

АБСТРАКТИ НА НАУЧНИТЕ ТРУДОВЕ

на доц. д-р Христо Стоянов Николов

представени за участие в конкурс за академичната длъжност “професор” обявен в Държавен вестник бр. 56 от 19.07.2022 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 „Системи за дистанционни изследвания“

Група В

В 4.1	<p>Borisova D., Nikolov H., Ivanova S., <i>Determining the overburden dumps by sub-pixel method</i>, International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences - ISPRS Archives Volume 362006 7th Symposium on Remote Sensing: From Pixels to Processes 2006, Code 155661, ISSN 16821750</p> <p>Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85076804468&origin=resultslist&sort=plf-f&src=s&st1=Determining+the+overburden+dumps+by+sub-pixel+method&st2=&sid=a73d82bffb6cc992450c6feac28aea3&sot=b&sdt=b&sl=67&s=TITLE-ABS-KEY%28Determining+the+overburden+dumps+by+sub-pixel+method%29&relpos=1&citeCnt=0&searchTerm&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1</p> <p style="text-align: center;">Абстракт</p> <p>Delineation of overburden dumps by means of remotely sensed multispectral data with moderate spatial resolution (e.g. Landsat TM/ETM+ 30m) is a challenging task. The major difficulties arise from: 1) large period using the dump (introducing multitemporality); 2) the unknown proportions of vegetation and soil/rock samples in the marginal areas. A variety of methods have been proposed to overcome the problems with impure pixels, but a promising one is the soft classification which assign a pixel to several land cover classes in proportion to the area of the pixel that each class covers. In this scenario for every pixel of the data the correct proportion of the end-members should be found and then co-registered with the corresponding original pixel. As a result this sub-pixel classification procedure generates a number of fraction images equal to the number of land cover classes (end-members). All sub-pixel mapping algorithms have one property in common: accuracy assessment of sub-pixel mapping algorithms is impossible because of missing high resolution ground truth imagery. In this case one possible solution is to use laboratory and in-situ measured spectrometric data. This study presents a successful implementation of soft classification method with additional, precise spectrometric data for determination of dump area of the copper plant. The results were used for proving the in-situ gathered data and coincidence of 93.5% was achieved.</p>
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B 4.2

Nikolov H., Borisova D., Mircheva M., *Reclaimed areas mapping by remotely sensed data*, International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences - ISPRS Archives Volume 362006 7th Symposium on Remote Sensing: From Pixels to Processes 2006, Code 155661, ISSN 16821750

Линк към публикацията:

https://www.scopus.com/record/display.uri?eid=2-s2.0-85039708062&origin=resultslist&sort=plf-f&src=s&st1=Reclaimed+areas+mapping+by+remotely+sensed+data.+&st2=&sid=a73d82bffbc6cc992450c6feac28aea3&sot=b&sdt=b&sl=56&s=TITLE%28Reclaimed+areas+mapping+by+remotely+sensed+data.+%29&relpos=0&citeCnt=1&searchTerm&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1

Абстракт

In the last decade several mining areas and corresponding dumps are subject to reclamation process in Bulgaria. We focused our research on one of the most important in the copper production for 20 year period for our country - Medet deposit. This mining complex consists of an open cast mine, the overburden dumps and a processing plant. After ceasing its exploitation in 1994 a rehabilitation program for soil cover and hydrographic network was established and launched. A continuous task is the monitoring of these activities from the beginning for at least 15 years period. We consider that revealing the potential of satellite multispectral and multitemporal imagery will provide valuable information on the impact of this long-term mining activity on the environment. One of the first tasks was to prepare thematic maps for several, non-successive years of the affected areas at regional scale. On the next step change detection methods were used to assist in short-term reclamation plans preparation and planting corresponding vegetation. In this research the data from Landsat TM/ETM+ combined with in-situ measured data was used. For data processing several techniques, both standard, such as basic and advanced statistics, image enhancement and data fusion, and novel methods for supervised classification were used. The results obtained show that used data and the implemented approach are useful in environmental monitoring and economically attractive for the company responsible for the ecological state of the region.

B 4.3

Ignatov G., **Nikolov H.**; Petkov D.;Georgiev G. *Segmentation of satellite images by means of morphological and object-oriented approaches*, International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences - ISPRS Archives Volume 362006 7th Symposium on Remote Sensing: From Pixels to Processes 2006, Code 155661, ISSN 16821750

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-84969540204&origin=resultslist&sort=plf-f&src=s&st1=Segmentation+of+satellite+images+by+means+of+morphological&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1

Абстракт

Segmentation of satellite images is one of the main tasks that need to be solved in the process of detection of geometric forms belonging to distinct land covers. In recent years a great variety of methods for satellite images segmentation was developed. The aim of this study was compare applicability of two methods for image processing for information extraction from satellite images - namely object-oriented approach and mathematical morphological method. Mathematical Morphology is a geometric approach in image processing and analysis with a strong mathematical favor. Originally, it was developed as a powerful tool for shape analysis in binary and, later, satellite images. The second method considered is the multivariate segmentation realized by the eCognition package. This patented algorithm is used as starting point for comparison of the newly developed ones. Both methods were applied for segmentation of a satellite image of central Bulgarian region. The obtained results were compared and the advantages and disadvantages of morphological method are discussed. Conclusions about applicability of morphological methods for segmentation of satellite images are also made.

B 4.4

Nikolov H., D. Borisova, D. Petkov *Unmixing techniques for better segmentation of urban zones, roads, and open pit mines*, Proceedings of SPIE - The International Society for Optical Engineering, Volume 78312010 Article number 78311L, Earth Resources and Environmental Remote Sensing/GIS Applications, 2010, ISSN 0277786X, ISBN 978-081948348-5, DOI 10.1117/12.865027

Линк към публикацията:

https://www.scopus.com/record/display.uri?eid=2-s2.0-78651111431&origin=resultslist&sort=plf-f&src=s&sid=7e8d0e7452e12fff4835816e7f112637&sot=autdocs&sdt=autdocs&sl=17&s=AU-ID%288642458900%29&relpos=27&citeCnt=0&searchTerm&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1

Абстракт

In this paper the linear unmixing method has been applied in classification of manmade objects, namely urbanized zones, roads etc. The idea is to exploit to larger extent the possibilities offered by multispectral imagers having mid spatial resolution in this case TM/ETM+ instruments. In this research unmixing is used to find consistent regression dependencies between multispectral data and those gathered in-situ and airborne-based sensors. The correct identification of the mixed pixels is key element for the subsequent segmentation forming the shape of the artificial feature is determined much more reliable. This especially holds true for objects with relatively narrow structure for example two-lane roads for which the spatial resolution is larger than the object itself. We have combined ground spectrometry of asphalt, Landsat images of RoI, and in-situ measured asphalt in order to determine the narrow roads. The reflectance of paving stones made from granite is highest compared to another ones which is true for open and stone pits. The potential for mapping is not limited to the mid-spatial Landsat data, but also may be used if the data has higher spatial resolution (as fine as 0.5 m). In this research the spectral and directional reflection properties of asphalt and concrete surfaces compared to those of paving stone made from different rocks have been measured. The in-situ measurements, which plays key role have been obtained using the Thematically Oriented Multichannel Spectrometer (TOMS) - designed in STIL-BAS.

B 4.5

D. Borisova, **Nikolov H.**, D. Petkov, B. Banushev, *Sub-pixel method for analysis of optical data in determining the overburden dumps and open pit mines*, Proceedings of SPIE, Earth resources and environmental remote sensing/gis applications II Volume 8181, 2010, Article Number 81811C, ISSN 0277-786X, DOI 10.1117/12.898267

Линк към публикацията: <https://www.webofscience.com/wos/woscc/full-record/WOS:000297788000029>

Абстракт

Mining plants are one of the factors having major negative impact on the area where they are situated. In our study this is the case of the mine production plant consisting of Elacite mine and Mirkovo floatation plant both located in central part of Stara Planina Mountain. In this study an attempt is made to delineate the overburden dumps and open pit mines by means of remotely sensed multispectral data with moderate spatial resolution (e.g. Landsat TM/ETM+ 30m) is a challenging task. The major difficulties arise from: 1) large period using the dump (introducing the need for multitemporal data); 2) the unknown proportions of vegetation, soil and embedding rock samples in the boundary areas and their seasonal variations; 3) relatively restricted access to places of interest. A variety of methods have been proposed to overcome the problems with pixels corresponding to two or more end-members, but a promising one is the soft classification which assign single pixel to several land cover classes in proportion to the area of the pixel that each class covers. In this scenario for every pixel of the data the correct proportion of the end-members should be found and then co-registered with the corresponding original pixel. As a result this sub-pixel classification procedure generates a number of fraction images equal to the number of land cover classes (end-members). The sub-pixel mapping algorithms we have exploited so far have one property in common: accuracy assessment of sub-pixel mapping algorithms is not easy because of missing high resolution ground truth data. One possible solution is to incorporate in the method adopted additional ex-situ and in-situ measured data from field and laboratory spectrometers with bandwidth about 1 nm. This study presents a successful implementation of soft classification method with additional, precise spectrometric data for determination of dump areas of the copper plant and open ore mine. The results achieved are proving that the in-situ gathered data provide coincidence of 93.5%. The main advantage of the presented technique is that mixed pixels are used during the training phase. Compared to these other techniques, the present one is simple, cheap and objective oriented. The results of this sub-pixel mapping implementation indicate that the technique can be useful to increase the resolution while keeping the classification accuracy high.

B 4.6

D. Borisova, **Nikolov H.**, D. Petkov, B. Banushev, *Multitemporal satellite data in mine waste monitoring of Medet copper deposit*, Proceedings of SPIE - The International Society for Optical Engineering, Vol. 85382012, Article number 85380J, Earth Resources and Environmental Remote Sensing/GIS Applications III, Code 96326, 2012, ISSN 0277786X, ISBN 978-081949278-4, DOI 10.1117/12.974423

Линк към публикацията:

https://www.scopus.com/record/display.uri?eid=2-s2.0-84875673398&origin=resultslist&sort=plf-f&src=s&sid=71ac3af7ad98bce4fe8350f1aa755b9f&sot=autdocs&sdt=autdocs&sl=17&s=AU-ID%288642458900%29&relpos=25&citeCnt=1&searchTerm&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

The anthropogenic impact of the mining industry on the environment is seen all over the world. In the last decades several mining areas and corresponding waste disposal sites in Bulgaria are being monitored for ongoing reclamation processes. In this research we were focused on one environmental status of one of the most important copper producing fields for our country - Medet deposit. The objectives of the study were: (1) to analyze multispectral satellite images for 1980 - 2000 in order to assess the environmental pollution from the mining activity in the Medet open pit mine in temporal perspective; (2) to prove that by means of remote sensing an integrated environmental impact assessment can be made. After ceasing its exploitation in 1994 a rehabilitation program for soil cover and hydrographic network was established and launched. A continuous task is the monitoring of these activities from the beginning for at least 15 years period. We consider that revealing the potential of satellite multispectral and multitemporal imagery will provide valuable information on the impact of this long-term mining activity on the environment. One of the first tasks was to prepare thematic maps for several, non-successive years of the affected areas at regional scale. On the next step change detection methods were used to assess the short-term reclamation activities by examination of vegetation cover status in the areas surrounding the mine. To complete this tasks data from Landsat TM/ETM+ instruments combined with in-situ measured data was used. For data processing several techniques, both standard, such as basic and advanced statistics, image enhancement and data fusion, and novel methods for supervised classification were used. The results obtained show that used data and the implemented approach are useful in environmental monitoring and economically attractive for the company responsible for the ecological state of the region

B 4.7

Nikolov H., Borisova D., "A framework for air quality monitoring based on free public data and open source tools," Proc. SPIE 9245, Earth Resources and Environmental Remote Sensing/GIS Applications V, 92451P, (23 October 2014); doi: 10.1117/12.2067328

Линк към публикацията:

https://www.scopus.com/record/display.uri?eid=2-s2.0-84923091820&origin=resultslist&sort=plf-f&src=s&sid=d4f571d605e0c7c90e70c02886f427c3&sot=autdocs&sdt=autdocs&sl=17&s=AU-ID%288642458900%29&relpos=18&citeCnt=0&searchTerm&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

In the recent years more and more widely accepted by the Space agencies (e.g. NASA, ESA) is the policy toward provision of Earth observation (EO) data and end products concerning air quality especially in large urban areas without cost to researchers and SMEs. Those EO data are complemented by increasing amount of in-situ data also provided at no cost either from national authorities or having crowdsourced origin. This accessibility together with the increased processing capabilities of the free and open source software is a prerequisite for creation of solid framework for air modeling in support of decision making at medium and large scale. Essential part of this framework is web-based GIS mapping tool responsible for dissemination of the output generated. In this research an attempt is made to establish a running framework based solely on openly accessible data on air quality and on set of freely available software tools for processing and modeling taking into account the present status quo in Bulgaria. Among the primary sources of data, especially for bigger urban areas, for different types of gases and dust particles, noted should be the National Institute of Meteorology and Hydrology of Bulgaria (NIMH) and National System for Environmental Monitoring managed by Bulgarian Executive Environmental Agency (ExEA). Both authorities provide data for concentration of several gases just to mention CO, CO₂, NO₂, SO₂, and fine suspended dust (PM₁₀, PM_{2.5}) on monthly (for some data on daily) basis. In the framework proposed these data will complement the data from satellite-based sensors such as OMI instrument aboard EOS-Aura satellite and from TROPOMI instrument payload for future ESA Sentinel-5P mission. Integral part of the framework is the modern map for the land use/land cover which is provided from EEA by initiative GIO Land CORINE. This map is also a product from EO data distributed at European level. First and above all, our effort is focused on provision to the wider public living in urbanized areas with one reliable source of information on the present conditions concerning the air quality. Also this information might be used as indicator for presence of acid rains in agriculture areas close to industrial or electricity plants. Its availability at regular basis makes such information valuable source in case of manmade industrial disasters or incidents such as forest fires. Key issue in developing this framework is to ensure the delivery of reliable data products related to air quality at larger scale that those available at the moment.

B 4.8

D. Borisova, **Nikolov H.**, D. Petkov, B., Banushev, *Remote Sensing Methods in Studying Stone Quarries*, Conference Proceedings, 8th Congress of the Balkan Geophysical Society, Oct 2015, Volume 2015, pp. 1-5. ISBN: 978-946282166-8, DOI 10.3997/2214-4609.201414136

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85088752795&origin=resultslist&sort=plf-f&src=s&st1=Remote+Sensing+Methods+in+Studying+Stone+Quarries&sid=e19e114bf1a7276de19394e13e4c0bbf&sot=b&sdt=b&sl=64&s=TITLE-ABS-KEY%28Remote+Sensing+Methods+in+Studying+Stone+Quarries%29&relpos=1&citeCnt=0&searchTerm=&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT

Абстракт

In Engineering and Environmental Geophysics different methods and techniques are applied. In this paper a remote sensing method has been tested in the segmentation of human made land covers such as open pit mines and stone quarries. The idea is to exploit to larger extent the possibilities offered by multispectral imagers having mind Thematic Mapper/TM/onboard satellite series Landsat. The method has been used in the framework of our research is to find consistent statistical dependencies between multispectral data gathered in-situ and the corresponding ones in the images offered by airborne-based sensors. After correct identification of the pixels the subsequent segmentation forming the shape of the artificial feature is determined much more reliable. We have been combined ground spectrometry of stone quarry near Smolsko village, Landsat images of region of interest/RoI/, and in-situ condition surveys for assessment of the quarry area. For the purpose of the study geological observations, petrographical investigations, photo documentation and in-situ spectrometric measurements have been performed.

B 4.9

Borisova, D., Banushev, B., **Nikolov H.**, Petkov, D., *Hyperspectral measurements for rock identification*, Conference Proceedings, 9th Congress of the Balkan Geophysical Society, BGS 2017, Volume 2017-November, 2017 Code 135104, ISBN 978-946282236-8, DOI 10.3997/2214-4609.201702589

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85048654133&origin=resultslist&sort=plf-f&src=s&sid=d4f571d605e0c7c90e70c02886f427c3&sot=autdocs&sdt=autdocs&sl=17&s=AU-ID%288642458900%29&relpos=11&citeCnt=0&searchTerm&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

Remote sensing investigations and applications in Earth observation /EO/ begins with the design and development of equipment for performing research of the monitored objects remotely and without disturbing their integrity. Ground-truth data in EO of the environment and in the remote sensing are very important. In present paper satellite remote sensing images are used for supporting mineral exploration and mapping geology and for recognizing rocks by their spectral signatures. We are used Landsat and Sentinel satellites images for detecting rocks in the studied area of Sredna Gora Mountain. For data verification hyperspectral systems in visible and infrared spectral regions are applied for laboratory and field spectrometric measurements. They provide spectral data to define finest spectral characteristics of rocks for their identification. The obtained spectral data are compared with similar data from different instruments for EO included in the spectral libraries (USGS and JPL) for data verification. The shape of the spectral signature based on the acquired spectral data in the same spectral range corresponds to the data obtained with other spectrometers. These promising results encourage us to plan the next campaigns for collecting mineral and rock samples for the laboratory and for the field spectrometric measurements in different regions of Bulgaria.

B 4.10 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), 107730D (6 August 2018); doi: 10.1117/12.2326005

Линк към публикацията:

<https://www.scopus.com/record/display.uri?eid=2-s2.0-85052715313&origin=resultslist&sort=plf-f&src=s&st1=Remote+sensing+measurements+in+creating+thematic+spectral+library&sid=2c216b407120d4f572c7b666192c0de8&sot=b&sdt=b&sl=80&s=TITLE-ABS-KEY%28Remote+sensing+measurements+in+creating+thematic+spectral+library%29&relpos=1&citeCnt=1&searchTerm=>

Абстракт

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.

B 4. 11 Atanasova M., **Nikolov H.**, *Studying the coastal landslides processes by InSAR*, Proceedings of SPIE - The International Society for Optical Engineering, Volume 111562019, Article number 1115619, Earth Resources and Environmental Remote Sensing/GIS Applications X, Code 154660, 2019

Линк КЪМ публикацията:
https://www.scopus.com/record/display.uri?origin=citedby&eid=2-s2.0-85075821441&noHighlight=false&relpos=0&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

The landslides are one of the well-known natural hazards occurring on the North East Black Sea coast of Bulgaria. The previous researches that take into account the geological and meteorological peculiarities of this region confirmed that the geomorphological conditions in this region are extremely favorable for landslide formation. Two are the main drivers that are being responsible for activation of the landslide processes in the area investigated. The first one is the sea erosion and the other is the increasing groundwater level. The influence of those is highly aggravated by the construction activities that took place in the last decades and the lack of sewerage networks. Those findings are based on information provided by the national authority responsible for monitoring and filing the landslides in Bulgaria. This was the motivation for developing and implementing reliable and accurate method for operational monitoring of the landslide processes in the said area. For development of such method data from SAR instruments were used. In this specific study data from Sentinel-1 SAR mission were processed by the freely provided by ESA SNAP software. Final results are interferometric images (IFIs) providing information about the ground movements. In this paper we present results reflecting the subsidence in the area of a landslide located some 20km north of the Albena resort. In the last decade two events have caused damages to the infrastructure in the area-one occurred in January 2015 which was attributed to the heavy rains the previous summer and the other took place in mid of August 2018. Both have been studied by processing SAR data for the periods mentioned. The results obtained are considered reliable since they have been reaffirmed by geodetic surveys and other terrain measurements. The outcomes of this research will contribute to better understanding the ongoing slow movements of the Earth's crust, and for forecasting and early warning of geological hazards.

B 4.12 Atanasova M., **Nikolov H.**, *Application of interferometry in landslide area analysis*, International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM 2019, 19 (5.2), pp. 107-114. ISSN 13142704, ISBN 978-619740876-8, DOI: 10.5593/sgem2019/5.2/S20.014

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85073339641&doi=10.5593%2fsgem2019%2f5.2%2fS20.014&origin=inward&txGid=5ed9907324b40b0d4cb1d2dc3f21ad83&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

Obtaining reliable data on the ongoing risky geo-processes and obtaining adequate and reliable information about them on the current state of the Earth's surface is a key factor in tracking the origin and dynamics of landslide processes as well as assessing the resulting threats to the population and infrastructure. According to information provided by the national authority responsible for the monitoring and keeping track of the landslides over the past two years their number has almost doubled. This is the main reason why it is necessary to develop and implement a rapid and accurate method for their operational observation. One possible solution proposed in this paper is to use the information derived from differential interferometric data processing from the synthesized aperture radar (SAR) data, based on which Earth's crust deformations are registered with magnitude of centimeters. Results from SAR data processing unambiguously indicate the presence of these movements in certain zones of these areas, but verified in-situ GNSS measurements are also required to obtain validated information. From what it was said above formulated is the main objective-studies of the landslide processes through the use of innovative methods. This objective is achieved through implementation of the following: Extraction of high quality and reliable information on SAR images focused on regular monitoring of landslide areas integrating interferometric imaging and GNSS data. Based on the freely available SAR data and the software provided by ESA, as well as data from national sources is make a prototype of an archive for monitoring the movements of Earth's crust (landslides, subsidence, etc.). Object of the this studies is the region that has been known for decades with several active large landslides is the Northeast Black Sea coast, which has determined its choice as an region of interest. The outcomes of this research can be summarized as follows-extensive research was performed on the recent activations of landslides, collected were geodetic data about the deformations caused by them, created was a local image archive of Sentinel-1 satellites for the region of Northeastern Bulgaria; justified is the need to use local DEM in order to improve the quality of the produced interferometric images; created was a set of interferometric images at fixed intervals-monthly, every 4 months, 8 months, a year; generated are thematic interferometric images used in mapping deformations for the region of Northern Black Sea coast, confirmed is the strong relationship between geodetic and satellite derived information concerning ongoing landslide activities.

B 4.13

Borisova, D., Hristova, V., Dimitrov, V., **Nikolov H.**, Goranova, M., *Thematic spectral remote sensing data in land covers' monitoring over test region*, Proc. SPIE 11156, Earth Resources and Environmental Remote Sensing/GIS Applications X, 11156, SPIE, 2019, ISSN:0277-786X, DOI:10.1117/12.2533119, 111560C-1-111560C-6. SJR (Scopus):0.238

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85075837303&doi=10.1117%2f12.2533119&origin=inward&txGid=4e57faa836a3b414b60e4308eb5c527a&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

In this work a project for the implementation of remote sensing research activities for the acquisition of new knowledge and encouraging the participation of the PhD students of Remote Sensing Systems/RSS/Department at SRTI-BAS in these activities is presented. The goal of the project is collecting data through spectral measurements for land cover monitoring in a selected test region in Bulgaria and create an open access spectral database. The first task of the work to collecting spectral measurements data is related to the methodology of acquiring in-situ spectral data of land covers in test site. Methodology follows the next steps of 1) collecting samples and additional information; 2) laboratory and field spectrometric measurements; 3) spectral data verification. For the implementation of the steps the test region is selected meeting the following requirements: i) Offers a wide variety of objects from the adopted nomenclature; ii) Has spectral data from Earth Observation device systems; iii) Has the possibility to perform regular measurements with available spectrometric systems. According to the described conditions the test region around the town of Novi Iskar is chosen. In CORINE Land Cover database for this area the presence of 12 classes of land covers has been verified which has to be characterized in detail on the basis of the received data. Each one will be recorded in the created database which is the next project task. This will allow the data received in the experiments to be considered reliable and representative. For monitoring purposes the data could be interpolated for larger areas with similar land covers to trace the dynamics of objects using spectral data.

B 4.14	<p>Chapanov ,Ya., Atanasova, M., Orehova T., Nikolov H., <i>Rainfalls and groundwater influences on landslides in Northeast Bulgaria.</i>, Proceedings of 10th Congress of Balkan Geophysical Society, BGS 20192019 10th Congress of Balkan Geophysical Society, Code 151752, ISBN 978-946282303-7, DOI: 10.3997/2214-4609.201902610</p> <p>Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85084020303&origin=resultslist&sort=plf-f&src=s&st1=Rainfalls+and+groundwater+influences+on+landslides+in+Northeast+Bulgaria&sid=b720e720d3a6a5bf6fc793e51bd0af97&sot=b&sdt=b&sl=87&s=TITLE-ABS-KEY%28Rainfalls+and+groundwater+influences+on+landslides+in+Northeast+Bulgaria%29&relpos=0&citeCnt=0&searchTerm=&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1</p> <p style="text-align: center;">Абстракт</p> <p>The main reason of landslide activation is rising of groundwater, saturation by rain, water infiltration and snow melting. One part of landslides in Northeast Bulgaria starts after heavy rainfalls, as was evident during the last 20-year wet period. The interconnection between the landslides in Northeast Bulgaria, rainfalls and groundwater maxima is investigated by variations of discharge for spring near Kotel and groundwater levels in two dug wells near Balchik, precipitation from meteorological stations Sofia, Varna, Veliko Tarnovo and Kazanlak, and Palmer Drought Severity Index (PDSI). The periods of maxima of precipitation, PDSI and groundwater time series are compared with the registered occurrence of landslides. Some part of landslides occurs after groundwater maxima, other part - after intensive short-time rainfalls without significant change of groundwater levels. It is necessary to analyze time series of precipitation and PDSI in order to provide comprehensive landslide forecast. The groundwater levels follow almost exactly the PDSI variations, while the short time intensive rainfalls are presented as significant spikes in precipitation time series. The hazard risk of landslides on the territory of Bulgaria should be estimated by the maxima of PDSI, real meteorological data from stations located near the Black Sea coast and inside the territory</p>
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B 4.15 Chapanov ,Ya., Atanasova, M., **Nikolov H.**, Heavy rainfalls in Bulgaria due to solar activity and their possible influence on landslides, Proceedings of 10th Congress of Balkan Geophysical Society, BGS 20192019 10th Congress of Balkan Geophysical Society, Code 151752, ISBN 978-946282303-7, DOI 10.3997/2214-4609.201902612

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85084691679&doi=10.3997%2f2214-4609.201902612&origin=inward&txGid=ad8dbf7112fece358f101fc64c04a2f4&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

The solar activity cycles affect various parameters of surface areas, including rains, snow covers, river streamflows and other hydrological cycles. These processes are due mainly to the total solar irradiance variations, followed by weather and climate changes. The interconnection between the solar cycles and decadal changes of rainfalls over Bulgaria is investigated by means of reconstructed Total Solar Irradiance TSI, precipitation from meteorological stations Sofia, Varna, and Palmer Drought Severity Index (PDSI) for the period 1899-2015. The decadal oscillations of precipitation and TSI with periods corresponding to the sunspots (11 years), solar magnetic cycle (22 years), equatorial solar asymmetry (45 years), Gleissberg cycle (70-100 years) and their harmonics are compared and analyzed. Models of decadal variations of PDSI and precipitation, based on solar cycles and harmonics, are created. The periods with rainfall and PDSI maxima are calculated on a century time span and a forecast of landslides is determined.

B 4.16 Atanasova, M., **Nikolov H.**, Georgiev, I., Ivanov, A., Dimitrov, N., *Monitoring of landslide processes at the NE Bulgaria by joint use of GNSS and InSAR*, Proceedings of 10th Congress of Balkan Geophysical Society, BGS 2019 10th Congress of Balkan Geophysical Society, Code 151752, ISBN 978-946282303-7, DOI: <https://doi.org/10.3997/2214-4609.201902640>

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85085853266&doi=10.3997%2f2214-4609.201902640&origin=inward&txGid=8b3087bd9eabc4a006a3fe90bf8d9b1e&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

The objective of the newly started project is monitoring the ongoing landslide processes. This will be achieved by using of an innovative methodology for continuous monitoring of landslide areas by integrating interferometric images and GNSS data from permanent and local geodetic networks. The study will give reliable data for ongoing risky geo-processes for the region of the Northeastern Bulgaria, known with several large active landslides. These results are important for understanding the origin and dynamics of landslide processes as well as assessing the resulting hazards. Local archive with Sentinel-1A/B images for this region is created and interferograms are produced

B 4.17

Atanasova, M., **Nikolov H.**, Protopopova, V. *DInSAR in displacement detection after seismic events*, Proceedings of 10th Congress of Balkan Geophysical Society, BGS 2019, 10th Congress of Balkan Geophysical Society, Code 151752, ISBN 978-946282303-7, DOI 10.3997/2214-4609.201902642

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85086687580&doi=10.3997%2f2214-4609.201902642&origin=inward&txGid=1ef008a924ed7a3c401a62146cf15ace&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

Earthquakes have devastating effect on population, landscape and economy. Since it is quite challenging to predict those events of utmost importance is to obtain reliable information after they had happened. This information is essential for rescue operations and for preparation of post-event management plans. In this paper two earthquake events are studied and produced are the ground displacement maps have been produced. Those maps are created on the basis of interferometric images obtained after processing SAR data from the ESA Sentinel-1 mission. The results have been compared with in-situ observations and measurements made after the event exhibiting good correlation with them

B 4.18

Dimitrov, V., Ilieva, N., **Nikolov H.**, *Evaluation of urban atlas and street tree layer 2012 local component datasets for Bulgaria*, Proceedings of SPIE - The International Society for Optical Engineering, Volume 115242020, Article number 1152417, 8th International Conference on Remote Sensing and Geoinformation of the Environment, RSCy 2020, Code 162750, ISSN 0277786X, ISBN 978-151063857-0, DOI 10.1117/12.2570763

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85091196490&doi=10.1117%2f12.2570763&origin=inward&txGid=ad91e25c0cb8ff35fd989419e33ab7a3&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

Land cover data derived from satellite images must be accompanied by information on their quality in order to be properly and fully used. The main purpose of this paper is to present the results of the evaluation of the Urban Atlas (UA) and Street Tree Layer (STL) datasets for Bulgaria for the reference 2012 year. This verification task is part of a project, managed by the European Environmental Agency (EEA) under the Copernicus program. A quantitative assessment approach is applied, based on stratified random sampling at polygon level. The working steps completed are, as follows: preparation of input and reference data, creation of a sample set of land cover/land use (LC/LU) polygons, visual interpretation of selected samples and evaluation of results. The LACO-Wiki web-based tool is used for sampling-related activities. Very highresolution (VHR) satellite imagery and digital aerial photos form major part of the reference data. This way, a scientifically based estimate of the thematic accuracy of UA and STL dataset are obtained and of some geometric characteristics, as well. The following features are estimated: user and producer's accuracy by LC/LU class, overall user's accuracy, uncertainty values, and correctness of delineation by LC/LU class. Comments by LC/LU class are provided. More than 89% of UA polygons have correctly delineated area. The detail of delineation accuracy is over 98%, while the positional accuracy is more than 97%. The overall weighted thematic accuracy of UA is 83.9%, which is higher than the target accuracy of 80%. STL product shows overall accuracy of 94.1%-higher than the required 85%. Relevant and diverse reference data sources together with appropriate stratification and sampling design tailored to the purpose and resources of the project helped to produce realistic accuracy results.

B 4.19

Nikolov H., Protopopova, V., Atanasova, M., *Studying seismic events via satellite interferometry*, Proceedings of SPIE - The International Society for Optical Engineering, Volume 115242020, Article number 115241B, 8th International Conference on Remote Sensing and Geoinformation of the Environment, RSCy 2020, Code 162750, ISSN 0277786X, ISBN 978-151063857-0, DOI 10.1117/12.2570676

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85091201769&doi=10.1117%2f12.2570676&origin=inward&txGid=50fd77dd4e353344d63e4e00f183166d&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

Satellite radar instruments deliver SAR data that are able to provide information on the magnitude of ground motions in range of centimeters. Such information is of extreme importance is assessing the consequences of natural or man-made disasters. Since earthquakes are occurring constantly and are not possible to predict it is recognized that any information on the size of this events is important for the local and national authorities responsible for mitigation of the post-event damages. In this research presented are the results obtained after processing two sets of SAR data along with other supplementary data in order to produce two interferometric images that provide information on the deformation processes after several earthquakes that took place on the Ionian shore of Albania in the second half of November 2019. The resulting deformation maps from ascending and descending orbits of the Sentinel1 satellite mission were compared to increase the reliability of the conclusions made upon them. The outcomes reported suggest that it would be possible to deliver to the national authorities details on deformation in regions that are problematical to inspect directly.

B 4.20

Nikolov H., Atanasova, M., Vassileva, K., Nankin, R., Ivanov, P., Dimitrov, N., *Study of the contemporary state of the landslides in the northern Bulgarian Black Sea coast*, Proceedings of SPIE - The International Society for Optical Engineering, Volume 11524, Article number 115241C , 8th International Conference on Remote Sensing and Geoinformation of the Environment, RSCy 2020, Code 162750, ISSN 0277786X, ISBN 978-151063857-0, 10.1117/12.2570678

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85091226814&doi=10.1117%2f12.2570678&origin=inward&txGid=23c2f2fc86a66d6de09a8edd77b8285d&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

The territorial distribution of landslides along the Northern Bulgarian Black Sea coast has been evaluated by analyzing the results of field surveys for 2018 and 2019 based on geological surveys and processing of interferometric images from synthesized aperture radars (SAR). A local image archive of Sentinel-1A/B was created for the period 2015-2019 for this region and interferograms were produced every 4 months, 8 months, 1 year and in case of registering an event, led to the activation of landslide processes. A raster map of the concentration of deformations of the Earth's crust was created based on data from the obtained interferograms. Areas with active landslide movements along the Northern Bulgarian Black Sea coast have been identified for monitoring with the Global Navigation Satellite Systems (GNSS). A geodynamic network of 30 points covering the landslide circus "Dalgiya Yar" and landslide "Thracian Cliffs" was established and the first measurement cycle was carried out.

B 4.21

Borisova, D., Hristova, V., Dimitrov, V., **Nikolov H.**, Goranova, M., *Spectral measurements over test site Novi Iskar for creating a specific data base*, Proceedings of SPIE - The International Society for Optical Engineering Volume 115242020 Article number 115240E , 8th International Conference on Remote Sensing and Geoinformation of the Environment, RSCy, Code 162750, ISSN 0277786X, ISBN 978-151063857-0, DOI 10.1117/12.2570741

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85091235694&doi=10.1117%2f12.2570741&origin=inward&txGid=c2058dd2265d4c7f69e1dcd69150a642&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

The authors aim to present the collecting of in-situ spectral data for filling in a thematic database of Earth observation as a part of joint project. In-situ spectrometric measurements were made for acquiring spectral data of the rock samples during and after a field campaign in the selected test site. The selected test points are around the town of Novi Iskar where space test site "Novi Iskar" is established. The related land covers in the studied area will also be taken into account in the analysis of satellite images of the region. These in-situ measurements are part of an integrated system for remote sensing and ground-based observations and in line with Copernicus In-Situ Component. In-situ spectrometric measurements have potential for long-term practical application to verify data, which increases their accuracy. Filling in the thematic database for monitoring over test site with the collecting spectral and ancillary data leads to an optimal correlation between the different methods of studying the different types of land covers, increases the effectiveness of scientific investigations in the field of Earth remote sensing, creates synergy between different scientific fields and helps to share information between researchers from different areas of scientific and practical interest. The team is developing a data base structure which is going to be available through SRTI-BAS website. The data base is going to include information about specific spectral properties of the studied objects in the test site.

B 4.22 Atanasova, M., **Nikolov H.**, *Integrative use of GNSS and InSAR data - A case study of landslide on the Thracian rocks coastal slope*, Proceedings of SPIE - The International Society for Optical Engineering, 2020, Volume 115342020, Article number 115340S, Earth Resources and Environmental Remote Sensing/GIS Applications XI, Code 163792, ISSN 0277786X, ISBN 978-151063881-5, DOI 10.1117/12.2573641

Линк към публикацията : https://www.scopus.com/record/display.uri?eid=2-s2.0-85093651688&doi=10.1117%2f12.2573641&origin=inward&txGid=a88b9b089204cd3799cf7860415a71a1&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

The main objective of this research is monitoring of landslide areas by integrating results from interferometric images, and GNSS data from permanent and local geodetic networks. This study is providing reliable information with regard to the hazard geo-processes taking place in the region of the landslide area Thracian Rocks. To accomplish the aforesaid the first step was to create a local archive of about 400 SLC images from ESA operated mission Sentinel-1 starting from the beginning of 2015. In this archive data from ascending and descending satellite orbits were included in order to increase the reliability of the information derived from SAR data. Due to considerable occurrence of vegetation in the studied area, which is recognized as one of the factors increasing the decorrelation during DInSAR processing, the authors processed mainly scenes with minimum availability of leaves on the trees and shrubs - autumn and spring. The geological setting of the landslide region reveals a narrow strip formed by old landslides that have an average width of 400-500 m and steep slopes of 40-50 m at certain locations. From this setting it was established that the landslide bodies have been formed by 3-4 visible linearly oriented steps and landslide packages with different heights creating negative ground forms with permanent or temporary swamps. Besides the ancient landslides a recent active local landslide processes occur forming recent landslides. In the framework of this study a control geodynamic network covering the landslide area located in the surroundings of Thracian Cliffs golf club was established. In it included are 10 points stabilized with metal pipes which are used to monitor deformations in this area. An advantage of the approach should be pointed out the possibility to map areas that are inaccessible by other means.

B 4.23	<p>Nikolov H., Atanasova, M., Ivanov, P., Berov, B., <i>Studying the slope deformations in a Bulgarian mountain by multitemporal DInSAR data processing</i>, Proceedings of SPIE - The International Society for Optical Engineering, Volume 115332020 Article number 1153319, Image and Signal Processing for Remote Sensing XXVI, Code 163955, ISSN 0277786X, ISBN 978-151063879-2, DOI 10.1117/12.2573945</p> <p>Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85093917332&doi=10.1117%2f12.2573945&origin=inward&txGid=812ec4070ecf9fc07bb5e8c0d460fcdd&featureToggles=FEATURE_NEW_DOC_DETAILS_EXP ORT:1,FEATURE_EXPORT_REDESIGN:1</p> <p style="text-align: center;">Абстракт</p> <p>This research is focused on registering the movements along the slope of the several slopes located on south-west of the mountain Stara Planina and establishing their average annual values. Currently at national level there are a low number of studies targeted at operational monitoring of the investigated slopes. These objects are quite specific for research since those kind of natural phenomena are inaccessible by other means or are quite dangerous to be investigated. On the other hand, the moving slopes are causing damages to infrastructural objects such as roads, bridges or power lines. Their behavior is difficult to forecast and for this reason they can be considered as natural hazards. Obtaining precise data for the single slope movements is done by in-situ investigations such as geodetic acquisitions, terrestrial laser scanning, and geological observations, which all require financial resources and human effort. For this reason, we used remotely sensed data from satellite based SAR instruments processed using the DInSAR method in order to analyze the motions of single slope and to establish a technique for the investigation of mountain slopes. An advantage of the selected method is the possibility to register the vertical movements of the whole slope with centimeter accuracy. This approach is based on the free access to the SAR data and tools for their thematic processing provided by ESA. In this study an emphasis is put on the manner how the obstacles encountered during the interferometric processing (e.g. presence of vegetation or topography) have been overcome. From the downloaded set of SAR images covering the region created were two multitemporal InSAR data series from ascending and descending orbits of the satellite. The results from the autumn-winter pairs exhibited good correlation with the expected displacements along the studied slope having a magnitude of 0.8 m.</p>
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B 4.24

Atanasova, M., Dimitrov, N., **Nikolov H.**, *Study on the geodynamic processes for the area of the southwest Bulgaria using InSAR data*, International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEMVolume 2020-August, Issue 2.1, Pages 573 - 580, 2020 20th International Multidisciplinary Scientific Geoconference: Informatics, Geoinformatics and Remote Sensing, SGEM 2020, 2020, ISSN 13142704, ISBN 978-619760304-0, 978-619760305-7, 978-619760306-4, 978-619760307-1, 978-619760308-8, 978-619760309-5, 978-619760310-1, 978-619760311-8, 978-619760312-5, DOI 10.5593/sgem2020/2.1/s08.074

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85099724018&doi=10.5593%2fsgem2020%2f2.1%2fs08.074&origin=inward&txGid=2cbf613c53f54319bac527a1b60b74c8&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

Geodynamic processes and seismic activity are considered to be the prime driver of horizontal and vertical movements of the Earth's crust in the Balkan Peninsula. One proven method for continuous monitoring of ground deformations is the use of data from active radar remote sensing. These data are the basis for the creation of interferometric images (IFIs) for quantitatively assessment the recorded ground movements of the Earths' surface within a fixed time interval. For this research a set of IFIs were created for areas surrounding the city of Sofia. The main objective of this research is monitoring of the ongoing geodynamic processes by complementary use of SAR and GNSS data. GNSS data from permanent and local geodetic networks are used for validation of the SAR derived information concerning the study area. The study will give reliable data for ongoing risky geo-processes for the region of the Southwest Bulgaria. Landslides are one of the main geological hazards that can cause critical damage to the infrastructure in an area and can result in serious risks to the people's safety there. Maps of active, stabilized and potential landslides in Southwest Bulgaria provided by the national landslide register part of the GIS maintained by Ministry of Regional Development and Public Works (MRDPW) are used. For mapping the deformations in the studied region interferometric images were produced at 4 months intervals. The results obtained from this study are used for the further development of the methodology for monitoring the risk of geo-processes by combining data from different sources.

B 4.25

Nikolov H., Shishkov, T., *Pilot Activities in Creating Soil Maps from Satellite Data—Struma River Valley Case Study*, Environmental Science and Engineering Pages 1901 - 1905 2021 2nd Euro-Mediterranean Conference on Environmental Integration, EMCEI , Code 258519, ISSN 18635520, ISBN 978-303051209-5, DOI 10.1007/978-3-030-51210-1_299

Линк към публикацията: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85106158591&doi=10.1007%2f978-3-030-51210-1_299&partnerID=40&md5=4fcc971f4d978440100d1742c0a2193d

Абстракт

Soil maps constitute a key factor in managing agricultural and forest plots. Their importance has increased with the implementation of innovative methods, such as precision agriculture, which are targeting the resilience to regional climate changes. Having up-to-date information on the soil current status is of extreme importance for updating the existing soil map. In this paper, a case study will be presented on the combined use of spectral data from in-situ and satellite measurements focused at producing information with regard to the soil composition and its physicochemical parameters. The most important result achieved in this research is the creation of a regional soil spectral library comprised of soil spectral signatures. Another important result is the update of the existing soil map for the studied region—Struma river valley located in the southwestern part of Bulgaria. As a result, a procedure for its regular modification will be outlined. This modern soil map can be valuable for a large number of stakeholders in the mentioned region—farmers, forest managers, and local authorities to name a few.

B 4.26

Atanasova, M., **Nikolov H.**, *Adding new information content to GNSS measurements by SAR data processing in studying a landslide*, Environmental Science and Engineering Pages 2063 - 2067 2021 2nd Euro-Mediterranean Conference on Environmental Integration, EMCEI 2019, Code 258519, ISSN 18635520, ISBN 978-303051209-5, DOI 10.1007/978-3-030-51210-1_323

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85106177031&doi=10.1007%2f978-3-030-51210-1_323&origin=inward&txGid=7e64e1e71320c18841685ce072b29377&featureToGgles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_RED_ESIGN:1

Абстракт

The availability of verified information concerning hazardous geo-processes is of prime importance in monitoring active or potential landslides since they largely affect human lives, infrastructure, and ecological status. Based on data from the Bulgarian national authority in charge of inventories, the landslides number has been constantly increasing since the past decade due to natural phenomena and human activities. Hence, it is necessary to establish a reliable procedure for operational monitoring. In this paper, a procedure is proposed for tracking landslide dynamics based on combining the advantages offered by Global Navigation Satellite System (GNSS) measurements and the information derived from interferometric images produced from Synthesized Aperture Radar (SAR) processing. The latter provides the possibility to register the earth's crust deformations with a magnitude of centimeters. This study covers the landslide area named Trifon Zarezan situated at the Bulgarian Northeast Black Sea Coast. The obtained results can be used as an additional source of information on ground deformations in active ground zones by a large number of local stakeholders, e.g. construction or utility companies.

B 4.27

Nikolov H., Atanasova, M., *Obtaining ground deformations by multitemporal DInSAR processing in vicinity of archaeological site "Solnitsata-Provadia"*, Proceedings of SPIE - The International Society for Optical Engineering, Volume 118612021 Article number 118610C, Microwave Remote Sensing: Data Processing and Applications, 2021, Virtual, Code 173225, ISSN 0277786X ISBN 978-151064566-0, DOI 10.1117/12.2599762

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85118540536&doi=10.1117%2f12.2599762&origin=inward&txGid=421e98c45c6607296b14f3b7bf28e040&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

The Differential Radar Interferometry (DInSAR) technique provides fast and accurate means for detecting small displacements of the Earth's surface having a magnitude in centimeters range. Applying this method monitoring of ground movements of natural or anthropogenic origin are reliably registered. The information is produced from the interferograms resulting from purposely processing the phase signal present in two SAR images from different dates over the one and the same area. The motivation behind this research was to study the crustal deformations that pose treat to the archaeological site "Solnitsa-Provadia" located in the area Mirovo salt deposit near the town Provadia, NE Bulgaria. It needs to be mentioned that the said monument is dated back to VI-V millennium BC and includes the remnants of an ancient city near Provadia. The registered deformations in the region are due to natural and anthropogenic factors. The mentioned factors have undisputable negative impact on the preservation of this historical site and justify the necessity of regular monitoring of the ongoing geodynamic processes. In this research the authors provide results based on multitemporal processing of freely accessible SAR data from Sentinel-1 mission by ESA. The information concerning the detected surface deformations was obtained by the DInSAR method. The multitemporal processing included creation of set of interferometric images from several periods with time span of four months. This interval was selected since it was needed to decrease the decorrelation of the phase signal caused by the vegetation and noise introduced by the atmosphere. In order to increase the reliability of the output information SAR data from ascending and descending orbits were processed which provided two different stereoscopic-like views to the investigated area. The results also have been compared with the trends of ground motions using data from repeated multi-year results geodetic measurements made at Mirovo geodynamic network.

B 4.28

Atanasova, M., **Nikolov H.**, *Surface displacements determinations at "Fish-Fish" landslide area based on UAV photogrammetric surveys and remotely sensed SAR data*, Proceedings of SPIE - The International Society for Optical Engineering Volume 118632021 Article number 1186317, Earth Resources and Environmental Remote Sensing/GIS Applications XII 2021, Code 173227, ISSN 0277786X, ISBN 978-151064570-7, DOI 10.1117/12.2599416

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85118659345&doi=10.1117%2f12.2599416&origin=inward&txGid=aa174bbfb653da68031d0728a71676f8&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

Landslide occurrences are result of natural or human activities, but regardless of the origin they change the landscape, destroy infrastructure and in some cases even leads to loss of human lives. In order to assess the hazard of this phenomenon remotely sensed data from aerial and satellite instruments are widely used to monitor the ground motions at regular intervals. Those methods are less expensive and less time consuming than terrain inspections and measurements and the other hand the size of the studied areas is larger. This was the rationale to initiate a study on the surface deformations in the area of "Fish-Fish" landslide located on the north part of the Black Sea coast of Bulgaria. Two sources of data were used to create a map of recent surface displacements in the said area-photogrammetric surveys with UAV and remotely sensed images from synthetic aperture radar from satellite instruments. The area of the landslide was investigated by photogrammetry in years 2019 and 2020 and as result created were two digital elevation models. The accuracy allowed registration of the surface motions at centimeter scale using ground control points located inside and outside the perimeter of the landslide. The satellite SAR data are provided at no cost by ESA originating from the twin constellation of Sentinel-1 mission. The authors downloaded SAR data for the same periods when the UAV surveys were made. Due to peculiarities of the local terrain it was possible only SAR images from descending orbit to be used. The processing of those data was done by verified interferometric processing method implemented in the SNAP software. Finally the results from control points for both sources were compared and good correlation between them was established. A map of the landslide area depicting the registered ground displacements was produced. © COPYRIGHT SPIE. Downloading of the abstract is permitted for personal use only.

B 4.29

Atanasova-Zlatareva, M., **Nikolov H.**, Georgiev, I., Ivanov, A., *Application of Contemporary Technologies for Monitoring Landslides „Thracian Cliff“*, 11th Congress of the Balkan Geophysical Society, BGS 2021, 2021, 11th Congress of the Balkan Geophysical Society, BGS 2021, Code 176572, ISBN 978-946282393-8

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85124345235&origin=inward&txGid=859906b4c63b1b75696ff4992c8d9a84&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

The area of research interest is an activated landslide located near the village of Topola, Kaliakra municipality and it is manifested in the front of an ancient stabilized landslide “Kalkan tepe”. The combined GNSS and InSAR applications for landslide monitoring in the north of the Black Sea coast, Bulgaria conducted in the past 3 years aimed to contribute to the complex geodetic and geological research. Due to their high precision GNSS are very appropriate for investigating geodynamic processes. The InSAR technique is a remote sensing technique mostly applied for the detection and monitoring of earth surface deformations with wide spatial coverage. In November 2020, an aerial drone survey of the Thracian Cliff landslide was performed using UAS technology to mapping surface models of the study area. The ability to observe many points (pixels), including the whole object, as well as their behavior over time, allows the development of models of the deformation process and facilitates the solution of a number of tasks on forecasting and geohazard. The application of contemporary technologies for monitoring greatly facilitates the monitoring of landslide deformation processes.

B 4.30 Atanasova, M., **Nikolov H.**, *Applying the DInSAR Method for Surface Deformations Detection in Pernik Valley*, 11th Congress of the Balkan Geophysical Society, BGS 20212021 11th Congress of the Balkan Geophysical Society, BGS 2021, Code 176572, ISBN 978-946282393-8

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85124346787&origin=inward&txGid=e485371576f1358e5e458262a96307b0&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

The need for regular monitoring of the ongoing surface displacements is highly recognized by local, national, and international authorities since they are responsible for losses of human lives and cause significant damages to homes, infrastructure, and industrial objects. In this research, the DInSAR method was applied to investigate the ground deformations in a highly populated and industrialized area of the Pernik valley. Outlined in it are the advantages of the technique used and the possibilities offered by processing freely available SAR data to produce reliable results concerning the Earth's motions in the researched area.

B 4.31

Zolnikova, N., Shkevov, R., Erokhin, N., Mikhailovskaya, L., Sheiretsky, K., **Nikolov H.**, *Climate Change: Numerical Simulations of Tropical Cyclones Behavior in the Context of the Global Warming*, 11th Congress of the Balkan Geophysical Society, BGS 2021/2021 11th Congress of the Balkan Geophysical Society, BGS 2021, Code 176572, ISBN 978-946282393-8

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85124362809&origin=inward&txGid=7813f7b549eb8182b2a721245e449669&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1

Абстракт

The climate change and especially the global warming environment in recent years bring many questions related to the numerous disasters caused by tropical cyclones (TC). The numerical study of the regional cyclogenesis dynamics based on a low parametric nonlinear model (LPNM) is continued. The model uses a system of coupled nonlinear differential equations for the maximum wind velocity and ocean surface temperature in the TC zone. Within the framework of LPNM, the generation of four powerful atmospheric vortexes with a diverse temporal dynamics during the active season in a specific area is considered. The TCs in the nonstationary background environment with lifetimes 7 - 16 days are obtained. In simulations the variability of the wind velocity and ocean's surface temperature, as well as other effective sources of disturbances were taken into account. In the context of the global warming, the numerical calculations show TCs amplification, when the ocean surface is heated up to 0.5°C - 1°C. Therefore, maximum wind velocity in RLSTC increases sharply, the duration of the development stage also increases and the TCs move to a higher category. These facts coincide with the results received from LPNM simulations, recent registered meteorological data and environmental observations.

B 4.32

Atanasova, M., **Nikolov H.**, Georgiev, I., Vassileva, K., Dimitrov, N., Ivanov, A., *Creating a thematic geodatabase for monitoring the landslide processes of the landslide circus "Dalgia Yar"*, IOP Conference Series: Earth and Environmental Science Open Access Volume 906, Issue 16 December 2021 Article number 0120357th World Multidisciplinary Earth Sciences Symposium, WMESS 2021, Code 175412, ISSN 17551307, DOI 10.1088/1755-1315/906/1/012035

Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85121446421&doi=10.1088%2f1755-1315%2f906%2f1%2f012035&origin=inward&txGid=24cda63345af067ff7bbcdf3115808ba&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATU RE_EXPORT_REDESIGN:1

Абстракт

Impact on the process of landslide origin and activation is result of many factors both endogenous and exogenous. The purpose of this study is to provide possibility for analysis and assessment of the geo-processes in the "Dalgia yar" landslide located at Northern Black Sea coast of Bulgaria in order to prevent risks and disasters of natural and anthropogenic origin. An important stage was to seamlessly include data from different sources such as geodetic measurements, satellite SAR (Synthetic-aperture radar) data as well as geological and geophysical data. The established geodatabase structures the collected information on dangerous geo-processes in the mentioned area and introduces them into the GIS (Geographic information system) environment. Its purpose is to facilitate the analysis of the available geological data for this landslide and to integrate them with results of measurements from regular monitoring. Interferometric images (IFIs), data from permanent GNSS (Global Navigation Satellite Systems) stations and from local geodynamic GNSS network, geological, seismic and geophysical data, updated geological maps and maps of the risk of landslide processes are included in the database. The IFIs have been produced using well established procedure for processing large number of Sentinel-1 SAR data of the purposely created local archive. Other key element used to improve the final results of SAR data processing and important part of the geodatabase is the precise Digital Elevation Model (DEM), which is much better in terms of horizontal and vertical resolutions than the open accessed ones (SRTM). The coordinates and velocities of the GNSS points are obtained from adjustment and analysis of two epoch measurements of the geodynamic control network of landslides "Dalgia yar". Since the area has complex geological structure, small scale maps reflecting the geological and geophysical hazards are integral part of the geodatabase. Having all this information the analysis concerning the ongoing geodynamical processes in the study area is significantly improved and more reliable information is produced for better regional planning by the local authorities and residents.

<p>B 4.33</p>	<p>Atanasova, M., Nikolov H., Oynakov, E., Co-seismic surface displacements after the earthquakes in Larissa, 3 march 2021, derived by DInSAR, Proceedings of 21th International Multidisciplinary Scientific GeoConference SGEM 2021, International Multidisciplinary Scientific GeoConference</p> <p>Линк към публикацията: https://www.scopus.com/record/display.uri?eid=2-s2.0-85131691451&origin=resultslist&sort=plf-f&src=s&st1=10.5593%2fsgem2021%2f2.1%2fs10.64&sid=7b8fa62bd7b8c9055019ecdc79a4db83&sot=b&sdt=b&sl=32&s=DOI%2810.5593%2fsgem2021%2f2.1%2fs10.64%29&relpos=0&citeCnt=0&searchTerm=&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATURE_EXPORT_REDESIGN:1</p> <p style="text-align: center;">Абстракт</p> <p>The focus of this study is detection of the deformations of the Earth's surface caused by March 3 2021 earthquake using Differential Interferometric Radar Synthetic Aperture technique. This method takes advantage of the remotely sensed SAR data provided at no cost by ESAs' Sentinel-1 mission which are often used for creation of topographic maps as well as for detection of ground motions. The final results of this processing deliver reliable information about the displacements caused by the mentioned events with centimeter accuracy. The DInSAR approach is based on precise measurements of the phase of the backscattered from the surface radar signal at different dates of acquisition. Based on the differences registered in both signals conclusions on the relative motions are drawn from the created interferometric image (IFI). In the course of the IFI formation a measure of its quality, named coherence, is created too. It needs to be emphasized that the registered ground displacements are in the line-of-sight of the radar and after additional calculations can be transformed into subsidence values. For this research produced were IFIs from two ascending (south-north) and two descending (north-south) orbits of the satellite which provided more details on the occurred ground motions after all earthquake events. The time period covered by the IFIs is from February 25th 2021 to March 20th 2021. The results obtained exhibited high values in the coherence images which guarantee reliability of the final information. All geocoded IFIs were co-registered to the first one which is produced. After that several profile lines reflecting the surface displacements resulting from the events were produced.</p>
<p>B 4.34</p>	<p>Atanasova, M., Nikolov H., <i>Use of two contemporary remote sensing technologies for mapping Thracian Cliffs landslide (Northern Bulgarian Black Sea Coast)</i>, Review of the Bulgarian geological society, 2021, vol. 82, part 3, pp. 159-161, ISSN:0007-3938, DOI:https://doi.org/10.52215/rev.bgs.2021.82.3.159,</p> <p>Линк към публикацията: https://www.webofscience.com/wos/alladb/full-record/WOS:000756220000044</p> <p style="text-align: center;">Абстракт</p> <p>In this paper are presented the results from the investigations of the active landslide, located in front of the Thracian Cliffs golf club (Northern Bulgarian Black Sea Coast) for the period 2019-2021. Extensive research by means of in-situ and remote sensing has been carried out on the latest landslide activations. As part of the study, a control GNSS geodynamic network was established. This network was used as benchmark for the results obtained from satellite SAR data processing and UAV surveys targeted at monitoring the modern landslide developments.</p>

B 4.35 Atanasova, M., **Nikolov, H.**, Vassileva, K.. Application of GNSS and SAR data in landslide monitoring along the Black Sea coast of Bulgaria. Aerospace Research in Bulgaria, 33, Space Research and Technology Institute Bulgarian Academy of Sciences, 2021, ISSN:1313-0927, pp. 87-100.

Линк към публикацията:

<https://www.webofscience.com/wos/woscc/full-record/WOS:000644687000007>

Абстракт

Landslide processes are considered the major part of the natural hazards occurring on the northern part of the Bulgarian sea side. Their monitoring can be done with high precision using GNSS data. The objective of this study is to provide solid grounds for monitoring of the landslide processes using GNSS and SAR data. This goal will be achieved by the implementation of the following: 1) establishment a verified methodology for extracting high-quality information from SAR images aimed at continuous monitoring of landslide areas integrating InterFerometric Images (IFI) and GNSS data and 2) creation of a working prototype of an information system for monitoring and prevention of the effects of earth crust movements (landslides, falls, etc.) based on freely accessible data provided by ESA and national sources. One of the scientific tasks to be solved includes the development of methodological approaches for comparison of the results from combined processing of interferometric images from SAR, measurements at permanent GNSS stations of the national NIGGG network in the area of study and geodetic measurements of a newly established test network covering a specific area on the Northern Black Sea coast of Bulgaria with active landslide processes.

Група Г

група Г показател 7

Г 7.1	<p>Krezhova D., Yanev T., Aleksieva V., Mishev D., Nikolov Hr., Early Detection by Means of Spectral Reflectance Coefficients of Physiological Changes in Leaves of Zea Mays L. Seedlings Grown Under Water Deficit and UV-B Radiation. <i>Compt.rend.Acad.bulg.Sci.</i>, 52, Volume53, Issue7, Pages 59-62 1999 (2000). ISSN 0861-1459</p> <p>Линк към публикацията: https://www.webofscience.com/wos/alldb/full-record/BCI:BCI200000513029</p> <p style="text-align: center;">Абстракт</p> <p>Introduction. Plant organisms are subjected during their ontogenetic development to the impact of different stress factors which cause changes in the plant physiological processes. Plant injuries are usually due to unfavourable environmental factors (extreme temperatures, water stress, high level of sun radiation, etc.). Some of the stress factors activate the cell metabolism which sometimes leads to an enhanced resistibility (cross adaptation) to other stress factors. As it is known [1,2] the action of most of the stress factors (increased UV-radiation and water deficit for example) leads to accumulation of active hydrogen species much more than is the cell capacity for their neutralization by endogenous antioxidants. Therefore, the cell membranes become damaged in result of lipid peroxidation, i.e. the injuring mechanism of different stress factors turns out to be identical or similar.</p> <p>The remote sensing methods for study of natural formations and the spectral reflectance (SR) of vegetation in particular (in the visible (VIS) and near infrared (NIR) ranges of the electromagnetic spectrum) provide the possibility early and statistically significant information to be obtained about crop state on large areas. The laboratory biochemical methods in current use do not meet these requirements to the necessary degree especially with respect to the early detection of stress effects. Three SR bands in the VIS (400–680 nm) and the NIR (680–900 nm) ranges give specific information about leaf status [3]: around 550 nm (maximal chlorophyll spectral reflectance), around 660 nm (maximal chlorophyll spectral absorption) and around 700 nm (the red edge band which is most significantly influenced by chemical fertilizers, heavy metal pollution, etc.). The leaf water content affects SR in a much wider SR wavelength range (400–2500 nm): the less the water contents is, the larger the SR values are, SR departures at the different wavelengths not being equidistant from SR of leaves with normal water content.</p>
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Yanev, T. ; Krezhova, D. ; Alexieva, V. ; **Nikolov, H.**, Spectral Reflectance Coefficients to Early Detect Physiological Changes in Leaves of *Zea mays* L. Seedlings Treated with Herbicides, *Comptes Rendus-Academie Bulgare des Sciences*; vol. 53; Issue8, pages 37-40, 2000 ISSN 0861-1459,

Линк към публикацията: <https://www.webofscience.com/wos/alldb/full-record/BCI:BCI200100091776>

Абстракт

Introduction. Abiotic and biotic agents exert changes in the normal physiological processes in all of the culture and wild plants. Plant damages and decrease of their productivity are most frequently due to unfavorable environmental factors (natural stress factors)—extreme temperature, water deficit, wet lands, saline soils, high Sun radiation, early autumn and late spring rimes, etc.

In recent years new impacts arising from human activity—toxic pollutants decrease the plant biosynthetic activity, change the plant normal functions and cause mortal damages [1]. Such toxic pollutants are pesticides, harmful gases (SO₂, NO, NO₂, N_x, O₃ and photochemical smog), photooxidants (peroxyacylnitrates), rise in acidity and mineral deficit in result of acid rainfalls, fertilization, heavy metals, increased UV-radiation, etc.

In spite of the more and more increasing requirements for environmental protection the use of herbicides continues to be an obligatory practice in food production in the countries with advanced agriculture [1]. The chemical pollution continues to be one of the most frequently met anthropogenic stresses.

The objective of our previous studies [2-6] was to examine whether damages in leaves of maize plants (in result of the stress impact of drought, low temperature, UV-B radiation and combinations of these stress factors) may be detected by means of the leaves spectral reflectance coefficients (SRC) not later than they are usually established through endogenous stress markers and important biochemical and biometric parameters.

The effect of the above mentioned stress factors was mainly estimated by:

a) The concentration of the following endogenous stress markers: proline, products of the lipid peroxidation (measured as malonedialdehyde (MDA) equivalents), hydrogen peroxide content, electrolyte leakage and in some of the experiments—by parameters such as fresh weight, chlorophyll content, etc.;

b) SRC changes in the visible and near-infrared ranges of the electromagnetic spectrum (480–810 nm).

In this work the possibility to early detect through SRC the physiological changes in leaves of maize plants treated with herbicides was studied. An overview is made as well on the main results of our previous studies for early detection through SRC of physiological changes in leaves of maize plants treated with other stress factors.

Г 7.3

Yanev T.; Dachev Ts., Semkova J., Koleva R., Kancheva R.; Krumov A.; Petkov D.; Krezhova D., Stoilova I.; Petkov N., **Nikolov Hr.**, Contributions of Prof. Dimitar Mishev to science, space terminology and international cooperation, 54th International Astronautical Congress of the International Astronautical Federation (IAF), the International Academy of Astronautics and the International Institute of Space Law, Volume 1, Pages 3789 – 3796, 2003

Линк към публикацията: <https://www.webofscience.com/wos/alldb/full-record/WOS:000756220000044>

Абстракт

Some contributions of Prof. Mishev to science, space research, education, space terminology, and international cooperation, are presented. In 1990 Prof. Mishev founded the Solar Terrestrial Influences Laboratory at Bulgarian Academy of Sciences (STIL-BAS) and in 1996 - its *Division for atmospheric optical investigations* in Stara Zagora town. He led the development and production of many spectrometric and radiometric systems and sensor aimed at investigating the reflectance characteristics of natural formation both onboard aerospace platforms and for ground based measurement. Prof. D. Mishev led the international space project ' Bulgaria-13000II' which was intended for remote sensing of earth surface.

B 7.4

Borisova D., **Nikolov H.**, M. Danov, Spectral mixture analysis for data verification and validation. 31st International Symposium on Remote Sensing of Environment, Saint Petersburg, Russia, <https://www.isprs.org/proceedings/2005/ISRSE/html/papers/667.pdf> , 2005. ISBN 7803-8977-8

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<https://www.scopus.com/record/display.uri?eid=2-s2.0-84879738209&origin=resultslist&sort=plf-t&src=s&st1=Spectral+mixture+analysis+for+data+verification+and+validation&nlo=&nlr=&nls=&sid=8cba27d4d7517f536ba2c63a9e3d3194&sot=b&sdt=b&sl=77&s=TITLE-ABS-KEY%28Spectral+mixture+analysis+for+data+verification+and+validation%29&relpos=1&citeCnt=0&searchTerm=>

Абстракт

One of the basic issues in remotely sensed data processing and their interpretation is the spectral mixture analysis. Remote sensing measurements include mainly spectral data for obtaining information about the studied objects and on this basis describe them. In the real-world scenario the land cover is a mixture of different matters and in this case the correct discrimination of a single class relies on the theory of spectral mixture analysis. The spectral properties of minerals and rocks depend on many factors such as chemical composition and texture. The goal of the paper is to study spectral mixture reflectance and emissivity from iron-containing minerals and to apply the spectral mixture decomposition technique for mineral identification and to find their proportions in context of further verification and validation. The data consists of laboratory measurements in the visible, near infrared and thermal infrared bands with multi-channel spectrometers and airborne data. Discussion is finally made on the potential applications and ways to improve the accuracy and robustness of the products.

B 7.5

Shutko, A., Haldin, A., Krapivin, V., Novichikhin, E., Tishchenko, Yu., Haarbrink, R., Kancheva, R., **Nikolov, H.**, Coleman, T., Archer, F., Pampaloni, P., Paloscia, S., Krissilov, A., Carmona, A., Remote sensing for emergency mapping of areas with water seepage through levees and of zones with dangerously high groundwater level, AIAA 57th International Astronautical Congress, IAC 2006, 3, pp. 1989-1995. <https://doi.org/10.2514/6.IAC-06-B1.1.09>

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<https://www.scopus.com/record/display.uri?eid=2-s2.0-41149168626&origin=resultslist&sort=plf-t&src=s&st1=Remote+sensing+for+emergency+mapping+of+areas+with+water+seepage+through&sid=a4abf5fed1cc4f38481f8518340a809c&sot=b&sdt=b&sl=87&s=TITLE-ABS-KEY%28Remote+sensing+for+emergency+mapping+of+areas+with+water+seepage+through%29&relpos=0&citeCnt=0&searchTerm=https://arc.aiaa.org/doi/10.2514/6.IAC-06-B1.1.09>

Абстракт

Detailed and geo-referenced maps identifying the locations of saturated and dry levees can be produced using microwave radiometric measurements from a light aircraft or helicopter, and integrated with GPS for positioning and orientation. The development of synergetic remote sensing technology for raised groundwater and seepage detection by the joint use of microwave and optical data along with GIS databases is an effective and most contemporary way of supporting risk assessment and facilitating disaster prevention and management. In this paper we present a remote sensing microwave technology for monitoring and detection of areas of water seepage through irrigation constructions, levees and dykes as well as for revealing areas with dangerously high groundwater level. The possibility for emergency response mapping, integrated with GPS and GIS data, facilitates the risk assessment and management services. The passive microwave radiometry (PMR) is based on spectral measurements in the millimetre to decimetre range of wavelengths. Compared to other remote sensing techniques, such as colour and infrared photography, thermal images and lidar, PMR is the only technology taking measurements under the Earth's surface and therefore is very well suited for water seepage and underground water monitoring in a fast and reliable way. The frameworks and the main aspects of multilateral collaboration activities are presented in the paper.

Г 7.6

Borisova D., **H. Nikolov**, D. Petkov, Ground-based multispectral measurements for airborne data verification in non-operating open pit mine "Kremikovtsi", Proc. SPIE 8893, Earth Resources and Environmental Remote Sensing/GIS Applications IV, 88930V, 2013, doi:10.1117/12.2029151

Линк към публикацията: <https://www.spiedigitallibrary.org/conference-proceedings-of-spie/8893/1/Ground-based-multispectral-measurements-for-airborne-data-verification-in-non/10.1117/12.2029151.short?SSO=1>

Абстракт

The impact of mining industry and metal production on the environment is presented all over the world. In our research we set focus on the impact of already non-operating ferrous "Kremikovtsi" open pit mine and related waste dumps and tailings which we consider to be the major factor responsible for pollution of one densely populated region in Bulgaria. The approach adopted is based on correct estimation of the distribution of the iron oxides inside open pit mines and the neighboring regions those considered in this case to be the key issue for the ecological state assessment of soils, vegetation and water. For this study the foremost source of data are those of airborne origin and those combined with ground-based in-situ and laboratory acquired data were used for verification of the environmental variables and thus in process of assessment of the present environmental status influenced by previous mining activities. The percentage of iron content was selected as main indicator for presence of metal pollution since it could be reliably identified by multispectral data used in this study and also because the iron compounds are widely spread in the most of the minerals, rocks and soils. In our research the number of samples from every source (air, field, lab) was taken in the way to be statistically sound and confident. In order to establish relationship between the degree of pollution of the soil and multispectral data 40 soil samples were collected during a field campaign in the study area together with GPS measurements for two types of laboratory measurements: the first one, chemical and mineralogical analysis and the second one, non-destructive spectroscopy. In this work for environmental variables verification over large areas multispectral satellite data from Landsat instruments TM/ETM+ and from ALI/OLI (Operational Land Imager) were used. Ground-based (laboratory and in-situ) spectrometric measurements were performed using the designed and constructed in Remote Sensing Systems Department at Space Research and Technology Institute thematically oriented spectrometric system TOMS working in the 0.4-0.9 μm range of the electromagnetic spectrum (EMS). For proper comparison between the data obtained from the different sources mentioned spectral transformations such as normalized difference and rationing data for two wavelengths were applied in order to avoid misinterpretation. Statistically significant dependence between the various spectral transformations and the quantitative content of the iron in the different type of compounds was established. The achieved results provided evidence that methodology used could be extended to other regions of the country polluted by the mining activities and should be also tested in the region of the copper and zinc extraction. In the next step of our research we intend to use the results obtained by the multitemporal analysis of the satellite and ground-based multispectral data for the same and the similar regions of interest.

Г 7.7

Borisova D, **Nikolov H**, Danov, M., Tsanev, V., Comparison between Reflectance/Emittance Spectra of Iron-containing Minerals. Proceedings of the 3rd International Conference on Recent Advances in Space Technologies, RAST 2007, pp.252-255, doi 10.1109/RAST.2007.4283988.

Линк към публикацията:

<https://www.webofscience.com/wos/woscc/full-record/WOS:000250805000050>

Абстракт

Correct estimation of the distribution of the iron oxides in open pit mines and the neighbouring regions is a key issue for the ecological state assessment of land cover. For this study airborne (satellite and aircraft) data combined with in-situ and laboratory acquired data were used for assessment of the environmental state from previous mining activities. As main indicator for presence of pollution the iron content was chosen since it could be reliably identified in the ranges used in this study and because of the wide-spread iron in the most of the rock types and soils. The number of samples from every source was taken in the way to be statistically confident. Soil samples together with GPS measurements were collected during a field campaign in the study area for two types of laboratory measurements - chemical and mineralogical analysis and non-destructive spectroscopy. Spectroscopy measurements (laboratory, in-situ and satellite) in visible and near infrared (VNIR) and thermal (TIR) ranges were performed using follows spectrometric systems: ISOH, 0.4-0.8 micrometers; SRM, 0.4-0.82 micrometers; TIRES, 8-1 square micrometers; ASTER, 0.4-1 square micrometers. Spectral transformations such as normalized difference and relation using two wavelengths were applied for the proper comparison between the data obtained from different sources. Dependence between various spectral transformations and the quantitative content of the iron was established. The achieved results proved that this methodology could be extended for other regions of the country polluted by mining activities mostly by cooper or lead plants.

Г 7.8

Atanasova-Zlatareva M., Nikolov H.. Displacements monitoring of the Trifon Zarezan landslide by gnss observations and InSAR, Proceedings of the 9th Congress of the Balkan Geophysical Society, EAGE, 2017, DOI:10.3997/2214-4609.201702589

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https://www.scopus.com/record/display.uri?eid=2-s2.0-85048665391&origin=resultslist&sort=plf-f&src=s&st1=Displacements+monitoring+of+the+Trifon+Zarezan+landslide+by+gnss+observations+and+InSAR&sid=e49e0718367cee7aaa06dc89840a2cf7&sot=b&sdt=b&sl=102&s=TITLE-ABS-KEY%28Displacements+monitoring+of+the+Trifon+Zarezan+landslide+by+gnss+observations+and+InSAR%29&relpos=0&citeCnt=1&searchTerm=&featureToggles=FEATURE_NEW_DOC_DETAILS_EXPORT:1,FEATU RE_EXPORT_REDESIGN:1

Абстракт

The Trifon Zarezan landslide is one of the well-studied areas north of Varna. It has been registered in 1998 and monitored since then, but due to expansion of construction activities and lack of sewerage facilities in 2005 it exhibited strong activation seriously damaging the panoramic coastal road remaining closed up to nowadays. One important issue in mitigating the effect of this phenomenon is its continuous monitoring and one promising solution of this problem is the usage of differential Synthetic Aperture Radar interferometry In the framework of this study two sources of data have been used –three geodetic surveys and SAR data from C-SAR instrument onboard Sentinel-1. The main research objective was to combine the advantages offered by both data sources in order to produce regularly updated information about the whole site. The GPS data are precise, but cannot be provided by a dense network, while SAR data cover the whole area, but they lack of high spatial resolution which is disadvantage in case of exploring small areas such as this one. Based on the results achieved it can be concluded that both sources of data provide information confirming the overall behavior of the studied phenomena for the time period concerned.

Г 7.9

Atanasova, M., **Nikolov, H.**, Dimitrov, N.. Study on Ground Motions in Southwest Bulgaria based on in-Situ and Satellite Data. Proceedings of the 7th International Conference on Geographical Information Systems Theory, Applications and Management (GISTAM), 2021, ISBN:978-989-758-503-6, ISSN:2184-500X, DOI:10.5220/0010503101570164, pp. 157-164.

Линк към публикацията:

<https://www.webofscience.com/wos/woscc/full-record/WOS:000250805000050>

Абстракт

In the last decades data from satellites are being used more frequently to study the ground movements. This fact is evidenced by the increased number of research papers and projects using freely provided data by space agencies such as ESA (European Space Agency) and JAXA (Japan Aerospace Exploration Agency) and increased revisiting time of the new instruments on-board satellites. Other reason for this increase are the latest developments in processing methods such as PSI (Persistent Scatterer Interferometry) and even increasing number of cloud processing options provided by universities and research centres. Nevertheless the information obtained by this manner has some drawbacks for example moderate spatial resolution. This is why in-situ data from precise GNSS (Global Navigation Satellite System) measurements are essential. In this study the authors used both kinds of data to study one of the regions of Bulgaria which is recognized to be highly prone to seismic and geological hazards namely the Southwest region. For this research two sources of data have been used - SAR (Synthetic Aperture Radar) data from Sentinel-1 mission of ESA and in-situ acquired contemporary and older GPS (Global Positioning System) data. As a result of SAR data processing produced were interferometric images from ascending and descending orbits to decrease the effect of the mountainous topography, while the results from the GNSS measurements were used for verification.

Atanasova-Zlatareva, M., **Nikolov, H.** Establishing Surface Displacements along a Railway Route near Mirovo Salt Deposit, NE Bulgaria. Proceedings of the 8th International Conference on Geographical Information Systems Theory, Applications and Management - GISTAM, 2022, pp.155-162, ISBN:978-989-758-571-5, ISSN:2184-500X, DOI:10.5220/0011075400003185

Линк към публикацията:

<https://www.webofscience.com/wos/alldb/full-record/WOS:000803076800017>

Абстракт

Studying Earths' surface motions using data acquired by active instruments such as satellite Synthetic Aperture Radar (SAR) have become ubiquitous in the last years. This trend could be attributed to large extent to the open data policy of ESA that provides such type data from Sentinel-1 mission at no cost from several online repositories. On the other hand the results produced after processing them need to be validated by data from other sources. In this paper a framework for SAR data processing is presented, whose results are compared and analysed with results from GNSS networks. In order to increase the reliability of the information provided by the radar data used in this research ascending and descending orbits of the satellite were used in order to decrease the effect of the topography. Part of railway line which passes through the town of Provadia and industrial area near it was selected as test site. This object was chosen since surface deformations often occur in it caused by natural and anthropogenic activities in that area.

Г 7.10

Група Г

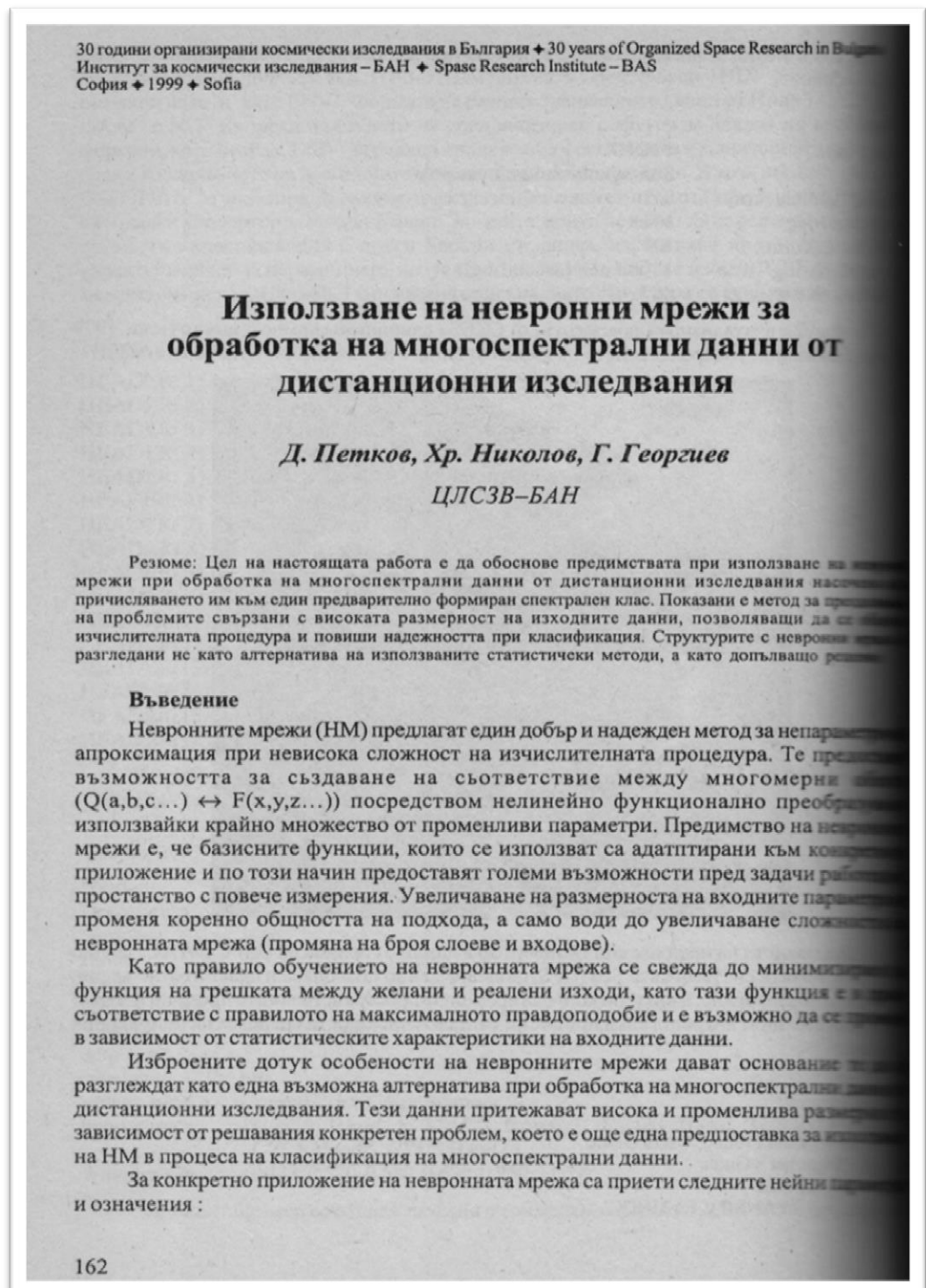
група Г показател 8

Г 8.1	<p>Velichkov A., Dombey A., H. Nikolov, T. Zdravev, D. Petkov, Image processing in transputer parallel environment, "Parallel Thinking" - Varna, In ACMBUL Newsletters, No 2, 1992,pp. 65-67</p> <p>Линк към публикацията:</p> <p>https://www.researchgate.net/publication/362776869_Image_Processing_in_Transputer_Parallel_Environment</p> <p style="text-align: center;">Абстракт</p> <p style="text-align: center;">1. Introduction</p> <p>An image processing has yet a long year history. The tasks in these field are characterized by its high complexity. Solving such a task in a real time needs a huge computational power. To obtain a real looking images 256 colors and number of pixels 512x512 for each image, are necessary. To satisfy this requirements, using a high resolution visualization system and high computational power, is essential. The transputers, which represents a contemporary "state of art" of computers for parallel environments, offers high computational possibilities at relatively low price i.e. high price/performance ratio, for building such a systems. Other goal when transputers are used is their flexibility. The aim of the proposed paper is to examine a pattern structure of parallel environment for image processing and a pattern algorithm for process an image. Presented in the article are results from experiments carried out with different number of transputers and different kind of connections between them - tree and ring.</p>
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Петков Д., **Николов Хр.**, Георгиев Г., Изследване на невронни мрежи за обработка на многозонални данни при дистанционни изследвания. Юбилейна научна сесия с международно участие: "30 години организирани космически изследвания в България" –София, 2000, стр. 118-121.

Линк към публикацията:
https://www.researchgate.net/publication/362770196_Izsledvane_na_nevronni_mrezi_za_obrabotka_na_mnogozonalni_danni_pri_distancionni_izsledvania

Абстракт



Г 8.3

Mardirossian G., Jeleв G., **Nikolov H.**, Mardirossian A., Electronic and Optic- Electronic Part of the System for Tsunami Physical Modeling, 12th, International scientific and applied science conference; Electronics ET'2003, pp. 174-179, , ISBN 054-438-374-3

Линк

към

публикацията:

https://www.researchgate.net/publication/343236174_Electronic_and_Optic-Electronic_Part_of_the_System_for_Tsunami_Physical_Modeling

Абстракт

Abstract. Nevertheless of the existing correct mathematical models, it could be claimed that only the tsunami physical modeling covers all the problems of tsunami generation and its effects, and to be used for prognostic purposes too. But the existing methods and instruments for tsunami physical modeling could lead to big mistakes in the capacity of the water displaced and the parameters of the modeled wave thereof, mainly due to non-reporting of the initial and final relief of the sea bottom.

The article briefly describes the method and apparatus for tsunami physical modeling, reporting the real relief of the sea bottom before and after the earthquake, giving a possibility for a multiple reiteration of the experiment, as well as a possibility for solving the opposite problem. A special attention is given to the most substantial part – the model block and more precisely, to the electronic and optic-electronic centers and elements. Basing the optimization analysis, selected are the main building elements and centers – lineal step electric engines, controllers, amplifiers, buffer blocks and etc. The program instruments used have also been discussed.

In projecting a concrete variety of the mechanism for the tsunami-genus Shabla focus in the Black sea, the main characteristics of this epicenter have been taken into consideration, motivated is the accepted space separating ability, maximum de-leveling, de-phasing per time, power of the electrical engines and etc. The vertical scale of the Black sea model is 1:2000 at expected and accepted real de-leveling of the bottom at an earthquake of magititude $M \approx 7,5$ of the order of 2–3 m.

The defects of the system, due to mainly the currently limited technological possibilities have also been commented.

The method and apparatus for tsunami physical modeling are under a patent defense.

Г 8.4

H. Nikolov, N. Nikolova-Jeliazkova, On the parameters selection of the neural network classifier for remotely sensed multichannel data, Минно-геоложки университет "Св. Иван Рилски", Годишник, том 47, свитък I, Геология и геофизика, София, 2004, стр. 283-286 , ISSN 1312-1820

Линк към публикацията:

<https://www.semanticscholar.org/paper/ON-THE-PARAMETERS-SELECTION-OF-THE-NEURAL-NETWORK-Nikolov-Nikolova-Jeliazkova/969eb363a6a3b6efb5d4214854e1d456f57a00fd#paper-header>

Абстракт

Neural networks have been used as a good general learning tool in data processing in solving large number of problems in many areas of scientific research. Since the neural networks falls in the category of supervised methods of classification the importance of the parameters of the network and training constraints are recognized as one of the key factors that affect the considerably on network performance. Different approaches could be adopted for tuning the parameters of the network, but there is not a rule of the thumb which is always valid. In this paper we propose some general rules, extracted from our experience classifying multispectral data from remote sensing experiments with neural networks, defining the role and the nature of each parameter. This rules target two basic topics in the methodology – first minimize the time needed for training the network (initial weights, momentum etc.), which allows the user to experiment with different structures. The second one is to find the most convenient structure of the network (number of layers, hidden neurons etc.) which suits the data used. We propose new characteristic features of the studied objects to be derived from the multispectral data, resulting in increase of the accuracy.

Г 8.5

Nikolov H., D.Borisova, M. Danov. *Sub-pixel mapping of open pit dumps.* Proceedings of the 11th International Scientific Conference "Solar-Terrestrial Influences", Sofia, pp.119-121, 2005

Линк към публикацията:

https://www.researchgate.net/publication/235970798_Sub-Pixel_Mapping_of_Open_Pit_Dumps

Абстракт

Investigating open pit dumps by means of remotely sensed multispectral data with moderate spatial resolution, often in form of an image cube, is a challenging task. The major difficulties arise from: 1) large period using the dump; 2) the unknown proportions of vegetation and soil/rock samples. A variety of methods have been proposed to overcome the problems with impure pixel, but a promising one is the soft classification. In this scenario for every pixel of the data the correct proportion of the end-members should be found and then co-registered with the corresponding original pixel. As a result this sub-pixel classification procedure generates a number of fraction images equal to the number of land cover classes (end-members). All sub-pixel mapping algorithms have one property in common: accuracy assessment of sub-pixel mapping algorithms is impossible because of missing high resolution ground truth imagery. In this case one possible solution is to use laboratory and in-situ measured spectrometric data. This study presents a successful implementation of soft classification method with additional, precise spectrometric data.

Г 8.6

Borisova D., **Nikolov H.**, Danov M., Kancheva R.. *Recognition of iron-containing ore minerals and rocks using remotely sensed data*, Proceedings, 4th Congress of the Balkan Geophysical Society, Oct 2005, Journal of the Balkan Geophysical Society, Vol.8, Suppl.1, pp. 275-278, 2005, DOI: <https://doi.org/10.3997/2214-4609-pdb.26.O13-02>

Линк към публикацията:

<https://www.earthdoc.org/content/papers/10.3997/2214-4609-pdb.26.O13-02>

Абстракт

Recognition of iron-containing ore minerals and rocks using remotely sensed data is a special case. Spectral mixture analysis has as one of the basic objective the definition of subpixel (subclass) proportions of spectral endmembers (classes) which are related to mappable surface constituents. Spectral mixture analysis decomposes the mixed pixel determining the fractions of each spectral endmember which combine to produce the mixed pixel's spectral signature. The spectral signature of the pixel is a combination (linear or non-linear) of the spectral signatures of the component surfaces. Assuming linear mixing, (the spatial fractions = the spectral fractions) we consider these fractions to be the area fractions. In this paper a study on ore minerals and rocks reflectance and emissivity was conducted. The data used during our study consists of reflectance VIS-NIR spectra derived from an image of the region of interest and modern topographic map. Remotely sensed data obtained in year 2000 for a region near an opencast mine in Bulgaria are compared with laboratory multispectral measurements of rock and mineral samples performed in the visible, near infrared and thermal infrared bands with multi-channel radiometers. Field data were collected to describe the characteristics of these classes in terms of land cover. Our results confirmed that successful methodology for remotely sensed data interpretation has been worked out.

Г 8.7	<p>Kancheva R., H. Nikolov, D. Borisova. <i>Modeling and verification in vegetation spectral studies</i>. Annual UMG "St. Ivan Rilski", Part I: Geology and Geophysics, vol. 48, pp.221-224, 2005.</p> <p>Линк към публикацията: https://mgu.bg/wp-content/uploads/2022/02/ANNUAL-I-Vol.-48.pdf</p> <p>Абстракт</p> <p>Remote sensing technologies are recognized as an efficient tool for getting information about land covers and have a wide range of investigation and application fields. In agriculture, remotely sensed data are used for plant growth monitoring, precision agriculture running and yield prediction. The interpretation of airborne and satellite data require explicit <i>a priori</i> information about crop spectral behavior under different conditions. Besides, the necessity to use various geoinformation technologies incorporating remote sensing and in-situ observations, ancillary data and etc., imposes data integration and sharing between different data sources. The paper is devoted to ground-level spectrometric studies as an integral part of remotely sensed data analysis.</p>
Г 8.8	<p>H. Nikolov, Borisova D., M. Danov, Classification of open pit mines and dump areas based on land cover mapping, Scientific Conference "SPACE, ECOLOGY, SAFETY" with International Participation 10–13 June 2005, Varna, Bulgaria</p> <p>Линк към публикацията: https://citeseerx.ist.psu.edu/viewdoc/summary;jsessionid=9E7C6DD3FC A4C408232A1063442C6F5A?doi=10.1.1.522.4077</p> <p>Абстракт</p> <p>Ferrous and non-ferrous open pit mining and waste dumped are result of a human activity and are the largest pollutants for certain regions in Bulgaria. Since in the most of the open pits the mined substance is stone we suggest the remote investigations in such area to be carried out in the more informative infrared range of electromagnetic spectrum. The data used during our study consists of laboratory measurements and airborne data in visible, near infrared, middle infrared and thermal ranges. After data processing and interpretation, areas into which reclamation activities have been made, could be easily determined. These results support the assessment of the human impact on the ecological status in contaminated by mining actions regions. Obtaining more reliable results is expected by the recently launched instruments with higher spatial resolution (less than 20 m).</p>

Г 8.9	<p>Georgiev G., Petkov D., Nikolov Hr. A field WLAN for agrometeorological data collection. Conference Proceedings, 4th Congress of the Balkan Geophysical Society, Oct 2005, cp-26-00162 "International Conference and Exhibition of Applied Geophysics and Earth Physics". – Bucharest, 2005</p> <p>Линк към публикацията: https://www.earthdoc.org/content/papers/10.3997/2214-4609-pdb.26.P9-03</p> <p style="text-align: center;">Абстракт</p> <p>Planning remote sensing experiments involves acquisition of airborne and in-situ data of the studied objects. The in-situ gathered data provides additional information that is helpful in establishing ground control points by GPS, measure the meteorological conditions, moisture. The last two parameters are of vast significance when monitoring vegetation cover and soil conditions. The proposed telemetric system consists of distributed network stand-alone field measuring devices. The main components are the autonomous, battery-powered microcontroller operated devices. The network has flexible structure that can be changed easily in order to meet the requirements of different type applications such as commands and data exchange between field-based devices.</p>
Г 8.10	<p>Tishchenko Yu., A. Chukhlantsev, S. Marechek, E. Novichikhin, S. Golovachev, R. Kancheva, D. Borisova, H. Nikolov, D. Petkov. <i>Spectrally-dependent attenuation of microwaves by vegetation canopies</i>. Proceedings of 26th EARSeL Symposium Warsaw, Poland, 29 May – 02 June 2006 "New developments and challenges in remote sensing", Millpress, Rotterdam, pp.73-80, 2007, ISBN 978-90-5966-053-3</p> <p>Линк към публикацията: http://www.earsel.org/symposia/2006-symposium-Warsaw/pdf/270.pdf</p> <p style="text-align: center;">Абстракт</p> <p>A wide-band waveguide transmission system and measuring technique have been developed to obtain continuous attenuation spectra of microwaves by vegetation in the frequency range 0.8–10.0 GHz. Laboratory experiments have been performed in order to examine the spectral dependence of the attenuation by different trees and tree fragments. Some results are presented showing the distinct difference of the attenuation as a function of the wavelength, vegetation type and moisture content. The attenuation of the microwave electromagnetic radiation by vegetation canopies is an essential factor in land cover radiometric studies. The knowledge of the attenuation effects is extremely important for remote sensing investigations as well as for improving the reliability of radio communications. The multiple dependence of the attenuation on such factors as the wavelength, incident angle, polarization, vegetation moisture, density and structural peculiarities makes the solution of the problem still more difficult.</p>

Г 8.11	<p>Borisova D., H. Nikolov, M. Danov, V. Tsanev, M. Tokmakchieva, B. Banushev. <i>Combined use of multispectral and thermal data for assessing iron distribution in mine areas</i>. Proceedings of 5th National Conference GEOSCIENCE 2006 with International Participation, Sofia, pp.306-308, 2006.</p> <p>Линк към публикацията: http://bggs.eu/Geonauki_2006/72.pdf</p> <p style="text-align: center;">Абстракт</p> <p>Correct estimation of the iron distribution in open pit mines and the neighboring regions is a key issue for the ecological state assessment of land cover. This problem is of great importance for Kremikovtzi area since it is located closely to a large number of populated zones. For this study combined use of multispectral data (Landsat ETM+ including thermal band) in combination with field and laboratory based data were utilized in the assessment of the environmental state from previous mining activities. The unmixing method was chosen in the process of classification of land cover. Large number of mineral, rock and soil samples was collected during a field campaign in the study area to obtain correct statistics. The laboratory measurements performed on those samples were separated as follows: 1) conventional chemical and mineralogical analysis and 2) non-destructive spectroscopy in VNIR (using TOMS, 0.45-0.9 um) and thermal (using TIRES, 8-14 um) ranges with different spectrometric systems. All laboratory data together with the field-acquired multispectral data were used to develop a model for the iron content in the samples. Next we developed a model for validation of Landsat ETM+ data, selecting representative pixels from the study area where the vegetation cover is less than 40 percent, with those achieved by other means. The results exhibited a good correlation between the model and the real multispectral data. For the thermal bands a practical method was developed for converting the emissivity data to temperature.</p> <p>Earth observation applications in the mining industry include the production of thematic maps for ground inspection and mineral alteration maps for exploitation. The exploitation of mineral resources is always associated with change of the land cover. Thorough monitoring of degraded areas is an essential task for effective management of surface mine recovery (Parks et al, 1987). The geological exploration of the iron-bearing rocks in the Kremikovtzi region started in the late 50-ies of 20-th century. As a result the mining plant "Kremikovtzi" was built who started its production 1963</p>
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Г 8.12

Tishchenko Yu., V. Savorskiy, M. Smirnov, R. Kancheva, D. Borisova, **H. Nikolov**, D. Petkov. Ecological monitoring of the Black Sea region. Proceedings of International Conference "Fundamental Space Research", Sunny Beach, Bulgaria, pp. 47-50, 2008.

Линк към публикацията: <http://www.stil.bas.bg/FSR/> ;
[https://www.researchgate.net/publication/339069985 Ecological Monitoring of the Black Sea Region](https://www.researchgate.net/publication/339069985_Ecological_Monitoring_of_the_Black_Sea_Region)

Абстракт

Hazard situations, ecological risks and destructive processes on our planet caused by natural disasters or anthropogenic activity are in the focus of scientific research and occupy the attention of state and government authorities. Recently, numerous projects on the environment study and control have been developed and carried out in different countries. In most of these projects a first and essential step is land cover change monitoring at a regional scale [1-4]. Remote sensing is the main source of information covering large territories, often being predictive and in this way giving possibilities for an appropriate and on-time decision making. The necessary data can be provided by a complex of instruments installed on airborne and satellite platforms thus implementing the multiscale, multipurpose and multitemporal approach [2, 5]. Such an insight on data acquisition and application approach is dictated by the interrelated nature of many environmental problems which determines the need of data integration and information sharing between different databases. On the other hand, since environmental situations are most often site-specific, the regional monitoring is a reasonable approach to begin with.

In the frameworks of a Project for joint Russian-Bulgarian activities on the development and application of new technologies in the aerospace remote sensing of the Earth, we suggest for regional monitoring, to rely on well equipped small aircraft platforms in combination with ground-based networks. Land covers state assessment will be performed and risk indices will be evaluated by using data in the visible, infrared and microwave spectral bands. A Geo-Information Monitoring System, including on-ground and aerospace monitoring and modeling of the Black Sea basin is supposed to be created. Any proposals for collaboration from other countries of the Black Sea region or elsewhere are welcome.

The results from aerospace observations and data processing technologies will permit to work out recommendations for detecting ecological systems in a risk state, for predicting ecological catastrophes and mitigation of their consequences.

Г 8.13

Nikolov H., D.Borisova. *Assessment of the reclamation activities near non-operating mine by remote sensing.* Proceedings of International Conference "Fundamental Space Research 2009", Bulgaria, pp.50-52, 2009.

Линк към публикацията: <http://www.stil.bas.bg/FSR2009/pap50.pdf>

Абстракт

The geological exploration of the copper-bearing rocks in the Sredna gora region, located in the middle of Bulgaria, started in the late 50-ies of 20-th century. As a result the mining plant "Medet" was built who started its production 1964. The main activity of this plant is extraction and recovery of copper together with all relevant engineering and commercial actions. The experience for exploration and mine plant construction gained on this site was implemented on other mine plants across Bulgaria during 60 and 70-ies of same century. In 1994 the open pit mine "Medet" was closed, but the newly developed "Asarel" mine started its operation.

In both cases the ore deposits are developed by open pit mining and together with them the dump areas are one of the largest pollutants of the environment in this region. That is the reason to start monitoring and rehabilitation activities for the region as a whole eco system. A monthly bulletin about the quality of the air and water is published and distributed in by local authorities. In the 2003 the company Assarel-Medet SJSCo implemented an integrated control system according to the international standards ISO part of which is an environmental standard ISO 14001:1996. This policy for ecologically clean production could be supported to great extent by data obtained by existing and new remote sensing instruments having moderate to high spatial resolution. Compared with the data taken 20 years ago the spatial precision of the data improved more then twice which may result in better decision support. This is the motivation of the team – to develop better understanding of the reclamation process and its monitoring.

The methodology of widely used *change* detection, based on *in-situ* digital data, is the process related to the changes of the land-cover properties. By this means the changes in the land cover between two dates are highlighted. Change detection has been used in many applications such as land-use changes, rate of deforestation, urban areas alteration implementing remotely sensed data along with spatial and temporal analysis procedures and digital image processing techniques.

Г 8.14

Borisova D., B. Banushev, **H. Nikolov**. *Granite and granodiorite identification using spectral unmixing techniques*. Proceedings of 5th Congress of Balkan Geophysical Society, Belgrade, Serbia, 10-16 May 2009, , 2009. ISSN:987-954-322-409-8

Линк към публикацията:

<https://www.earthdoc.org/content/papers/10.3997/2214-4609-pdb.126.6518>

Абстракт

The development of efficient technologies for data analysis is one of the most challenging issues that the remote sensing community is facing. Matters of data reduction, processing algorithms accuracy, information amount, cost and time saving determines the efficiency of data analysis. The importance of this issue is directly connected with the ever-increasing quantity of data provided by numerous airborne, field and laboratory operated sensors, with their synergistic use as well as with the accuracy of data processing algorithms and results verification. We present here some results from a study of different spectral unmixing techniques over two similar rock types such as granite and granodiorite in relation to objects type and proportions determination. Experimental data from field and laboratory spectral reflectance measurements in the visible and near infrared band are used. Various decomposition methods (linear unmixing, clustering) are applied and evaluated. Spectral linear unmixing is efficient approach to the spectral decomposition of multichannel remotely sensed data. A main problem to its process is that the number of spectral components (has to be correctly distinguished. Therefore, the evaluating of the possibility of using spectral mixture decomposition in relation to their type and proportion determination for subpixel identification is described.

Г 8.15

Borisova D., **H. Nikolov**, B. Banushev. *Monitoring water quality in open basins of non-operating mines and dumps*. Proceedings & Exhibitors' Catalogue of 6th Congress of Balkan Geophysical Society, 2011, , ISBN 978-90-73834-16-3, DOI: <https://doi.org/10.3997/2214-4609-pdb.262.B10>

Линк към публикацията:

<https://www.earthdoc.org/content/papers/10.3997/2214-4609-pdb.262.B10>

Абстракт

Within this research we explore time and seasonal behavior of multispectral satellite data with middle to high spatial resolution in order to estimate the content of metal particles in the water basins formed by non-operating copper mine and dumps. The aim is to test if regression model could be created between metal polluted water and the spectral response of the basins. As basis the spectral response of the embedded rocks of the copper mine and sands on the beaches of the dump site have been investigated. Similar to the well known vegetation indices such as NDVI several spectral indices are suggested, analyzed and the results are reported. The obtained results showed that the analyzed data and the implemented approach are proved to be useful in environmental monitoring process for the mining company responsible for the ecological state of the region. Also the successful implementation of method could be considered as basis for establishment of airborne monitoring of the ecological state of these areas.

Абстракт

Abstract

Aim: In this research we focus on the environmental status of the most exploited open pit copper mines in Europe "Medet".

Materials and Methods: As first step of the impact assessment change detection methods were used to evaluate the short-term reclamation activities by examining the vegetation cover status in the areas surrounding the mine. To complete this task multispectral and multitemporal data from Landsat TM/ETM+ instruments along with in-situ measured data was used. For data processing several techniques, both standard, such as basic and advanced statistics, image enhancement and data fusion, and novel methods for supervised classification were used.

Results: The observed change in the landscape near the mine site is mostly due to expansion of the roads leading to the dumps. No decrease of the area of the open pit was found, but only seasonal variations.

Conclusions: The remotely sensed data and the implemented approach are useful in environmental monitoring and are economically attractive in assessing the activities undertaken by the company responsible for the regional ecological state.

Keywords: mining industry impact, multitemporal remote sensing, water pollution, waste management

Introduction

Open pit mining in the last decades brought large increase of pit sizes and extracted ore volumes. Large volumes of waste rock and ore (50.000-100.000 tons per day) are moved. In the second half of 20-th century the second largest European open pit mine was Medet/Bulgaria copper mine (11 million tons per year). The ore deposits were developed by open pit mining and together with them the dump areas are one of the largest pollutants of the environment in this region. In this research we were focused on one environmental status of one of the most important copper producing fields for our country - Medet deposit.

The objectives of the study were: (1) to perform multitemporal analyses on multispectral satellite data for a period 1972 - 2011 in order to assess the land cover change due to mining activity in the area of Medet open pit mine; (2) to prove that by means of remotely sensed data an integrated assessment on the environmental impact from the mining activities can be made.

After ceasing its exploitation in 1994 a rehabilitation program for soil cover and hydro-graphic network monitoring was established and launched. A monthly bulletin about the quality of the air and water is published and distributed by local authorities. This policy for ecologically clean production could be supported to great extent by data obtained by the new satellite based remote sensing instruments with their increased spatial resolution.

Г 8.17	<p>Borisova D., Nikolov H., Banushev B., <i>Assessment of environmental conditions close to abandoned open mines</i>, Proceedings of 7th Congress of the Balkan Geophysical Society, Tirana, Albania, 18650.pdf, ISBN 978-90-73834-55-2, 2013, doi:10.3997/2214-4609.20131724</p> <p>Линк към публикацията: http://www.earthdoc.org/publication/publicationdetails/?publication=71451</p> <p style="text-align: center;">Абстракт</p> <p>As main source of information spectral data from three different sources airborne, field and laboratory measurements are considered. The main assumption is that correlation exists between all mentioned data and this way extrapolation about the soil state can be made over larger regions based on single point measurements. The advantage is that these data are acquired digitally, at the moment there is a large series of them over same regions and they can be easily processed and utilized in various information formats. In order verify of the results gathered from satellite data additional spectrometric measurements of samples from test sites are performed in-situ and in laboratory. The final target is to estimate the damage caused by sample open pit mine to the neighboring soil cover. The obtained results show that the used data and the implemented approach are useful in soil condition estimation and the method proposed is economically attractive for the company responsible for maintenance of the ecological state of the region.</p>
Г 8.18	<p>Nikolov H., D. Borisova, D. Petkov, T. Lubenov, <i>Remotely sensed data for water volume assessment in inoperative mines</i>, Proceedings of 7th Congress of the Balkan Geophysical Society, Tirana, Albania, 18647.pdf, ISBN 978-90-73834-55-2, 2013, doi:10.3997/2214-4609.20131721</p> <p>Линк към публикацията: http://www.earthdoc.org/publication/publicationdetails/?publication=71448</p> <p style="text-align: center;">Абстракт</p> <p>Abandoned open pit mines create serious ecological risk for the region of their location. This is valid especially for the quality of water since the rainfalls together with underground waters fill the open pit and form water body with different depth. One example for such opencast, inactive copper mine is Medet (Bulgaria). There are many cases reported for water pollution by heavy metals in the rivers running close to this open pit mine after autumn and spring rains. This justifies the need for long term and sustainable monitoring of the area of the water basin of this unused mine in order to estimate its acid drainage. The imaging spectroscopy combined with is-situ investigations is proved to provide reliable results about the area of the water table and the water volume in it. In this study we have investigated historical data gathered by remote sensing which allowed us to make conclusions about the year behavior of this area. The team expects that the results of this research will help in the rehabilitation process of this inactive mine and will provide the local authorities engaged in water quality monitoring with a tool to estimate the possible damage caused to the local rivers.</p>

Г 8.19

Borisova, D., **Nikolov H.**, B. Banushev, D. Petkov, *Estimation of water area increase by remotely sensed data in the non-operating open pit mines Medet and Kremikovtsi*, Annual of the University of Mining and Geology "St. Ivan Rilski", Vol. 56, Part I, Geology and Geophysics, pp. 163-166, 2013, ISSN 1312-1820, <https://mgu.bg/wp-content/uploads/2022/02/Vol.-56-I-2013.pdf>

Линк към публикацията:

Абстракт

Abandoned open pit mines create serious ecological risk for the region of their location. This is valid especially for the quality of the water since the rainfalls together with underground waters fill the open pit and form water body with different depth. The examples for such opencast, inactive mines are the copper mine Medet and the ferrous mine Kremikovtsi. There are many cases reported for water and soil pollution by heavy metals in the rivers running close to these open pit mines after autumn and spring rains. This justifies the need for long term and sustainable monitoring of the area of the water basins of these unused mines in order to estimate its acid drainage. The imaging spectroscopy combined with in-situ investigations is proved to provide reliable results about the area of the water table. In this study we have investigated multitemporal data gathered by remote sensing which allowed us to make conclusions about the year behavior of both areas. The team expects that the results of this research will help in the rehabilitation process of the inactive mines and will provide the local authorities engaged in water quality monitoring with a tool to estimate the possible damage caused to the local rivers and to the soils in the neighboring areas.

Г 8.20

Николов Х., Д. Борисова, Д. Петков, Т. Любенов, *Моделиране на обем на водно тяло в изоставени открити рудници по данни от дистанционни изследвания*, Сб. доклади XXIII международен симпозиум “Модерните технологии, образованието и професионалната практика в геодезията и свързаните с нея области”, 2013

Линк към публикацията:

Абстракт

Нефункционалните и изоставени открити минни изработки създават сериозни предпоставки за увеличаване на степента на екологичен риск за региона, в който са разположени. Основен източник на замърсяване е събиращата се в чашата на открития рудник вода, дължаща се на валежите и неизпомпваните и отвеждани подземни води. Тази вода по правило е с много висока концентрация на метали и е силно замърсена, тъй като повечето скали, потопени във вода за по-дълъг период, създават окиси на съдържащите се в тях метали. Един доста често срещан случай е разтваряне на сулфиди на метали (пиритни руди) и образуване на сярна киселина, която от своя страна е в състояние да разтваря тежки метали като арсен, олово, хром, кадмий. За години, в които есенните и пролетните дъждове са по-обилни, има много съобщения за случаи на замърсяване с тежки метали на водите в протичащите в близост реки. Това обосновава необходимостта от дългосрочно и устойчиво наблюдение на района на формирания в неизползвана минна изработка водоем, за да се оцени темпа на нейното нарастване и да се набележат мерките за нейното отводняване. В това изследване като пример за такава открита, неексплоатирана открита минна изработка ще се разгледа рудник “Медет”, който е част от Панагюрското рудно поле. Тя е въведена в експлоатация преди 50 години и била е най-голямата в България към онзи момент, но през 1994 г. на 20 в. експлоатацията е прекратена. В настоящото изследване са използвани многоканални изображения, комбинирани с in-situ измервания, за които е доказано, че предоставят надеждни резултати за идентификация на площта и възможност за изчисляване обема на водното тяло. В това проучване сме използвали времева поредица данни, събрани чрез дистанционни изследвания, което ни позволи да направим изводи за целогодишното състояние на рудника. Екипът се надява, че резултатите от това изследване ще подпомогнат процеса на възстановяване на околната среда от минните дейности, предлагайки надежден и ефективен метод за мониторинг на минни изработки извън експлоатация. Също така по получените резултати и ще предоставят на местните власти, ангажирани в мониторинга на качеството на водите в района, инструмент за оценка на възможни щети причинени на местните реки и почви.

Г 8.21

Atanasova, M., **Nikolov H.**, *Detection of the Earth's crust deformation in Provadia area using InSAR technique*, XXVI International Symposium on Modern Technologies, Education and Professional Practice in Geodesy and Related Fields, Sofia, Bulgaria, November 03-04, 2016, ISSN 2367 – 6051

Линк към публикацията:

https://www.researchgate.net/publication/311035762_DETECTION_OF_THE_EARTH%27S_CRUST_DEFORMATION_IN_PROVADIA_AREA_USING_INSAR_TECHNIQUE

Абстракт

The InSAR technique provides fast and accurate means for detecting even small displacements of the Earth's having a magnitude of several centimeters. This method is particularly suitable in monitoring horizontal or vertical movements of natural or anthropogenic origin. The information concerning the shifts is based on solely on the interferograms resulting from processing phase data contained in two SAR images from different dates over the same region. The periodic geodetic measurements are made in order to obtain reliable information on horizontal and vertical movements and deformation processes of the Earth's crust, resulting in shrinkage, stretch, sinking, tilting. Compared to geodetic measurements, the InSAR interferograms, obtained from satellite-based instruments, cover larger areas thus offering cost effective manner for monitoring of deformation and movements on the Earth's crust.

The motivation behind this research was to study the crustal deformations in the area Mirovo salt deposit near the town Provadia, NE Bulgaria which has been extensively explored by other in-situ methods. The authors provide here first results on processing freely accessible interferometric data from Sentinel-1 SAR mission by ESA for the said region following the Differential Radar Interferometry (DInSAR) method and draw conclusions on the deformations detected based only on these results.

The choice of Mirovo salt deposit was made since it is a unique natural phenomenon for Bulgaria taking into accounts its origin, shape, composition and location. From geological and geophysical point of view the region is characterized by several faults with different spatial orientation, forming a complex tectonic unit and block fragments. Also this area has been investigated for its seismicity in several studies. The mentioned peculiarities justify the necessity of regular monitoring of the geodynamic situation and surface subsidence in it.

Regardless of the short time between the acquisitions of the source images used in interferogram creation the results presented unequivocally supported the drawn conclusions for the small horizontal and vertical movements that have been detected. Here we present a method for revealing displacement with magnitude of 5 to 6 mm/y and they have been compared with repetition levelling and precise GPS data from field surveys conducted in the said area. Based on these results one can make reliable forecast with regard to further progress of those movements since several areas having different type of movement were identified. In this research we present results of the analyses of the geological and seismotectonic situation, assessment of the surface subsidence, analyses of the seismic regime variation for the zone of the Mirovo salt deposit.

Г 8.22

Borisova D., B. Banushev, **H. Nikolov**, D. Petkov, 2016. *Identification of exposed rocks in open pit mines using infrared spectral data*. Annual of the University of Mining and Geology "St. Ivan Rilski", Vol. 59, Part I, Geology and Geophysics, ISSN 1312-1820, pp. 192-195.

Линк към публикацията:
https://www.researchgate.net/publication/362377716_Identification_of_exposed_rocks_in_open_pit_mines_using_infrared_spectral_data

Абстракт

In this study satellite data from Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) in the wavelength range (1.6-2.5 μm) of bare rocks and soils in the region of open pit mines "Elshitsa" and "Tsar Asen" in Bulgaria were used. The spectral reflectance of exposed rocks was compared with the spectral reflectance of the same rocks taken from different spectral libraries. The analysis of the spectral characteristics in the specified range indicates maintain their specific features. In the obtained curves were observed distinctive extrema that be able to be used to identify the type of rocks. The results show that the suggested methods for analyzing the spectral data could be used to identify exposed rocks. Theoretical and analytical techniques that have been developed for the analysis of the laboratory spectral data also could be applied to field spectral data.

Г 8.23

Nikolov, H., Borisova, D., *Detecting landscape changes near open pit mines*. Proceedings of Fifth International Conference Ecological Engineering and Environment Protection (EEEEP'2017), National Association "Ecological Engineering and Environment Protection", 2017, ISSN:2535-0773, pp. 179-185

Линк към публикацията:

https://www.researchgate.net/publication/362945953_ECOLOGICAL_ENG_INEERING_and_ENVIRONMENT_PROTECTION_EEEP'2017_FIFTH_IN_TERNATIONAL_CONFERENCE_PROCEEDINGS_Plovdiv_BULGARIA

Абстракт

Open pit mining areas in Europe are 8333 km² according to Corine2006 data. In this article we focus our research on landscape change in one of the most exploited mining areas of Bulgaria - the Panagyuriste ore district. We explore the impact of the mining industry in this specific area as it has been exploited since the early 1960s. In our previous studies, we tracked small-scale environmental changes examining a particular opencast minework, and one of the conclusions was that a broad study covering the entire region was needed. In this case we focus on the changes taking place over a larger area and the impact that this specific species has activities have on the environment. We expect that the results of this study can be used for the better regional level planning. A major source of data used throughout this study is the multi-channel data from the TM / ETM + / OLI instruments of the Landsat satellite and this selection is based on the two basic requirements for this study - repeatability of data and derived products and free access next to them. Additional data from other sources - measurements - were used to confirm the results on site by the team at specific points of the researched area, digital orthophotos, DEMs', etc.

Г 8.24

Borisova, D., Banushev, B., **Nikolov, H.**, Nedkov, R., Avetisyan, D., *Hyperspectral measurements of rocks and soils in Central Srednogie.* Journal of Mining and Geological Sciences, 60, Part I, Publishing House "St. Ivan Rilski", 2017, ISSN:1312-1820, pp. 117-121

Линк към публикацията:

https://mgu.bg/wp-content/uploads/2021/10/B7_BorisovaD-et-all-2017.pdf

Абстракт

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 used Landsat, ASTER, and Sentinel satellites images to interpret structures, soils and rocks. For data verification, the hyper-spectral systems USB 2000 and NIRQUEST 512.2 of Ocean Optics Inc. are used in laboratory and field spectrometric measurements. They make it possible to define the 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.

Г 8.25

Атанасова М., **Николов Х.**, *Изучаване на взаимовръзките между почвената влага и активните свлачищни процеси в Северозападна България въз основа на SAR данни*, Списание „Геодезия, Картография, Земеустройство“, 5-6, 2018, ISSN:0324-1610, pp. 22-27

Линк към публикацията:

https://mgu.bg/wp-content/uploads/2021/10/B7_BorisovaD-et-all-2017.pdf

Абстракт

Влиянието на водното ниво на р. Дунав и неговите притоци са един от ключовите фактори за развитието на свлачищни процеси в северозападната част на България. Започвайки с оценка на специфичната геоложка обстановка за района, в който бе извършено изследването, а именно от гр. Видин до гр. Никопол, където са локализирани голям брой свлачища, беше уточнен периметъра на тяхното разпространение. Повечето от споменатите свлачища са активни и стабилизирани, формирайки една почти непрекъсната линия. Характерна особеност за този тип обекти от района, е че те се намират в крехко равновесие, което често се губи при увеличаването на количеството повърхностни и подземни води, които се считат за основна причина за тяхното активизиране. В рамките на това изследване са използвани свободно достъпни данни от SAR апаратурен комплекс, намираща се на борда на сателита Sentinel-1, за наблюдение площта на водни тела и определяне количеството на почвената влага. Тази информация бе използвана като индикатор за инициране и последващ мониторинг на потенциални свлачищни дейности. За някои от свлачищата в района (гр. Лом, гр. Оряхово) са създадени интерферометрични карти за да се оцени повърхностната деформация, като за същия период бяха оценени площите на водните тела и влажността на почвата. Приложеният при това изследване комплексен подход наложи използване на данни от различни източници, които бяха обединени и обработвани в ГИС среда.

Г 8.26

Atanasova, M., **Nikolov, H.**, Ground displacements detection in Trifon Zarezan landslide based on GNSS and SAR data. Micro Macro & Mezzo Geo Information, 11, Geo-SEE Institute, 2018, ISSN:1857-9000, EISSN: 1857-9019

Линк към публикацията:

http://mmm-gi.geo-see.org/wp-content/uploads/MMM-GI_11/Atanasova_M-Nikolov_H.pdf

Абстракт

The Trifon Zarezan landslide is one of the well-studied areas north of Varna. It has been registered in 1998 and monitored since then, but due to expansion of construction activities and lack of sewerage facilities in 2005 it exhibited strong activation seriously damaging the panoramic coastal road remaining closed up to nowadays. One important issue in mitigating the effect of this phenomenon is its continuous monitoring and one promising solution of this problem is the usage of differential Synthetic Aperture Radar interferometry. In the framework of this study two sources of data have been used – three geodetic surveys and SAR data from C-SAR instrument onboard Sentinel-1. The main research objective was to combine the advantages offered by both data sources in order to produce regularly updated information about the whole site. The GNSS data are precise, but does not originate from dense geodetic network, while SAR data cover the whole area, but they lack of high spatial resolution which is disadvantage in case of exploring small areas such as this one. Based on the results achieved it can be concluded that both sources of data provide complementary information confirming the overall behavior of the studied phenomena for the time period analyzed.

Г 8.27	<p>Атанасова М. Николов Хр., Протопопова В. <i>Определяне на деформациите на земната кора след земетресение посредством DInSAR</i>, IXта Национална конференция по геофизика, 30 Ноември 2018, София,</p> <p>Линк към публикацията:</p> <p>http://www.bggs.eu/Conferencia_2018/contents.html http://www.bggs.eu/Conferencia_2018/Reports/N6.pdf</p> <p style="text-align: center;">Абстракт</p> <p>Земетресенията са природно бедствие, причиняващо щети, които се измерват с човешки животи и разрушения на природни и инфраструктурни обекти. Преки последствия от тяхното настъпване са предизвиканите цунами, активизирането на свлачища, разкъсвания и вибрации на земната повърхност. Важна задача след настъпване на подобно събитие е изготвянето на план за тяхното преодоляване, в основата на който са данни за състоянието на територията. Ценен източник на данни за текущото състояние на участъци от земната повърхност е програма „Коперник“ на ЕС. Един от нейните компоненти е съставената от два сателита мисия Sentinel-1, които осигуряват данни от радар със синтезирана апертура (РСА). Благодарение на тях е възможно определянето на деформации на земната кора. В това изследване те са използвани за определяне параметрите на деформациите настъпили вследствие на земетресението в Егейско море засегнало гръцкия остров Кос и гр. Бодрум в югозападната част на Турция на 20 юли 2017 г., чийто магнитуд е определен от NOA и KOERI на Mw 6.6. Данните от РСА бяха използвани за регистриране на настъпилите земни премествания посредством създаването на интерферометрични изображения, от които бе извлечена информация за причинените от земетресението пропадания.</p>
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Г 8.28	<p>Atanassov, V., Borisova, D., Dimitrov, V., Petkov, D., Nikolov, H., Georgiev, G., Vasileva, H., 2018. <i>Multisensor Earth observation system</i>. Proceedings SES2018, Space Research Technology Institute - Bulgarian Academy of Sciences, ISSN 2603-3313, 282-288</p> <p>Линк към публикацията: http://www.space.bas.bg/SES/archive/SES%202018%20DOKLADI/3_Remote%20Sensing/8_Atanassov.pdf</p> <p style="text-align: center;">Абстракт</p> <p>Satellite Earth observation systems mark the high rates of growth and today provide a huge volume with a wide variety of data regarding the spectral, spatial and temporal characteristics of observed objects. Notwithstanding these achievements, due to the particularities of the remote observation technology, it is not possible in many practical cases to define precisely certain characteristics of the monitored objects. Therefore, in order to make full use of this variety of multispectral high spatial resolution data is also required obtaining and using multisensor and multitemporal data from observation. In the proposed work, the authors discuss a multisensor Earth observation system focusing primarily on the place and role of these systems in today's Earth exploration phase. The examples presented show both the advantages of its use and the particularities of the functioning of such systems. The location and role of a multisensor system in sync with existing global observation systems is outlined, a set of tools and systems that could be included in the exemplary implementation of such a system is shown. The accompanying difficulties and challenges that need to be solved for sharing and merging data from a multisensor system are outlined.</p>
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Г 8.29	<p>Atanasova M., Nikolov H., <i>Detection of ground motions in coastal area</i>, XXIX International symposium on “Modern technologies, education and professional practice in geodesy and related fields”, 05-06 November 2019, Istanbul, Turkey</p> <p>Линк към публикацията: https://www.researchgate.net/publication/337445039_Detection_of_ground_motions_in_coastal_area</p> <p style="text-align: center;">Абстракт</p> <p>Landslide processes are considered to be the major part of the natural hazards occurring on the northern part of the Bulgarian sea side. Their monitoring can be done by direct measurements in dedicated GNSS networks, which is the most accurate method. The objective of this study is to provide solid grounds for monitoring of the landslide processes using innovative methods by combining GNSS and SAR data. This goal will be achieved by implementation the following two sub-objectives: first, establishment a verified methodology for extracting high-quality information from SAR images aimed at continuous monitoring of landslide areas integrating interferometric images (IFI) and in-situ GNSS data and second, based of freely accessible data provided by ESA and national sources to create a working prototype of an information system for monitoring and preventing the effects of earth crust movements (landslides, falls, etc.). One of the scientific tasks to be solved includes the development of methodological approaches to compare the results of the combined processing of interferometric images from SAR, in-situ measurements by permanent GNSS stations from the national NIGGG network in the area of study and geodetic measurements of a newly built test network a specific area on the Northern Black Sea coast of Bulgaria subject to landslide processes. After the primary processing of the data from three sources, their reconciliation which will form a geodatabase for subsequent spatial analysis envisaged in GIS environment.</p>
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Г 8.30

Атанасова М., **Николов Хр.**, *Изучаване на свлачищни процеси чрез съвместно използване на данни от INSAR и GNSS*, Списание „Геодезия, Картография, Земеустройство“, Съюз на геодезистите и земеустроителите в България - ФНТС, 2018, ISSN:0324-1610, бр. 1-2, стр. 16-22, 2020

Линк към публикацията:

<https://viewer.joomag.com/%D0%93%D0%B5%D0%BE%D0%B4%D0%B5%D0%B7%D0%B8%D1%8F-%D0%9A%D0%B0%D1%80%D1%82%D0%BE%D0%B3%D1%80%D0%B0%D1%84%D0%B8%D1%8F-%D0%97%D0%B5%D0%BC%D0%B5%D1%83%D1%81%D1%82%D1%80%D0%BE%D0%B9%D1%81%D1%82%D0%B2%D0%BE-gkz-1-22020-%D0%97%D0%B0-%D1%81%D0%B0%D0%B9%D1%82%D0%B0/0040504001589095337?page=3>

Абстракт

РЕЗЮМЕ

Основната цел на това изследване е мониторинг на процесите, протичащи в свлачищен район чрез допълващо използване на данни от SAR (радар с синтезирана апертура - PCA) и GNSS (глобални навигационни спътникови системи). Тя ще бъде постигната чрез прилагане на доказана методология за непрекъснат мониторинг на свлачищните зони посредством интегриране на информация от интерферометрични изображения и данни от GNSS. Това проучване предоставя надеждни данни за продължаващи рискови геопроцеси за региона на Североизточна България, който е известен с няколко големи активни свлачища. В рамките на изследването е създаден локален архив с изображения от Sentinel-1A/B за този регион, от който беше получен набор от интерферограми, показващи развитието на геодинамичните процеси. Получените от тях резултати са важни за разбирането на произхода и динамиката на свлачищните процеси, както и за оценка на произтичащите от тях опасности.

Г 8.31

Николов, Хр., Атанасова, М.. *Оценка на земните премествания в урбанизирани и промишлени райони посредством DInSAR времева серия.* X Национална конференция по геофизика, 2021, ISSN:1314 - 2518, 11-17

Линк към публикацията:

https://bggs.eu/Conferencia_2021/N2%20-%20DGB2021_Hristo_Nikolov.pdf

Абстракт

Деформациите на терена в градски и индустриални зони представляват сериозен риск за човешкия живот и причиняват значителни икономически загуби. Един съвременен метод за тяхното регистриране е използването на информация, получена чрез обработка на данни получени от сателитенобазирани радарни със синтезирана апертура (РСА). За да се получи тази информация е необходимо да са има големи времеви редове от тези данни, обработени по метод DInSAR. Благодарение на политиката за отворени данни на ESA от непрекъснато и регулярно регистриране на данни от РСА стана възможно да се направят оценки на текущите премествания на земната повърхност в района на град Перник. В този регион са разположени голям брой минни и промишлени предприятия, занимаващи се главно с производство и преработка на въглища и стомана, които са обслужвани от железопътни линии и магистрали. Също така плътността на населението в района е висока и поради тази причина там има и големи жилищни площи и обслужващата ги инфраструктура. Всички споменати промишлени, инфраструктурни и градски обекти могат да бъдат силно засегнати от бавни движения на земната кора, ако те не са правилно проследени във времето. Това е причината авторите да създадат кратки времеви редове с информация за тях получена от възходящи и низходящи орбити на мисията Sentinel-1 за да оценят протичащите геодинамични процеси в този регион. Тези резултати могат да бъдат използвани от местните власти за изготвяне на планове за смекчаване на тези неблагоприятни въздействия.

Г 8.32	<p>Атанасова, М., Николов, Хр.. Определяне на деформациите на земната кора посредством DInSAR настъпили след земетресението в района Лариса от 3 март 2021. X Национална конференция по геофизика, 2021, ISSN:1314 – 2518, 18-25</p> <p>Линк към публикацията: https://bggs.eu/Conferencia_2021/N3%20-%20DGB2021_Mila_Atanasova.pdf</p> <p style="text-align: center;">Абстракт</p> <p>Земетресенията са природно бедствие, причиняващо щети, които се измерват с човешки животи и разрушения на природни и инфраструктурни обекти. Преки последствия от тяхното настъпване са предизвиканите, активизиране на свлачища, разкъсвания и вибрации на земната повърхност, цунами. В това изследване сме се фокусирали върху определяне на настъпилите повърхностни деформации след земетресение Mw 6.0 /определено от NOA и USGS/, което се случи на 3 март 2021 г. на 20км северозападно от гръцкия град Лариса. Ценен източник на данни за текущото състояние на земната повърхност в райони е програмата „Коперник“ на ЕС. Един от нейните компоненти е съставената от два сателита мисия Sentinel-1, които осигуряват данни от радар със синтезирана апертура (РСА). Благодарение на тях е възможно определянето на деформации на земната кора. В това изследване те са използвани за определяне параметрите на деформациите настъпили вследствие на земетресението. Данните от РСА бяха използвани за регистриране на настъпилите земни премествания посредством създаването на интерферометрични изображения, от които бе извлечена информация за причинените от земетресението пропадания.</p>
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Г 8.33

Николов, Хр., Атанасова, М., Борисова, Д.. *Създаване на нов аерокосмически полигон в България за мониторинг и оценка на техногенното въздействие върху околната среда – Панагюрски руден район.* Proceedings of Seventeenth international scientific conference Space, ecology, safety – SES'2021, 2021, ISSN:p-ISSN 2603 – 3313 / e-ISSN 2603 – 3321, 192-198

Линк към публикацията:

http://space.bas.bg/SES/archive/SES%202021_DOKLADI/3_Remote%20Sensing/5_Nikolov.pdf

Абстракт

В този доклад са обобщени извършените дейности за създаване на нов тестов аерокосмически полигон в България насочен към проследяване динамиката на промените в ландшафта на Панагюрския руден район, като се използват най-новите постижения на технологиите за дистанционни и полеви изследвания. По принцип полигонали и тестовите участъци в тях са относително големи площи от земната повърхност съставени от обекти, които лесно се идентифицират в изображения получавани от сателитни и/или самолетни апаратурни комплекси. В разглеждания район е очевидно техногенното въздействие причинено от предходни (обхващащи последните 40 години) и съвременни минни дейности в няколко открити рудници разположени в него. В това изследване са представени резултатите, получени от авторите при изучаване на промяната в земеползването на районите, където все още функционират минно-добивни комплекси, състоящи се от открит рудник и флотационна фабрика. Друга важна тема, която беше изследвана, са дейностите по възстановяване на качествата на почвата в зоните изложени на висок риск от замърсяване и трансформацията на бивши насипища и хвостохранилища в няколко вече затворени минни обекта в същия регион. Друг резултат от проведеното изследване е редовното наблюдение на текущите минни дейности в изследваната зона, които се считат за основен фактор за местното (река Тополница), както и за трансгранично замърсяване на посредством река Марица. От изследванията, проведени до този момент, беше създадена обширна геобазаданни, която се състои от растерни и векторни слоеве, които са готови да бъдат използвани от местните власти за по-добро регионално планиране.

Г 8.34

Николов Хр., Атанасова,М., Протопопова, В.. *Приложение на сателитни SAR данни за установяване деформации на земната кора след земетресения*, Proceedings of 2nd National Workshop with International Participation on EU “Copernicus“ Programme, ISBN:978-619-7490-09-1, 2020, pp. 25-37

Линк към публикацията:

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

Абстракт

Сателитнобазираните радарни апартурни комплекси предоставят данни, на базата на които е възможно да се получи информация за размера на настъпили движения на земната повърхност от порядъка на сантиметри. Подобна информация е от изключително значение за оценка на последиците от природни бедствия или такива с антропогенен произход. Тъй като земетресения се случват постоянно и не е възможно да бъдат предсказани всяка допълнителна информация относно обхвата на конкретни сеизмично събитие е от изключителна важност за местните и национални власти, които са отговорни за отстраняване на щетите причинени на населението, инфраструктурата и ландшафта след такива събития.. В това изследване са представени резултатите получени след съвместна обработка на два набора SAR данни, допълнени и с данни от други източници, на чиято основа се формират две интерферометрични изображения, които предоставят информация за настъпилите деформационни процеси в райони от земната повърхност след поредица от земетресения, станали на три различни места на Балканския полуостров - едният в близост до остров Кос и град Бодрум, другият близо до остров Закинтос и третият на Йонийското крайбрежие на Албания. Получените карти, отразяващи деформациите на земната кора след споменатите събития, се основават на данни от възходяща и низходяща орбита на спътника Sentinel-1, който е част от програма „Коперник“ на ЕС за наблюдение на Земята. Получените резултати за трите изследвани събития включени в това проучване доказва своята надеждност тъй като бяха сравнени с in-situ измервания. Тази констатация дава основание да се твърди, че на базата на получените резултати е възможно на компетентните национални органи да се предостави надеждна информация относно настъпилите деформации на земната кора в региони, които са проблематични за директни теренни проверки, които имат за задача да установят настъпилите деформации.

Г 8.35

Атанасова, М., **Николов Хр.**, *Мониторинг на свлачищни процеси по Северното Черноморие на България, използвайки данни от програма Коперник*, Proceedings of 2nd National Workshop with International Participation on EU "Copernicus" Programme, ISBN:978-619-7490-09-1, 2020, pp. 38-52

Линк към публикацията:

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

Абстракт

Основната цел на това изследване е мониторинг на процесите протичащи в свлачищен район чрез допълващо използване на данни от SAR (радари със синтезирана апертура - PCA) и GNSS (глобални навигационни спътникови системи). Резултатите от изследването предоставят надеждни данни за протичащи рискови геопроцеси за региона на Североизточна България известен с няколко големи активни свлачища. Получените резултати са важни за разбирането на произхода и динамиката на свлачищните процеси, както и за оценка на произтичащите от тях опасности. В настоящото изследване е използван метод DInSAR за установяване на деформации на земната повърхност в района на Северното Черноморие на България с цел определяне на райони с регистрирани деформации на земната повърхност и идентифициране на протичащи свлачищни процеси. Локализираните свлачища, както вече регистрираните, така и потенциални могат да бъдат изследвани с помощта на изградена локална геодинамична GNSS мрежа за тяхното прецизно наблюдение. За целта съвместно се анализират резултати от проведените от авторите през 2019г. и 2020г. теренни проучвания и резултати от обработка на набор от SAR данни. Въз основа на получените резултати може да се заключи, че и двата използвани източника от данни водят до подобни резултати (преместванията са в диапазона на сантиметри) и те потвърждават цялостното поведение на изследваните свлачища. Разликите между тях могат да бъдат обяснени с големия брой външни фактори, влияещи върху данните за SAR, като растителност и времева декорелация. При съпоставяне на двата метода трябва да се вземе предвид, че стойностите на елементите на интерферометричните изображения (IFI) съответстват на много по-голяма площ (14 м. на 14 м. размер на пиксел), докато GNSS се отнася до отделни точки.

Г 8.36

Борисова Д., **Николов Хр.**, Д. Петков, Б. Банушев, *Оценка на рекултивационни дейности на нарушени терени около открити рудници с дистанционни методи за изследвания*, Proceedings of Eighth Scientific Conference with International Participation "Space, Ecology, Safety" (SES'2012), Sofia, стр. 426-431, 2013, ISSN 1313-3888,

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http://space.bas.bg/SES/archive/SES%202012_DOKLADI/PROCEEDING_S%20SES%202012.pdf

Абстракт

Антропогенното въздействие на минната индустрия върху околната среда се наблюдава по целия свят. През последните десетилетия няколко миннодобивни райони и съответните депа за отпадъци в България се наблюдават за протичащите процеси на рекултивация в тях. В тази работа се спряхме на изследване и последващо наблюдение на екологичния статус на един от най-важните райони за производство на мед за страната ни - Медет. Целите на настоящата работа са: (1) да се анализират многоспектрални спътникови данни за периода 1972 - 2011 г., за да се оцени замърсяването на околната среда от минна дейност в района на открития рудник Медет във времето, (2) да се докаже, че с помощта на дистанционните изследвания и наблюдения може да се направи комплексна оценка на въздействието върху околната среда. След преустановяване на експлоатацията на рудник Медет през 1994 г. е създадена и започва програма за рекултивация на почвената покривка и хидрографската мрежа. От 1995 г., за най-малко 15-годишен период, постоянна задача е проследяването на тези дейности. Считаме, че разкриването на потенциала на многоспектралните спътникови изображения, анализирани във времето, ще предостави ценна информация за въздействието на многогодишната минна дейност върху околната среда. Една от първите стъпки е използването на методи за установяване на постепенната промяна за оценка на краткосрочните рекултивационни дейности чрез изследване на състоянието на растителната покривка в районите около рудника. За да изпълним тази задача бяха използвани данни от Landsat TM/ETM+, съчетани с данните от проведените на място измервания. За обработка на данните бяха приложени няколко метода, както стандартните статистически обработки, подобряване на изображението и синтез на данните, така и нови методи за контролирана класификация. Получените резултати показват, че използваните данни и приложеният подход са полезни в наблюдението на околната среда и икономически изгодни за компанията, отговорна за екологичното състояние на региона.

Г 8.37	<p>Atanasova, M., Nikolov, H. <i>Creation of glaciers velocity maps in Livingston island using Sentinel-1 data</i>. 8th International Conference on Cartography and GIS, 2, Bulgarian Cartographic Association, 2022, ISSN:1314-0604, 191-198</p> <p>Линк към публикацията: https://iccgis2020.cartography-gis.com/proceedings-vol-2/</p> <p style="text-align: center;">Абстракт</p> <p>Livingston Island is an Antarctic island in the Southern Ocean, part of the South Shetlands Archipelago. The Bulgarian base "St. Kliment Ohridski" is located on the Hurd Peninsula some 130 m from the shores of the inner bay Emona. In this study we use data from the Sentinel-1 satellite constellation to produce velocity maps, covering few key outlet glaciers. During this research used were Sentinel-1 data in GRD format with HH polarisation. We followed the processing workflow described by international scientific community to derive ice velocity maps from pairs of SAR images using the SNAP software. In this paper are presented results for glaciers found in Livingston Island and the ice velocity extracted along the two flow line transects/longitudinal and transverse profiles. This study provides a first demonstration by authors of the operational radar satellites capacity to map and thus providing frequent and timely monitoring of the ice sheet flow as well as to monitor the dynamic evolution of the glaciers around the Bulgarian base "St. Kliment Ohridski"</p>
Г 8.38	<p>Nikolov, H., Atanasova, M.. <i>Creating a local geodatabase for inventory mapping and risk monitoring the landslide processes of the landslide "Fish-Fish"</i>. 8th International Conference on Cartography and GIS, 2, Bulgarian Cartographic Association, 2022, ISSN:1314-0604, 253-258</p> <p>Линк към публикацията: https://iccgis2020.cartography-gis.com/proceedings-vol-2/</p> <p style="text-align: center;">Абстракт</p> <p>The purpose of this study is to provide new means for analysis and assessment of current geo processes in the active landslide located in "Fish-Fish" residential area, northern Black Sea coast of Bulgaria in order to mitigate the risks of natural and anthropogenic origin. In recent decades, starting in 2002, the study region has been subject of several calamity events such as landslides, earth masses collapse, etc. To this end, it is essential to prepare risk management plans using information of high quality and regularly monitor the most vulnerable areas in this zone in advance. In this paper presented is the developed local geodatabase for the investigated site consisting of several layers all of them related to the modelling of the processes such as erosion, sea abrasion, etc.. This modelling is based on large variety of sources - terrain investigations, remotely sensed data from satellites and unmanned aerial systems (UAS).</p>