Published works and news

Most important achievements in the research sphere

Assessment of relative erodibility of cliffs on the Slovenian coast+

In the published contribution, we have presented a risk assessment method of erosional processes on the Slovenian coastal cliffs, which was originally presented by del Rio, L., Gracia, F. J. 2009: Erosion risk assessment of active coastal cliffs in temperate environments (Geomorphology 112, 82–95). They have used a quantified approach to risk assessment by introducing several indices composed of geological, climatic and anthropogenic factors: Hazard Index (HI), Impact Index (II) and combined Risk Index (RI). In this contribution, we have used the proposed methods, which we have later upgraded (see: An upgrade to the erosion risk assessment method of active flysch cliffs along the Slovenian coast (COBISS.SI-ID 104051459) by introduction or modification of several factors, for example the modification of lithological factors (due to flysch composition), introduction of new factors regarding the exposure to wind, modified factor of populated areas, and other modifications.

VERBOVŠEK, Timotej, ROŽIČ, Boštjan, ŽVAB ROŽIČ, Petra, VRABEC, Marko, JORDANOVA, Galena, DOLENEC, Matej, FIFER BIZJAK, Karmen, BEZAK, Nejc, MIKOŠ, Matjaž, KUZMANIĆ, Tamara, KREGAR, Klemen, KOZMUS TRAJKOVSKI, Klemen, ŽAGAR, Dušan. Ocena relativne erodibilnosti klifov na Slovenski obali. V: ROŽIČ, Boštjan (ur.). ***Razprave, poročila = Treatises, reports : 25. posvetovanje slovenskih geologov = 25th Meeting of Slovenian Geologists***. 25. posvetovanje slovenskih geologov = 25th Meeting of Slovenian Geologists, Ljubljana, october, 2021. Ljubljana: Univerza v Ljubljani, Naravoslovnotehniška fakulteta, Oddelek za geologijo, 2021. Str. 146-147. Geološki zbornik, 26. ISSN 0352-3802. [COBISS.SI-ID 81568771]

Improved automatic classification of litho-geomorphological units by using raster image blending+

In the contribution, we present the method of supervised classification of the region in GIS environment with the Maximum Likelihood Classification tool, by which it is possible to distinguish the areas of slope deposit sediments and litho-geomorphological units in general. Method is based only on the digital elevation data, due to the fact that different geological processes produce diverse geomorphological features in the field. Method was primarly used in the Vipava valley region (with occurring flysch and other geological units) and will be later applied with different parameters on the project flysch area on the Slovenian coast.

JORDANOVA, Galena, VERBOVŠEK, Timotej. Improved automatic classification of litho-geomorphological units by using raster image blending, Vipava Valley (SW Slovenia). ***Remote sensing***. 2023, vol. 15, iss. 2, str. 1-19. ISSN 2072-4292. DOI: 10.3390/rs15020531. [COBISS.SI-ID 138060547]

An upgrade to the erosion risk assessment method of active flysch cliffs along the Slovenian coast+

VERBOVŠEK, Timotej, ROŽIČ, Boštjan, ŽVAB ROŽIČ, Petra, VRABEC, Marko, JORDANOVA, Galena, DOLENEC, Matej, FIFER BIZJAK, Karmen, BEZAK, Nejc, MIKOŠ, Matjaž, KUZMANIĆ, Tamara, KREGAR, Klemen, KOZMUS TRAJKOVSKI, Klemen, ŽAGAR, Dušan. An upgrade to the erosion risk assessment method of active flysch cliffs

along the Slovenian coast. V: PERANIĆ, Josip (ur.), et al. Landslide modelling & applications : 5th Regional Symposium on Landslides in the Adriatic-Balkan Region : Rijeka, 23-26 March 2022 : book of abstracts. Rijeka: Faculty of Civil Engineering, University of Rijeka; Zagreb: Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb, 2022. Str. 34. ISBN 978-953-6953-57-8, ISBN 978-953-6953-58-5, ISBN 978-953-6923-45-8, ISBN 978-953-6923-44-1. [COBISS.SI-ID 104051459]

The impact of bed and joint characteristics on coastal cliff erosion+

VERBOVŠEK, Timotej, JORDANOVA, Galena, ROŽIČ, Boštjan. Vpliv lastnosti plasti in diskontinuitet na spodjedanje obalnih klifov. V: RMAN, Nina (ur.), BRAČIČ-ŽELEZNIK, Branka (ur.), ŽVAB ROŽIČ, Petra (ur.). "Vedeti (ne)vidno – vloga geologije v naši družbi" : 6. slovenski geološki kongres : zbornik povzetkov = book of abstracts : 3.-5. oktober 2022, Rogaška Slatina. Ljubljana: Slovensko geološko društvo, 2022. Str. 99. ISBN 978-96--95928-0-9. [COBISS.SI-ID 125700099]

Analysis of human exposure to landslides with a GIS multiscale approach+

As part of the work on the project (DP 5, DS 5.3), a global analysis of exposure to major mass movements was also carried out, where climatological factors were also taken into account in the analyzes as one of the triggering factors of such events, which include rockfalls. Decision-making plays a key role in reducing the risk of landslides and rockfalls and preventing natural disasters. Land management, rehabilitation of degraded land, urban planning and environmental protection in general are fundamental for reducing the danger and risk of various forms of landslides, including rockfalls. In this global analysis, the most important factors that have a dominant influence on the risk of landslides and rockfalls have been highlighted. At a smaller spatial level (e.g. region), variables such as land use, topographic humidity and local climatic factors have been shown to be very important in relation to the hazard from larger mass movements.

MODUGNO, Sirio, JOHNSON, Sarah C. M., BORRELLI, Pasquale, ALAM, Edris, BEZAK, Nejc, BALZTER, Heiko. Analysis of human exposure to landslides with a GIS multiscale approach. Natural hazards. 2022, vol. 10. jan., [26] f., ilustr. ISSN 0921-030X. https://link.springer.com/content/pdf/10.1007/s11069-021-05186-7.pdf, DOI: 10.1007/s11069-021-05186-7.

Prediction of the peak shear strength of the rock joints with artificial neural networks+

The paper presents the use of artificial neural networks for determination of geomechanical properties of rocks and their behaviour (peak shear strength of the rock joints) under different stress conditions. The surface roughness of joints was measured with a photogrammetric scanner, and the peak shear strength was determined by the Robertson direct shear test. With the development of computer technology, artificial neural networks are becoming increasingly useful in the field of engineering geology and geotechnics, as geomechanical properties of rocks or their behaviour could be predicted under different stress conditions. Slope failures or underground excavations in rocks namely mostly occurr through joints, which are essential for the stability of geotechnical structures. The results of the research and the method itself will therefore be useful for the analyses of flysch samples in the project research flysch area.

FIFER BIZJAK, Karmen, VEZOČNIK, Rok. Prediction of the peak shear strength of the rock joints with artificial neural networks = Napoved vrhunske strižne trdnosti po razpoki v kamnini z nevronskimi mrežami. Geologija.

[Tiskana izd.]. 2022, vol. 65, no. 2, str. 149-158. ISSN 0016-7789. https://www.geologija-revija.si/index.php/geologija/article/view/1839/1904, DOI: 10.5474/geologija.2022.009. [COBISS.SI-ID 129981955]

Hydrogeochemical and isotope analyses of submarine and terrestrial springs near Izola city+

The research comprises the analyses of springs in the vicinity of Izola city, where several submarine and terrestrial springs occur on the contact of flysch and limestone. Research was primarily focused in the field of hydrogeology, however three of the authors (P.Ž.R., B.R. and T.V.) have produced a detailed geological map of the Izola broader area, which will be used for the final interpretation of engineering geological properties of the sandstones and marlstones, which occur in the flysch in broader region of the research project, and also we have investigated the climate and meteorological conditions in the hinterland of the Izola city, which will also serve for the final comparison with erosional processes on the cliffs.

ŠUŠMELJ, Kaja, ŽVAB ROŽIČ, Petra, VREČA, Polona, KANDUČ, Tjaša, VERBOVŠEK, Timotej, ŽAGAR, Klara, ZULIANI, Tea, ČENČUR CURK, Barbara, ROŽIČ, Boštjan, ČERMELJ, Branko. Hidrogeokemične in izotopske raziskave podmorskih in kopenskih izvirov pri Izoli. V: ***Raziskave s področja geodezije in geofizike 2021 : zbornik del : 27. srečanje Slovenskega združenja za geodezijo in geofiziko, Ljubljana, 27. januar 2022***. Elektronska izd. Ljubljana: Slovensko združenje za geodezijo in geofiziko, 2022. Str. 55-64, ilustr. ISBN 978-961-95299-2-8. http://fgg-web.fgg.uni-lj.si/SUGG/referati/2022/SZGG_2022_Susmelj_in_dr.pdf. [COBISS.SI-ID 95813379]

Rock frost weathering and rockfall activity assessment in Slovenia+

As part of the work on the project within DP 5 and DP 4, an analysis of the impact of freezing cycles on the occurrence of rockfalls in Slovenia was also carried out. As part of the contribution, an analysis of air and soil temperature was carried out in connection with past events (rockfalls) in Slovenia. Both ARSO point data (meteorological station measurements) and reanalysis data (ERA5-Land) were used. A comparison of both types of data on the number of freeze-thaw cycles was performed. We also tested several simple susceptibility models for the preparation of the rockfall trigger map. We found that the slope and lithology are two factors that have a dominant influence on rockfalls in Slovenia. Considering the map showing the number of freeze-thaw cycles did not significantly improve the predictive performance of the tested model. This is especially true for the Mediterranean part of the country (flysch), where specific conditions prevail.

MIKOŠ, Matjaž, JEMEC AUFLIČ, Mateja, JEŽ, Jernej, BEZAK, Nejc. Rock frost weathering and rockfall activity assessment in Slovenia. V: PERANIĆ, Josip (ur.), et al. Landslide modelling & applications : proceedings of the 5th Regional Symposium on Landslides in the Adriatic-Balkan Region : [23-26 March 2022, Rijeka]. Rijeka: Faculty of Civil Engineering, University of Rijeka; Zagreb: Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb, 2022. Str. 137-144. ISBN 978-953-6953-55-4, ISBN 978-953-6953-56-1, ISBN 978-95--6923-47-2, ISBN 978-953-6923-46-5.

Precipitation and soil erosion - Slovenia+

MIKOŠ, Matjaž, BEZAK, Nejc. Oborine i erozija zemljišta u Sloveniji = Precipitation and soil erosion – Slovenia. V: DIJANA, Oskoruš (ur.), RUBINIĆ, Josip (ur.). Zbornik radova = Proceedings. Okrugli stol s međunarobnim

sudjelovanjem Nanos u vodnim sustavima – stanje i trendovi, Varaždin 2020 – The round table with international participation Sediment and water systems – current state and trends. Zagreb: Hrvatsko hidrološko društvo (HHD), 2020. Str. 143-154, ilustr. ISBN 978-953-96705-5-7. http://hhd.hr/2020/05/08/okrugli-stol-nanos-u-vodnim-sustavima/. [COBISS.SI-ID 17296387]

Evaluation of hydrological rainfall loss methods+

BEZAK, Nejc, PERANIĆ, Josip, MIKOŠ, Matjaž, ARBANAS, Željko. Evaluation of hydrological rainfall loss methods using small-scale physical landslide model. Water. 2022, letn. 14, št. 17, art. 2726, 21 str., ilustr. ISSN 2073-4441. https://www.mdpi.com/2073-4441/14/17/2726, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=140936, DOI: 10.3390/w14172726. [COBISS.SI-ID 120546563]

Most important achievements in the economy sphere, societal and cultural activities

Debeli rtič Landscape park - Geological attractions+

We have published a promotional leaflet, which reminds the visitors of the landscape park Debeli rtič of the processes of rockfall on the coastal cliffs. The leaflet is available in the landscape park Debeli rtič office and in the municipality of Ankaran office. Interactive map: https://goo.gl/maps/uyeC8EHy7aqvuTLT7

VERBOVŠEK, Timotej, ROŽIČ, Boštjan. ***Krajinski park Debeli rtič – geološke zanimivosti : s karto ogroženosti zaradi padanja kamenja in skal : [zgibanka]***. [Ankaran]: Občina Ankaran, 2021. 1 zgibanka, 30 x 21 cm, zgibana na 10 x 21 cm, barvne fotograf. [COBISS.SI-ID 126245891]

Strunjan Landscape park - coastal rockfall risk+

Link to website: https://sites.google.com/view/cliffall

Brochure for download: KP Strunjan Mesečev zaliv Cliffall zgibanka

Upgrade of geological contents in the landscape park Strunjan with technologies of Virtual and Augmented Reality+

We are continuing the work of previously published integration of coastal cliff geological presentation for a broader public with technologies of Virtual (VR) and Augmented Reality (AR), in cooperation with Landscape park Strunjan.

VERBOVŠEK, Timotej (avtor, vodja projekta), MAKOVAC, Samanta (927). ***Nadgradnja geoloških vsebin v Krajinskem parku Strunjan s tehnologijama navidezne in obogatene resničnosti (GEO-VR-AR) : končno poročilo o doseženih ciljih***. Ljubljana: Naravoslovnotehniška fakulteta, 2020. loč. pag., tabele, grafični prikazi. [COBISS.SI-ID 52380675]

Possible fossil medusae in the Eocene flysch from the Slovenian coast+

ROŽIČ, Boštjan, UCHMAN, Alfred, GALE, Luka, VERBOVŠEK, Timotej. Possible fossil medusae in the Eocene

flysch from the Slovenian coast. V: HUDÁČKOVÁ, Natália (ur.), RUMAN, Andrej (ur.), ŠUJAN, Michal (ur.). Environmental, structural and stratigraphical evolution of the Western Carpathias, 12th ESSEWECA Conference, 8th-9th December 2022, Bratislava, Slovakia : abstract book. Bratislava: Comenius University in Braislava, 2022. Str. 123. ISBN 978-80-223-5518-6, ISBN 978-80-223-5519-3. [COBISS.SI-ID 133348867]

Media posts connected to the project

Med strunjansko plažo in San Simonom se je odlomil del klifa+

https://www.24ur.com/novice/slovenija/med-strunjansko-plazo-in-san-simonom-se-je-odlomil-del-klifa.html

Erozija piranske pečine grozi stavbi župnišča, da se bo prelomila in zgrmela v morje+

https://www.rtvslo.si/lokalne-novice/primorje/erozija-piranske-pecine-grozi-stavbi-zupnisca-da-se-bo-prelomila-in-zgrmela-v-morje/535910

Previdno ob obisku pod klifi+

https://parkstrunjan.si/previdno-ob-obisku-pod-klifi/

Reševali bodo piransko župnišče+

https://www.delo.si/novice/slovenija/resevali-bodo-piransko-zupnisce/

Velik podor v Mesečevem zalivu opozarja+

https://www.delo.si/novice/slovenija/velik-podor-v-mesecevem-zalivu-opozarja/

Debeli rtič: skala skoraj ubila plavalko, reševalci svarijo pred divjimi kopališči+

https://www.24ur.com/novice/slovenija/resevalci-iz-vode-svarijo-pred-divjimi-kopalisci.html

SANACIJA PIRANSKEGA ŽUPNIŠČA KONČANA, ZA FASADO BO POSKRBEL ŽUPNIK: Zaradi nevarnosti bodo sanirali tudi klif pod krstilnico (FOTO)+

https://www.regionalobala.si/novica/sanacija-piranskega-zupnisca-koncana-za-fasado-bo-poskrbe-zupnik-zaradi-nevarnosti-bodo-sanirali-tu

Hoja ob obali ni varna+

http://www.primorske.si/primorska/istra/hoja-ob-obali-ni-varna

Ne hodi spodaj - klif se ruši in se bo še!+

https://www.primorske.si/primorska/istra/ne-hodi-spodaj-klif-se-rusi-in-se-bo-se

Obsežen podor strunjanskega klifa+

https://365.rtvslo.si/arhiv/morje-in-mi/174665922

Območje velikega podora na strunjanskem klifu zelo nevarno+

https://www.rtvslo.si/radio-koper/novice/obmocje-velikega-podora-na-strunjanskem-klifu-zelo-nevarno/511944

3D modela

Dostopnost

Rockfall of flysch cliff at Strunjan+

- Link to 3D view: https://skfb.ly/6PQQD

Piransko župnišče+

- Download pdf file*: 3D model Piransko župnišče

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