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Ζαγόρι

ΕΛΛΗΝΙΚΗ
ΕΠΙΣΤΗΜΟΝΙΚΗ
ΕΤΑΙΡΕΙΑ
ΕΔΑΦΟΜΗΧΑΝΙΚΗΣ
& ΓΕΩΤΕΧΝΙΚΗΣ
ΜΗΧΑΝΙΚΗΣ

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Βωβούσα, Ζαγόρι

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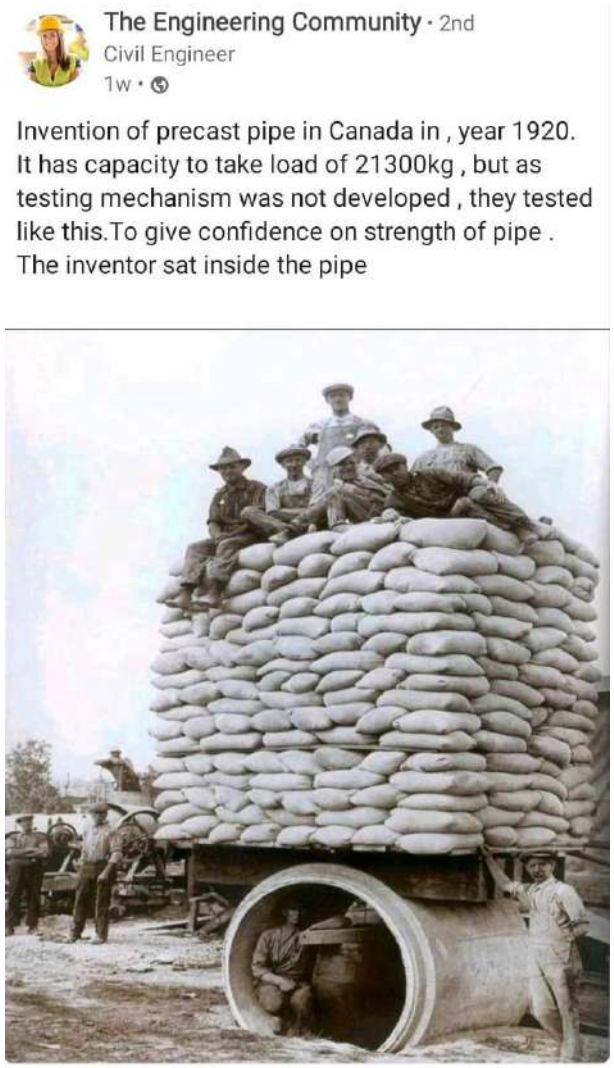
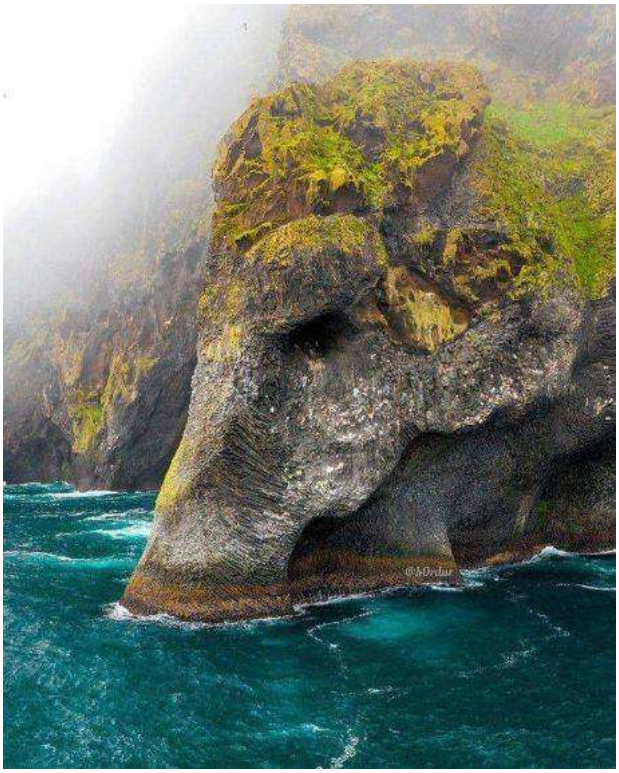
ISO 14688-1:2002

Name				Size range (mm)	Size range (approx. in)
Very coarse soil		Large boulder	LBo	>630	>24.8031
		Boulder	Bo	200–630	7.8740–24.803
		Cobble	Co	63–200	2.4803–7.8740
Coarse soil	Gravel	Coarse gravel	CGr	20–63	0.78740–2.4803
		Medium gravel	MGr	6.3–20	0.24803–0.78740
		Fine gravel	FGr	2.0–6.3	0.078740–0.24803
	Sand	Coarse sand	CSa	0.63–2.0	0.024803–0.078740
		Medium sand	MSa	0.2–0.63	0.0078740–0.024803
		Fine sand	FSa	0.063–0.2	0.0024803–0.0078740
Fine soil	Silt	Coarse silt	CSi	0.02–0.063	0.00078740–0.0024803
		Medium silt	MSi	0.0063–0.02	0.00024803–0.00078740
		Fine silt	FSi	0.002–0.0063	0.000078740–0.00024803
	Clay		Cl	≤0.002	≤0.000078740





Elephant Rock, Iceland

ΕΛΛΗΝΙΚΗ ΕΠΙΣΤΗΜΟΝΙΚΗ ΕΤΑΙΡΕΙΑ ΕΔΑΦΟΜΗΧΑΝΙΚΗΣ & ΓΕΩΤΕΧΝΙΚΗΣ ΜΗΧΑΝΙΚΗΣ

Διαδικτυακή Διάλεξη
τ. Επίκουρου Καθηγητή Ε.Μ.Π. Ιωάννη Στεφανάκου
την Τετάρτη 23/03/2022 στις 6:00μμ

Μεγάλα και Μικρά Υδροηλεκτρικά Έργα (ΥΗΕ-ΜΥΗΕ), Ο ρόλος τους στο ενεργειακό σύστημα της χώρας

Περίληψη Διάλεξης

Τα φράγματα, ως τεχνικά έργα 'αναχαίτισης' υγρών ή στερεών υλικών, έχουν χρησιμοποιηθεί κυρίως για τη δημιουργία κλειστών λεκανών ταμίευσης νερού ή αποθήκευσης στερεών καθώς και για αντιπλημμυρική προστασία και δευτερευόντως για την εκτροπή ποταμών και χειμάρρων, καθώς και για την διαμόρφωση ηπιότερων κλίσεων τόσο του πυθμένα ρεμάτων (έλεγχος διάβρωσης) όσο και της στάθμης νερού κατά μήκος ποταμών (ναυσιπλοΐα).

Η ανάγκη για ταμίευση νερού εμφανίστηκε αρχικά με τη βαθμιαία ή ραγδαία ανάπτυξη των οικισμών σε πόλεις και τη σημαντική αύξηση των κατοίκων τους, ενώ μεταγενέστερα προστέθηκε και η ανάγκη βελτίωσης των αρδεύσεων. Στον ελληνικό χώρο, φράγματα για ταμίευση νερού άρχισαν να κατασκευάζονται μετά τον 1ο Παγκόσμιο Πόλεμο, αρχικά για ύδρευση και σταδιακά για υδροηλεκτρική παραγωγή και αρδεύσεις.

Το φράγμα Μαραθώνα ήταν το πρώτο φράγμα που κατασκευάστηκε στην Ελλάδα, το 1930, με σκοπό να καλύψει τις επιτακτικές ανάγκες ύδρευσης της πόλης των Αθηνών. Μετά μία νεκρή περίοδο 20 ετών, άρχισε δειλά τη δεκαετία του '50, η κατασκευή φραγμάτων για παραγωγή υδροηλεκτρικής ενέργειας, με την υλοποίηση τριών φραγμάτων από σκυρόδεμα, δύο βαρύτητας (Λούρου και Λάδωνα) και ενός τοξωτού (Ταυρωπού). Από τη δεκαετία του '60 άρχισε η κατασκευή γεωφραγμάτων με βαθμιαία αυξανόμενους ρυθμούς, ενώ από το 1980 άρχισε η κατασκευή και άλλων τύπων φραγμάτων, όπως κυλινδρούμενου σκυροδέματος, σκληρού επιχώματος κ.α., με αποτέλεσμα σήμερα (2022) να υπάρχουν και να λειτουργούν στον ελλαδικό χώρο περισσότερα από 150 φράγματα.

Μέχρι τα τέλη της δεκαετίας '60, ο σχεδιασμός, η μελέτη και η κατασκευή των φραγμάτων ήταν αντικείμενο αποκλειστικά αλλοδαπών μελετητικών γραφείων και κατασκευαστικών εταιριών (με ελάχιστες εξαιρέσεις). Το μεγάλο άλμα πραγματοποιήθηκε τη δεκαετία του '70, όταν για πρώτη φορά μελετήθηκε φράγμα και υδροηλεκτρικό έργο (ΥΗΕ) από Έλληνες Μηχανικούς, με τη βοήθεια αλλοδαπών τεχνικών συμβούλων. Έκτοτε, πρακτικά όλα τα φράγματα που κατασκευάστηκαν στη χώρα σχεδιάστηκαν, μελετήθηκαν και κατασκευάστηκαν από ελληνικό ανθρώπινο δυναμικό, με εξαίρεση τον Η/Μ εξοπλισμό τους.

Μέχρι τα τέλη της δεκαετίας του '70, η ΔΕΗ πρακτικά μονοπωλούσε την κατασκευή φραγμάτων. Όμως από το 1980 και μέχρι σήμερα έχουν εμπλακεί στη μελέτη και την κατασκευή φραγμάτων μεγάλος αριθμός φορέων του Δημοσίου, ΟΤΑ και εταιρίες. Την δεκαετία του '60 συστάθηκε η Ελληνική Επιτροπή Μεγάλων Φραγμάτων, που έγινε αποδεκτή ως μέλος στη Διεθνή Επιτροπή Μεγάλων Φραγμάτων, συμμετοχή που συνεχίζεται μέχρι σήμερα.

Η κρίση των τελευταίων ετών επηρέασε και την υλοποίηση φραγμάτων στη χώρα, με αποτέλεσμα αφενός την αναστολή των εργασιών σε μεγάλο αριθμό τέτοιων έργων, που παραμένουν επικίνδυνα ημιτελή (Μεσοχώρα, Συκιά κλπ), και αφετέρου, πρακτικά τη διακοπή των αναθέσεων νέων μελετών και νέων έργων προς κατασκευή, με αποτέλεσμα τη συρρίκνωση του κλάδου.

Σύντομο Βιογραφικό Σημείωμα Ομιλητή

Ο Δρ. Ιωάννης Στεφανάκος έχει σαράντα εννέα χρόνια εμπειρία (1973-2022), στο σχεδιασμό και την κατασκευή μεγάλων υδροηλεκτρικών έργων που καλύπτουν τις περιοχές φραγμάτων (χωμάτινα και λιθόρριπτα, βαρύτητας από συμβατικό σκυρόδεμα ή από κυλινδρούμενο σκυρόδεμα-RCC με τη χρήση ιπτάμενης τέφρας), οδοποιίας, γεφυρών, σηράγγων (που διανοίχτηκαν με τις συμβατικές μεθόδους ή τη μέθοδο ολομέτωπης κοπής-TBM), φρεάτων, υπογείων θαλάμων, μεγάλων δομικών έργων και βιομηχανικών κτιρίων, έργων από μαζικό σκυρόδεμα, διαφραγματικών τοίχων, αντιστηρίξεων, πασσαλώσεων, έργων ελέγχου των υδάτων, διαφραγμάτων υδατοστεγάνωσης και αποστράγγισης κλπ.

Έχει επίσης: Μακροχρόνια εμπειρία σε θέματα ενεργειακής στρατηγικής, πολιτικών ενέργειας, οικονομικής αξιολόγησης και προγραμματισμού μεγάλων ενεργειακών έργων. Μεγάλη εμπειρία σε θέματα σύνταξης και ελέγχου μελετών δημοπράτησης και μελετών κατασκευής, τεχνικής υποστήριξης της επίβλεψης της κατασκευής, ποσοτικής και ποιοτικής παρακολούθησης, σύνταξης τεχνικών προδιαγραφών, τιμολογίων και προϋπολογισμών, χρονικού και οικονομικού προγραμματισμού των μεγάλων έργων. Σημαντική εμπειρία σε θέματα μελέτης και αξιολόγησης έργων ανανεώσιμων πηγών ενέργειας και ιδιαίτερα σε μικρά υδροηλεκτρικά και υβριδικά έργα, με έμφαση στις μελέτες για την αδειοδότηση και τον ενεργειακό τους σχεδιασμό.

Είχε δεκαεπταετή (1998-2014) ακαδημαϊκή δραστηριότητα ως μέλος ΔΕΠ (Λέκτορας μερικής απασχόλησης και Επίκουρος Καθηγητής) στον Τομέα Υδατικών Πόρων & Περιβάλλοντος της Σχολής Πολιτικών Μηχανικών του Εθνικού Μετσοβίου Πολυτεχνείου και συμμετοχή σε αυτοδύναμη διδασκαλία έξι (6) μαθημάτων.

Πρόσφατη απασχόληση, με την υποστήριξη της Ευρωπαϊκής Ένωσης, ως Διεθνής Ειδικός στην Ασφάλεια Φραγμάτων, για την εξέταση της ασφάλειας ένδεκα συνολικά φραγμάτων στο Λάος.

ΑΡΘΡΑ

Landslides: Understanding and simulating failures

Loughborough University geotechnical engineering professor **Neil Dixon** and civil engineering senior lecturer **Alister Smith** on clay earthwork slope failures and current research into weather driven deterioration.

Engineered soil slopes are major components of rail, road and flood defence infrastructure. They are vital to the safe, reliable and economic operation of critical services.

However, failure of these assets is common. There is growing evidence that ageing infrastructure, intensive use and environmental extremes caused by climate change threaten to increase the scale and frequency of failures.

These risks were brought into focus by the fatal accident at Stonehaven, Aberdeenshire, in August 2020. Three people were killed following derailment of a train when a washout landslide was triggered by intensive rainfall. Two subsequent independent reviews have made more than 50 recommendations about ways the UK's rail network can better cope with extreme weather.

A poor understanding of weather and climate change impacts on earthwork assets is a significant barrier to the development and maintenance of resilient infrastructure.

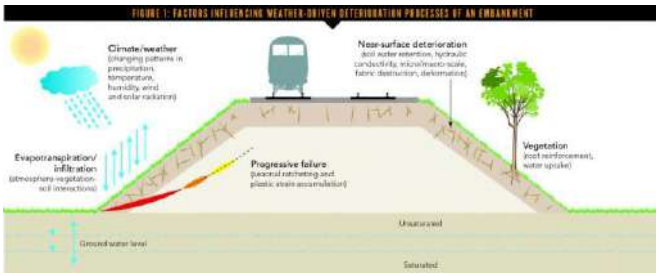
Current approaches to design and asset management perpetuate this situation because they are based on historical experience, which cannot always be extrapolated to predict future performance.

It is therefore vital to understand and anticipate when and why earthwork failures might occur to enhance preventative action and build more resilient structures in the future.

Achilles

Addressing these challenges requires knowledge of the multiple mechanisms of earthwork slope failures for the range of geological materials encountered in the UK, including associated deterioration processes and trigger events.

As part of the UK research effort, the Assessment, Costing and Enhancement of Long Life, Long Linear Assets (Achilles) programme grant is focused on understanding weather-driven deterioration processes in clay cutting and embankment earthwork slopes that can result in shallow failures (*Figure 1*).



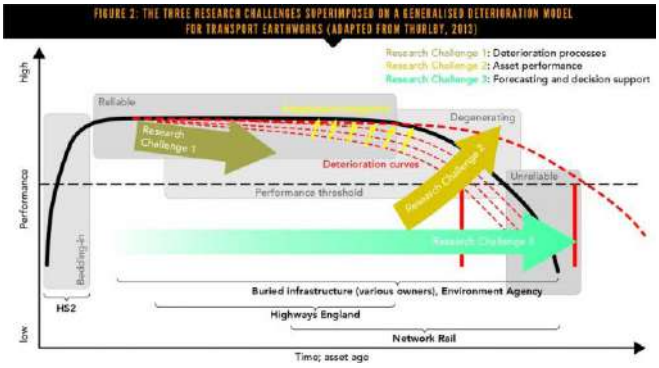
Funded by the UK Engineering & Physical Sciences Research Council, Achilles commenced in July 2018.

It is a four and a half year collaboration between research departments at Newcastle, Loughborough, Durham, Southampton, Bath and Leeds universities; the British Geological Survey; and project partners, including the Environment Agency, National Highways, Network Rail, Mott MacDonald and Jacobs.

A key question being addressed is: why can clay earthwork slopes fail during a prolonged period of wet weather when they have survived similar weather events many times in their past?

The inference is that over time, deterioration processes reduce available strength of the soil. The challenge is to bring together advances in research and technology with industry-led innovation in design and asset management practice to reduce the risks posed to infrastructure systems from deterioration and future change.

Achilles aims to develop the tools necessary to assess, monitor, design and repair the geotechnical performance of embankments and cuttings constructed from fine grained soils through advancing knowledge in three research challenges: deterioration processes; asset performance; and forecasting and decision support (*Figure 2*).



This is being achieved by working across three scales: characterising the materials; analysis of asset-scale processes; and assessment of network-scale performance.

There is also a focus on four themes:

- **Performance and deterioration** – linking understanding of concepts and processes developed via research with stakeholder observations and experience
- **Monitoring and measurement** – learning from laboratory and asset-scale observations to deliver the knowledge base to understand processes, leading to model development and validation

- **Simulation and modelling** – employing long weather sequences (for example up to 200 years of daily weather) as input to numerical models capturing deterioration processes, including use of climate scenarios to explore possible future trends, and establishing approaches for upscaling to network scale
- **Decisions and design** – evaluating the value of data and delivering tools for better design and decision making.

A critical component of Achilles is the production and use of long field observational records for exemplar clay earthwork slopes.

These comprise: a highway cut slope in high-plasticity London Clay in Newbury with 18 years of monitoring data; the full-scale rail/road embankment at Bionics in intermediate-plasticity clay near Newcastle upon Tyne with 15 years of data; and a low-plasticity clay flood embankment observatory initiated by the Achilles consortium.

Measurements of weather, pore water pressures, moisture content and deformations – coupled with field and laboratory measurements – are being used to quantify the interaction between hydro-mechanical processes and to validate numerical models of deterioration.

Many studies have attempted to develop numerical models to investigate weather-driven deterioration processes, but few, if any, have had access to such rich and extensive field data to facilitate rigorous validation.

Important outputs from Achilles to date include:

- A conceptual model for deterioration of clay soils subject to cycles of wetting and drying based on laboratory and field measurements
- A clay constitutive model incorporating deterioration
- A validated numerical model that can replicate observed seasonal (wetting and drying) ratcheting deformation behaviour in clay slopes
- Weather-driven asset deterioration curves for clay cut slopes, including future climate scenarios
- Favourable comparison of modelled times to failure with observed slope failure records for the London to Bristol rail line
- Insight into the benefits and optimum timing of engineering interventions such as soil nails to extend slope life
- Development of a statistical emulator to facilitate rapid production of deterioration curves and hence assessment of slope design life for a range of geometries and soil parameters
- Recommendations for parameter selection to deliver targeted design life for an asset.

Engineered slope simulator

Despite the many successes and benefits of the Achilles programme, a continuing challenge is obtaining measurements from a clay earthwork slope that has deteriorated towards failure. This is required to confirm the link between progressive slope deformation behaviour in response to weather sequences – for example cycles of dry and prolonged periods of wet weather.

This need led to a proposal to build and operate a large scale engineered clay slope simulator facility at Loughborough University.

A grant of £500,000 has been received from the Wolfson Foundation charity to deliver the facility, with the first slope simulations to be undertaken as part of Achilles.

The Engineered Slope Simulator is a configurable climate-controlled testing facility for investigating weather-driven shallow processes in clay embankment slopes. Using a range of common problem clay soils, slopes will be constructed on a tilting table housed in a purpose designed building. There, they will be subjected to accelerated cycles of controlled wetting and drying that simulate seasonal weather conditions and extreme environmental events.

The table will be tilted and held at an angle typical of an earthwork slope while subjected to the cycles.

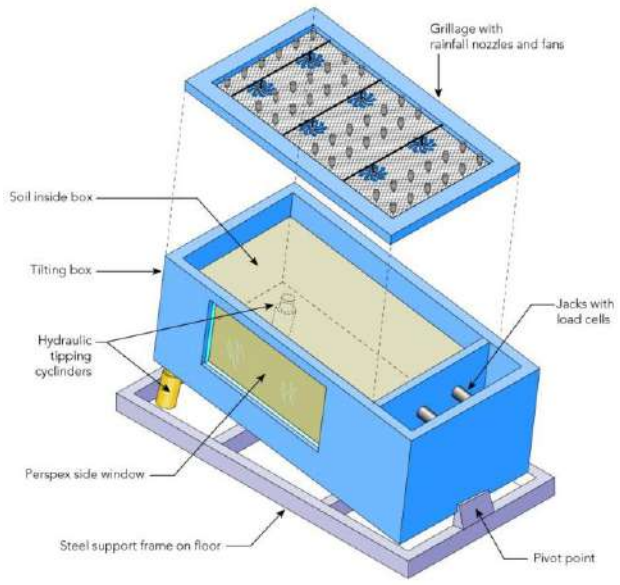
Continuous monitoring via extensive instrumentation installed in the soil slope will provide unique information about the impact of different weather patterns and extremes on coupled hydro-mechanical processes.

On completion of the simulation, the slope will be tilted up to 45° to cause failure, providing a measure of the remaining strength capacity.

This information cannot be obtained via field trials as it is technically difficult and costly to bring an existing slope to failure. The tilting table will also be used to investigate the performance of slope engineering interventions, up to and including failure, to allow optimisation of slope repair and design strategies.

The tilting table is in essence a steel box in which a large-scale compacted soil slope will be constructed (*Figure 3*).

FIGURE 3: SCHEMATIC OF THE ENGINEERED SLOPE SIMULATOR SHOWING CONTROL MEASURES FOR APPLYING WETTING AND DRYING CYCLES SUSPENDED OVER THE SOIL



The slope will measure 5m long by 3m wide with a soil thickness of 1.5m to simulate the surface soil layer on a slope.

Weighing in the order of 45t, the soil self-weight will replicate forces experienced in the field that influence slope deterioration and instability.

Material properties of the soil forming the slope such as density and consistency of compacted layers will be reproduced using field-scale compaction processes and equipment, which is achievable due to the large size of the table.

Progressive failure under simulated infinite slope conditions is facilitated by using an active toe. This is achieved using a plate at the toe of the slope to support the soil body.

If deterioration of the soil strength occurs and the slope moves downslope, increased pressure on the plate will activate jacks to move the toe plate away from the soil to maintain constant support conditions.

This will allow mobilisation of post peak soil strengths in developing shear zones, potentially leading to slope failure.

Testing is expected to commence in autumn 2022, with each experiment taking between six and 12 months.

The programme of research being delivered by Achilles and extended using the Engineered Slope Simulator facility is bringing together new advances in research and technology, with industry-led advances in design and management practices, for a range of clay earthwork asset types.

The aim is to reduce the risks posed to infrastructure systems from deterioration and future change. The research outcomes will inform timely commitment of resources by stakeholders to address these risks.

Thurlby R (2013) Managing the asset time bomb: a system dynamics approach. Proceedings of the Institution of Civil Engineers-Forensic Engineering, 166(3), 134-142.

(GEOTECHNICAL ENGINEERING Editorial, 25 January, 2022, https://www.geplus.co.uk/opinion/landslides-understanding-and-simulating-failures-25-01-2022)

Monitoring a soft-rock coastal cliff using webcams and strain sensors

Diego Guenzi, Danilo Godone, Paolo Allasia, Nunzio Luciano Fazio, Michele Perrotti, and Piernicola Lollino

Abstract

In this brief communication, we describe a case study about monitoring a soft-rock coastal cliff using webcams and a strain sensor, located in the Apulia region (southeastern Italy). In this urban and touristic area, coastal recession is extremely rapid and rockfalls are very frequent. Using low-cost and open-source hardware and software, we are monitoring the area, trying to correlate both meteorological information with measures obtained from the crack meter and webcams, aiming to recognize potential precursor signals that could be triggered by instability phenomena.

How to cite.

Guenzi, D., Godone, D., Allasia, P., Fazio, N. L., Perrotti, M., and Lollino, P.: Brief communication: Monitoring a soft-rock coastal cliff using webcams and strain sensors, Nat. Hazards Earth Syst. Sci., 22, 207–212, https://doi.org/10.5194/nhess-22-207-2022, 2022.

1 Introduction

Among the geo-hydrological instability phenomena that affect the Apulia region, the rockfall hazard affecting the coastal areas characterized by high cliffs formed from soft rocks is of high scientific interest, mainly due to the possible interaction with nearby infrastructures and urban areas.

The evolution of these cliffs and their collapse is well known among the scientific community (Sunamura, 1992; Adams et al., 2005; Stephenson and Naylor, 2010; Sansò et al., 2016; Fazio et al., 2019), but currently there are no consolidated methods concerning the monitoring of these phenomena with a spatial and temporal resolution suitable for prediction and alerting purposes. Along these cliffs, brittle failures are frequent, resulting in entire cliff sectors that suddenly are involved in rockfalls without any appreciable precursor signal. The main elements that contribute to the collapse are the poor geomechanical properties of the rock materials combined with environmental forcing, such as sea waves, winds, rainfalls, and temperature variations (Perrotti et al., 2020; Lollino et al., 2021). In our study, we want to pursue a monitoring approach with two main aims: (i) the integration of conventional geotechnical sensors with digital images and video processing and (ii) the detection of potential precursor signals that could occur in case of instability phenomena.

2 Study area

The coastal area of Melendugno, located in the southeastern area of the Apulia region (latitude 40°16′45″ N and longitude 18°25′53″ E), has been characterized by a large number of rockfall events in the last decades (Lollino et al., 2021). Coastal erosion phenomena are continuously evolving, and many sites have reached a high degree of geomorphological hazard due to the close presence of roads, infrastructures, and urban areas. From a geological point of view, the area is characterized by the outcropping of the Uggiano la Chiesa Formation, dating back to the upper Pliocene–lower Pleistocene, which is formed from stratified marly calcisiltites and biocalcarenites of low mechanical strength and highly susceptible to water-induced weakening processes. A specific sector of the local coastline has shown a significant coastal recession in recent years due to recurring rockfalls, with an average retreat rate estimated in approximately 0.10–0.15 m yr^{-1} as described in Lollino et al. (2021). Moreover, laboratory testing carried out by the authors on rock samples taken from the study area (or of the same typology) has confirmed that even rock of low mechanical strength can exhibit brittle failure (Lollino and Andriani, 2017; Perrotti et al., 2020). Therefore, an integrated monitoring system has been specifically designed in order to control the evolution of the coastal sector and the corresponding recession rate.

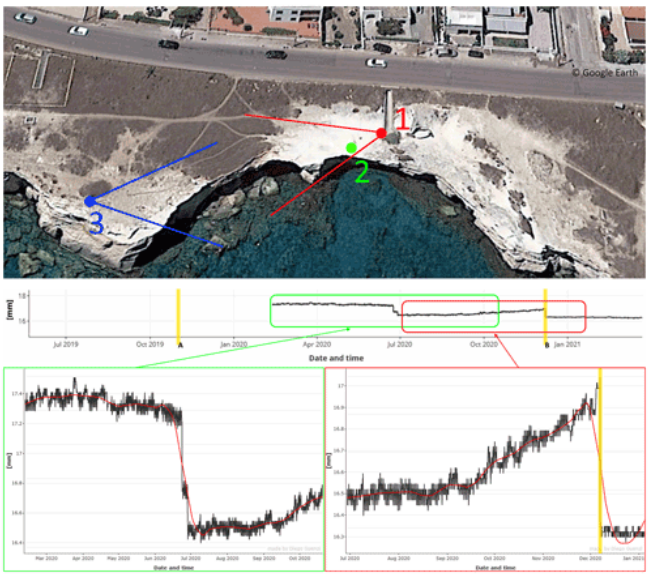


Figure 1 At the top, plan of the monitored cliff area (taken from © Google Earth) – in red (marked with "1") the main camera position and the Raspberry Camera Module field of view; in blue (marked with "3") the secondary camera; the green dot marked with "2" is the position of the crack meter. At the bottom, the crack-meter data – in the green box the first period of data obtained using the automatic crack meter (from 12 February 2020 up to 20 October 2020). In the red box the second period of data of the same crack meter (going from 29 June 2020 to 4 January 2021). Two main rockfalls have been noticed in this period and have been marked with the "A" and "B" yellow lines.

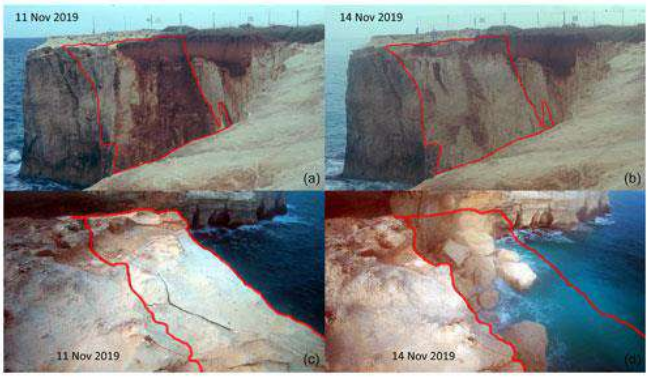


Figure 2 The first rockfall (marked with "A" in Fig. 1) – panel **(a)** shows the cliff as it was on 11 November 2019 and panel **(b)** shows it as it was 3 d later (both images are taken from the Raspberry Camera Module – see Fig. 1 for the position). Panels **(c)** and **(d)** show the same event but from a different point of view (the secondary camera – see Fig. 1 for the position): **(c)** a picture taken before the collapse and **(d)** a picture taken on 14 November 2019.

3 Materials and methods

Automatic monitoring of geo-hydrological phenomena allows high-frequency data acquisition that enables advancements in the analysis of the phenomena and their evolution. In par-

ticular, due to the reduced temporal delay between sequential measurements, rapidly evolving brittle processes can even be explored and eventually correlated with external variables. To ensure such a frequent monitoring, however, it is necessary to have both software and hardware that are able to adequately support all the activities of the system in addition to a suitable power supply system (Herrera et al., 2011; Intrieri et al., 2015; Allasia et al., 2020).

In our study, we decided to implement a digital photographic monitoring system that follows these principles (Giordan et al., 2016; Dematteis et al., 2021) and that is based mostly on open-source hardware and software, ensuring a flexible and low-cost system. In particular, we choose a Raspberry Pi Zero W (https://www.raspberrypi.org/, last access: 25 January 2022) as the main control unit. This single-board computer is connected wirelessly to two webcams: a main camera (a commercial 2 MP PTZ Foscam – https://www.foscam.it, last access: 25 January 2022) and a secondary one (a 2 MP bullet-model Foscam). Moreover, it integrates an additional 8 MP webcam cabled directly to its Camera Serial Interface: the Raspberry Camera Module. All these optical sensors constantly monitor the area 24 h a day also thanks to the infrared (IR) capability, storing videos in full high definition (HD) and photos. In particular, webcams continuously record videos and take shots every few seconds, while the Raspberry Camera Module takes only shots at timed intervals. The periodically acquired images are analyzed and, in case of a possible rockfall between two consecutive photos, we analyze the corresponding videos to obtain further details. This can be achieved either manually or using artificial intelligence techniques (i.e., image change detection), leading to an automated and smart system.

The two webcams are mounted on two different poles distant approximately 50 m, watching each other and looking at different sides of the cliff (see top of Fig. 1). Each camera (which is around 5 m from the cliff) has its own solar panel, charge controller, and 12 V battery; on the main camera pole, there is also a 4G wireless router with an IP voltmeter and a relay. Thanks to the router, it is possible to connect remotely to the Raspberry (i.e., via SSH) to have a complete control, in addition to changing webcam configuration and orientation. Moreover, the IP voltmeter let us know in real time the system voltage, while the relay allows turning on/off of any device (router, Raspberry, or webcam). Finally, it is possible to obtain all the data by uploading photographs and videos automatically and periodically to an FTP server in real time. This system was installed at the end of May 2019, while on 12 February 2020 we added an electric crack meter on the most evident fracture present on the cliff (see bottom of Fig. 1). This crack meter has an accuracy of 0.1–0.3 mm and is remotely connected with the FTP server.

In addition to photos, videos, and crack-meter measurements, we constantly download data from a neighboring weather station managed by the Civil Protection in order to correlate the information logged from the cameras and the crack meter with the meteorological variables such as temperature, rainfall rate, wind speed, and direction. The analysis is carried out using a code written in the R language (R Core Team, 2021).

4 Results

In these 2 years of activity, the monitoring system recorded several events. The first remarkable event occurred between 12 November 2019 (after 09:00 CET) and 14 November 2019 (before 08:30) when a collapse of a large part of the cliff took place (see Fig. 2). Unfortunately, when the failure occurred, the instrumentation was inactive due to the lack of energy caused by the severe rainstorm that struck the area for a few days; moreover, no crack meter was still available (see bottom of Fig. 1). Despite these issues, both images and videos just before and after the collapse were available. Based on such information and the application of image change detection techniques, we estimated a volume of the collapse equal to 300 m^3±30 % following the methods described in Giordan et al. (2020).

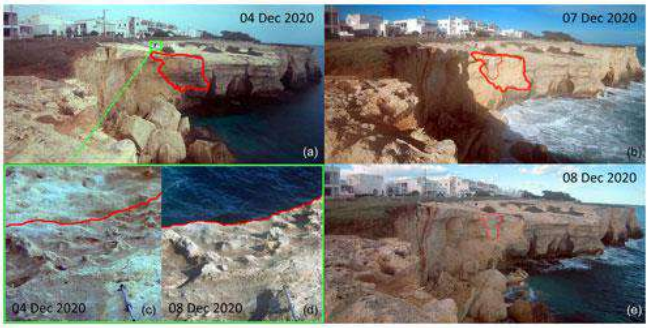


Figure 3 The second rockfall (marked with "B" in Fig. 1) – panel **(a)** shows the cliff as it was on 4 December 2020 and panel **(b)** shows it as it was on the morning of 7 December 2020, after the main collapse (marked by the thick red line). Panel **(e)** shows the cliff as it was on 8 December 2020, after a minor rockfall (marked by the thin red line). Those three images are taken from the secondary camera (see Fig. 1 for the position). In panels **(c)** and **(d)**, two smaller images that show the collapse from another point of view (the main camera, which could also be seen in the top left image, highlighted in green – see Fig. 1 for the position) both before the rockfall **(c)** and after it **(d)**. In those images, the newly installed automatic crack meter is also visible.

Two other rockfall events took place on 23 June 2020, around 17:05 (bottom of Fig. 1, green area), and on 28 June 2020, approximately between 09:00 and 11:00. In the latter event, the cameras, despite the area being under restricted access, also detected the presence of a passer-by; this anthropogenic disturbance interfered with the crack-meter measurements. This event confirmed that crack-meter devices alone cannot be used to monitor areas like the examined one, and an optical system is fundamental for having an additional control on the global factors acting on the site.

The last recorded event is related to the rockfall that occurred on 7 December 2020, 04:15. In this case, crack-meter data starting from July 2020 show a slight trend of the monitored fissure, which is seen to gradually enlarge up to the time of failure (bottom of Fig. 1, red area). Unfortunately, at that time, the optical instrumentation was off due to the lack of power caused by the adverse weather conditions: in the previous 96 h, a rather intense rainfall event occurred, which reached a peak of 24 h cumulative precipitation of 80 mm. Despite this issue, however, the images and videos obtained before and after the event are consistent with what was detected by the sudden deviation in the data of the crack meter. The fracture monitored by the instrument was not directly affected by the collapse, since the collapse involved a rock block not far from it, while the crack meter itself recorded, at the time of failure, a contraction of approximately 1 mm. In this case, following the same approach, it was possible to estimate the volume of the collapse, which resulted in being about 20 m^3±30 %. Based on the data acquired by the secondary camera, we have also observed that the collapse itself occurred in two stages: the most conspicuous part, as already mentioned, collapsed around 04:15, while a second detachment, considerably smaller, occurred between 11:00 and 16:30 on the same day, without affecting the crack-meter measurements (see Fig. 3).

5 Concluding remarks

An optical monitoring system (integrated by conventional strain measurement devices) for the control of a coastal rock cliff has been presented in this paper, and the data acquired through the last 2 years have been briefly discussed. The data indicate that the combination of frequently acquired digital images with local displacement measurements can provide useful information regarding the evolution of the rock cliff. In particular, digital images can give information on the rock volumes progressively subjected to detachment and collapse, thus providing clear indications on the evolution of the cliff recession and the areas highly susceptible to instability as well as on the correlation of the failure events with potential triggering factors. Strain sensors, instead, can offer detailed information on the local enlargement or closure behavior of single fractures and joints to be related to the information obtained from the optical images.

In all the events described above, adverse conditions (i.e., severe storms, battery outage, and human disturbance) prevented us from obtaining direct optical information on the collapse itself and from detecting potential precursory signs of the failure. However, the data acquired show that, even in such adverse cases, the monitoring system is capable of giving valuable information, even using only shots that are antecedent and subsequent to the failure event.

The choice of using a single strain sensor is only due to the fact that we are experimenting with a very low-cost monitoring system; in other cases, this system can be extended with as many crack meters as needed.

Moreover, despite being a low-cost solution, this system demonstrated a lot of potential, especially in flexibility and adaptability, since it allows us to readily estimate the volume of the fallen blocks as well as the evolving failure mechanism of the examined coastal sector and, as such, the potential evolution of the coastal retreat. As a consequence, it could easily be applied to the monitoring of different coastal areas subject to rockfalls.

European Geosciences Union / Natural Hazards and Earth System Sciences / Volume 22, issue 1, NHESS, 22, 207–212, 2022 (https://nhess.copernicus.org/articles/22/207/2022)

Στα χνάρια της κατολίσθησης του Παλαιού Μικρού Χωριού Ευρυτανίας

Κωνσταντίνος Λουπασάκης, Αναπλ. Καθηγητής ΕΜΠ

Η τρομακτική κατολίσθηση που εξαφάνισε 80 σπίτια του Μικρού Χωριού Ευρυτανίας έλαβε χώρα στις 13/1/1963, πρωί Κυριακής (Φωτ. 1 & 2). Δεκατρείς (13) κάτοικοι έχασαν τη ζωή τους. Ο αριθμός των θυμάτων θα ήταν πολύ μεγαλύτερος αν η κατολίσθηση ελάμβανε χώρα κάποια άλλη μέρα και ώρα, καθώς το πρωί της Κυριακής το σύνολο σχεδόν των κατοίκων ήταν στην εκκλησία του χωριού. Η εκκλησία βρίσκεται στο τμήμα του χωριού που δεν πλήγηκε από την κατολίσθηση.

Φωτ. 1 & 2: Φωτογραφίες από τον τύπο της εποχής.

Η κατολίσθηση εκδηλώθηκε στα πλευρικά κορήματα που καταλαμβάνουν μεγάλο τμήμα της κλιτύος που φέρει τον οικισμό (Φωτ. 3). Η επιφάνεια ολίσθησης περιέλαβε και τμήματα των σχηματισμών του υποβάθρου, αποτελούμενα από ασβεστόλιθους και υλικά της ζώνης μετάβασης, της γεωτεκτονικής ζώνης της Πίνδου (Ρόζος & Αποστολίδης, 2004). Κύριος εναυσματικός παράγοντας της αστοχίας ήταν οι έντονες βροχοπτώσεις. Χωρίς όμως να αποκλείεται και η συνεπίδραση της έντονης σεισμικής δραστηριότητας που, όπως αναφέρεται, εκδηλωνόταν εκείνη την περίοδο στην περιοχή.

Πενήντα εννέα (59) χρόνια μετά την καταστροφή και ακόμα διακρίνονται τα ερείπια των σπιτιών (Φωτ. 4 & 5). Επίσης διακρίνεται η κύρια κατακρήμνιση της αστοχίας (φωτ. 6 & 7) καθώς και μια μικρή λίμνη που δημιουργήθηκε στο πόδι της κατολισθαίνουσας μάζας λόγω της έμφραξης του διερχόμενου χείμαρρου (φωτ. 8).

Φωτ. 3: Άποψη των κορημάτων που δομούν το μεγαλύτερο τμήμα της κατολισθαίνουσας μάζας. Διακρίνονται και πάγκοι ισχυρά συγκολλημένων κροκαλοπαγών.

Φωτ. 4 & 5: Ερείπια των σπιτιών.

Φωτ 6: Άποψη της κύριας κατακρήμνισης και της μάζας της κατολίσθησης.

Φωτ. 7: Άποψη της ευρύτερης περιοχής του χωριού. Διακρίνεται η κύρια κατακρήμνιση και η μάζα της κατολίσθησης, ενώ επισημαίνεται και η θέση της μικρής λίμνης που έχει σχηματιστεί στο πόδι της κατολίσθησης. Απόσπασμα από το Google Earth.

Φωτ 8: Άποψη της μικρής αβαθούς λίμνης στο πόδι της κατολισθαίνουσας μάζας.

Ρόζος Δ., Αποστολίδης Ε., (2004) Τεχνικογεωλογική διερεύνηση των αστοχιών πρανών στο Παλαιό Μικρό Χωριό Νομού Ευρυτανίας για την ασφαλή οικιστική ανάπτυξή του. Πρακτικά 10ου Διεθνούς Συνεδρίου της ΕΓΕ, Δελτίο της Ελληνικής Γεωλογικής Εταιρίας, Τόμος XXXVI, σελ. 1806-1815.

ΝΕΑ ΑΠΟ ΤΙΣ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ

ΕΛΛΗΝΙΚΗ ΕΠΙΤΡΟΠΗ ΜΕΓΑΛΩΝ ΦΡΑΓΜΑΤΩΝ

Νέο Διοικητικό Συμβούλιο

Μετά από τη Γενική Συνέλευση της ΕΕΜΦ, που πραγματοποιήθηκε στις 22/09/21, και την πρώτη συνάντηση του νεοεκλεχθέντος Διοικητικού Συμβουλίου στις 11/10/21, το ΔΣ συγ-κροτήθηκε σε σώμα ως εξής:

- Πρόεδρος: Χαρά Παπαχατζάκη
- Α' Αντιπρόεδρος: Παναγιώτης Παπανικολάου
- Β' Αντιπρόεδρος: Χρήστος Δήμου
- Γενική Γραμματέας: Σέρα Λαζαρίδου
- Ταμίας: Σοφία Σαρλά
- Μέλη: Μπενσασσών Λίζα, Ράμπιας Άγγελος, Σούλης Βασίλης, Φωτοπούλου

Οι κ.κ. Κώστας Αναστασόπουλος και Γιώργος Ντουνιάς θα συνδράμουν την ΕΕΜΦ συμμετέχοντας στη σύσταση του ΔΣ ως Επίτιμοι Πρόεδροι.

International Society for Soil Mechanics and Geotechnical Engineering

ISSMGE News & Information Circular January 2022

https://www.issmge.org/news/issmge-news-and-information-circular-january-2022

1. ELECTION OF ISSMGE PRESIDENT 2022-2026

As a consequence of the 20ICSMGE being pushed back to May 2022, and in accordance with the Statutes and Bylaws, the deadline for receiving nominations for the next ISSMGE President has been extended to 30th January 2022.

2. 20ICSMGE / 7iYGEC NEW DATES MAY 2022

New dates have been confirmed for the conferences in Sydney as follows;

7iYGEC - Friday 29 April - Sunday 1 May 2022
20ICSMGE - Sunday 1 May - Thursday 5 May 2022.

Registration is now open via the conference website https://icsmge2022.org/registration.php

3. TIME CAPSULE PROJECT (TCP) - Informal "showcases" to start in Nov 2021

The Time Capsule Project (TCP) aims to create and sustain a conversation about the past, present and future of geotechnical engineering to the benefit of our over 20,000 members. Contributions from all sectors of the ISSMGE, including legacy material, will be held and promoted through an online platform. This platform will be formally launched at the 20th ICSMGE (1-5 May 2022).

From November 2021 onwards, a series of informal and engaging "showcases" will be hosted to enable contributors to learn from each other's experience. Even draft contributions can be presented so we can learn from each other. The concept is novel and exciting even for us in the TCP Design Team!

For further information, please make contact with TCP Design Team directly or through the form available at: https://www.issmge.org/the-society/time-capsule .

4. VIRTUAL UNIVERSITY

The following have recently been added to the website:

Performance assessment of soils and structures by numerical analysis Prof. Toshihiro Noda

How to perform reliability analyses on a spreadsheet Dr Lei Wang

Collapse of Fujinuma Dam by the 2011 Great East Japan Earthquake and its reconstruction - Prof. Fumio Tatsuoka and Dr. Antoine Duttine.

Probability Analysis in Civil Engineering Prof. Jie Zhang

5. BULLETIN

The latest edition of the ISSMGE Bulletin (Volume 15, Issue 6, December 2021) is available from the website https://www.issmge.org/publications/issmge-bulletin/vol-15-issue-6-december-2022

6. ISSMGE FOUNDATION

The next deadline for receipt of applications for awards from the ISSMGE Foundation is the 31st January 2022. Click here for further information on the ISSMGE Foundation.

7. CONFERENCES

For a listing of all ISSMGE and ISSMGE supported conferences, and full information on all events, including deadlines, please go to the Events page at https://www.issmge.org/events. However, for updated in-

formation concerning possible changes due to the corona-virus outbreak (ie. postponements, cancellations, change of deadlines, etc), please refer to that specific events website.

A number of events have been rescheduled and we update the Events page whenever we are advised of changes.

The following are events that have been added since the previous Circular:

ISSMGE Conferences

Fourth International Conference Challenges in Geotechnical Engineering - 01-06-2022 - 03-06-2022 Kyiv National University of Construction and Architecture (Ukraine), Languages: English, Ukrainian; Organiser: Kyiv National University of Construction and Architecture (Ukraine) and University of Zielona Gora (Poland)Contact person: Viktor Nosenko, Vasyl Pidlutskyi, Liudmyla Skochko; Address: 31, Povitroflotsky ave., KNUCA, Kyiv, 03037, Ukraine; Phone: +38(097)3811265 ; Fax: +38(097) 381-12-65; Email: info@cgeconf.com; Website: http://www.cgeconf.com; Email: info@cgeconf.com

Fifth International Conference on New Developments in Soil Mechanics and Geotechnical Engineering - 30-06-2022 - 02-07-2022 Atatürk Cultural and Congress Center Near East University, Nicosia; Language: English; Organiser: Turkish Society of Soil Mechanics and Geotechnical Engineering and Near East University; Contact person: Cavit ATALAR ; Phone: 05338342829; Fax: 00903922236461 ; Email: cavit.atalar@neu.edu.tr; Website: http://zm2022.neu.edu.tr; Email: zm.2022@neu.edu.tr

17th Asian Region Geotechnical Engineering Conference - 14-08-2023 - 18-08-2023, Nur-Sultan, Kazakhstan; Language: English; Organiser: Kazakhstan Geotechnical Society; Contact person: Ms. Bibigul Abdrakhmanova ; Address: 2, Satpayev Street, Eurasian National University, Geotechnical Institute; Phone: +7-7172- 344796 ; Fax: +7-7172-353740 ; Email: bibakgs@gmail.com; Website: https://17arc.org/; Email: milanbi@mail.ru

TC306's GEE conferences indexed in Scopus

We are delighted to announce an important distinction for the community of geotechnical engineering education: our application for Scopus listing was approved for the series of the conference proceedings Geotechnical Engineering Education (ISSN 2732-7256), starting with the GEE 2020 conference, which was streamed from Athens in June 2020.

One more reason for the geotechnical engineering community to continue its support to the GEE conferences with high quality contributions and increased participation!

The Editors of the GEE 2020 proceedings

Marina Pantazidou, Michele Calvello, Margarida Pinho Lopes https://www.issmge.org/news/tc306s-gee-conferences-indexed-in-scopus

TC201 Newsletter July 2020

The TC201 Newsletter July 2020 is the eighteenth newsletter of the ISSMGE Technical Committee 201: Geotechnical Aspects of Dykes and Levees and Shore Protection. The intention of the newsletter is to keep all members informed on coming activities of our TC201 and the ISSMGE https://www.issmge.org/news/tc201-newsletter-july-2020

TC201 Newsletter February 2021

This is the nineteenth newsletter of the ISSMGE Technical Committee 201: Geotechnical Aspects of Dykes and Levees and Shore Protection. The intention of the newsletter is to keep all members informed on coming activities of our TC201 and the ISSMGE. https://www.issmge.org/news/tc201-newsletter-february-2021

Minutes of TC201 online meeting on June 15, 2021

Tuesday June 15th, 2021 (7:00 h Mexico/ 14:00 h Delft/ 22:00 h Seoul) https://www.issmge.org/news/minutes-of-tc201-online-meeting-on-june-15-2021

TC201 Newsletter December 2021

This is the twentieth newsletter of the ISSMGE Technical Committee 201: Geotechnical Aspects of Dykes and Levees and Shore Protection. The intention of the newsletter is to keep all members informed on coming activities of our TC201 and the ISSMGE. https://www.issmge.org/news/tc201-newsletter-december-2021

2nd TC212 International Conference

4° C.F.P.B. took place from the 23rd to 24th of May, 2019, after three previous successful conferences held in 2013, 2015 and 2017. The conference organized in cooperation with ISSMGE Technical Committee TC212, Deep Foundations - was organized by INCOTEC S.A. in association with the Society of Engineers of Bolivia and the Bolivian Society of Soil Mechanics and Geotechnical Engineering. The conference was held at the Marriot Hotel in Santa Cruz Bolivia, followed by four short courses on the 25th about topics related to the design and execution of deep foundations. These courses took place in the UPSA Campus (Universidad Privada de Santa Cruz), the main private university of the city.

The themes of the conference were: Large pile groups and urban excavations, including the State of the art, experiences and design criteria. The focus was on the presentation and discussion of the state-of-practice and new developments in the area of these two topics. Special presentations were given by guest speakers who are leading international experts in their fields. Particular emphasis was on the discussion and exchange of practical experience and the application of research results in practice. An exhibition including field demonstrations was arranged with the participation of leading manufacturers of foundation equipment and machines.

https://www.issmge.org/news/2nd-tc212-international-conference

Rocscience Webinar - 3D Slope Stability Analysis using Slide3 and RSPile

Description: This webinar brought to you by Rocscience will demonstrate how the 3D Limit Equilibrium Method program, Slide3 integrates with RSPile and allows users to perform more complex 3D Slope Stability Analysis.

Link for the registration: https://www.rocscience.com/events/webinar-3d-slope-stability-analysis-using-slide3-and-rspile

Data/Time: Wednesday, January 26th, 2022, at 1 PM Eastern Standard Time

https://www.issmge.org/news/rocscience-webinar-3d-slope-stability-analysis-using-slide3-and-rspile

Webinar: Geotechnical Issues of Tailings Dams

In July 2021, a short questionnaire of 6 questions was prepared and sent to the TC221 members. Close to 50 responses were received, which are analyzed in this document.

TC221 on Tailings and Mine Wastes is organizing a Webinar taking place on 20th January 2022. This webinar was motivated by answers given to a brief questionnaire on some main geotechnical issues associated with the stability of tailing dams. A significant number of responses showed serious divergences on key aspects related to design, analysis and monitoring of tailings dams, prompting the organization of a discussion session.

Broadcast at: **https://www.abms.com.br/canal/**
Time: 11:00 AM - Brazilian time

https://www.issmge.org/news/tsfs0

TC 105 Webinars with Education Focus

Technical Committee TC105, Geomechanics from Micro to Macro, organizes five seminars on "**Discrete Element Method (DEM) in geotechnical engineering education**", on February 8 (Francois Guillard & Benjy Marks), February 22 (Benjy Marks & Francois Guillard), March 29 (Vincent Richefeu), April 26 (Shiwei Zhao) and May 24 (Krishna Kumar).

Please see attached flyer for further information and registration links.

https://www.issmge.org/news/tc-105-webinars-with-education-focus

Discrete Element Method (DEM) in geotechnical engineering education

This Spring, TC105 Geomechanics from Micro to Macro is hosting a webinar series on Discrete Element Method (DEM) in geotechnical engineering education. See below. If you would like to listen to the seminars, please register from the flyer that can be accessed from here.

Lecture 1: Tuesday, February 8, 2022 (4pm Sydney time, 1pm China time, 6am Europe time, 9pm(-1 day) US Pacific time)
Teaching granular mechanics with Discrete Element Method
Francois Guillard and Benjy Marks (University of Sydney)

Lecture 2: Tuesday, February 22, 2022 (4pm Sydney time, 1pm China time, 6am Europe time, 9pm(-1 day) US Pacific time)
Virtual laboratory testing using DEM to understand soil behaviour
Benjy Marks and Francois Guillard (University of Sydney)

Lecture 3: Tuesday, March 29, 2022 (6pm Sydney time, 3pm China time, 9am Europe time, 12am US Pacific time)
Let's code the discrete element method for a deeper understanding
Vincent Richefeu (Université Grenoble Alpes)

Lecture 4: Tuesday, April 26, 2022 (5pm Sydney time, 3pm China time, 9am Europe time, 12am US Pacific time)
Using open source DEM in teaching
Shiwei Zhao (Hong Kong University of Science and Technology)

Lecture 5: Tuesday, May 24, 2022 (1am(+1 day) Sydney time, 11pm(+1 day) China time, 5pm Europe time, 8am US Pacific time)
Building a real-time interactive playground with in-situ viz and deep learning
Krishna Kumar (University of Texas, Austin)

https://www.issmge.org/news/discrete-element-method-dem-in-geotechnical-engineering-education

ICSE-10 proceedings now available

All papers of ICSE-10 proceedings are now available at Online Library | ISSMGE. https://www.issmge.org/news/icse-10-proceedings-now-available

ISSMGE TC210 4th committee meeting

1. Welcome and membership. Many ISSMGE member societies nominated new TC210 members in the first half of 2021. The latest roasters of the committee can be found at https://www.issmge.org/committees/technical-committees/applications/embankment-dams. Welcome new members!
2. ISSMGE Time Capsule Project (TCP) (https://www.issmge.org/the-society/time-capsule)
    1. The Time Capsule project will be launched on 1-6 May 2022, 20th ICSMGE, Sydney, Australia. TC210 will have a special TCP session.
    2. Call for a series of state-of-the-art review articles on major aspects of the design, construction and maintenance of embankment dams. No word limit (can be a few pages or very long). If you would like to prepare a TCP paper, please send your suggested tittle to me or Dr Rui Wang. We will then discuss with you matters about format, scope etc.
    3. TC210 has so far three on-going TCP projects:
3. Assessment and management of landslide dam risks (Dr Ming Peng, Tongji University, China)
4. Cemented coarse granular embankment dams (Dr Duruo, Tsinghua University)
5. Interface mechanical behavior of rockfill dams (Dr Rui Wang, Tsinghua Univ)
4. Submissions from Europe, north and south America, Africa, Australasia and the rest part of Asia are most welcome.
6. TC210 special session in the 4th Int. Conf. on Performance-based Design in Earthquake Geotechnical Engineering, 15 -17 July 2022, Beijing. (http://www.pbd-iv2021.com). Papers are solicited from TC210 members.

7. Workshop (ISSMGE TC201 and TC210, ICOLD TC E and TC LE) over ISC 6, Hungarian Academy of Sciences, Budapest (Coordinator: Emke Imre)
8. AOB

https://www.issmge.org/news/issmge-tc210-4th-committee-meeting

91,421 paper downloads in 2021 for the ISSMGE International Journal of Geoengineering Case Histories

The ISSMGE International Journal of Geoengineering Case Histories is proud to announce that its papers were downloaded 91,421 times in 2021.

The International Journal of Geoengineering Case Histories is an official journal of the International Society for Soil Mechanics and Geotechnical Engineering, the premier scien-tific organization for geotechnical engineering worldwide. The Case Histories Journal covers the broad area of practice in geotechnical engineering (soils and rocks), including geotechnical earthquake engineering, environmental geotechnics and engineering geology, and energy geo-construction with a focus on careful documentation of case histories and emphasis on observations and data collected during and after project construction.

Papers published in this refereed journal are freely available in color and are accompanied by databases that include the electronic data presented in the paper as well as additional figures (as necessary). The locations of the case histories are also positioned in the IJGCH Geographic Database.

The platinum open access feature of the journal, i.e., the publication of papers without a cost to readers or authors, is aimed to better serve the professional and research geo-community. All papers are immediately downloadable by visitors and accessed through Google Scholar and Georef index databases. The 91,000+ paper downloads in 2021 encourages us in our Mission and is indicative of the impact the journal is having to the profession.

Below, you can find the list of the top 10 papers downloaded from the International Journal of Geoengineering Case Histories in 2021:

1. Jafari, N. H., Stark, T. D., and Merry, S. (2013). The July 10 2000 Payatas Landfill Slope Failure. International Journal of Geoengineering Case Histories, Vol.2, Issue 3, p.208-228. (2,719 downloads 11,066 downloads since 2017)
2. Xenaki, V., Doulis, G., Athanasopoulos, G. (2016). Geotechnical Design of Embankment: Slope Stability Analyses and Settlement Calculations. International Journal of Geoengineering Case Histories, Vol. 3, Issue 4, p.246-261. (2,109 downloads 11,473 downloads since 2017)
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The open access scope of the Journal is supported by the following forward-looking organizations: DarGroup, Geosyntec Consultants, ConeTec and ENGEO. These organizations make possible the circulation of the journal to thousands of readers at no cost.

The ISSMGE International Journal of Geoengineering Case Histories is a great place to publish case histories and make sure professionals globally read them! We encourage you to consider the ISSMGE International Journal of Geoengineering Case Histories as a high impact means to disseminate your work.

The co-Editors in Chief,

Dimitrios Zekkos, University of California at Berkeley

https://www.issmge.org/news/91421-paper-downloads-in-2021-for-the-issmge-international-journal-of-geoengineering-case-histories

IAEG Commission 25 - Engineering Geology Models - Press Release

Please click here to read a press release from the IAEG Commission 25 on Engineering Geological Models.

https://www.issmge.org/news/iaeg-commission-25-engineering-geology-models-press-release

AGS Association of Geotechnical & Geoenvironmental Specialists

https://www.ags.org.uk/2022/01/ags-magazine-january-2022/

ISRM International Society for Rock Mechanics and Rock Engineering

News
https://www.isrm.net

1st ISRM Young Members' Seminar - 26 January, 17:00 GMT 2022-01-05

The ISRM Young Members' Seminar (YMS) Series is a new ISRM Young Members Group initiative. It consists of a series of virtual events, with the goal of providing a global platform for ISRM young members to share knowledge, experiences, and ideas. More details on the YMS are available in the December 2021 ISRM Newsletter.

The 1st ISRM Young Members' Seminar will take place on 26 January, at 17:00 GMT with two speakers from Europe:

- Sophie Jung (PhD student at Laboratoire Navier - Ecole des Ponts ParisTech, France)
  Topic: *Modeling of the long term behavior of the damaged zone by fracturing around the underground storage works in argilites*

- Alessandra Insana (Research assistant at Politecnico di Torino, Italy)
  Topic: *Challenges in the Lyon-Turin base tunnel project*

You can join using the Zoom link created for each Seminar and you can participate in the question and answers period. The Seminars will also be live-streamed to the ISRM YM's YouTube channel, where they will be stored. Full information is available in the leaflet of the 1st YMS Seminar.

In February and March, we will have speakers from Asia and Latin America. Stay tuned for more details from the YMS organising committee.

Sevda Dehkhoda
Chair of the ISRM Young Members Committee

RocDyn-4, Xuzhou, China, 17-19 August 2022 – Keynote speakers announced, registration open 2022-01-11

Dear Colleagues,

We would like to thank you for your constant attention to the Fourth International Conference on Rock Dynamics and Applications (RocDyn-4) in Xuzhou, China, 17-19 August 2022.

Now, the registration channel has been opened. You can click here to register for the conference. The deadline for full-length paper submission is 15 March 2022.

We have invited eight distinguished speakers to lead the keynote lectures and highlight some of the latest development in rock dynamic research, innovations, challenges, and future directions. Click here to download the flyer with the speakers' information.

Sincerely yours,

Organizing Committee
RocDyn-4, Xuzhou 2022

Tunirock2022 - full paper submission deadline is 28 February 2022 2022-01-15

Dear Colleagues,

I have the pleasure to inform you that the FULL PAPER SUBMISSION DEADLINE is now extended to February 28th, 2022.

On the other hand, considering the global pandemic situation, the organizing committee also decided to offer the choice to the participants to attend the conference online. The possibility of on site participation is maintained (You can visit the conference web page for further details: https://atmr.ig90.com/tunirock2022.php).

Shall you have any questions, suggestions, or feedback, please do not hesitate to contact us at any time (atmroches@gmail.com).

We look forward to seeing you among us on 26-28 March 2022 in Hammamet, TUNISIA.

Keep safe !

Best Regards,

General Conference Chair

Prof. Essaieb HAMDI

First ISRM Young Members' Seminar (YMS) tomorrow, 26 january at 5 P.M. GMT 2022-01-25

The first ISRM Young Members' Seminar (YMS) will be held tomorrow, 26 january at 5 P.M. GMT, with presentations by Sophie Jung (PhD student at Laboratoire Navier - Ecole des Ponts ParisTech, France) on the topic "Modeling of the long term behavior of the damaged zone by fracturing around the underground storage works in argilites", and Alessandra Insana (Research assistant at Politecnico di Torino, Italy) on the topic "Challenges in the Lyon-Turin base tunnel project".

The Zoom registration link is: https://zoom.us/meeting/register/tJMsdOmoqT0pG9KYZsybO9wDFq46BfhWPPdi, find more information in the leaflet.

3rd JTC1 Workshop on Impact of global changes on landslide risk 2022-01-26

The Joint Technical Committee on Natural Slopes and Landslides (JTC1) of FedICGS is delighted to invite you to join us at the 3rd **JTC1 Workshop on Impact of global changes on landslide risk,** to be held in **Oslo, Norway** on **June 7th – 10th, 2023**.

Anthropogenic impacts and related climate change are unquestionably changing the landslide risk and impacting how we assess and manage the risk(s).

The aim of the Workshop is to **promote discussion between scientists and engineers** on whether we are capable of predicting and quantifying the expected changes in landslide risk and how we could implement the knowledge gained from academic research on landslide risk management into practice. The advanced topics in focus for the discussions include:

- Rock mass degradation and landslide initiation;
- Climate and anthropogenic impact on landslide risk in various geographic regions, including the Arctic;
- Prediction of landslide mobility and impact footprint, including landslides initiated at mine tailings storage facilities;
- Application of modern remote sensing technologies to landslide risk assessment;
- Landslide risk reduction strategies: risk mitigation, including early warning and nature-based solutions;
- Applications of new technologies like machine learning for landslide susceptibility and landslide hazard mapping.

The workshop will consist of two lecture days (June 8 and 9), and a one-day technical excursion (June 10). The lecture days will be a combination of five keynote lectures, a number of invited lectures, the 3rd Hutchinson Lecture as well as discussion sessions.

You are invited to submit extended abstracts (up to 4 pages) for oral presentation and short abstracts (max 1 page) for poster presentation. Instructions and templates for abstract submission can be found here.

The deadline for submitting both extended and poster abstracts is **31 March 2022.**

The digital proceedings will be issued right after the workshop and made available on the 3rd JTC1 Workshop website.

The Organizing Committee will make a selection of the best abstracts (oral presentations and posters) and invite the authors to provide a full manuscript to be published in a Special Issue of a refereed, open-access journal. A total of 10 to 15 articles are envisioned for the Special Issue, which is expected to be published within one year after the workshop.

For detailed information check the dedicated website at: https://jtc1-2023.com/

Prof. Seokwon Jeon from the Republic of Korea elected ISRM President for 2023-2027

The election took place during the ISRM Council meeting on 17 November 2021. The President-elect will now join the Board and will assume the Presidency of the Society after the 15th Interna-tional Congress on Rock Mechanics in October 2023.

37th Online Lecture - Prof. Yuzo Onishi's presentation

For the 37th ISRM Online Lecture, the ISRM invited Prof. Yuzo Ohnishi, from Japan. The title of the lecture is "Evolution of numerical methods for coupled problems in rock mechanics and engineering". It will broadcast on 24 March 2022 at 10 A.M. GMT at www.isrm.net.

Prof. Yuzo Ohnishi is an Emeritus Professor at Kyoto University. He received his Bachelor Degree in Civil Engineering in 1968 from Kyoto University and his PhD in 1973 from the University of California at Berkeley, USA with supervision by Prof. R.E. Goodman. After he worked as a staff member at Lawrence Berkeley Laboratory, he returned to Kyoto University. During his 39 years' career in Kyoto University he was Assistant Professor, Associate Professor and Professor of Geotechnical Engineering in the Department of Civil Engineering. In the meantime, he conducted his research at the Geological Engineering Laboratory in the Civil and Environmental Engineering at MIT from 1987 to 1988.

His research interests include mechanical properties of soils and rock masses, continuous and discontinuous numerical analysis such as FEM, DEM and DDA, and groundwater modeling. His major contribution to rock engineering has been in the area of coupled analysis between various influencing factors for discontinuous rock masses. Now the coupling between solid rock and water has been extended to a wider range including temperature and geochemical effects.

Discrete methods such as DEM and DDA, in addition to FEM, are now being used to understand complex rock mass behavior. In fluid modeling, methods called particle methods (MPS, SPH, etc.) have been developed in recent years. These methods are used to investigate the physical and mechanical effects of water on the rock mass and provide a means to understand the behavior of the rock mass.

He published over 300 papers in journals and conferences in the field of rock mechanics, geotechnical engineering, groundwater analyses and numerical computation. He is also an editorial board member of several international journals. At the same time, he has been active in the University administration. He was an Executive Vice President of Kyoto University from 2012 to 2015.

He has served as ISRM Vice President at Large from 2011 to 2014 and played a trailblazing role in evaluating ISRM commission activities. Furthermore, he has served as President of the Japanese Committee for Rock Mechanics and Chairperson of the Rock Engineering Committee in the Japan Society for Civil Engineers.

Course on Crustal Stress Assessment and its Application in Engineering and Research Engineering

In order to improve the methods and techniques of borehole-based stress-strain observatory, especially for calibration technology, promote experimental studies on deep-borehole stress measurement, and advance research collaboration associating the crustal stress with seismicity, seismogenesis, and rock failure process, the ISRM Commission on Crustal Stress and Earthquakes invited five commission members to present a video course. This course includes two parts on the technology of in-situ stress measurement and its application in engineering, two parts on the technology of borehole tensor strainmeter and its calibration, and one part on the application of the crustal stress in Earthquake research:

- Part 0 - Furen XIE - Course Presentation
- Part 1 – Hong LI - Realization of multi-component and 3-D borehole strain-meter observation technology
- Part 2 - Takatoshi ITO - Core deformation: A new stress indicator applicable in a wide range of depth and temperature
- Part 3
  - Part 3.1 - Zhongqi Quentin YUE - Methane gas refined fault theory for cause of tectonic earthquakes
  - Part 3.2 - Zhongqi Quentin YUE - Methane gas refined fault theory for cause of tectonic earthquakes
  - Part 3.3 - Zhongqi Quentin YUE - Methane gas refined fault theory for cause of tectonic earthquakes
- Part 4 - Qunce CHEN - In situ stress measurements around Eastern Himalayan syntaxis
- Part 5 - Jiayong TIAN - Dynamic calibration of borehole tensor strainmeters

https://isrm.net/isrm/page/show/1638

3rd ISRM Young Member's Seminar series

The third ISRM Young Members' Seminar (YMS) will be held on 30th March, with presentations from by Kimie Susuki (Chile) and Alexander Ramos (Peru)

- Numerical modelling of rock masses in block cave mining by Kimie Susuki (Chile).
- Strategy and tactics for burst-prone conditions in a deep underground mine by Alexander Ramos (Peru).

Download the flyer.

ASSOCIATION INTERNATIONALE DES TUNNELS ET DE L'ESPACE SOUTERRAIN
AITES | ITA
INTERNATIONAL TUNNELLING AND UNDERGROUND SPACE ASSOCIATION

Scooped by ITA-AITES #58, 4 January 2022

HRBT expansion boring? Yes and no | United States of America

Mumbai Metro 3: Tunneling machinery assembling for two tunnel works initiated | India

Jajarkot-Jumla tunnel: Feasibility study begins | Nepal

Metrolinx's tunnel boring machines for the Eglinton Crosstown West Extension arrive at launch site | Canada

Patna Metro: Underground and elevated construction work likely to begin in February | India

Will Uttarakhand get the world's longest road tunnel? | India

Moscow Metro sets a new record | Russia

Erdoğan inaugurates road tunnel connecting Turkey to Caucasus | Turkey

HS2 boss heralds 'incredible momentum' for 2022 | UK

Former Victorian rail line is set to be Europe's longest underground cycle lane | UK

Sydney airport metro tunnelling contract awarded | Australia

Amazing pictures of the youngest Mersey tunnel as it reaches 50 | UK

Scooped by ITA-AITES #59, 19 January 2022

Largest-ever tunnel boring machines in SEA for Genting ECRL project, says Dr Wee | Malaysia

Construction of new road and tunnel near Georgian-Russian border will be completed by 2024 | Azerbaijan

Tami Nadu Chief Minister announces 15.3km new Airport Metro line in Chennai | India

China's longest underwater highway tunnel opens

By 2023 end, this tunnel in Maharashtra will be world's widest | India

New tunnelling research and training centre established in Singapore

The only way is... down! Why underground urban development is on the rise | Australia

Howard Street Tunnel expansion project | United States of America

Watercare seeks consent for record-breaking tunnel | New Zealand

Circle Line 6 tunnelling works complete, 3 new stations set to open in 2026 | Singapore

Small steps forward in sustainable sprayed concrete tunnels

Ross Dimmock – Vice President Tunnelling, Normet Group

Something interesting happened during this Covid Pandemic, it seemed the world became far more caring and conscious of our existence and roles, and perhaps through coincidence or consequence, our UK tunnelling industry has an increasing focus towards new, caring approaches to meeting the climate goal ambition set out in the Paris Accord and the recent impetus at COP26 in Glasgow. But given all the positive talk, what are we doing about reaching our lower carbon tunnelling objectives . . . are we walking the talk?

The lecture presents some small steps forwards in developing sustainable sprayed concrete tunnels, not just purely focused on the concrete material technology that is often the only item under scrutiny, but a more holistic view covering concept design, spraying equipment and smart digital tools. The lecture also highlights the needed behaviours to support the adoption of more low carbon solutions, where in the speaker's view, the active involvement with all stakeholders to drive change is a pre-requisite, but certainly with strong direction and leadership from client teams who inevitably benefit in the long run.

The lecture will illustrate by example how we currently compare to another "advanced" tunnelling nation such as Norway who have stepped ahead in this more sustainable tunnelling quest.

Thursday 20th January 2022 at 18:15 hrs [GMT], Online at : https://youtu.be/XfnFXCdS6aM

Geotech Tools

Have you checked out Geotech Tools yet? Create your FREE account and unlock a library of case histories on over 25 geotechnical subdisciplines! Perfect for people new to geotech, someone stepping out of their comfort zone on a project, or just looking to see best practices. Head over to geotech-tools.org, join our more than 11,000 GTT members, and get started!

Login | GeoTechTools | Geo-Institute

geoinstitute.org

Bradley Keelor, 2nd Director, Geo-Institute at American Society of Civil Engineers

ΔΙΑΚΡΙΣΕΙΣ ΕΛΛΗΝΩΝ ΓΕΩΤΕΧΝΙΚΩΝ ΜΗΧΑΝΙΚΩΝ

Η Assistant Professor του UCDAVIS Κατερίνα Ζιωτοπούλου παρουσίασε σεμινάριο Γεωτεχνικής Μηχανικής στο Τμήμα Πολιτικών Μηχανικών της Σχολής Φυσικών Επιστημών και Μαθηματικών του Πανεπιστημίου της Χιλής

Το σεμινάριο διεξήχθη την 30η Μαρτίου 2021 και είχε τίτλο «Performance-based Assessment of Liquefaction-Induced Ground Failure: Element- & System-Level Considerations».

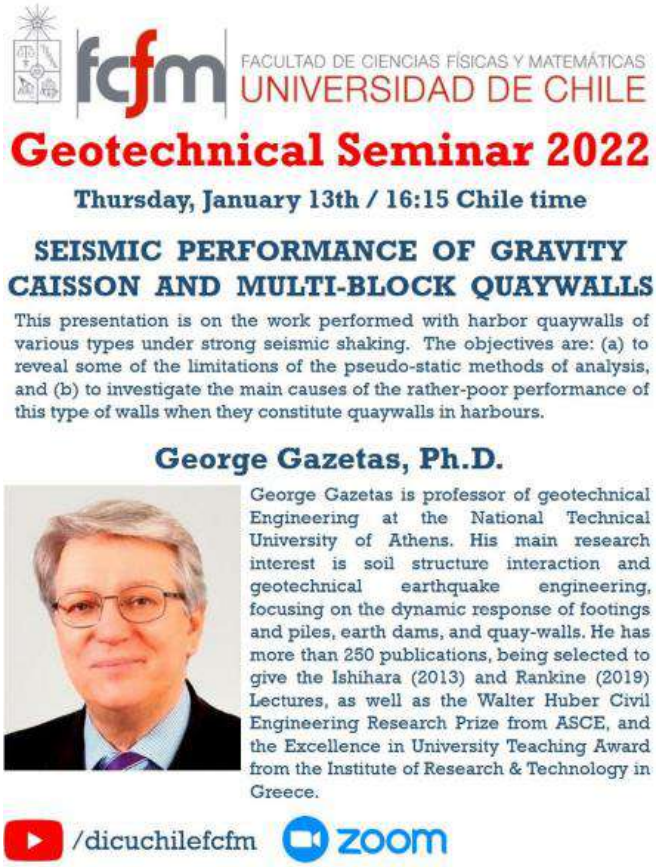
https://www.youtube.com/watch?v=d6Mfn_O0M9k&list=PLrYqavfMNupXRZU47xPPAm48n-jJZxfTg

Ο Ομότιμος Καθηγητής ΕΜΠ Γιώργος Γκαζέτας παρουσίασε σεμινάριο Γεωτεχνικής Μηχανικής στο Τμήμα Πολιτικών Μηχανικών της Σχολής Φυσικών Επιστημών και Μαθηματικών του Πανεπιστημίου της Χιλής

Το σεμινάριο διεξήχθη την 30η Μαρτίου 2021 και είχε τίτλο «Sesmic Performance of Gravity Caisson and Multi-Block GRAVITY Quat-Walls».

Αντιγράφουμε από την ανακοίνωση του σεμιναρίου:

This presentation is on the work performed with harbor quay walls of various types under strong seismic shaking. The objectives are: (a) to reveal some of the limitations of the pseudo-static methods of analysis, and (b) to investigate the main causes of the rather-poor performance of this type of walls when they constitute quay walls in harbours.



https://www.youtube.com/watch?v=0F6Rp0AZJH0&list=PLrYqavfMNupWUlicSu2pRxkcufwI5ry1C

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

Για τις παλαιότερες καταχωρήσεις περισσότερες πληροφορίες μπορούν να αναζητηθούν στα προηγούμενα τεύχη του «περιοδικού» και στις παρατιθέμενες ιστοσελίδες.

GeoAfrica 2021 - 4th African Regional Conference on Geosynthetics Geosynthetics in Sustainable Infrastructures and Mega Projects, 21-24 February 2022, Cairo, Egypt, https://geoafrica2021.org

16th ICGE 2022 – 16th International Conference on Geotehnical Engineering, Lahore, Pakistan, 23-24 February, 2022, https://16icge.uet.edu.pk/

15 - 17 March 2022, Kuala Lumpur, Malaysia
www.hydropower-dams.com/asia-2022

THE SECOND BETANCOURT CONFERENCE "NON-LINEAR SOIL-STRUCTURE INTERACTION CALCULATIONS"
April 2022

Augustin Betancourt was an outstanding offspring of the Spanish nation and a citizen of the Russian empire, the founder of the Russian engineering school, the first head of a Russian agency for architecture and civil engineering. Betancourt Conferences are devoted to discussion of the important engineering problems faced by the professional community. The conference characteristic feature is involvement of experts of various profiles in discussion of relevant issues that fosters interdisciplinary communication and synthesis of knowledge.

The first conference held in June 2019 was devoted to underground urban planning, it drew attention of city planners, architects, geotechnical engineers, historical city preservation activists. Expectedly, the discussion of issues of underground space development resulted in creation of the regulatory document – Set of Rules 473.1325800.2019 "Buildings, structures and underground complexes. The rules of city planning design".

At the Second Betancourt Conference, which is going to be held in April in the format of video conference, we suggest to discuss burning issues of soil-structure interaction calculations taking into account non-linear and rheological properties of soils and structures which solution is impossible without a synthesis of engineering knowledge in the field of geotechnical engineering and design of superstructures.

For the Organizing Committee of the Conference

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16th International Benchmark Workshop on Numerical Analysis of Dams, 6–8 April 2022, Ljubljana, Slovenia, https://icold-bw2022.fgg.uni-lj.si

ICEGT-2020 2nd International Conference on Energy Geotechnics, 10-13 April 2022, La Jolla, California, USA, https://icegt-2020.eng.ucsd.edu/home

5th International Seminar on Earthworks in Europe
20-22.4.2022, Prague, Czech Republic
www.c-in.eu

Aim

The 5th International seminar on Earthworks in Europe that will take place in Prague, Czech Republic in 2022 has for aim to promote good practice of earthworks in all kinds of civil engineering construction as well as to exchange information between professionals regarding planning, designing and constructing earth structures. New approaches and materials, construction risks, environmental aspects as well as

great achievements in the field of earthworks will be discussed. This seminar follows up four previous similar events that were organised in Paris (2005), London (2009), Berlin (2012) and Madrid (2018). The seminar was originally planned for April 2021 but due to coronavirus restrictions was postponed to April 2022.

We invite everyone interested in earthworks not only from Europe but also from other corners of the world to come to Prague and share their experience with others. Earthworks represent major share in time and costs in civil engineering constructions. Billions of cubic meters of soil and rock as well as secondary and artificial materials are moved and placed in earth structures every year. Our goal is earthworks conducted in high quality, quickly and environmentally friendly.

The seminar will be organised under the auspices of the Czech Road Society and Czech Chamber of Engineers.

Topics

The main discussed topics proposed:

- Earthworks standards
- Soil treatment
- Alternative and special materials in earthworks
- Soil reinforcement
- Hydraulic fills
- Earthwork failures

CONTACTS

Seminar secretariat
C-IN
Prague Congress Centre
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E-mail: info@earthworks2022.org
Website: www.c-in.eu

RaSim 10 Rockbursts and Seismicity in Mines, 24 – 29 April 2022, Tucson, USA, www.rasimsymposium.com

SYDNEY 7iYGEC 2021 7th International Young Geotechnical Engineers Conference A Geotechnical Discovery Down Under, 29 April - 1 May 2022, Sydney, Australia, http://icsmge2021.org/7iygec

SYDNEY ICSMGE 2021 20th International Conference on Soil Mechanics and Geotechnical Engineering, 1–5 May 2022, Sydney, Australia, www.icsgme2021.org

LARMS 2021 – IX Latin American Rock Mechanics Symposium Challenges in rock mechanics: towards a sustainable development of infrastructure, 15 – 18 May 2022, Asuncion, Paraguay, https://larms2021.com

Transport Geotechnics
19 May 2022, London, United Kingdom
https://transport.geplus.co.uk/getr/en/page/

Ground Engineering is excited to announce the return of **Transport Geotechnics** on **Thursday 19 May 2022** taking place at **America Square Conference Centre, London.**

GE Transport Geotechnics is an essential meeting for anyone involved in ground engineering for infrastructure assets with a **focus on sharing**, showcasing and **driving best practice** and **innovation**. The conference will give you expert knowledge, best practice from major projects and networking opportunities with innovative clients, contractors and designers.

This year we will also be hosting our **Asset Resilience Workshop** in London on **Wednesday 18 May 2022**. **It will** feature a range of discussions and sessions aimed at helping asset managers and geotechnical professionals deal with and understand the **technical challenges from climate resilience to asset failure.**

The GE Transport Geotechnics conference will give you insight into key questions including:

- What is the outlook and pipeline for the development of transport geotechnical assets in the next 5 years?
- How is technology changing the way we design, build and maintain assets?
- How can we improve the management of ageing assets given the climate challenges?

The half day workshop event will feature:

- Interactive workshops aimed at key sharing key learnings about developments and technologies
- Insightful sessions to better help Asset Managers and geotechnical professionals deal with technical challenges from climate resilience to asset failure

Booking enquiries
Ben Joudar
020 3953 2638
Ben.Joudar@emap.com

2022 ICOLD 27th Congress - 90th Annual Meeting 27 May - 3 June 2022, Marseille, France, https://cigb-icold2022.fr/en

CPT'22 5th International Symposium on Cone Penetration Testing, 8-10 June 2022, Bologna, Italy, http://cpt22.org

3rd European Conference on Earthquake Engineering and Seismology (3ECEES), 19-24 June 2022, Bucharest, Romania, https://3ecees.ro

Progressive Failure of Brittle Rocks
June 20-24th, 2022, Flatrock, NC, USA
www.prf2022.org

The progressive growth of fractures in rock directly impacts virtually all natural Earth surface systems and components of the built environment that involve rock. As rocks fracture in response to environmental, tectonic and topographic forces and factors, that crack growth itself changes rock strength, porosity and permeability. In turn, these changes impact natural processes and society. For example, the stability of slopes, excavations, tunnels, and boreholes are all intimately linked to these changes, as is the management of aging infrastructure, the conservation of our archaeological heritage, and the assessment of hazard risks related to phenomena like landslides and rockfalls. Crack growth also impacts the overall evolution of the critical zone, governing rates and modes of Earth surface processes ranging from CO2 cycling, to regolith production and hillslope sediment supply, to bedrock channel incision.

Thus, there is substantial societal and scientific motivation for understanding rock fracture, the role it plays across a range of time and space scales, and for identifying key controls on its morphology, mechanisms, rates and processes. However, **the factors (e.g. climate, material properties, water chemistry and stresses) that drive or limit fracture growth itself - as well its manifestation and impacts over time - remain poorly characterized across a broad array of disciplines.**

Like PRF2017, we hope PRF2022 can illustrate a pathway forward for filling the many knowledge gaps related to rock fracture overall, but particularly with respect to progressive rock failure (PRF). **There is a burgeoning appreciation that crack growth in the natural and built environment is non-linear, most commonly progressing as slow, subcritical deformation (i.e. PRF; Eppes and Keanini, 2017) which can at times accelerate towards rapid and hazardous critical failure without obvious forewarning.**

Yet, the potentially central role that PRF may play in all fracture-related systems has been largely unrecognized or misconceived across both surface-process and engineering applications.

Geomorphologists studying natural rock fracture have largely overlooked the knowledge and concepts to be derived from rock physics and engineering research on PRF; and engineers and rock physicists have remained largely unaware of the potential applications and validations that might be possible via the study of PRF in natural landscapes.

PRF2022 seeks to bring together these communities for lively discussions and data analysis centered around testing and considering the assertion that virtually all natural rock fracture is dominated by - or at least predicated to some degree on - PRF.

PRF2022 is a 5-day, NSF-sponsored, GSA Penrose Conference dedicated to bringing together - in person - scientists from **Rock Physics, Surface Processes, Soil Science, Stone Heritage, Critical Zone Sciences, Planetary Sciences and Geoengineering disciplines** in order to open new doors to a myriad of concepts, applications and validations of all geologic work related to rock fracture.

Specifically, we are leading PRF2022 under the assertion that **all natural Earth and planetary surface systems – as well as multifarious constituents of the built environment - are intimately tied to the progressive – subcritical - growth of fractures in rock.** We are excited to discuss and debate this idea and its ramifications to a wide range of research topics.

To further foster a sense of belonging at the conference, we will implement a **mentoring scheme** in advance of the conference.

Field, laboratory and modeling approaches are all encouraged. We welcome a full range of abstract topics - including but not limited to:

- Climate/Environmental dependence of fracture
- Fracturing Processes: theory and observations
- Landforms, erosion, and/or landscape evolution tied to rock fracture, including: Rivers, Arches, Erosion Rates, Landslides/Rockfalls, Planetary Processes, Hillslopes
- Geotechnical issues related to rock fracture
- Crack-tip chemo-physical processes of subcritical fracture.
- Building stone preservation related to rock fracture and vice versa
- Fracture and stresses related to Topography/Tectonics /Gravity
- Fracture and Stresses related to climate, freezing, thermal conditions, biological processes, salts, chemical Processes
- Natural Hazards related to rock fracture

PRF 2022
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3rd International Symposium on Geotechnical Engineering for the Preservation of Monuments and Historic Sites 22-24 June 2022, Napoli, Italy, https://tc301-napoli.org

IS-Cambridge 2020 10th International Symposium on Geotechnical Aspects of Underground Construction in Soft Ground, 27 - 29 June 2022, Cambridge, United Kingdom, www.is-cambridge2020.eng.cam.ac.uk

5.ICNDSMGE – ZM 2020 5th International Conference on New Developments in Soil Mechanics and Geotechnical Engineering, June 30 to July 2, 2022, Nicosia, Cyprus, https://zm2020.neu.edu.tr

ICONHIC2022: THE STEP FORWARD - 3rd International Conference on Natural Hazards & Infrastructure, 5 – 7 July 2022, Athens, GREECE, https://iconhic.com/2021

RocDyn-4 4th International Conference on Rock Dynamics an ISRM Specialized Conference, 17-19 August 2022. Xuzhou, China, http://rocdyn.org

ISFOG 2020 4th International Symposium on Frontiers in Offshore Geotechnics, 28 – 31 August 2022, Austin, United States, www.isfog2020.org

16th International Conference of the International Association for Computer Methods and Advances in Geomechanics – IACMAG 30-08-2022 – 02-09-2022, Torino, Italy, www.iacmag2022.org

WTC 2022 World Tunnel Congress 2022 - Underground solutions for a world in change, 2-8 September 2022, Copenhagen, Denmark, www.wtc2021.dk

11th International Symposium on Field Monitoring in Geomechanics, September 4 - September 7, 2022, London, UK, https://isfmg2022.uk

7th European Geosynthetics Conference, 4 to 7 September, 2022, Warsaw, Poland, https://eurogeo7.org

3rd EUROPEAN CONFERENCE ON EARTHQUAKE ENGINEERING &SEISMOLOGY

September 4-9, 2022

A joint event of the
17th European Conference on Earthquake Engineering &
38th General Assembly of the European Seismological Commission
International Conference Centre, Bucharest, Romania.

https://3ecees.ro

The Third European Conference on Earthquake Engineering and Seismology will be organized in Bucharest in the period September 4 – September 9, 2022.

The Romanian Association for Earthquake Engineering, with the support of Technical University of Civil Engineering of Bucharest (UTCB) and National Institute for Earth Physics (INFP), will organize with commitment and motivation the Third European Conference on Earthquake Engineering and Seismology (3ECEES), in 2022 in Bucharest, Romania.

Through Bucharest 3ECEES, we are fully motivated and committed to promote the values of earthquake engineering and seismology for the benefit of human kind, to boost the European cooperation in these fields, to push the frontiers of knowledge and to equip the decision makers and building officials with the roadmap for the years to come aiming at seismic risk reduction and enhanced societal resilience.

Topics

The Third European Conference on Earthquake Engineering and Seismology (3ECEES) is aiming at providing a creative and stimulating environment for sharing and tackling the most challenging topics of global importance and interest in Earthquake Engineering and Seismology, such as (the list is neither exhaustive, nor restrictive):

- Physics of earthquakes and Seismic Sources
- Seismicity Analysis
- Induced and Triggered Seismicity
- Engineering Seismology and Strong Ground Motion
- Big Data and Large Research Infrastructures
- Geotechnical Earthquake Engineering
- Seismic Hazard
- Site Effects and Microzonation Studies
- Seismic Analysis and Design of Buildings and Structure
- Seismic Evaluation and Rehabilitation of Buildings and Structure
- Performance Based Design of Buildings and Structures
- Seismic Design Codes
- Lifeline Earthquake Engineering
- Structural Health Monitoring
- Seismic Exposure, Fragility and Risk
- Seismic Resilience
- Lessons from recent earthquakes

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The 17th Danube - European Conference on Geotechnical Engineering
5-7 September, 2022, Bucharest, Romania
https://sites.google.com/view/17decgero

Eurock 2022 Rock and Fracture Mechanics in Rock Engineering and Mining, 12÷15 September 2022, Helsinki, Finland, www.ril.fi/en/events/eurock-2022.html

IAEG XIV Congress 2022, Chengdu, China September 14-20, 2022, https://iaeg2022.org

28th European Young Geotechnical Engineers Conference and Geogames, 15 – 17 – 19 September 2022, Moscow, Russia, https://www.eygec28.com/?

10th International Conference on Physical Modelling in Geotechnics (ICPMG 2022), September 19 to 23, 2022, KAIST, Daejeon, Korea, https://icpmg2022.org

11th International Conference on Stress Wave Theory and Design and Testing Methods for Deep Foundations, 20 - 23 September 2022, De Doelen, Rotterdam, The Netherlands, https://www.kivi.nl/afdelingen/geotechniek/stress-wave-conference-2022

10th Nordic Grouting Symposium, 4 - 6 October, 2022, Stockholm, Sweden, https://www.ngs2022.se/

IX Latin American Rock Mechanics Symposium - Challenges in rock mechanics: towards a sustainable development of infrastructure, an ISRM International Symposium, 16-19 October 2022, Asuncion, Paraguay, http://larms2022.com

5ο Πανελλήνιο Συνέδριο Αντισεισμικής Μηχανικής και Τεχνικής Σεισμολογίας
20-22 Οκτωβρίου 2022, Αθήνα

Ανακοινώνεται η συνδιοργάνωση εκ μέρους του Ελληνικού Τμήματος Αντισεισμικής Μηχανικής και του Τεχνικού Επιμελητηρίου Ελλάδας του 5ου Πανελλήνιου Συνεδρίου Αντισεισμικής Μηχανικής και Τεχνικής Σεισμολογίας (5ΠΣΑΜΤΣ), στην Αθήνα στις 20-22 Οκτωβρίου 2022. Αποτελεί τη συνέχεια της σειράς των σχετικών συνεδρίων με τελευταίο το 4ΠΣΑΜΤΣ που διοργανώθηκε στην Αθήνα το 2019 και θα πραγματοποιηθεί στους χώρους του Royal Olympic Hotel.

2022 GEOASIA7 - 7th Asian Regional Conference on International Geosynthetics Society, October 31 – November 4, 2022, Taipei, Taiwan, www.geoasia7.org

AUSROCK Conference 2022, 6th Australasian Ground Control in Mining Conference –an ISRM Regional Symposium, 29 November – 1 December 2022, Melbourne, Australia, www.ausimm.com/conferences-and-events/ausrock/

4th African Regional Conference on Geosynthetics – Geosynthetics in Sustainable Infrastructures and Mega Projects, 20-23 February 2023, Cairo, Egypt, www.geoafrica2023.org

88th ICOLD Annual Meeting & Symposium on Sustainable Development of Dams and River Basins, April 2023, New Delhi, India, https://www.icold2020.org

UNSAT2022
8th International Conference on Unsaturated Soils
2-5 May 2023, Milos island, Greece

World Tunnel Congress 2023
Expanding Underground
Knowledge & Passion to Make a Positive Impact on the World
12 - 18 May 2023, Athens, Greece
https://wtc2023.gr

Rapid **urbanization**, natural **hazards**, **climate** change, sustainable **energy** geo-resources, people's mobility and transportation of goods are first-priority demanding challenges that the globe is facing.

Cities and infrastructure expansion towards underground provide safe, sustainable and **green solution** facilitating the transformation of millions of people's lives into a more **resilient** lifestyle. A comprehensive understanding, **rethinking and reshaping** of the underground spaces have become even more vital and crucial in the urban transformation of **future** cities. For the latter to be attained, planning and organization of **underground development**, a **holistic approach** is required not only in terms of spatial organization or overcoming engineering challenges, but also in regards to the establishments of policies, regulations and consideration of social factors.

WTC 2023 in Athens will highlight the multiple advantages and solutions that underground space could provide, at the prospect of a whole new era of **smart technology** where sophisticated **"digital tools"** change investigation, design, construction and operation methods and **strategies** rapidly. WTC 2023 will additionally provide an ideal opportunity to showcase recent innovations and the perspective of technol-

ogy to further efficiently upgrade underground infrastructure assets, transforming the industry and the **societies** it serves.

Athens (Greece) has the knowledge, and we strongly believe we have the **means** and the **responsibility** to literally make a **positive impact** on the world.

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NROCK2022

The IV Nordic Symposium on Rock Mechanics and Rock Engineering
24 – 25 May 2023, Reykjavic, Iceland
www.nrock2023.com

Address

Icelandic Geotechnical Society Engjateigur 9 105 Reykjavík ICELAND
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3rd JTC1 Workshop on
Impact of global changes on landslide risk
7 – 10 June 2023, Oslo, Norway
https://jtc1-2023.com

The Joint Technical Committee on Natural Slopes and Landslides (JTC1) of FedICGS[1] is delighted to invite you to join us at the 3rd **JTC1 Workshop on Impact of global changes on landslide risk,** to be held in **Oslo, Norway** on **7 – 10 June 2023**.

Anthropogenic impacts and related climate change are unquestionably changing the landslide risk and impacting how we assess and manage the risk(s).

The aim of the Workshop is to **promote discussion between scientists and engineers** on whether we are capable of predicting and quantifying the expected changes in landslide risk and how we could implement the knowledge gained from academic research on landslide risk management into practice. The advanced topics in focus for the discussions include:

- Rock mass degradation and landslide initiation;
- Climate and anthropogenic impact on landslide risk in various geographic regions, including the Arctic;
- Prediction of landslide mobility and impact footprint, including landslides initiated at mine tailings storage facilities;
- Application of modern remote sensing technologies to landslide risk assessment;
- Landslide risk reduction strategies: risk mitigation, including early warning and nature-based solutions;
- Applications of new technologies like machine learning for landslide susceptibility and landslide hazard mapping.

The workshop will consist of two lecture days (June 8 and 9), and a one-day technical excursion (June 10). The lecture days will be a combination of five keynote lectures, a number of invited lectures, the 3rd Hutchinson Lecture as well as discussion sessions.

You are invited to submit extended abstracts (up to 4 pages) for oral presentation and short abstracts (max 1 page) for poster presentation. Instructions and templates for abstract submission can be found here.

The deadline for submitting both extended and poster abstracts is **31 March 2022.**

The digital proceedings will be issued right after the workshop and made available on the 3rd JTC1 Workshop website.

The Organizing Committee will make a selection of the best abstracts (oral presentations and posters) and invite the authors to provide a full manuscript to be published in a Special Issue of a refereed, open-access journal. A total of 10 to 15 articles are envisioned for the Special Issue, which is expected to be published within one year after the workshop.

For detailed information check the dedicated JTC1 website.

Contact: Dr. Vittoria Capobianco (NGI), Chair of the 3rd JTC1

Looking forward to seeing you in Oslo, 2023!

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[1] **FediGS**: Federation of international Geo-Engineering Societies is composed of **ISSMGE:** International Society for Soil Mechanics and Geotechnical Engineering; **ISRM:** International Society for Rock Mechanics and Rock Engineering; **IAEG:** International Association for Engineering Geology and the Environment; **IGS:** International Geosynthetics Society.

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9th International Congress on Environmental Geotechnics
Highlighting the role of Environmental Geotechnics in Addressing Global Grand Challenges
25-28 June 2023, Chania, Crete island, Greece
www.iceg2022.org

The 9th International Congress on Environmental Geotechnics is part of the well established series of ICEG. This conference will be held on an outstanding resort in the town of Chania of the island of Crete in Greece. The theme of the conference is "Highlighting the role of Environmental Geotechnics in Addressing Global Grand Challenges" and will highlight the leadership role of Geoenvironmental Engineers play on tackling our society's grand challenges.

Contact Information

- Contact person: Dr. Rallis Kourkoulis
- Email: rallisko@grid-engineers.com

17th Asian Regional Geotechnical Engineering Conference
14-18 August 2023, Nur-Sultan, Kazakhstan

Organiser: Kazakhstan Geotechnical Society;
Contact person: Ms. Bibigul Abdrakhmanova;
Address: 2, Satpayev Street, Eurasian National University, Geotechnical Institute;
Phone: +7-7172- 34479;
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9th International SUT OSIG Conference
"Innovative Geotechnologies for Energy Transition"
12 - 14 September, 2023, London, United Kingdom
https://www.sut.org/event/osig2023/

The SUT's Offshore Site Investigation and Geotechnics (OSIG) committee is pleased to announce that its 9th international conference, 'Innovative Geotechnologies for Energy Transition', will take place from 12-14 September 2023 at Imperial College in South Kensington, London.

OSIG is the longest standing international conference series of this type. It brings together the offshore Geotechnical, Geophysical & Geoscientific industry & academic communities to share the latest research, knowledge and experience. Building on the success of previous events, the programme will encompass a wide range of technical themes, aiming to attract hundreds of international delegates. Social and networking events are also being programmed, culminating in a dinner and evening event at the famous Natural History Museum, London, with an exciting guest speaker.

Conference Themes

1. New regions, geology and geotechnics
2. Advances in geoscientific data acquisition
3. Advances in geoscientific processing
4. Advances in geotechnical investigation
5. Advances in AI for offshore geotechnology
6. Underground carbon capture and storage
7. Seabed slopes and slides
8. Hydrates, shallow gas and seepage
9. Seismic hazards and tsunamis
10. Data integration and ground modelling
11. Learning from offshore incidents
12. Foundation research and design
13. Optimisation and performance-based design
14. Monopile design, installation and performance
15. Jacket pile design, installation and performance
16. Suction installed foundations
17. Gravity based foundations
18. Jack up foundations
19. Floating system anchoring and foundations
20. Cyclic and seismic loading of foundations
21. Scour assessment and monitoring
22. Pipeline and cable engineering
23. Seabed interaction of dynamic cables and risers
24. Environmental and anthropogenic impacts of engineering
25. Decommissioning and clean-up
26. Engineering for climate change
27. Near coastal geotechnical engineering
28. Seabed mineral extraction

For any queries, and for details of sponsorship opportunities, please contact SUT Events **osig2023@sut.org**

13th International Conference on Structural Analysis of Historical Constructions
"Heritage conservation across boundaries"
12-15 September 2023, Kyoto, Japan
https://sahc2023.org/

The 13th edition of the International Conference on Structural Analysis of Historical Constructions (SAHC 2023) will take place during 12-15 September 2023 in Kyoto, Japan. Twelve editions of the SAHC conference have been held since

it was started in Barcelona in 1995. The last edition, celebrated in 2021 and attended by more than 300 experts, signaled the 25th anniversary of the conference series.

Motivation and Objectives

During the last decades the study and conservation of historical structures has attained high technological and scientific standards. Today's practice involves the combination of innovative non-destructive inspection technologies, sophisticated monitoring systems, advanced numerical models for structural analysis, and respectful intervention solutions for restoration and retrofit. More than ever, it is in recent decades, the study and conservation of historical structures has shown remarkable technological and scientific advances. The restoration of heritage structures is performed on the basis of advanced non-destructive testing techniques, effectual monitoring systems, rigorous numerical analysis and comprehensive intervention schemes for restoration and strengthening. The conservation project must be undertaken by multidisciplinary teams composed of a wide range of specialists such as engineers, architects, historians, archaeologists, geophysicists and chemists. In addition, it is increasingly recognised that the study of historical structures requires an integrated approach as conservation practice faces problems at different scales (e.g. materials, structures and surroundings). For these reasons, the study of historical constructions still poses serious challenges that need to be confronted through comprehensive international scientific collaboration.

Conference Topics

- History of construction and building technology
- Theory and practice of conservation
- Inspection methods, non-destructive techniques and laboratory testing
- Numerical modeling and structural analysis
- Management of heritage structures and conservation strategies
- Structural health monitoring
- Repair and strengthening strategies and techniques
- Vernacular constructions
- Conservation of 20th c. architectural heritage
- Seismic analysis and retrofit
- Vulnerability and risk analysis
- Resilience of historic areas to climate change and hazard events
- Durability and sustainability
- Interdisciplinary projects and case studies

CONFERENCE SECRETARIAT

Endo Research Group (ERG)
Development of Architecture, Faculty of Engineering, Shinshu-university, Wakasato 4-17-1 Nagano, 380-8553, Japan
Email. sahc2023_erg@shinshu-u.ac.jp, Tel. +81 26 269 5420

XII ICG - 12th International Conference on Geosynthetics, September 17 – 21, 2023, Rome, Italy, www.12icg-roma.org

2023 15th ISRM Congress, International Congress in Rock Mechanics Challenges in Rock Mechanics and Rock Engineering, 9÷14 October 2023, Salzburg, Austria, https://www.isrm2023.info/en/

6th World Landslide Forum "Landslides Science for sustainable development", 14 to 17 November 2023, Florence, Italy, https://wlf6.org

World Tunnel Congress 2024
Shenzhen, China

China is the official host of the ITA-AITES World Tunnel Congress 2024 and 50th General Assembly.

The General Assembly which took place on June 30th by video-conference, has confirmed the candidacy of Shenzhen to organise the WTC 2024.

XVIII European Conference on Soil Mechanics and Geotechnical Engineering
25-30 August 2024, Lisbon, Portugal

Organiser: SPG
Contact person: SPG
Address: Av. BRASIL, 101
Email: spg@lnec.pt
Website: http://www.spgeotecnia.pt

ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

Ground Engineering
Top 10 technical papers of 2021

What were the most-read technical papers in 2021? *Ground Engineering* lists them below.

Top 10 technical papers

Field test verification of ground bearing pressure under rig tracks and implications for working platform design, Michał Topolnicki, Keller Holding; Jürgen Wäger, Steffen Schweizer and Alfred Koller, Liebherr-Werk Nenzing; and Tadeusz Brzozowski and Grzegorz Sołtys, Keller Polska

Plate load testing for working platforms, David Corke, DC Project Solutions; Jim De Waele, Keller Group; and Domenico Lombardi, University of Manchester

Ground movement prediction for a piled basement: A case study from Garlickhythe, City of London, UK, Nicholas John Langdon, Richard Jonathan Ball and David Peter Giles, CGL (Card Geotechnics)

Cooling Prize Paper: Practical geo-dynamic assessment of high speed rail earthworks on the Align contract (High Speed 2), Alice Duley, Jacobs

Productivity analysis of diaphragm wall construction for Prince Edward Road Station on Circle Line 6, Mark Smith, Land Transport Authority, Singapore

Road traffic loads for geotechnical analyses of embankments, Michał Topolnicki, Keller Holding

Bearing capacity of a geogrid-stabilised granular layer on clay, Andrew Lees and Peter Matthias, Tensar International

Risk and reliability in gas protection design – 20 years on: Part 1, Geoff Card, GB Card and Partners; James Lucas, The Environmental Protection Group; and Steve Wilson, EPG

Sonic drilling and sample quality on the Olympic Park ground investigation, Dan Brenton, Andy Condron, ERS Remediation and Callum Whitelaw, Geosonic Drilling

The new grouted anchor testing standard EN ISO 22477-5:2018, Devon Mothersille, Geoserve Global and convenor to TC 182/Working Group 3

(geeditorial / GROUND ENGINEERING, 24 December, 2021, https://www.geplus.co.uk/news/top-10-technical-papers-of-2021-24-12-2021)

Abundant landslides on the slopes of Mount Merapi Volcano, Central Java, Indonesia

26.12.2021, https://twitter.com/deZabedrosky/status/1475819247477526531

An incredibly impressive roadside failure from Nariño in Colombia

Via Policarpa (Boquerón sector)… we are in a road emergency! Government of Nariño is advancing against time to meet so many requests. The rainy season is impressive, only in the north of Nariño we have 30 continuous hours of rain, according to a report from mayors.

https://twitter.com/pantoja_nilza/status/1475633024658251778

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Landslide in dry soil

This is a fascinating example of a landslide in dry soil. At this time of year Nepal has very low levels of rainfall, so it will be interesting to understand the trigger and causes. Dave Petley.

A huge shallow granular landslide on a steep slope in Nepal; might have been triggered by some co-seismic shaking as the region is seismically active. Dr Mohammad Heidarzadeh.

Jan 1, 2022, https://twitter.com/basanta58_raj/status/1477187603652759553

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Groundforce Shorco supports Swedish basement excavation

Excavation support specialist Groundforce Shorco is assisting groundworks contractor Peab Grundläggning on a school project in Gothenburg, Sweden.

Peab Grundläggning is carrying out ground reinforcement works in preparation for a new school, which is being built by its parent company Peab Sverige for City of Gothenburg Property Management.

The wide yet shallow basement excavation for the project is set in poor ground conditions, meaning lateral support is required to shore up the sides.

Groundforce Shorco has supplied 15 of its 150t capacity MP150 hydraulic props to support the steel sheet-piled retaining wall.

"Because of the excavation's width, most of the props do not span from side to side but are installed as raking props, braced against a central concrete slab section cast into the base of the excavation," Groundforce explained.

On this project, Groundforce is using "bird's-mouth" adaptors that are fixed to the base of each prop.

Groundforce regional sales engineer Sam Oldroyd said: "The bird's-mouth adaptors look like a bird's open beak – hence the name. They fit over the edge of the slab or thrust block and are a very quick way of making a connection."

Peab Grundläggning's project manager Andreas Berntsson noted: "The main reason for using Groundforce is that we think it's cost-efficient. The time for installing the props is much faster than the traditional way of welding steel tubes."

He added: "It's a question of working environment. For example, when we're about to dismantle the props, it's safer to just let the hydraulic pressure decrease. We also protect the environment by using these props instead of buying new steel tubes and welding them on site."

Groundforce Shorco is the excavation support division of construction solutions specialist Groundforce, which is a part of UK-based equipment rental group Vp.

(Nia Kajastie / Ground Engineering, 07 January, 2022, https://www.geplus.co.uk/news/groundforce-shorco-supports-swedish-basement-excavation-07-01-2022)

Collapse of a retaining wall in a large excavation in China

Large cracks in the road appeared before the disaster. Fortunately, construction officials who noticed the cracks on the surface, evacuated the site and closed the roadway. Therefore, there were no casualties. The rains that hit the area a few days earlier may have contributed to the collapse (water variation).

https://www.facebook.com/watch/?v=352378765995037, (Oct 26, 2020)

Design and construction of the protection and crossing structure of the Vallon de Casterino

Our civil engineering teams have just won a new contract to protect and restore traffic to the hamlet of Casterino, which was made impossible in the low season following the damage caused by storm Alex in October 2020.

The aim of the works is to durably protect the landslide corridor regularly subject to:

- boulder falls from 2 to 54 m in diameter
- accidental avalanches that can reach a thickness of 5 m on the structure

The project promises its share of technical challenges:

- 11 months to complete the work
- on a steep site at an altitude of 1435 m
- on an area of unstable scree
- very small work areas
- difficult road access...

The 60 m long structure will comprise 510 m² of support and 720 m² of receiving structure.

https://www.linkedin.com/company/egis/posts/?feedView=all

Massive rock topple at Canyon de Furnas in Brazil kills 10 people, injures 32

At least 10 people have been killed and 32 others injured after a massive chunk of rocks toppled onto boaters in Canyon de Furnas, Brazil. The event took place on Saturday, January 8, 2022, after a period of heavy rain. 4 boats were affected, of which two directly.

The site is a part of a reservoir created by the large Furnas Dam on the Rio Grande just downstream of Canyon de Furnas.

The event occurred after heavy rainfall and at a time when the water level behind the dam was high, landslides expert Dr. Dave Petley said.[1]

The tragic event was captured on video (viewer discretion advised).

https://www.youtube.com/watch?v=IGJooJMrOfs

"The failure itself is a classic flexural topple, in which failure is dominated by vertical or near-vertical structures in the rock mass," Petley said.

"The second part of the video [above] also captures the minute or so leading up to the main failure, in which the rock mass is (with hindsight) progressively deforming, generating a succession of rockfalls."

"This precursory activity is common. Once again the message needs to be that if a rock slope is generating a succession of rockfalls then a large failure event might be developing."

At least 10 people have been killed, all apparently from a single boat that was hit directly by the rock pillar. 32 others have been injured in other nearby boats.[2]

https://www.youtube.com/watch?v=HKYmULvlptc

https://www.youtube.com/watch?v=eFAWao7dS7s

The head of the Applied Geology Division of the Brazilian Geological Service, Tiago Antonelli, said the cliff wall is subject to centuries of erosion and susceptible to rain, heat and cold.

References:

[1] The fatal flexural topple at Canyon de Furnas in Brazil - Landslide Blog

[2] Death toll rises to 10 after a wall of rock fell on boaters in a Brazilian lake - AP

(Teo Blašković , January 10, 2022, https://watchers.news/2022/01/10/massive-rock-topple-canyon-de-furnas-brazil-january-2022/)

Pau Branco: another significant mining-related landslide in Brazil

On Saturday 8 January 2022 another significant mining-related landslide occurred in Brazil. On this occasion the site was the Pau Branco iron ore mine, which is located on the western side of Quadrilátero Ferrífero region. The mine is reportedly owned by the French company Vallourec. Mining operations at the site have been suspended by the regulator.

The Brazilian website Observatório da Mineração has a report on the landslide, in Portuguese. It includes this image of the failure:

The 8 January 2022 landslide at the Pau Branco mine in Brazil.

The location appears to be -20.145, -43.968. This is Google Earth image of the location, from a similar perspective as above:

Google Earth image of the site of the 8 January 2022 landslide at Pau Branco.

It appears that a benched slope has failed. The mechanism is unclear but a rotational landslide looks likely. It appears that the mass has fluidised to become a flow. The image below suggests that this then overtopped a water retention lagoon, but fortunately the dam did not fail. The landslide then impacted the major road at the foot of the slope.

The flowpath of the 8 January 2022 landslide at the Pau Branco mine in Brazil.

A report on the Observatório da Mineração website indicates that the retention structure, which is not a tailings dam, was upgraded last year. The failure itself has occurred in a benched slope above the lagoon. It appears to me that this slope consisted of mine waste dumped onto the natural slope – Google Earth images suggest that the slope was created between 2006 and 2010 – but this needs confirmation. I would imagine that this slope was created to increase the volume of mine waste that could be dumped upslope in the main waste storage site. The Google Earth image below shows the configuration:

So overall I this that this was probably a rotational landslide that fluidised into a flow, with the failure occurring in benched mine waste. But I would welcome views from others via the comments.

Once again, this event will ask questions about the stability of mine waste in Brazil (and beyond). It also continues to drive concerns about the capability of mining companies to ensure that slopes are stable and that regulators are able to ensure that appropriate methods are being used. It feels likely that we will see another major mine waste failure this year, despite some efforts to improve mine waste management practices.

(Dave Petley / THE LANDSLIDE BLOG, 11 January 2022, https://blogs.agu.org/landslideblog/2022/01/11/pau-branco-1)

Flow from the mining landslide at Pau Branco

The mining landslide at Pau Branco caused a significant release of mine waste, which appears to have flowed into the water retention structure below. This image, from the Observatório da Mineração, shows the flow path:

The flow path of the 8 January 2022 landslide at the Pau Branco mine in Brazil. Image via Observatório da Mineração by Bruno Costalonga Ferrete.

As the image shows, the landslide overtopped the retaining structure, which remained essentially intact (note the superficial erosion on either side of the dam abutments). The debris, presumably now more fluid having entrained water and saturated sediment from the lagoon, flowed across a major road, the BR-040. This is captured rather nicely in the video below, posted onto Youtube:
https://www.youtube.com/watch?v=BT6FqaT18vo

On Youtube, videos have been posted of the situation on the road as the flow arrived. The best of these was taken from the cab of a lorry on the road at the key moment:
https://www.youtube.com/watch?v=h081tC4qIDI

Another video recorded the event from a different angle:
https://www.youtube.com/watch?v= iZ_H7L23CQ

Meanwhile heavy rainfall continues in Brazil. As a consequence a number of mining operations have been temporarily suspended, including those by Vale and Samarco, both of whom have had major tailings failures in recent years. Vallourec, who operate the mine at Pau Branco, have been served an order for the environmental damage caused by the slope failure on Saturday, totalling over R$289 million (about $52 million).

Sadly, some newspapers are suggesting that the landslide was associated with the death of a family of five people. The

situation is a little unclear – Forum reports (in Portuguese) that:

The family dodged the landslide and took an alternate route, but ended up being buried. The bodies of the victims were found on Monday (10).

The suggestion appears to be that the family took a detour as a result of the road closure, but was then buried by a separate landslide.

(Dave Petley / THE LANDSLIDE BLOG, 12 January 2022, https://blogs.agu.org/landslideblog/2022/01/12/pau-branco-2)

The Pau Branco landslide – video of the overtopping of the dam

A video has now emerged online that shows the overtopping of the dam immediately downstream of the Pau Branco landslide in Brazil on 8 January 2022. This video was apparently collected by CCTV at the site:

https://www.youtube.com/watch?v=s7lmiWYRids&t=9s

At the start of the video it is clear that the rainfall was heavy, and the dam was full with water cascading down the spillway on the far side. As the landslide becomes visible on the left side of the footage a displacement wave races across the lagoon and causes an initial overtopping event. This quickly develops as the volume of the lagoon is filled with landslide debris.

Initially most of the overtopping is water from within the lagoon, and this is reflected by the videos from the road below the dam. Later in the video solid material overtops the structure – this may be a combination of landslide debris and silt from within the pond.

A still from the video of the overtopping of the small dam caused by the Pau Branco landslide.

The video demonstrates the power of such an event – the speed and relentless nature of the overtopping are stark. It is fortunate that the structure was in place – it has retained a large proportion of the mine waste, probably preventing a much more powerful and destructive flow from reaching the road and from a greater volume of mine waste being unretained now.

And of course it is fortunate that the retaining structure was able to stand up to the flow. If it had collapsed rapidly then the impact would have been much more serious.

Meanwhile the fallout from the Pau Branco landslide continues. Inevitably, further questions are being asked about the stability of the huge numbers of mine waste piles in Brazil (this should not be confined to Brazil of course). Reports also indicate that a licence was granted in January 2021 for an expansion of the mine waste pile that failed. It will be interesting to know how much of this expansion had occurred at the time of the collapse.

Finally, of course, there are many similar slopes associated with this mine waste pile. Urgent work is needed to determine the stability of these slopes.

(Dave Petley / THE LANDSLIDE BLOG, 13 January 2022, https://blogs.agu.org/landslideblog/2022/01/13/pau-branco-3)

Ouro Preto: a Brazilian landslide destroys historic houses

I have been writing about landslides in Brazil all week. To cap it off, videos emerged yesterday of another landslide there, this time in the city of Ouro Preto in Minas Gerais. In fact, there are two remarkable drone videos, and some additional mobile phone videos, of this event.

The video that has been most widely circulated is this one:

https://www.youtube.com/watch?v=DQ-whLDkSfI

But this drone video of the same event is also worth a look:

https://www.youtube.com/watch?v=4NH8f-0EOiE&t=1s

The landslide occurred at 9 am (local time) on 13 January 2022 at Morro da Forca. Instability in the slope had been noted by local residents, and the site had been cordoned off. As a consequence there were no casualties, but two buildings

dating from the 19th Century were destroyed. Reports indicate that the failure has followed heavy rainfall, although conditions were dry at the time of the landslide.

Hoje Emdia has this image of the aftermath of the landslide:

The aftermath of the 13 January 2022 landslide at Ouro Preto in Brazil.

The second video posted above is interesting. It shows a series of collapses at the toe of the slope as the main mass destabilises and moves. The power of even a comparatively small landslide is clearly illustrated by the rapid and complete destruction of presumably well-constructed historic buildings,

Reports indicate that there (rightly) continues to be concern about the potential for a further failure at this site. The area remains cordoned off. There are concerns about the historic buildings on the other side of the street, which include a hotel, a restaurant and the Arts and Convention Center of the Federal University of Ouro Preto (UFOP).

Given the age of the buildings, this slope had presumably been stable for many decades after the initial building works. It would be interesting to know if any modifications to the slope had been conducted in recent years.

Finally, the image above suggests to me that in the upper part of the scarp the landslide might have mobilised existing planes of weakness, but this remains to be confirmed.

Brazil often receives heavy rainfall at this time of the year, and landslides are common. This year appears to have been quite bad again.

(Dave Petley / THE LANDSLIDE BLOG, 14 January 2022, https://blogs.agu.org/landslideblog/2022/01/14/ouro-preto-1)

Geo Legends S02 E01 - Clyde Baker

The Geo-Legends series features our most eminent members. In episode 1 of season 2, Bill Walton of GEI Consultants interviews Clyde Baker, retired from AECOM. Clyde was the 2000 Peck Lecturer, the 2009 Terzaghi Lecturer, and a 2008 OPAL Award winner.

He talks about everything from mountain climbing in Vermont, his time at MIT, tall buildings, going underground in a tuxedo, and more!

Special thanks to Mark and Terry Baker for all their help with this episode, and to Scott Lewis and Jeff Rubenstone at the Engineering News-Record.

The Geo-Institute is a technical society with about 12,000 geotechnical engineers and geologists as members. Find out more or join at geoinstitute.org.

Music in this episode: The Cure - Pictures of You. From the 1989 album Disintegration.

https://www.youtube.com/watch?v=VnJft5gmEAA

Geo-Institute of ASCE, 11 Ιαν 2022

Captivating Geotechnical Engineering News in 2021

A total of 188 news were posted in Geoengineer.org's News Center in 2021. (http://www.geoengineer.org)

Here is a compilation of the most captivating news this year.

JANUARY - 0:09
- Landslide sweeps away section of Highway 1 in California.
- Strong earthquake hits Indonesia: At least 77 fatalities.
- Massive sinkhole opens near an Italian hospital.

FEBRUARY - 0:33
- Owner fined $7 billion in compensation for 2019 brazilian Tailings dam collapse.

MARCH - 0:41
- Marsquakes detected by NASA's InSight Mission.
- Bentley Systems acquires Seequent.

https://www.youtube.com/watch?v=Lg20sOdJrEE

APRIL - 0:56

- Massive cliff collapse in Jurassic Coast, UK.

MAY - 1:05

- GEOWORLD Survey: Impact of Covid-19 on geoengineering.
- Massive evacuations after volcanic eruption in the Democratic Republic of Congo.

JUNE - 1:20

- The Hoover dam reaches all-time low water level.

JULY - 1:28

- Western Europe hit by devastating floods.
- Bridge destroyed by rockslide in India: At least 9 casualties.

AUGUST - 1:44

- Permafrost-associated landslide causes major issues in Denali National Park, Alaska.
- Hubbel Helical Piles used to stabilize building following hurricane Sandy damage.

SEPTEMBER - 1:59

- Landslide sweeps away a multistory building in India.

OCTOBER - 2:07

- Heavy rains in India's Kerala state trigger floods and landslides.
- Rocscience acquires Novotech software. NOVEMBER - 2:22
- Four metro tunnels are completed in Hong Kong. -Keller acquires Voges.

DECEMBER - 2:38

- Floods and landslides in Vietnam after heavy rains.

Geoengineer.org, Jan 17, 2022, https://twitter.com/GeoengineerOrg/status/1482959823411064834?cxt=HBwWhMC9qcaGxJQpAAAA&cn=ZmxleGlibGVfcmVjcw%3D%3D&refsrc=email

Arhavi, Turkey: the appalling landslide impacts of new roads

Over the last two decades the appalling impact of poor quality road construction on landslides in upland areas has become increasingly clear. I have written about this issue in Nepal and India, but it is a global issue.

A really interesting **open access** paper has just been published in the journal *Natural Hazards* (Tanyaş *et al.* 2022) that highlights this issue in relation to a road constructed as part of the development of a hydroelectric scheme in Arhavi, Turkey. The paper comes to this stunning conclusion:-

"Our findings show that the damage generated by the road construction in terms of sediment loads to river channels is compatible with the possible effect of a theoretical earthquake with a magnitude greater than $M_w = 6.0$."

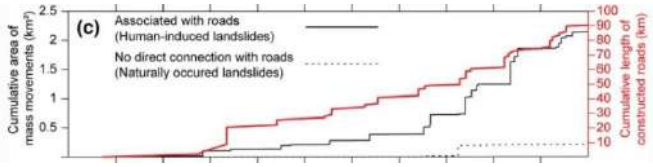
The location of the study is in the area of 41.195, 41.364, from which the Google Earth image below is taken:

Google Earth image showing road related landslides in the Arhavi area of Turkey.

In this area a number of road projects have been undertaken since 2016, with the most notable providing the access routes to an under construction hydroelectric scheme. Tanyaş *et al.* (2022) have mapped the generation of landslides using imagery and ground truthing from 2010 to 2020. In the paper they provide some images of the impact of road-related landslides:

Examples of road related landslides, and their impacts, in the Arhavi area of Turkey. Image from Tanyaş *et al.* (2022).

As the images above show, the construction of these roads has had a shocking impact on the slopes in an area of ecological importance. The released debris has migrated into the river channels, dramatically changing the sediment loads. In total Tanyaş *et al.* (2022) have mapped 557 landslides along 267.2 km of roads, 33.9% of which have been constructed over the last 11 years. The authors include this fascinating graph, which shows the increase in road length and the increase in road related and non-road related landslide area over the study period:



The occurrence of new landslides in the Arhavi area of Turkey as a result of road construction.

The authors note the change in landslide area responds to periods of heavy rainfall – in other words, the roads establish the instability and rainfall then triggers the landslides.

Tanyaş *et al.* (2022) draw a very interesting comparison between their findings and the landslides associated with the 2013 $M_s = 6.6$ Minxian earthquake in China, which occurred in broadly similar terrain over a broadly similar area. They conclude that the landslide impacts of the earthquake and the road construction in terms of sediment supply into the river system are of a similar scale, although clearly operating in a different timescale.

The sad element of this is that these landslides almost entirely avoidable – such road related landslide impacts are down to poor engineering practice. Roads do not need to be built in this way, and there are plenty of examples of good practice from around the world.

Reference

Tanyaş, H., Görüm, T., Kirschbaum, D. *et al.* 2022. Could road constructions be more hazardous than an earthquake in terms of mass movement? *Natural Hazards*. https://doi.org/10.1007/s11069-021-05199-2.

(Dave Petley / THE LANDSLIDE BLOG, 18 January 2022, https://blogs.agu.org/landslideblog/2022/01/18/arhavi-1)

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A large rock slab topple from India

The video below, posted to Youtube, occurred at about 4:10 pm on 7 January 2022. It shows a slab topple in a coherent slice of rock:

The location is reportedly the Ban Toll Plaza in Jammu and Kashmir in India, which is situated on the NH-44 road between Samba and Kunjwani. The location is 32.838, 74.940. It appears clearly on Google Earth.

There is little further information about this landslide, but it was associated with heavy rainfall. The slab topple appears to be a single, surprisingly coherent, slab of rock.

It is likely that the release plane was a pre-existing, near vertical joint. It is extremely fortunate there was empty space in the impact zone.

https://www.youtube.com/watch?v=-a5Ikd1z8zI&t=1s

The presence of this joint should have been picked up in the geotechnical investigations when the road was constructed. However, sub-vertical rock joints can be difficult to detect in rock joint surveys as they do not appear on the vertical face of the outcrop.

(Dave Petley / THE LANDSLIDE BLOG, 20 January 2022, https://blogs.agu.org/landslideblog/2022/01/20/slab-topple-1)

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Murgame: a debris flow game from the WSL

GeoPrac.net recently highlighted that the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) has written an interactive game, Murgame, that both highlights the risks associated with debris flows to mountain communities and that gives the player experience of the effectiveness, and economics, of various types of mitigation. The game can be accessed for free online and is available in a range of languages, including English. It is good fun to play.

A simulation of a large debris flow on a small village in Murgame.

The premise of the game is that the player is asked to design and build a village that meets key parameters (number of inhabitants, schools, shops, farms, etc). The location of the

village is on either side of a debris flow channel. Once constructed, the player simulates either a large or a small debris flow. Murgame uses the well-known and very effective RAMMS simulation tool to assess the debris flow behaviour. At the end of the event, which plays out on the screen, the user is presented with data on the costs of the event to their village.

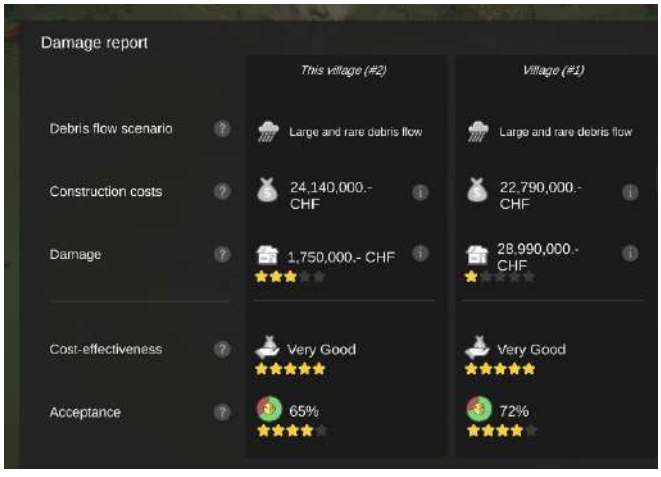
The player can then design various mitigations, which range from soft (an information centre and/or a siren) to hard (levees along the channel for example). The simulation is then run again, and the impact on the villages, as well as the acceptability of the measures to the local population and the cost-effectiveness, are calculated.

I played the game to design a small village (18 inhabitants) with a school, a farm and a shop. I then simulated the large debris flow. The outcome was not a happy one:

I then constructed some levees along the channel to protect the village and re-ran the simulation:

A simulation of a large debris flow on a small village with levees in Murgame.

The game demonstrates that the levees are highly effective in controlling the flow, and the village emerges mostly unscathed. Of course this is an unsightly and expensive option though. The game provides an assessment of the amount of damage prevented, the cost-effectiveness of the measures and the acceptability to the residents:



The effectiveness of the measures to protect the small village in Murgame.

The player can then experiment with other measures, and with other village configurations, to explore the balance between loss, investment and acceptability.

I thoroughly recommend Murgame – it's fun, educational and valuable. I can imagine using it to raise awareness with older school children, students and members of the public. WSL should be commended for this initiative.

(Dave Petley / THE LANDSLIDE BLOG, 21 January 2022, https://blogs.agu.org/landslideblog/2022/01/21/murgame)

Seri Kembangan: an impressive cut slope failure in Kuala Lumpur, Malaysia

On 25 January 2022 a large cut slope failure occurred on the banks of a drainage channel in Seri Kembangan, a suburb of Kuala Lumpur in Malaysia. This event was notable because it was caught by local people on a set of spectacular videos. For example, this one provides a good perspective on the event from two different viewpoints, and includes some images of the aftermath:

https://www.youtube.com/watch?v=VVJJZD4TIXI

In the second video in the above compilation a driver can be seen rescuing a car a few seconds before the collapse. That was a lucky escape. Reports indicate that cracks formed in the road in the hour or so ahead of the collapse, and that a number of other cars were moved before the videos started,

The site of the collapse, Jalan LP 1A/2 Lestari Perdana, Serdang, is shown in the Google Streetview image from January last year:

The site of the collapse at Seri Kembangan in Malaysia.

It is interesting to note the poor state of repair of the site and the patches in the road surface. The best image that I've tracked down of the aftermath is this one, from MyMetro:

The aftermath of the landslide at Seri Kembangan in Kuala Lumpur, Malaysia.

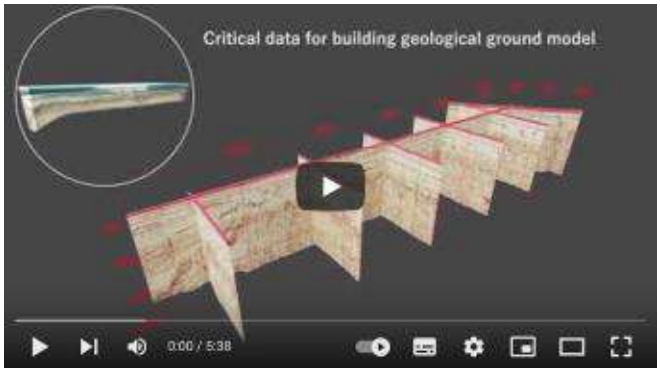
News reports indicate that works are now underway to secure the site with sheet piles whilst a permanent solution is found. This is a pragmatic approach – note the arcuate cracks extending through the road surface in the image above. There are also calls now for an enhanced safety regime from slopes in Malaysia, along the lines of the processes in Hong Kong.

In many ways this is reminiscent of the 2014 retaining wall collapse in Charles Town, Baltimore, which also sent cars tumbling into a drainage channel.

(Dave Petley / THE LANDSLIDE BLOG, 28 January 2022, https://blogs.agu.org/landslideblog/2022/01/28/seri-kembangan-1)

Ten noorden van de Waddeneilanden Wind Farm Zone

Ten noorden van de Waddeneilanden Wind Farm Zone is located 56 kilometers off the north coast of the Netherlands. It covers approximately 120 km2 and is almost the size of Amsterdam! NGI and SAND Geophysics have developed an Integrated Ground Model that provides geotechnical design parameters for the complete 3D area.



https://www.youtube.com/watch?v=JEenpiAU8Mk

Europe's most impressive tunnel projects

With new infrastructure spending set to result in more tunnelling projects across Europe, Leila Steed reports on the industry's latest projects.

Of all the activities encompassed within the construction sector, tunnelling is known for being among the most technically complex, expensive and dangerous of undertakings.

While the demands and challenges inherent in the sector means the actual building of tunnels is a notoriously slow process – as evidenced by the daily progress of tunnel boring machines (TBMs) usually measured in feet and inches rather than metres – the most recent tunnelling projects across Europe are breaking new ground in more ways than one.

Raiseboring

Take Master Drilling Europe's recent work on the West Link infrastructure project in Gothenburg, Sweden, for example.

Also known as "Västlänken", the project includes the construction of a 6km long underground railway tunnel and three new train stations, which upon completion will connect commuter routes throughout the city.

Master Drilling's raiseboring rig pulls up the reamer head that bores the vertical shaft.

In October of this year, Master Drilling completed the excavation of a 66m long vertical tunnel for the city's new Haga Station, using the raiseboring method – an unusual choice of method given that the shaft measured 6.6m in diameter.

"Here is the thing, this shaft is actually very big. Traditionally raiseboring is not done so big," says Joakim Furtenback, General Manager at Master Drilling Europe.

While raiseboring has been used in the mining sector for a long time; to create tunnels typically measuring between 2m and 4m, it is rare for the method to be used for urban infrastructure projects – and even rarer for the construction of such a large tunnel.

The process saw the company install a raiseboring drill rig on a concrete pad at surface level. With the rig surrounded by fences equipped with soundproofing, Bergteamet began by drilling a pilot hole down from the surface into a newly excavated tunnel below.

Once the pilot bit had penetrated the roof of the tunnel below, the company then removed the pilot bit from the rig and connected a 6.6m diameter, 44.2 tonne reamer head equipped with cutters.

With the reamer head pushed up against the ceiling of the tunnel and, using a rotating motion, it carved out the tunnel as the rig pulled it up through the ground to the surface.

Master Drilling's 44.2 tonne reamer head is equipped with cutters and pulled up by the raiseboring rig, situated above ground.

"All the debris will just fall down by gravity between the wings so it will come down to the bottom of the tunnel and all the loading will be done at the bottom of the tunnel," explains Joakim.

"It's quite impressive actually. It's a lot of tonnes – just the weight of the reamer and the weight of the rods, and then on top of that the pressure you need to apply to the rock… It's hundreds of tonnes of force."

Joakim says, "A lot of people have seen this in the infrastructure business – I mean contractors around the world are asking us 'why did you use this method? Why did you not use the conventional drill and blast - or use excavators with rock breakers?'

It took Sweden-based Master Drilling Europe 48 days to bore the 6.6m diameter shaft.

The simple answer is that the raiseboring method offered several advantages over other tunnelling methods.

"Typically the shafts that are being developed at stations like this on construction job sites are, most of the time, top-down demolitions of the shaft, using excavating or even using explosives sometimes," says Joakim.

"But in the city centres the noise level – also the cracks that you get in the building and the rock when you do blasting is not the preferred method. And also you have dust, vibrations…all those things."

With the construction site being located less than 75m from a number of apartment blocks and less than 100m from a nursery school, the raiseboring method enabled the company to excavate the tunnel without any noise or percussion.

Joakim says, "When you start the piloting, as soon as the pilot bit is maybe one or two metres underground then there is just rotating and water."

"There is no percussion. So there is basically no noise level and the machine itself operates from electricity on the surface.

"And even when you start from the bottom with the reamer, you start at 70m deep and you pull the reamer up to the top, so again there is no vibration and no noise at all from this method, which is a great advantage in city centres."

The 66m long vertical tunnel was completed in less than three months, and while Master Drilling was not looking to break any speed records, others in Europe have.

Tunnel boring projects

Take the TBM deployed on the 3.05km long Esme-Salihli Railway Tunnel in Turkey for example.

Personnel from Kolin Construction and Robbins celebrate the breakthrough of a Crossover XRE TBM after it completed Turkey's Esme-Salihli Railway Tunnel.

Manufactured by US-based specialist Robbins, the 13.7m diameter Crossover XRE TBM recently set new records for the most amount of tunnel bored in a single day, week and month.

It excavated distances of 32.4m on its best day, 178.2m over the course of its best week and achieved a best month distance of 721.8m, beating the records it had previously set in May and June.

Designed to work in ground that comprises a mixture of hard rock, soft soils and boulders, Robbins says the machine's large diameter enables both a screw conveyor and belt conveyor to remain in place.

This allows it to operate in different modes according to the ground type and to quickly change between modes.

The excavation of the Esme-Salihli Railway Tunnel, which forms part of the new 508km long Ankara-İzmir High Speed Railway being built by Turkish State Railways on the country' west coast, began in March 2021.

It saw the Crossover XRE TBM bore through sandstone, gravelstone, claystone, quartz and siltstone, before breaking through its end point just last month.

While this has led the TBM to be dubbed the fastest in the world for this diameter class, Onur Kansu, TBM manager for project contractor Kolin Construction, says, "The most important reason for achieving fast advance rates is that we have an experienced and qualified team.

"Such a team allows us to anticipate the malfunctions and to go to the solution in a very short time.

"In addition, all necessary maintenance is carried out on time, and the appropriate consumables are selected to increase the performance," Kansu adds.

Brenner Base Tunnel

Similarly, Italian construction giant Webuild also recently celebrated the breakthrough of one its TBMs working on the 65km Brenner Base Tunnel, which is currently under construction beneath the Eastern Alps of the Brenner Pass between Fortezza in Italy and Innsbruck in Austria.

The TBM, which was built by German manufacturer Herrenknecht and is named Serena, completed the excavation of a 14km exploratory tunnel on the Italian side of the Brenner Base Tunnel.

TBM Serena has now completed her three and a half year bore on the Brenner Base Tunnel.

It took the double shield machine three and a half years to complete the task, which represents just over 80% of Webuild's excavation work on Lot Mules 2-3.

Adding to its work on the project, last month Webuild and its Swiss subsidiary CSC also won the contract for Lot H41 Gola del Sill- Pfons on the Brenner Base Tunnel.

Valued at €651 million, the contract is for a section of railway tunnel on the Austrian side of the Alps. The works will see the construction of two 7.3km long parallel tunnels – including auxiliary tunnels – using traditional methods, as well as the excavation of another 16.5km tunnel using TBMs.

Webuild and SCS will use two TMBs with diameters of over 10m to carry out the works, which include the lining of the completed tunnels, the construction of access tunnels, exploratory tunnels and the building of an underground emergency stop at Innsbruck.

Prior to this latest contract award, the Italian construction and engineering group also secured a €1.07 billion contract to build the 22.5km railway line extending from the southern end of the Brenner Base Tunnel.

Commissioned by the Italian railway infrastructure management company Rete Ferroviaria Italiana, Webuild will be responsible for the design and construction of the line between Fortezza and Ponte Gardena on the Italian side of the Alps.

Taking place predominantly underground, the project will include not only the track, but also a number of underground interconnections and additional works at Ponte Gardena.

Likewise, another major infrastructure project in Europe is also speeding ahead.

HS2 update: TBM launch

Just a few weeks ago, a 2,000-tonne tunnelling boring machine named Dorothy was launched in the West Midlands region, as part of works to build the new High Speed 2 (HS2) railway in the UK.

Dorothy's name was chosen by local residents and school children via a competition.

The 125-metre-long machine, which was built and assembled by 170 engineers, set off from the north portal of the under-construction Chiltern Tunnel in Warwickshire. It is the first TBM to be launched on the Midlands section of HS2.

Named after Dorothy Hodgkin - the first British woman to win a Nobel Prize for Chemistry – the TBM will excavate a one-mile twin bore tunnel that runs under Long Itchington Wood.

Dubbed the Long Itchington Wood Tunnel, its construction will preserve an ancient woodland aboveground, which is classified as a Site of Special Scientific Interest and is home to a complex ecosystem that has evolved over centuries.

HS2 CEO Mark Thurston pushes the button to start TBM Dorothy on her HS2 journey.

HS2 says the final section will form a 'green tunnel' - also known as a cut and cover tunnel - where a roof above will return the land to the natural landscape.

"This is yet another vital landmark in our journey towards a better connected Britain and with the launching of Dorothy today in Warwickshire, shows real progress in helping trans-

form journeys across our country," says Andrew Stephenson, Department for Transport Minister of State for HS2.

Dorothy will be in continuous operation for the next five months and, manned by an "expert tunnelling team" working 24 hours a day in two shifts, she will remove a total of 250,000 cubic metres of mudstone and soil.

The TBM, which was built by Herrenknecht, is currently scheduled to break through the Chiltern Tunnel's south portal next spring.

After completing the first bore, Dorothy will be disassembled and taken back to her launch site by road, where she will then be reassembled before setting off on the second bore for the twin-tunnel, which is due to be completed in early 2023.

Dorothy is not the first TBM to be launched for the high speed railway project, but with just 1 mile of tunnel to excavate beneath England's soils, she will be the first to complete her bore.

Her launch comes seven months after that of 'Florence' - the largest TBM ever used on a UK rail project - and six months after the launch of Florence's twin sister machine, Cecilia.

While European tunnelling projects like HS2 will be ongoing for a number a years, increased infrastructure spending by governments to stimulate economic growth in the face of Covid-19 – not to mention the growing need for mass transit systems that can help Europe meet net zero carbon emissions - means the tunnelling sector will likely grow over the next few years.

Sea tunnels

While projects like the Brenner Base Tunnel, HS2 and the Ankara-İzmir tunnel aim to improve Europe's railways, the proposed Stad Ship Tunnel at the western tip of Norway intends to help ships navigate the most exposed stretch of sea on the country's coast.

After years of debating the possibility of a tunnel through the mountains of the Stad peninsula the Norwegian government has now provisionally allocated NOK2.7 billion (€265 million) towards a tunnel project based on a revised plan put forward by the Norwegian Coastal Administration (NCA) in 2017, CE's Mike Hayes reports.

The proposed tunnel will measure 1.7km long, 37m high and 26.5m wide – large enough to be safely navigated by ships the size of a coastal steamer.

The cross-sectional area of the tunnel will be 1,661m2, and the total volume of rock expected to be removed is approximately 3 million m3 – equivalent to some 8 million tonnes of blasted rock.

Construction of the tunnel is likely to be undertaken using conventional blasting methods, utilising underground drilling rigs and pallet rigs.

Tunnel formwork

When it came to the construction of the Benta Berri Metro Station for the Lugaritz-Miraconcha section of the new San Sebastian Subway in Spain, contractors chose to use a method of stabilisation normally used in mining.

The new Benta Berri Metro Station in the city of Donostia-San Sebastian, which is located on Spain's north-eastern most coast near the Andorran border, comprises a cavern station with two lateral platforms situated 25m underground.

Due the oval-shaped cavern's dimensions, which come in at 16m wide by 12m tall with a total volume of 14,500m3, its construction required the used of 3,200m2 of formwork.

To enable the onsite technicians to pour the concrete for the cavern, which had to be carried out in three separate stages – for the inverted vault, side walls and vault, global formwork specialist Alsina was contracted to provide a formwork system commonally used in mining.

Alsina provided a combination of products for the works, including its Multiform, Circular One-sided Wall, and high-bearing-capacity scaffolding.

To enable workers to build the arch of the inverted vault, Alsina supplied "climbing equipment that could adapt to any position with circular formwork". This allowed 30m2 sections of concrete to be poured each day.

Additionally, Alsina provided two 6m moving trolleys that allowed the concrete to be poured up to twice a week for the construction of the inverted vault's keystone.

Tunnel lining

Italian company William Mosconi is currently using a Magni telehandler to carry out waterproofing works to the underwater section of the 55km long Brenner Base Tunnel.

The demolition and waterproofing specialist was contracted by Webuild to hermetically isolate the tunnel section, which runs under the Isarco river, using waterproof PVC membranes to prevent water seepages.

William Mosconi, technical director of William Mosconi, says, "This work must be performed at height and once the ribs supporting the vault have been installed. After taking into account different players of the lifting sector, Mosconi decided to entrust Magni with this special project."

The company selected Magni's twin energy RTH 5.21 SH model for the project, which will see parts of the ground beneath the river frozen to allow construction of the tunnel.

The rotating telehandler, which features an electric mode for operation in environments with poorly ventilation, was connected to external electricity supply of 380V.

The telescopic model is fitted with a 15kW electric motor and a 90-litre piston pump, and has a maximum lifting height of 21m and an outreach of 15.5m.

Capable of lifting 5,000lbs at full height and equipped with two platforms, Mosconi says using the telehandler allows workers to safely reach the height of the vault to install the PVC sheaths.

Cut-and-cover tunnels

Earlier this year a joint venture company made up of Ferrovial's construction subsidiary and infrastructure specialist Acciona, won a contract for works to the new Calle-30 tunnel in Madrid, Spain.

The contract – the value of which was not disclosed – was awarded by Madrid City Council as part of the city's

"Nuevo Mahou-Calderón" road renewal project.

The project aims to transform the city's above-ground M30 motorway into an underground route. The M30 is a major inner-city orbital that measures over 30km long and surrounds Madrid's central most districts.

With much of the works to redirect the route underground already complete, Ferrovial and Acciona's new Calle-30 tunnel contract covers the last above-ground section of the M30's southern arc.

The Ferrovial-Acciona joint venture will build a 630m-long cut-and-cover tunnel that will be integrated with the adjoining sections of the new Calle-30 tunnel, which have already been built.

With varying widths of between 21m at its northern end to 26m at its southern end, the new Calle-30 underground road tunnel will also incorporate the related facilities and services required for its operation and maintenance.

These include systems for ventilation, atmospheric conditions detection, radio communications, CCTV and other power and traffic control systems such as a public address system

(Leila Steed / CONSTRUCTION EUROPE, 25 January 2022, https://www.construction-europe.com/news/Europe-s-most-impressive-tunnel-projects/8017657.article)

China's longest underwater highway tunnel opens

An aerial photo taken on September 5, 2021 of the Nanquan section of the just-opened Taihu tunnel in east China's Jiangsu Province

After nearly four years of construction, China's longest underwater highway tunnel is now open to vehicle traffic.

At a length of 10.79 kilometers (6.65 miles), the Taihu tunnel stretches under Lake Taihu in eastern China's Jiangsu Province, about 50 kilometers east of Shanghai.

According to government officials in Jiangsu, the tunnel was built at a cost 9.9 billion yuan (about $1.56 billion). Construction began on January 9, 2018.

Over 2 million cubic meters of concrete were used to build the two-way tunnel, which has six lanes and is 17.45 meters wide, reports China's official news agency, Xinhua.

The ceiling of the tunnel has been outfitted with colorful LED lights, designed to prevent driver fatigue.

A view of the LED ceiling installed in the 10.79-kilometer tunnel under Lake Taihu.

The tunnel is part of the 43.9-kilometer Changzhou-Wuxi Highway, which opened to the public on December 30, 2021. It provides an alternative expressway for travelers journeying between Shanghai and Nanjing, Jiangsu's capital.

Connecting the expressways of Suzhou, Wuxi and Changzhou, it was built to alleviate traffic pressure on the cities next to Lake Taihu while promoting the economic development of the cities in Yangtze River Delta area.

So how does the Taihu tunnel stack up against its global counterparts? The world's longest underway highway tunnel is Norway's 14.3-kilometer twin-road Ryfast tunnel, which runs between the city of Stavanger and the municipality of Strand.

The underwater tunnel portion of the Tokyo Bay Aqua-Line, a vehicle highway that travels under Tokyo Bay, is 9.6 kilometers.

In terms of underwater tunnels in general, though, the top honor goes to the Channel Tunnel, which connects England and France by rail. Its submerged portion runs for 37.9 kilometers, the longest of any underwater tunnel in the world.

(Yong Xiong and Karla Cripps / CNN, 4th January 2022, https://edition.cnn.com/travel/article/china-longest-underwater-highway-tunnel/index.html)

Rotational landslide destroys seaside building on Salamina Island, Greece

This photo was supplied by IAEG member Dr. Nikolaos Tavoularis, who is Dr. of Engineering Geology at the NTUA of Greece. Many thanks for submitting this photo!

Installation of rock bolts in Austria

Many thanks to Dr. Franz Riepler of Salzburg, Austria, for this excellent photo of the installation of rock bolts after a rockfall event. It is on Felbertauern road in Matrei in the East Tyrol of Austria.

Road has a moving problem!

This photo was taken last week on the side of a hill. A large landslide (over 10 hectares in size) is moving to the left. Photo is from a road in Oregon, USA. Dr. Scott Burns, Portland State University, USA

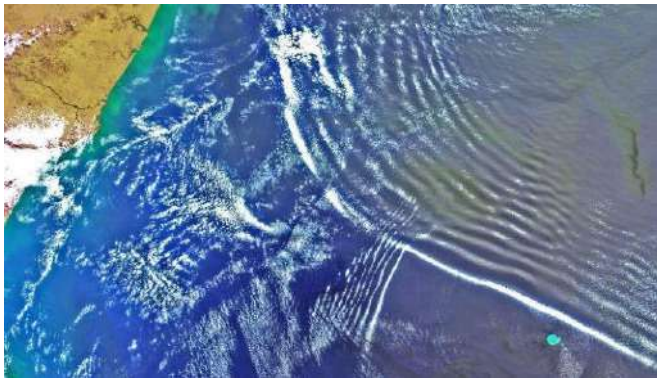
https://www.iaeg.info/iaeg-connector-e-news/

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΣΕΙΣΜΟΙ & ΑΝΤΙΣΕΙΣΜΙΚΗ ΜΗΧΑΝΙΚΗ

Magnetic field to predict Tsunami

What if the magnetic field generated by a tsunami could be detected & used to predict the height of a wave? On the #EGUblogs this week Gillian D'Souza investigates the first results demonstrating this is actually possible, presented at #AGU21. Read more: https://egu.eu/3J3F48/

What if a tsunami's magnetic field could predict the height of the wave?



Atmospheric gravity waves

It's been well established that tsunamis generate magnetic fields as they move seawater (which is conductive unlike freshwater) through the Earth's magnetic field. Although researchers previously *predicted* that the tsunami's magnetic field would arrive before a change in sea level, they lacked the means to simultaneously measure magnetics and sea level to confirm this phenomenon.

Now, a new study finds the magnetic field generated by a tsunami can be detected a few minutes earlier than changes in sea level, which could improve warnings of these giant waves. The study provides real-world evidence for using tsunamis' magnetic fields to predict the height of tsunami waves using data from two real events — a 2009 tsunami in Samoa and a 2010 tsunami in Chile — that have both sets of necessary data. The study was recently published in the American Geophysical Union's (AGU) *Journal of Geophysical Research: Solid Earth*, which focuses on the physics and chemistry of the solid Earth.

"It is very exciting because in previous studies we didn't have the observation [of] sea level change," said Zhiheng Lin, senior study author and a geophysicist at Kyoto University. "We have observations [of] sea level change, and we find that the observation agrees with our magnetic data as well as theoretical simulation."

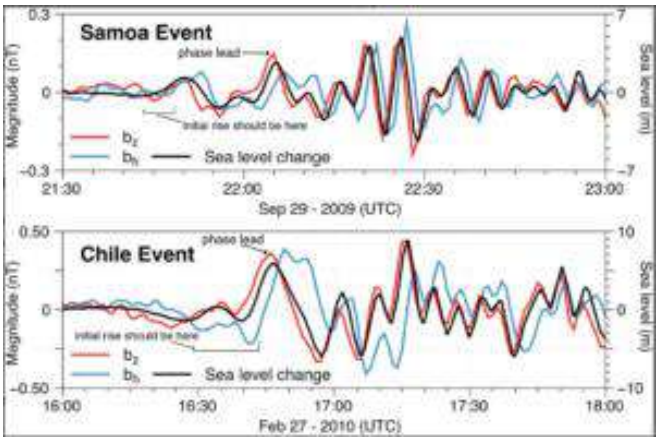
Four key findings:

- The magnetic field generated by a tsunami arrives ahead of sea-level change and its magnitude can be used to estimate the tsunami's wave height
- How much earlier the magnetic field arrives depends on the water depth
- Authors found the early arrival time to be about one minute prior to sea level change when the water depth was a 4800-meter-deep sea
- If incorporated into tsunami risk models, this could provide earlier disaster warning, potentially saving lives

How the team arrived at their findings

The research team looked at simultaneous measurements of sea level change from seafloor pressure data and magnetic fields during the two tsunamis. They found that the primary arrival of the magnetic field, like that of the beginning of a seismic wave, can be used for the purpose of early tsunami warning. The tsunami-generated magnetic field is so sensitive that even a wave height of a few centimeters can be detected.

Comparing the horizontal and vertical components of the tsunami magnetic field with sea level change, researchers found that both components can precisely predict tsunami sea level change, if models include good estimates for ocean depth and the electrical structure below the seafloor.



Comparison of the simultaneous observed magnetic field with sea level change. The comparison shows the peaks of tsunami bz arrive slightly earlier than the sea level changes.

What does this new discovery mean?

The authors explain that this relationship between magnetic fields and wave height can be used to improve tsunami source models, which estimate the initial sea surface topography of a tsunami and then predict the wave arrival time and height. It serves as important data for informing disaster readiness and response.

Unfortunately, the difficulty of maintaining already limited observational stations means that these types of data from tsunamis are often not available. Additionally, these findings only apply to tsunamis that are detected in deep-sea settings and not in coastal environments. This is most likely because the inherent magnetic field noise that develops in shallow coastal water affects the data collected in coastal water.

Although more research on the subject is certainly welcome, the authors conclude that predicting the scale of these severe events — which have the potential to cause immense damage to large areas — makes the available predictions worthwhile.

(Gillian D'Souza / EGU Blogs » GeoLog, January 12, 2022, https://blogs.egu.eu/geolog/2022/01/12/what-if-a-tsunamis-magnetic-field-could-predict-wave-height-before-sea-level-change)

Direct Comparison of the Tsunami-Generated Magnetic Field With Sea Level Change for the 2009 Samoa and 2010 Chile Tsunamis

Zhiheng Lin, Hiroaki Toh, Takuto Minami

Abstract

The motion of conductive seawater by tsunamis can generate magnetic fields in the presence of the background geomagnetic main field. Previous studies found that, using the tsunami-generated seafloor magnetic field, it is possible to predict the propagation direction and wave height prior to the actual arrivals of tsunamis. This study correlates the tsunami magnetic field and the tsunami sea level change using observed data and three-dimensional simulations of the 2009 Samoa and 2010 Chile tsunamis. Our direct comparison of the tsunami observed magnetic field and tsunami sea level change illustrate that the vertical tsunami magnetic component, b_z, arrived earlier than the sea level change. The "initial rise" signal in the observed horizontal tsunami magnetic component, b_h, which was arrived even earlier than b_z also is found by combing the observation with the three-dimensional simulations. We further examine the precision of conversion of the tsunami magnetic field to the sea level change and find that the magnetic field derived tsunami sea levels are as precise as those obtained from differential pressure gauge data. However, our simulation shows that existing tsunami source models are incompatible with our tsunami magnetic data. Therefore, it is necessary to include magnetic field derived tsunami sea level changes to improve those source models.

Plain Language Summary

The tsunami-generated magnetic field is a magnetic field that appears with movement of seawater by tsunamis. In the previous studies, researchers found that the tsunami-generated magnetic field arrives earlier than the tsunami sea level change based on analytical solutions and numerical simulations. In this study, we used the world's first simultaneous data of sea level change and magnetic field in the 2009 Samoa and 2010 Chile tsunamis to study the relation between these two physical quantities. We found that the vertical component of tsunami magnetic field arrives earlier than the sea level change. Moreover, the horizontal component of tsunami magnetic field arrives even earlier than the vertical component. We also revealed that the tsunami magnetic field can be used to estimate the tsunami wave height very accurately. We investigated the observed tsunami magnetic field by the 3-D time domain simulation. However, the currently available tsunami source models were unable to reproduce the observation in our research area. We confirmed that a better source model can improve the simulation. It follows that our high precision tsunami wave height data calculated from the magnetic field can improve the existing tsunami source models.

Read the full text PDF

(https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2021JB022760)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΓΕΩΛΟΓΙΑ

State-of-play on CO2 geological storage in 32 European countries

Abstract

Looking for the latest news on the status of geological storage of CO_2 in Europe? Interested in knowing where CO_2 storage is permissible, where the hot spots for research and practical demonstration are, or what barriers are hindering deployment in a particular country? Look no further! The latest CO_2GeoNet State of Play on CO_2 storage in Europe puts this information right at your fingertips in one easy-to-use report.

Pathways to the Paris Agreement targets require significant emission reduction and even negative emissions; CO_2 capture and storage has an essential role to play. The role of CO_2 capture and storage (CCS) in meeting national emission targets is under discussion in many European countries. Several full-chain CCS projects are evolving, including around large-scale cross-border CO_2 transport infrastructures. CCS is of increased interest to cut emissions from industrial and energy intensive sources where there is no other option. Research projects on aspects of the CCS chain, funded through EC and national programmes, have made significant advances in refining aspects of CO_2 storage.

These recent developments motivated the CO_2GeoNet Association to prepare an update on the State-of-play on geological storage of CO_2 in Europe.

The report addresses the following: national policies and climate-protection strategies; national legislation and regu-lations; national storage options, potential and capacity; large-scale demonstration projects, pilot and test sites for CCS; research activities with respect to CO_2 storage; national actors driving CCS forward, public awareness and engage-ment.

The report draws on responses to a questionnaire completed by national experts to provide an up to date summary on these key topics, with the completed questionnaires appended to offer a detailed country-by-country view.

Download the document

(01-10-2021, http://co2geonet.com/state-of-play)

Το ηφαίστειο που «ώθησε» την Επανάσταση του 1821

Ο καθηγητής Χρήστος Ζερεφός στην «Κ»

Ο κρατήρας του ηφαιστείου Ταμπόρα όπως είναι σήμερα. Η έκρηξή του τον Απρίλιο του 1815 (ίσως η μεγαλύτερη της καταγεγραμμένης Ιστορίας) σκότωσε 117.000 ανθρώπους και προκάλεσε αλλαγή του κλίματος σε όλο τον κόσμο.

Τι ρόλο έπαιξε η τεράστια έκρηξη του ηφαιστείου Ταμπόρα, στη σημερινή Ινδονησία, τον Απρίλιο του 1815, στο ξέσπασμα της Ελληνικής Επανάστασης του 1821; Λειτούργησαν ως επιταχυντές κοινωνικών διεργασιών το «έτος δίχως θέρος» του 1816 και όσα σκοτεινά και παγωμένα έτη ακολούθησαν για να λάμψει το φως της επανάστασης;

Πώς η παρατεταμένη σιτοδεία, που σημάδεψε τις δεκαετίες πριν από το 1821 και ειδικά τα τελευταία χρόνια, καθώς η ηφαιστειακή τέφρα από το Ταμπόρα είχε κρύψει τον ήλιο και προκαλέσει μεγάλη πτώση της θερμοκρασίας, έγινε ένας κρίσιμος παράγοντας για τον ξεσηκωμό;

Μια επιστημονική εργασία του Κέντρου Ερεύνης Φυσικής της Ατμόσφαιρας και Κλιματολογίας της Ακαδημίας Αθηνών, η οποία βρίσκεται υπό δημοσίευση σε έγκυρο επιστημονικό περιοδικό, έρχεται να φωτίσει το πώς η έκρηξη του ηφαιστείου Ταμπόρα το 1815 (ίσως η μεγαλύτερη της καταγεγραμμένης Ιστορίας) προκάλεσε καταστροφή και μεγάλη μείωση των καλλιεργειών τις επόμενες χρονιές, με αποτέλεσμα απότομη επιδείνωση των συνθηκών διαβίωσης των πληθυσμών –και των υπόδουλων στην Οθωμανική Αυτοκρατορία–, «διευκολύνοντας» και το ξέσπασμα της Επανάστασης του 1821.

Ο ρόλος μεγάλων κλιματικών διαταραχών στην πορεία των κοινωνικών εξελίξεων, ακόμα και στην έκρηξη επαναστάσεων και στην κατάρρευση δυναστειών, μελετάται τα τελευταία χρόνια από ιστορικούς, παλαιοκλιματολόγους και επιστήμονες της κλιματικής αλλαγής. «Η Ελληνική Επανάσταση προετοιμαζόταν πολλές δεκαετίες πριν από το ξέσπασμά της. Μέσα σε αυτό το κλίμα της ανάγκης απελευθέρωσης από τον οθωμανικό ζυγό, συνέβησαν ορισμένα σημαντικότατα περιβαλλοντικά γεγονότα τα οποία ξεχείλισαν το ποτήρι της δίψας για την ελευθερία. Σε αυτό συνέβαλε η φοβερή φτώχεια που ενέσκηψε στις τελευταίες δεκαετίες του 18ου και στις πρώτες δεκαετίες του 19ου αιώνα από εκρήξεις μεγάλων ηφαιστείων, από τα μοναδικά συμβάντα στην ιστορία του πλανήτη μας. Για την Ελληνική Επανάσταση, καθοριστική ήταν η έκρηξη του ηφαιστείου Ταμπόρα το 1815, η οποία οδήγησε σε τεράστιες περιβαλλοντικές αλλαγές σε όλη την Ευρώπη και ευρύτερα», λέει στην «Κ» ο Χρήστος Ζερεφός, γενικός γραμματέας της Ακαδημίας Αθηνών και Εθνικός Εκπρόσωπος για την Κλιματική Αλλαγή.

«Ετος χωρίς θέρος»

Η έκρηξη του Ταμπόρα στην Ινδονησία το 1815 επηρέασε το

κλίμα ακόμη και στην περιοχή μας, προκαλώντας φοβερή σιτοδεία και ακραία φτώχεια.

«Το θέρος του 1815 και ιδίως όσα συνέβησαν το 1816, το οποίο χαρακτηρίστηκε ως "το έτος χωρίς θέρος", δημιούργησαν τέτοια φτώχεια, τέτοια σιτοδεία και τέτοια καταχνιά σε ολόκληρη την Ευρώπη, που μόνο η γραφίδα του Λόρδου Βύρωνα και της Μαίρη Σέλεϊ μπόρεσαν να μεταφέρουν με τον πιο λογοτεχνικό και ποιητικό τρόπο αυτά που έζησαν το καλοκαίρι του 1816, όπως με το ποίημα "Darkness" (Σκοτάδι) του Λόρδου Βύρωνα. Και οι δύο έγραψαν τι έβλεπαν στη λίμνη της Γενεύης εκείνο το καλοκαίρι που οι κεραυνοί και οι βροχές δεν είχαν τελειωμό», εξηγεί ο κ. Ζερεφός στην «Κ», δίνοντας τη συνολική εικόνα με όσα προηγήθηκαν:

«Ανατρέχοντας στα ιστορικά κείμενα, αλλά και στις ελάχιστες παρατηρήσεις και μετρήσεις που υπήρξαν τότε, προκύπτει μια ψυχρή περίοδος, η οποία παρέτεινε την προηγηθείσα πολύ κρύα περίοδο που είχε πλήξει την Ευρώπη τους προηγούμενους αιώνες. Αυτή η περίοδος έχει ονομαστεί "μικρή παγετώδης" και διήρκεσε περίπου από την πτώση της Κωνσταντινουπόλεως μέχρι τα μέσα του 19ου αιώνα. Κατά την προεπαναστατική περίοδο οι τιμές των σιτηρών στο χρηματιστήριο του Λονδίνου ανέβηκαν κατακόρυφα ως αποτέλεσμα της μείωσης της σιτοπαραγωγής. Οι ζημιές σε όλα τα αγαθά ήταν μεγάλες, ξεκινώντας από το παγκόσμιο εμπόριο βαμβακιού. Οι ραγιάδες όχι μόνο δεν είχαν ελευθερία, όχι μόνο έπρεπε να κρύβουν τα παιδιά και τις γυναίκες από την αρπαγή για τα σκλαβοπάζαρα, αλλά αντιμετώπιζαν και φτώχεια και σιτοδεία. Οι τιμές του σίτου κάλπαζαν, για να φθάσουν σε επίπεδα απαγορευτικά για τους φτωχούς».

Η έρευνα της Ακαδημίας

Στο Κέντρο Ερεύνης Φυσικής της Ατμόσφαιρας και Κλιματολογίας της Ακαδημίας Αθηνών εκπονείται σχετική έρευνα, με επόπτη τον κ. Ζερεφό, ερευνητές τους Ι. Καψωμενάκη και Σ. Σολωμό, καθώς και εξωτερικούς συνεργάτες, όπως η καθηγήτρια Ε. Ξοπλάκη και ο καθηγητής J. Luterbacher (Γερμανία – Ελβετία), η καθηγήτρια Φ. Κουντούρη (Οικονομικό Πανεπιστήμιο Αθηνών), ερευνητές από το Κέντρο Ερεύνης της Ιστορίας του Νεωτέρου Ελληνισμού της Ακαδημίας Αθηνών, όπως ο Γ. Καλπαδάκης, και από το Γεωπονικό Πανεπιστήμιο Αθηνών, όπως ο Δ. Βολουδάκης, μαζί με τους ακαδημαϊκούς Χ. Μαλτέζου και Π. Κιτρομηλίδη. Στη μελέτη αναδεικνύεται πως ο παράγοντας αποσταθεροποίησης του κλίματος από φυσικά αίτια, και συγκεκριμένα από τα ηφαίστεια Λάκι της Ισλανδίας και Ταμπόρα, έδρασε ως επιταχυντής του ξεσπάσματος της Επανάστασης.

Οπως σημειώνει ο κ. Ζερεφός, η μελέτη θα συμπληρώσει την πλειάδα ιστορικών θεμάτων στην έκθεση που θα πραγματοποιηθεί στην Ακαδημία Αθηνών τον Ιανουάριο του 2022, στην οποία θα εκτεθούν χειρόγραφα και άλλα ιστορικά ντοκουμέντα από την προεπαναστατική και επαναστατική περίοδο της Ελλάδας, συμπεριλαμβανομένων και των ενδείξεων για αυτές τις φοβερές κλιματολογικές συνθήκες και τη σιτοδεία που επικράτησε τότε. Η έκθεση δεν έχει ανοίξει ακόμη λόγω της πανδημίας, ενώ η εμφάνιση του στελέχους «Ομικρον» δημιουργεί επιπλέον δυσκολίες.

Η ερευνητική ομάδα μελέτησε την αξία του σίτου στο χρηματιστήριο του Λονδίνου κατά την περίοδο 1751-1850, όπου καταγράφεται σημαντική αύξηση των τιμών στα χρόνια πριν από την Ελληνική Επανάσταση. «Ταυτόχρονα, όπως βλέπει κανείς από τις θερμοκρασίες αλλά και την παραγωγή του σίτου, από μοντέλα που έχουμε σήμερα δημιουργήσει για να προσομοιάσουμε τη σιτοπαραγωγή, προκύπτει η σημαντική μείωση της θερμοκρασίας στην Ευρώπη τα χρόνια που ακολούθησαν την έκρηξη του Ταμπόρα και η εμφάνιση μεγάλης σιτοδείας στους βασικούς σιτοβολώνες τής τότε Οθωμανικής Αυτοκρατορίας και ιδιαίτερα της περιοχής των Βαλκανίων», υπογραμμίζει στην «Κ» ο γενικός γραμματέας της Ακαδημίας Αθηνών.

Το κλίμα εκείνης της εποχής

«Η προηγηθείσα έκρηξη στο Λάκι της Ισλανδίας το 1783-

1784, η μεγάλη έκρηξη στη Νότιο Αμερική ενός αγνώστου ηφαιστείου (βρέθηκαν "στοιχεία" του στον… Βόρειο Πόλο) και η τελική αιτία της αποσταθεροποίησης του κλίματος και της σιτοδείας το 1815, δημιούργησαν εφιαλτική φτώχεια, η οποία αθροίστηκε στο υπόβαθρο της εξαθλίωσης των Ελλήνων που τόσο χαρακτηριστικά περιγράφεται στο έργο του Pouqueville "Histoire de la régénération de la Grèce". Βασική αιτία της σιτοδείας υπήρξε η σκίαση του φωτός και η μείωση της φωτοσύνθεσης στους βασικούς σιτοβολώνες της Νοτιοανατολικής Ευρώπης. Εκτιμήσεις παλαιοκλιματικών μοντέλων που αναπτύσσουμε στο Κέντρο Κλιματολογίας της Ακαδημίας Αθηνών δείχνουν ότι η σκίαση του Ηλίου έφθασε μέχρι και 25%, ενώ παράλληλα η θερμοκρασία έπεσε έως και κατά 2 βαθμούς Κελσίου τη χρονιά μετά την έκρηξη του Ταμπόρα, με αποτέλεσμα τη μείωση της σιτοπαραγωγής έως και κατά 25% στους μεγαλύτερους σιτοβολώνες της Οθωμανικής Αυτοκρατορίας, με συνέπεια οι τιμές του σίτου στο χρηματιστήριο του Λονδίνου να αυξηθούν έως και κατά 150%», σημειώνει ο κ. Ζερεφός. «Θα πρέπει να ληφθεί υπόψη στα μελλοντικά ιστορικά συγγράμματα σχετικά με την Ελληνική Επανάσταση ότι ο ηρωισμός των Ελλήνων στον αγώνα τους για την απελευθέρωση έγινε και κάτω από αντίξοες κλιματικές συνθήκες, και κυρίως σε συνθήκες ακραίας φτώχειας. Τα μεγάλα κατορθώματα που επετεύχθησαν από τον ελληνικό λαό αξίζουν ακόμα περισσότερο τον θαυμασμό μας, ως μοναδικά παραδείγματα ηρωισμού και αυτοθυσίας, που θυμίζουν πράγματι εποχές σαν εκείνες των Θερμοπυλών και της Σαλαμίνας».

(Γιάννης Ελαφρός / Η ΚΑΘΗΜΕΡΙΝΗ, 02.01.2022, https://www.kathimerini.gr/society/561651172/to-ifaisteio-poy-othise-tin-epanastasi-toy-1821-k/)

Geologists to pinpoint official birthplace of the Anthropocene in 2022

Whether we are in a new geological epoch is still up for debate, but geologists have almost decided where on Earth should be the official birthplace of the Anthropocene

Crawford Lake in Ontario, one of the candidate sites to mark the dawn of the Anthropocene

A long-running effort to declare that the global impact of humans is enough to establish a new geological epoch will

come to a head this year – when a decision is made on the best site to officially mark the beginning of the Anthropocene.

The past 11,650 or so years form a geological unit of time known as the Holocene, considered a climatically benign epoch in the planet's history that allowed civilisation to flourish. …

(Adam Vaughan / New Scientist – Earth, 25 January 2022, https://www.newscientist.com/article/2305801-geologists-to-pinpoint-official-birthplace-of-the-anthropocene-in-2022/#ixzz7O6EqnxeN)

Permafrost - what is it?

https://www.youtube.com/watch?v=lxixy1u8GjY&list=PLfp1hFsaJhKYRCUHPCR8Z8Xhf67DBa5-Z&index=12, https://lnkd.in/eemc5Cy2

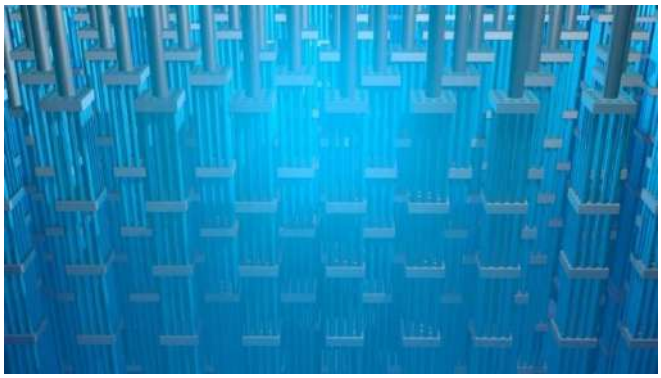
What is permafrost? What happens when permafrost thaws? This animation answers these questions. Scientists at the Alfred Wegener Institute conduct annual expeditions to the polar regions in order to understand the diverse processes in the permafrost an to precisely assess the impacts of its degradation.

Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΠΕΡΙΒΑΛΛΟΝ

Boreholes proposed for UK's nuclear waste

The entire UK inventory of high-level waste from fuel reprocessing could be disposed of in seven boreholes averaging 4.85km depth spread over an area less than three football pitches.



This is the claim of Sheffield University's Prof Fergus Gibb who has co-authored a study that sets out a design for a new way of permanently disposing of high-level radioactive waste deep underground in boreholes.

"These could be used alongside or separate from a much smaller-cheaper mined repository which is needed for the huge volume of intermediate-level wastes," he said.

The UK has accumulated around 248,000m^3 of radioactive waste with over 95 per cent of its radioactivity arising from 1,390m^3 (0.56 per cent), which is categorised as high-level waste.

The government's current plan is to bury the waste at a depth of a few hundred metres in a geological disposal facility (GDF) if, and when, a geologically, politically and socially suitable site is found.

It is estimated that a GDF will cost over £13bn, could not be available before 2040 at the earliest and would not be able to take any high-level waste before 2080. It would then remain operational and open for over 150 years.

Disposing of high-level waste in deep boreholes was previously thought not to be possible, as the UK's waste is packaged in containers that were considered too large.

Now, Prof Gibb and John Beswick of Marriott Drilling propose a combination of blind shaft and oilfield drilling technologies that increase the diameters achievable in deep boreholes.

"The innovative combination of blind shaft drilling – normally used for sinking mine shafts – for the top 2.5km with conventional oilfield drilling for the bottom half of the hole enables holes at full depth, or approximately 5km, to be almost twice as wide as previously considered practical," said Gibb. "This enables disposal of larger waste containers, such as those in which the UK's high-level waste is already packaged."

He added that in practise a borehole would be drilled, cased to full depth, cleaned, calibrated and waste packages would then be lowered downhole on coiled tubing and deposited one at a time at the bottom of the hole.

"There is then an option of just leaving them stacked up or sealing them individually into the borehole," he continued. "Once the disposal zone of the borehole – below 3km – is filled the whole borehole is sealed up all the way to the surface."

A generic reference design is presented in the paper published in *Energy* and the researchers have concluded that disposal of the high-level waste could be completed, using currently available technology, in under ten years from the location and approval of a suitable site.

Cost estimates in the study show an entire deep borehole disposal programme, including a non-active demonstration borehole, could be undertaken for less than £750m at current prices, representing a net saving on the combined GDF and deep borehole disposal programmes of over £8bn.

Gibb added that the correct geological conditions exist at a greater number of locations than might be suitable for the much larger mined repository needed for co-disposal.

The borehole solution is also potentially safer because of the order of magnitude greater isolation (depth) and strength of the natural geological barriers, which can demonstrably survive for the necessary timescale.

(Jason Ford / THE ENGINEER, 13th January 2022, https://www.theengineer.co.uk/boreholes-nuclear-waste-drilling-sheffield)

A deep borehole disposal solution for the UK's high-level radioactive waste

Fergus G.F. Gibb & A. John Beswick

Abstract

The size of deep boreholes suitable for disposal of radioactive wastes can be increased through an innovative combination of blind shaft and oilfield drilling technologies. This would enable deep borehole disposal (DBD) of the UK's high-level waste (HLW), which is being packaged in containers hitherto considered too large for DBD and destined for a deep geological repository (DGR/GDF). DBD could advance, by over 40 years, disposal of this waste, avoid expensive replacement of ageing storage facilities and reduce the size and cost of the DGR/GDF by up to 70%. A generic reference design is presented for the boreholes and a route proposed for DBD of the UK's HLW in between seven and ten boreholes on a site smaller than three football pitches. Following location and approval of a suitable site, disposal could be completed in under 10 years using currently available technology. Estimates are presented that show the entire programme, including a non-active demonstration borehole, could be undertaken for less than £744 million (at today's prices); a saving of over £8.5 billion on the estimated cost of the proposed DGR/GDF. Implementing DBD of the UK's HLW could begin now and should be reconsidered as a matter of urgency.

OPEN PDF https://www.icevirtuallibrary.com/doi/pdf/10.1680/jener.21.00015

Three Gorges hydro generated more than 103.6 billion kWh of electricity in 2021

China Three Gorges reports that its 22.5 GW Three Gorges Power Station generated a total of 103.649 billion kWh of electricity in 2021, crossing the 100 billion kWh mark again.

This volume of the clean electricity is equivalent to a reduction of 31.758 million tons of standard coal and cutting emissions of 86.858 million tons of carbon dioxide, as well as 19,400 tons of sulfur dioxide and 20,200 tons of nitrogen oxides.

The Three Gorges Power Station on the Yangtze River is the world's biggest hydropower plant in terms of installed capacity. It set a record for annual power generation volume from a single hydropower station in 2020, beating the previous world record of 103.098 billion kWh set by South America's 24 GW Itaipu hydropower project in 2016. The Itaipu plant, on the Parana River, is shared by Brazil and Paraguay.

Apart from achieving annual power generation of over 100 billion kWh for the second year in a row, the Three Gorges Project also provided significant benefits, such as flood control, navigation and water resource utilization.

(hydroreviewcontentdirectors, 1.20.2022, https://www.hydroreview.com/business-finance/three-gorges-hydro-generated-more-than-103-6-billion-kwh-of-electricity-in-2021)

Σχόλιο

Οι φίλοι μας οι Κινέζοι παρήγαγαν λοιπόν το 2021 την διπλάσια από την δική μας συνολική ετήσια κατανάλωση ηλεκτρικής ενέργειας, από ένα και μόνο ΥΗΕ (το τεράστιο Three Gorges βέβαια...). Και εμείς ακόμη ψαχνόμαστε με τα δικά μας υπόλοιπα 25 ημιτελή και νέα ΥΗΕ, τα οποία με κοστος 5 δις περίπου, θα μπορούσαν να μας υπερδιπλασιάσουν την διαθέσιμη-παραγόμενη υδροηλεκτρική ισχύ και ενέργεια...

Ιωάννης Στεφανάκος

Geotextile covers preserve glacier resources

How geotextiles preserve natural snow and ice from melting in summer

In this photograph, the geotextile-covered glacier to the right shows approximately 14.8 feet (4.5 m) of snow from the last winter season. To the left, an area that was not covered shows that the snow has melted down to the bare rocks. Photograph courtesy TenCate Geosynthetics

In Austria, glaciers are considered a national treasure. During summer, glaciers are covered with geotextiles to preserve the natural ice and snow from the winter season. That way, energy expenditures for the production of artificial snow are reduced to a minimum.

Only nine of the numerous glaciers in Austria are operated actively. The operators face the challenge to align the economic interests with the ecological interests. The only way to combine these interests is to protect the glaciers by means of technical devices.

To date there is no comparable alternative to covering the valuable Austrian glaciers with geotextiles. The white nonwoven fabrics reflect most sun radiation (Albedo effect) and form an insulating layer underground due to the voluminous structure.

From a technical point of view, this is the best way to conserve snow and ice from the winter months in terms of energy efficiency. The insulating layer for the glacier ensures a smooth beginning of the skiing season without having to produce artificial snow.

"We have brought our product to technical perfection due to our long-standing experience and continued improvements in cooperation with local universities as well as operators of various glacier skiing areas," says Michael Uebigau, sales manager west Austria, TenCate Geosynthetics.

In the Tyrol, a state in western Austria, the production of one cubic meter of snow is estimated to cost €3 ($3.40), while covering the glaciers with geotextiles costs less than €2 Euros ($2.26).

TenCate Geosynthetics only uses mechanically bonded continuous filament nonwovens from 100% UV-stabilized polypropylene (PP) to protect glaciers, as these have a considerably higher elongation strength compared to thermally bonded filaments.

TenCate Geosynthetics has developed a patented special form of mechanical bonding: hydroentanglement for nonwoven geotextiles. With this method, the needles are replaced by microscopically small water jets, which intrude the product by means of extremely high pressure. With this technique there are no needle breakages, and the bonding of the fibers is much gentler than with traditional techniques.

*This article first appeared on the TenCate Geosynthetics Europe blog, **https://blog.tencategeo.eu**.*

(IFAI, December 30, 2021, https://geosyntheticsmagazine.com/2021/12/30/geotextile-covers-preserve-glacier-resources)

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ

https://www.issmge.org/publications/issmge-bulletin/vol-15-issue-6-december-2021

Κυκλοφόρησε το Τεύχος 6 / Τόμος 15 Δεκεμβρίου 2021 του ISSMGE Bulletin με τα ακόλουθα περιεχόμενα:

- President's message
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- Conference reports
  XXXI Italian National Conference on Geosynthetics Engineering, Bari, Italy
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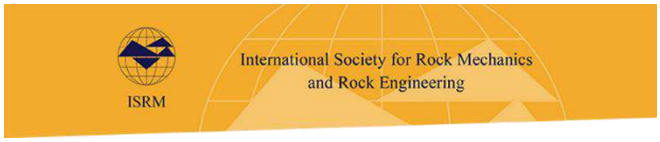

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- President's 2022 New Year Address
- Prof. Seokwon Jeon elected ISRM President for 2023-2027
- ISRM International Symposium LARMS 2022, Asunción, Paraguay, 16 to 19 October – Call for papers
- 35th ISRM online lecture by Prof. Charlie Li
- Eurock2022, Helsinki, Finland, 12-15 September
- AusRock 2022, Melbourne, 9 November-1 December – an ISRM Regional Symposium: abstract submissions closing soon
- 15th International ISRM Congress, Salzburg, Austria – The place to be in October 2023
- New ISRM course on Ground Control in Longwall Mining by Prof. Ismet Canbulat
- First European Rock Mechanics Debate
- Introducing the ISRM Young Members' Seminar Series
- Renew your access to the ISRM Digital Library
- Rocha Medal 2022 winner and runners-up were announced
- 5th Symposium of the Macedonian Association for Geotechnics, Ohrid, 23-25 June – an ISRM Specialized Conference
- 9th Brazilian Rock Mechanics Symposium, 23-26 August 2022, Campinas, Brazil – an ISRM Specialized Conference
- Nordic Grouting Symposium, 4-6 October 2022 in Stockholm, Sweden – an ISRM Specialized Conference
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https://about.ita-aites.org/news

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- Tunnelling the world 2021 Video
- World Tunnel Day 2021: 24hr online meet-up
- Lunchtime Lecture Serie #11
- 6th International Symposium on Tunnels and Shafts in soils and rocks
- Focus on 2021 ITA Tunnelling Awards
- 2021 ITA publication: Strategy for Site Investigation of Tunnelling Projects in portuguese version
- ITACUS, official partner to UN Environment Programme
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IGS NEWSLETTER – January 2022

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- Upcoming Webinars
  - Vertical load transfer and settlement analysis of geosynthetic-reinforced column-supported embankments January 20, Presented by Dr. Michael McGuire - REGISTRATION INFORMATION
- Calendar of Events

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https://www.sciencedirect.com/journal/geotextiles-and-geomembranes/vol/49/issue/6

Κυκλοφόρησε το Τεύχος 6 του Τόμου 49 (Δεκεμβρίου 2021) του Geotextiles and Geomembrabes της International Geosynthetics Society με τα ακόλουθα περιεχόμενα:

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