankova, N., Nedkov, R., Ivanova, I., **Avetisyan, D.**. Modeling of forest ecosystems recovery after fire based on orthogonalization of multispectral satellite data. Proc. SPIE 10790, Earth Resources and Environmental Remote Sensing/GIS Applications IX, 10790, SPIE, 2018, DOI:10.1117/12.2325643, 107901R-1-107901R-7. SJR:0.234 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2325643

ABSTRACT
The aim of this study is to monitor the post-fire recovery of forest ecosystems on the basis of remote aerospace methods and data. To achieve this goal, a hybrid model for styding the dynamics of recovery processes of forest ecosystems after fire was developed. Based on the Greenness Tasseled cap component, Normalized Differential Greenness Index (NDGI) was obtained and used as input data in combination with vegetation indices (NDVI, MCARI2). NDGI is an index for vegetation dynamic assessment based on orthogonal transformation of satellite images from Sentinel-2. NDGI shows the vegetation dynamic change depending on temporal periods. The values of this index range from +1 to -1. Using NDGI assessment can be made of negative and positive changes of the vegetation. This study uses a new approach for forest ecosystems assessment, based on this index using the Greenness component obtained from orthogonalization of satellite images in combination with generated vegetation indices (NDVI and MCARI2). Optimization of model performance and automatization of Sentinel-2 MSI data processing were conducted. Sentinel-2 MSI model for orthogonalization of multispectral data was used for Tasseled cap transformation. Results obtained by implementation of the proposed approach show that the integrated composite images of NDGI, NDVI and MCARI2 represent the condition of forest ecosystems.

B4.6

Avetisyan, D., Velizarova, E., Nedkov, R., Borisova, D.. Assessment and mapping of the current state of the landscapes in Haskovo region (Southeastern Bulgaria) in relation to ecosystem services using remote sensing and GIS. Proc. SPIE 10773, Sixth International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2018), 10773, SPIE, 2018, ISSN:0277-786X, DOI:10.1117/12.2325894, 107731P-1-107731P-9. SJR:0.234 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2325894

ABSTRACT
Assessment and mapping of the ecosystems state in the context of ecosystem services that they supply are important tasks to improve human well-being, especially in regions with considerable land degradation. Haskovo region is situated in the Southeastern part of Bulgaria and is considered as an extremely sensitive to land degradation in terms of climate change and human activities in result of unappropriated land management practices. In order to improve the conservation activities and ecosystem services of the region, rapid and

available technics are needed in addition to the used analytical methods. The study presents the potential of remote sensing methods (satellite data from different sensors Sentinel and Landsat) and GIS for assessment of the current state of the landscapes to supply ecosystem services and allows a comprehensive evaluation of the main indicators for assessment of ecosystem services to be performed. The proposed methodology includes application of vegetation indices (NDVI, NDWI and MSAVI2) and SAR data. The results show that the referred technics can be used for a rapid and accurate assessment of the main indicators showing the state of the terrestrial ecosystems such as: soil degradation, land use and impact of human activities, responsible for the ecosystem services supply.

B4.7

Borisova, D., Petkov, D., Nedkov, R., Nikolov, H., Dimitrov, V., Goranova, M., **Avetisyan, D**., Radeva, K.. Remote sensing measurements in creating thematic spectral library. Proc. SPIE 10773, Sixth International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2018), 10773, SPIE, 2018, ISSN:0277-786X, DOI:10.1117/12.2326005, 107730D-1-107730D-7. SJR (Scopus):0.234 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2326005

ABSTRACT
In Earth observations the reference spectra of well-described objects are required for better object-oriented interpretation of remotely sensed data from laboratory, field, airborne, and satellite sensors. For this purpose measurements of spectra using laboratory and field spectrometers are performed. The acquired spectra are used in creating a thematic spectral library. The used spectral instruments work in the wavelengths (0.4 to 2.5 microns) covering the spectral ranges from the visible /VIS/ to the shortwave infrared /SWIR/. Two different spectrometers are used to measure spectra included in the library: (1) Thematically oriented multichannel spectrometer covering the spectral range 0.4 to 0.9 microns and (2) high resolution NIRQuest spectrometer covering the range from 0.9 to 2.5 microns, both models of Ocean Optics Inc. Spectrometric measurements of representative samples of minerals, rocks, related soils, vegetation, and their natural mixtures are made in laboratory and field conditions. In some cases, samples were purified, so that the unique spectral characteristics of the studied objects could be related to their typical structure. The relations between the spectra and the structures are important for interpreting remotely sensed data acquired in the field or from an air- or space-borne platform. In some cases for making easy wide use of the spectra in the library the obtained spectra have to resample to selected broadband multispectral sensors for example those based on the satellites Landsat and Sentinel. The obtained spectral data with the metadata and additional information are planned for including in files for better interpretation of images with different spatial resolution.

B4.8

Avetisyan, D., Nedkov, R., Velizarova, E., Borisova, D.. SAR and optical data in land degradation processes estimation: a case study from Southeast Bulgaria. Proc. SPIE 10428, Earth Resources and Environmental Remote Sensing/GIS Applications VIII, 10428, SPIE, 2017, ISSN:0277-786X, DOI:10.1117/12.2277945, 104281D-1-104281D-9. SJR:0.228 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2277945

ABSTRACT
Soil is a dominant factor of the terrestrial geosystems in semi-arid and dry sub-humid zones, particularly through its effect on biomass production. Due to the climate changes and industrial development, soil resources in these zones are prone to degradation. On the other hand, degradation processes cause changes in land cover. Remote sensing optical data are widely used in the process of determining land cover change whereas SAR data is suitable for determination of soil moisture dynamics. In the present study, Tasseled Cap Transform (TCT) and modified Change Vector Analysis (mCVA) techniques are applied to Landsat and Sentinel 2 data in order to be determined magnitude and direction of land cover changes in the semi-natural areas of Haskovo Region, Southeast Bulgaria. The study of the vector direction presents some distinct changes in the soil characteristics for the whole territory and significant changes in vegetation characteristics and moisture content in part of the semi-mountainous territories of the examined region. It has been found that the magnitude of those changes increases up to 50% in some of the territories under investigation. SAR data has been used to evaluate the relative soil moisture content in various soil differences and to trace its dynamics during growing season. In order to achieve this aim, Relative Soil Moisture Index (RSMI) is used. The index estimates the relative variation of volumetric soil moisture content in a given time period and enables determination of its change in relative values. On the basis of integrated application of aforementioned techniques, a model providing key information about the impact of soil moisture change and dynamics upon processes related to land cover change. The suggested model is appropriate for estimation of ecosystem services and functions delivered by landscapes in semi-arid and dry sub-humid zones.

B4.9

Stankova, N., Nedkov, R., Ivanova, I., **Avetisyan, D.**. Integration of multispectral and SAR data for monitoring forest ecosystems recovery after fire. Proc. SPIE 10444, Fifth International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2017), 10444, SPIE, 2017, ISBN:978-9963-697-24-3, ISSN:0277-786X, DOI:10.1117/12.2277313, 104441J-1-104441J-9. SJR:0.216 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2277313

ABSTRACT
The aim of this study is assessing the impacts and monitoring the condition and recovery processes of forest ecosystems after fire based on remote aerospace methods and data. To achieve this goal, satellite imagery in microwave and optical range of the spectrum were used. A hybrid model for assessing the instantaneous condition of forest ecosystems after fire that uses parallel data from optical and Synthetic Aperture Radar (SAR) was developed. Based on the three Tasseled Cap components (Brightness-BR, Greenness-GR and Wetness-W), a vector describing the current condition of the forest ecosystems was obtained and used as input data from the optical range. Results obtained by implementation of the proposed approach show that the integrated composite images of VIC and SAR represent the degree of recovery.

B4.10

Borisova, D., Banushev, B., Petkov, D., Nedkov, R., **Avetisyan, D.**. Optical hyperspectral measurements of rocks and soils in Central Srednogorie, Bulgaria. Proc. SPIE 10444, Fifth International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2017), 10444, SPIE, 2017, ISSN:0277-786X, DOI:10.1117/12.2277508, 104441O-1-104441O-7. SJR:0.228 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2277508

ABSTRACT
Remote sensing is the technique of acquiring, processing, and interpreting images and multi channels spectral data, acquired from optical imager sensors mounted on aircraft and satellite platforms recording the interaction between investigated objects and electromagnetic energy. Remote sensing application in Earth observation begins with the design and development of equipment for carrying out research of the monitored objects remotely and without disturbing their integrity. Ground-truth data in Earth observation of the environment and in the remote sensing investigations are very important. In this work remote sensing images are used for mineral exploration in different applications for mapping geology and recognizing soils and rocks by their spectral signatures. We are used Landsat, ASTER and Sentinel satellites images used to interpret both structures, soils and rocks. For data verification hyperspectral systems USB 2000 and NIRQUEST 512.2 of Ocean Optics Inc. are used in laboratory and field spectrometric measurements. They provide to define finest spectral characteristics of soil minerals and rocks for their identification. The obtained spectral data are compared with similar data from different instruments for Earth observation included in the spectral libraries. They correspond to the shape of the spectral signature in the same spectral range obtained with other spectrometers. These promising results encourage us to plan the next campaigns for the field spectroscopy measurements in different regions of Bulgaria.

Г7.1

Avetisyan, D.. A satellite-based modified plant senescence reflectance index for green-water drought monitoring. Proc. SPIE 11863, Earth Resources and Environmental Remote Sensing/GIS Applications XII, 1186318, 2021, DOI:doi.org/10.1117/12.2599676, 1186318-1-1186318-11. SJR (Scopus):0.192, JCR-IF (Web of Science):0.45 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2599676

ABSTRACT
The present research introduces a satellite-based plant senescence reflectance index (PSRI2) involving in its calculation two red edge bands (0.705 μm and 0.783 μm) and the green peak band (0.560 μm) of Sentinel-2 sensors. The index takes the advantages of the effectiveness of the red edge and green peak bands in monitoring alterations of cellular structures and anthocyanins content induced by drought stress. Environmental stresses are associated with accelerated cellular leaf senescence and browning of plant tissues. As browning progresses, the spectral reflectance in the whole range of the spectrum decreases. The decrease in reflectance is most pronounced in the green peak and in the range between 0.750 and 0.800 μm, and is much smaller in the red and the blue regions, which are employed in the calculation of the original PSRI. Ranging PSRI2 values, representative for various land cover classes and ecosystems, developing under various environmental and climatic conditions were calculated. The studied land cover classes include broad-leaved, coniferous and mixed forest, transitional woodlands/shrubs, and natural grassland and pastures. Satellite images, acquired in different growing seasons, distinguished with different environmental conditions were used. A comparative analysis between the newly presented index and widely recognized indices for assessment of water content and moisture stress was made. The obtained results could be used in various studies related to monitoring of drought impact and climate change on ecosystems, assessment of ecosystem degradation processes, natural resource management, sustainability and planning.

Г7.2

Avetisyan, D., Cvetanova G.. Spectral signature profiles of winter wheat in different growth stages under various environmental conditions. Proc. SPIE 11856, Remote Sensing for Agriculture, Ecosystems, and Hydrology XXIII, 11856, 2021, DOI:doi.org/10.1117/12.2599674, 118561A-1-118561A-10. SJR (Scopus):0.192, JCR-IF (Web of Science):0.45 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2599674

ABSTRACT
Due to depletion of natural resources, climate change and their impact on the land-production systems, farmers are facing more and more challenges related to the practical application of the sustainable development paradigm. These problems result in rapid development of precision agriculture as a management strategy, taking advantage of state-of-theart technologies. In precision agriculture, Variable Rate Application (VRA) technology is focused on the automated application of materials (such as fertilizers, herbicides, and irrigation water) to a given crop field. It involves different approaches, including sensor-based systems for monitoring and assessment of crop status and field environmental conditions. For operational success of VRA reliable data is needed to indicate the variety of processes taking place in the farm field. In the present research, we present spectral signature data for the status of winter wheat (Triticum aestivum L.) development in different growth stages. Spectral signatures vary depending on environmental conditions and related effects for the agroecosystems such as drought stress, crop diseases, and crop nutrient deficiencies. The generated spectral signature profiles are based on the Sentinel-2 satellite data, acquired in three consecutive growing seasons, distinguished with different ecological conditions. Spectral vegetation indices, indirectly representing the manifestation of biophysical processes and drought stress are calculated for each profile. Field climatic data is used for differentiation of the ecological conditions and validation of the results. The present research supports the creation of spectral library and can be used to create machine learning algorithms for monitoring of winter wheat status and application of variable rate technology.

Г7.3

Avetisyan, D., Borisova, D., Velizarova, E.. Integrated evaluation of vegetation drought stress through satellite remote sensing. Forests, 12, 8, MDPI AG, 2021, ISSN:1999-4907, DOI:10.3390/f12080974, SJR (Scopus):0.68 Q1, не оглавява ранглистата (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.3390/f12080974

ABSTRACT
In the coming decades, Bulgaria is expected to be affected by higher air temperatures and decreased precipitation, which will significantly increase the risk of droughts, forest ecosystem degradation and loss of ecosystem services (ES). Drought in terrestrial ecosystems is characterized by reduced water storage in soil and vegetation, affecting the function of landscapes and the ES they provide. An interdisciplinary assessment is required for an accurate evaluation of drought impact. In this study, we introduce an innovative, experimental methodology, incorporating remote sensing methods and a system approach to evaluate vegetation drought stress in complex systems (landscapes and ecosystems) which are influenced by various factors. The elevation and land cover type are key climate-forming factors which significantly impact the ecosystem's and vegetation's response to drought. Their influence cannot be sufficiently gauged by a traditional remote sensing-based drought index. Therefore, based on differences between the spectral reflectance of the individual natural land cover types, in a near-optimal vegetation state and divided by elevation, we assigned coefficients for normalization. The coefficients for normalization by elevation and land cover type were introduced in order to facilitate the comparison of the drought stress effect on the ecosystems throughout a heterogeneous territory. The obtained drought

coefficient (DC) shows patterns of temporal, spatial, and interspecific differences on the response of vegetation to drought stress. The accuracy of the methodology is examined by field measurements of spectral reflectance, statistical analysis and validation methods using spectral reflectance profiles.

Г7.4

Avetisyan, D., Nedkov, R.. Monitoring the dynamics of phenological development of winter wheat using orthogonalization of multispectral satellite data. Proc. SPIE 11528, Remote Sensing for Agriculture, Ecosystems, and Hydrology XXIII, 115280, XXII, Society of Photo-Optical Instrumentation Engineers (SPIE), 2020, ISSN:0277-786X, DOI:https://doi.org/10.1117/12.2573274, 115280Y-1-115280Y-10. SJR (Scopus):0.215 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2573274

ABSTRACT
This article presents a novel methodology for monitoring and assessment of dynamics of phenological development of crop vegetation, based on orthogonal transformation of multispectral satellite images from Sentinel-2. In this work two indices using the Greenness and Wetness components of the Tasselled Cap Transformation (TCT) model are applied. The essence of the TCT model is the unitary matrix for orthogonal transformation, which is fixed for each individual sensor. The presented methodology implements a model for automated processing of Sentinel-2 images, aimed at obtaining Greenness and Wetness Tasselled Cap indices. The applied indices are defined as Normalized Differential Greenness Index (NDGI) and Normalized Differential Wetness Index (NDWNI). These indices are strongly sensitive to small changes and reflect quantitatively the vegetation dynamics in defined temporal periods. NDGI and NDWNI are especially suitable for determination of timing of different growth stages and for monitoring of the health status of the studied crops during these stages. The manifestation of the indices and their dynamics is closely related to variations of chlorophyll and moisture content, which are observed during the transition from one stage to another.

Г7.5

Avetisyan, D., Nedkov, R., Georgiev, N.. Monitoring maize (Zea Mays L.) phenology response to water deficit using Sentinel-2 multispectral data. Proc. SPIE 11524, Eighth International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2020), 11524, Society of Photo-Optical Instrumentation Engineers (SPIE), 2020, ISSN:0277-786X, DOI:https://doi.org/10.1117/12.2570734, SJR (Scopus):0.215 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2570734

ABSTRACT
Productivity of maize (Zea mays L.) is strongly regulated by the availability of water. There are critical stages of crop development, in which water deficit could have a detrimental effect on crop functioning and yield. Facing the challenges related to climate changes and rapidly depleting water resources, it is of utmost importance for agriculture, biologically optimal water status of different crops, at different stages of ontogeny to be determined. In order to achieve this aim, it is necessary a continuous monitoring of crops and assessment of their functioning during each of the growth stages and in different environmental conditions to be conducted. Remote sensing (RS) methods enable valuable information about crop functioning to be obtained. In the present study remotely sensed spectral vegetation indices and orthogonalization of multispectral satellite data are used, in order changes related to phenological dynamics and biomass accumulation to be studied. The suggested methodology facilitates identification of the timing of phenological transitions that are related to maize physiological development. The research evaluates the dynamics of maize phenological development in the environmental conditions of growing season 2019, using multispectral imagery, acquired by Sentinel-2 sensor of the European Space Agency Program for Earth Observation “Copernicus” and daily measured field climatic data.

Г7.6

Nedkov, R., Velizarova, E., **Avetisyan, D.**, Gigova, I.. Assessment of forest vegetation state through remote sensing in response to fire impact. Proc. SPIE 11524, Eighth International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2020), 11524, Society of Photo-Optical Instrumentation Engineers (SPIE), 2020, ISSN:0277-786X, DOI:https://doi.org/10.1117/12.2570808, SJR (Scopus):0.215 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2570808

ABSTRACT
Forests ecosystems are extremely vulnerable to the changes of climatic parameters such as quantity and seasonal distribution of precipitations, temperature variation, heat transfer, soil moisture content and others. The consequences of forest vegetation alterations include growth and productivity failures, insect outbreaks, biodiversity changes, and increase in the incidence of forest fires and floods. Remote sensing has been identified as an effective tool for better understanding how forest ecosystems respond to dynamics of climatic parameters and their impact to forest vegetation state in terms of the occurrence of hazard events. In the present study spectral indices like Normalized difference greenness indices (NDGI), Normalized Difference Vegetation Index (NDVI), Improved Modified Chlorophyll Adsorption Ratio Index (MCARI2), Moisture Stress Index (MSI), and Normalized Difference Water Index (NDWI), derived trough remote sensing methods have been applied for monitoring of the forest state before and after fire event occurred on 29 July 2016. Using a model based on the three major Tasseled Cap components, a Disturbance Index (DI) for the affected forest ecosystem was quantified. The study area is situated in southeastern Bulgaria – a region, highly vulnerable to forest disturbances due to climate changes. The results obtained after the application of the suggested indices show that changes observed in the forest ecosystem state could be assessed with a high accuracy. These results were confirmed with statistical

analyses with high correlation coefficients for greenness component and Normalized Difference Vegetation Index (NDVI).

Г7.7

Avetisyan, D., Nedkov, R.. Application of remote sensing and GIS for determination of predicted status of the ecosystem/landscape services in changing environmental conditions. Proc. SPIE, Vol.11174,111740I, 11174, SPIE, 2019, DOI:10.1117/12.2532609, 111740I-1-111740I-10. SJR (Scopus):0.238 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2532609

ABSTRACT
Desertification is a global ecological problem connected with a set of undesirable and devastating processes and the consequences resulting from them. Desertification is related to degradation processes and loss of ecosystem services, caused by human activities and climate changes in the arid and semi-arid territories. Degradation processes lead to modifications in horizontal and vertical landscape structure and accordingly to changes of the ecosystem services, delivered by landscapes. The study area is located in south-eastern part of Bulgaria, where, in the last years, intensification of degradation processes in landscapes, induced by drought is occurred. There is a real threat from intensification of desertification processes in these landscapes in the next decades. The case study aims to determine a predicted status of the ecosystem services, delivered by landscapes. As a starting point, two landscape maps valid to different time moments (2000, 2018) and an assessment of delivered by the landscapes ecosystem services are used. The landscape maps are created by application of supervised classification on Landsat TM and Sentinel 2 images. For differentiation of the changes and determination of a predicted status, Discriminant Function Change Detection is used. The results show the increase and respectively decrease of the area of different land cover classes within the territory and testify for the temp of the change in the horizontal landscape structure. The determination of a predicted status enables differentiation of potential risk territories, which to be prioritized in the ecological management.

Г7.8

Avetisyan, D., Nedkov, R.. Modification in landscape horizontal structure, induced by changing environmental conditions: a case study of Haskovo region (Southeastern Bulgaria). Proc. SPIE 10790, Earth Resources and Environmental Remote Sensing/GIS Applications IX, 10790, SPIE, 2018, ISSN:0277-786X, DOI:10.1117/12.2325398, 107901K-1-107901K-10. SJR:0.234 SJR, непопадащ в Q категория (Scopus).

Индексирана в: Scopus
Линк към публикацията: https://doi.org/10.1117/12.2325398

ABSTRACT
Land cover changes (LCC) in Mediterranean lands are generally connected with anthropogenization and climate changes. The territory of Haskovo region is located in south-eastern part of Bulgaria, where, in the last years, intensification of degradation processes in landscapes, induced by drought is occurred. There is a real threat from intensification of desertification processes in these landscapes in the next decades. The precise investigation of degradation processes requires in-depth knowledge of landscape components, of the ongoing processes that take place in them and functions that ensures existence and maintenance of ecosystems. In the case study, we have determined the LCC that have occurred in the last 18 years. Remote sensing methods and GIS have been applied. The LCC have been determined by using supervised classification, as for the basis of the classification, vector layers of Land cover and vegetation have been used. Two landscape maps were created. The first is valid to 2000 and the second is a map of the modern landscapes. In order type of the change and its magnitude to be determined, Tasseled Cap Transform (TCT) and modified Change Vector Analysis (mCVA) techniques were applied. The application of this approach allows differentiation of the most affected by the LCC landscapes, determination of the type and direction of change, and assessment of the potential of the landscape to deliver ecosystem services in changing environmental conditions.

Г7.9

Avetisyan, D., Bilyana, B., Nedkov, R.. Determination of the Landscapes Regulation Capacity and Their Role in the Prevention of Catastrophic Events: A Case Study from the Lom River Upper Valley, Bulgaria. Challenges and Perspectives in Southeastern Europe, Springer, 2016, DOI:10.1007/978-3-319-27905-3_13, 173-190. SJR:0.415, ISI IF:0.415 Q4 (Web of Science)

Индексирана в: Web of Science
Линк към публикацията: https://link.springer.com/chapter/10.1007/978-3-319-27905-3_13

ABSTRACT
Floods are among the most dangerous natural disasters that threaten large territories in Bulgaria. The assessment of flood risk provides valuable information for environmental management. An important part of this assessment is the determination of landscapes flood regulation capacity. The study area is a small basin in the upper valley of the Lom River. The capacities of the landscapes to regulate floods were assessed through investigations of water retention functions of different natural components. Features of vegetation, land use, soil, orohydrography, and relief were considered. Each feature influencing the landscape regulatory functions was given a weight coefficient. To achieve more precise assessment, we combined field methods and remote sensing. The MODIS NDVI 250 m Multi-Temporal Imagery Dataset for the period 2008–2014 and widely accepted indices such as NDVI (Normalized Difference Vegetation Index), NDWI (Normalized Difference Water Index), and VCI (Vegetation Condition Index) were also applied. Thematic maps showing the regulating service capacity of each of the investigated components and that of the landscapes were generated, and a final assessment was made. In the study area, the natural landscapes of the Biosphere Reserve “Chuprene” and landscapes with different degrees of anthropogenic load occur as well. This work contributed the comparative characteristics of these two major

landscape classes to be performed so that the main factors affecting their surface runoff regulation capacity could be determined.

Г8.1

Avetisyan, D., Nedkov, R.. Assessment of Fire Hazard Zones in the Forest Landscapes in Simitli Municipality (Bulgaria). Journal of Environment Protection and Sustainable Development, 1, 4, American Institute of Science, 2015, ISSN:2381-7747, 225-233.

Линк към публикацията: http://www.aiscience.org/journal/paperInfo/jepsd?paperId=1957

ABSTRACT
Forest landscapes provide a wide variety of ecosystem services, part of which is their regulating function, expressed by prevention of natural hazard and climate changes regulation. In arid regions, where a large part of Simitli Municipality is located, major threat for the forest ecosystems and landscapes are wildfires. In the present study, the fire hazard zones in the forest landscapes in Simitli Municipality were determined and assessed. An elaborate landscape map on different hierarchical levels was created. Each level was assigned a weight coefficient, defining its significance for increase in landscape vulnerability to wildfires. The vegetation condition by applying vegetation indices was also taken into account.

Г8.2

Avetisyan, D.. Assessment of Vegetation Cover Degradation and Soil Erosion in Chuprene Reserve (Northwestern Bulgaria) Using Remote Sensing and Geographical Information Systems. Ecological Engineering and Environment Protection, 1, National Society of Ecological Engineering and Environment Protection, 2015, ISSN:1311 – 8668, 47-56.

Линк към публикацията: http://ecoleng.org/archive/2015/1/47-56.pdf

ABSTRACT
Vegetation cover degradation and soil erosion lead to processes connected with alternation of landscape structure and statement of landscape components. Simultaneously, these processes are accompanied by changing of heat – moisture ratio in landscapes and continuously running drought processes. Variations in solar activity can be considered as one of the possible factors causing vegetation cover degradation, drought, and desertification. In the recent study, vegetation cover degradation is assessed using satellite images and the vegetation indices Normalized Difference Vegetation Index (NDVI), Vegetation Condition Index (VCI), and Normalized Multi-band Drought Index (NMDI). Vegetation condition is one of the main factors of Universal Soil Loss Equation (USLE) used as basis of soil erosion assessment. Parallel study of both processes in 2000, 2007, and 2014 allows tracing of their dynamics and deriving possible trend in their progress.

Г8.3

Чолакова Зорница, **Аветисян Даниела**, Иванова Екатерина, Недков Румен. Съвременни ландшафти и степен на тяхната антропогенизация в част от горното поречие на р.Лом, картографирани с ГИС на базата на GPS, спътникови и наземни данни. Екологично инженерство и опазване на околната среда, 1, Националното дружество по екологично инженерство и опазване на околната среда, 2012, 4, ISSN:1311-8668, 4-12.

ABSTRACT
Cartographic methods, satellite data and GIS resource, used in this paper are especially valuable for establishing the direction and trends in the anthropogenic landscape changes. Geo-data base in GIS was created. Thematic map of contemporary landscapes in part of the upper Lom River Basin was composed and anthropogenic stage of the landscapes was classified on the base of those data. A territorial analysis of the level of human impact on the individual landscapes in the region was made on the base of the cartographic results.

Г8.4

Аветисян Даниела, Борисова Биляна. Комплексна геоекологична оценка за целите на ландшафтно-екологичното планиране в планински условия (по примера на Западна Стара планина и Западния Предбалкан). Годишник на Софийския Университет „Св. Климент Охридски“ Геолого-географски факултет, 107, Университетско издателство „Св. Климент Охридски“, 2016, ISSN:0324-2579, 165-182

Avetisyan D, Borisova B; (2016) A Complex Geo-ecological Assessment for Landscape Ecology Planning Purposes in Mountain Regions (in the Case of Western Balkan and Western Fore Balkan Mountain Areas) (in Bulgarian). Annuaire de L’Universite De Sofia “St.Kliment Ohridski”, Faculte de Geologie et Geographie, Livre 2 Geographie, Tome 107 ,2016, 165 – 182 pp

ABSTRACT
The Landscape Ecology Approach has a leading role among the new territorial planning methods. Its main goal is to focus on the spatial dimensions of ecological processes and identify natural sustainable development factors. The study area includes areas in the western part of the Stara Planina Mountain and the Fore-Balkan at the state border between Bulgaria and Serbia. It covers 285 square kilometers. The investigation uses a system of landscape assessments. Its results show that anthropogenic activities have to be limited in approximately 60% of the studied landscapes. The presented model of territorial functional zoning can be used for the purposes of landscape ecology
planning in mountain regions.

Г8.5

Чолакова Зорница, **Аветисян Даниела**. Ландшафтно-геохимични особености в басейна на река Лом в Западна Стара планина и Западния Предбалкан. Годишник на Софийския Университет „Св. Климент Охридски“ Геолого-географски факултет, 106, Университетско Издателство „Св. Климент Охридски“, 2014, ISSN:0324-2579, 191-216.

Cholakova Z., **Avetisyan D**. (2014) Landscape-geochemical Features of Lom River Basin in West Balkan and West Forebalkan Mountains (in Bulgarian); Annuaire de L'Universite De Sofia "St.Kliment Ohridski", Faculte de Geologie et Geographie, Livre 2 Geographie, Tome 106, pp.191-216. ISSN 0324-2579

ABSTRACT
The article presents the results of the microelements-heavy metals (Cu, Zn, Pb, Mn, Cd, Co, Cr, Ni) concentration and differentiation study in the rock formations, soils, rivers bottom sediments and water of Lom river basin in West Balkan and West Forebalkan mountains. The results are compared with average data for background and technogenic regions of Bulgaria, with the threshold and maximum permissible standard concentrations, and with the data of the national environmental monitoring system. Special attention is paid to the area of biosphere reserve "Chuprene".

Г8.6

Avetisyan, D., Cvetanova, G.. Water status assessment in maize and sunflower crops using Sentinel-2 multispectral data. Proceeding SES 2019, 2019.

ABSTRACT
Productivity of sunflower (Helianthus annuus L.) and maize (Zea mays L.) is strongly regulated by the availability of water. Boosting the efficiency of using water resources in agriculture requires innovations in tracing crop water status in different growth stages. Early detection of water stress in plants is needed in order inevitable crop damage and yield loss to be prevented. Remote sensing methods provide low cost and quick techniques for monitoring of crop water status, assessment of water stress and irrigation scheduling. In this study, remotely sensed spectral indices (Normalized Difference Water index - NDWI, Moisture Stress Index - MSI, and Normalized Difference Wetness Index - NDWNI) and spectral transformation methods (Tasselled Cap Transform) are applied. The research evaluates dynamics of sunflower and maize water status in the environmental conditions of growth season 2019, using multispectral imagery, acquired by Sentinel-2 sensor of the European Space Agency Program for Earth Observation "Copernicus" and daily measured field climatic data (air
temperature and precipitation).

Даниела Аветисян и Галя Цветанова. 2019. Оценка на водния статус на царевица и слънчоглед с използване на мултиспектрални данни от Sentinel-2. Proc. Space, Ecology, Safety (SES) 2019.

РЕЗЮМЕ:
Продуктивността на агроекосистемите с царевица (Zea mays L.) и слънчоглед (Helianthus annuus L.) е силно зависима от наличието на вода. Повишаването на ефективността в използването на водните ресурси в земеделието изисква прилагането на иновативни подходи за проследяване на водния статус през различните фази на развитие на земеделските култури. За да бъдат предотвратени необратими физиологични поражения върху организма на растенията и загубата на земеделска продукция е необходимо ранно отчитане на водния стрес при насажденията. Методите

на дистанционните изследвания предоставят икономични и бързи способи за мониторинг на водния статус на земеделските култури, оценка на водния стрес и определяне на поливния режим на посевите. В настоящето изследване са приложени спектрални индекси (NDWI, MSI, NDWNI) и методи за спектрална трансформация (Tasselled Cap Transform). Изследването прави оценка на динамиката на водния статус на насаждения с царевица и слънчоглед в условията на вегетационния сезон през 2019 г., с използване на мултиспектрални изображения от спътника Sentinel-2 на Европейската космическа агенция и ежедневно измервани полеви климатични данни (температура на въздуха и количество на валежите).

Г8.7

Миланова Йоанна, **Аветисян Даниела**, Недков Румен.(2014) Сравнителен анализ на състоянието и динамиката на земеделска и горска растителност на базата на спътникови и наземни данни. Сборник доклади. Научна конференция с международно участие "География и регионалистика" в чест на проф.д-р Иван Батаклиев, Терарт, София, 2014, ISBN:978-954-9531-25-1, 145-151

РЕЗЮМЕ
Климатичните промени оказват значително влияние на околната среда и природните ресурси, като въздействат върху нашия живот по много различни начини.По-високите температури повишават честотата, интензитета и продължителността на горещниците. От друга страна драстичното нарастване на интензитета на валежите през последните години причиняват природни бедствия като наводнения, селеви явлиния, засилване на ерозионните процеси и др. Вариациите на климата от такъв характер се отразяват негативно върху състоянието и развитието на растителността, като особено чувствителни се оказват агрофитоценозите, при които се развиват болести и в много случаи тези катаклизми водят до тяхното пълно унищожаване.Цел на настоящето изследване е да бъде направен сравнителен анализ на състоянието и динамиката на аграрната и естествената растителност в два района на България, като бъдат отчетени вариациите на температурата на въздуха и количеството на валежите през годините за периода от 1987 до 2013 г. За постигането на тази цел са използвани методите на дистанционните изследвания, верифицирани с помощта на наземни данни.
