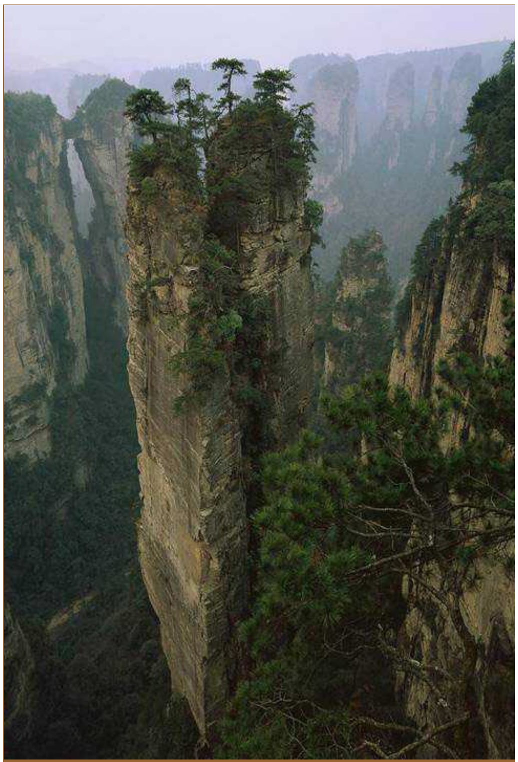

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Engineering the new age

A conversation with James Martin II

When the New Pittsburgh Courier was preparing to interview James Martin II, the new dean of Pitt's Swanson School of Engineering, we expected to talk about his international reputation as an expert on earthquakes and disaster mitigation; about what his being the first Black dean of the school might mean for minority enrollment; about why he became an engineer.

We didn't talk about any of that—instead, we talked about the Roman Empire, about philosophy, about Chaos theory and non-linearity, about how the global industrial age started here in Pittsburgh, and about how its coming replacement—which no one has a name for yet—could also start here in Pittsburgh.

"The focus in the industrial age was on efficiency. We built institutions that mimicked the machines we built. It was a linear model," Martin II told the Courier. "But we live in a non-lineal world. It's not about size and consolidating resources. It's about knowledge and connecting to flows of resources. It's why a company that didn't exist 10 years ago, Uber, is valued at $150 billion and Sears is going bankrupt."

Roman engineers, Martin II noted, before they ever

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(συνέχεια από την πρώτη σελίδα)

learned a thing about engineering, learned philosophy, music, languages—they learned how to think. The waning industrial age model that puts knowledge and skills in distinct silos—medicine, law, business, engineering—limits thinking and, more importantly, limits imagination.

"The structure of organizations dictates how we think. We need a new way of thinking; not about what we know, but about where we can go. Our opportunity here is to have a deeper sense of purpose, being part of something larger than ourselves," he said.

"It's like two guys building a wall. You ask one what he's doing, and he says he's laying brick. You ask the other guy and he says he's building a palace."

To that end, Martin II is reorganizing the structure of the Pitt engineering school—from eliminating job titles and designations like "staff," to replacing furniture in a conference room so it is more conducive to collaborative working, probably altering the curriculum.

Martin II, who took over as dean on Aug. 15, earned both a master's degree and a doctorate in civil engineering at Virginia Tech, according to a release from Pitt. He was inducted into the Civil Engineering Department's Academy of Distinguished Alumni in 2015. While at Virginia Tech, he also received the department's Alumni Award for Teaching Excellence and the College of Engineering Dean's Award for Excellence in Professional Service. In addition, he was recognized with the Norman Medal from the American Society of Civil Engineers, the field's highest honor for published work.

"The first person I hired is a psychologist—an expert in organizational science and human complexity. She is now our director of organizational innovation," Martin II said. "I think the curriculum will be entirely different. Of course, you still need math and physics, but engineers build communities. We need to be building and making things and engaging in the real world."

Martin II argues that the "silos" organized around expertise need to come down, so that more inclusive collaboration among disciplines can flourish. His current research is looking at the "strange attractors" that dictate how individuals coalesce into social and working groups, how others act as bridges between those groups, and how it can be predicted and possibly designed—human engineering.

"Why is biomechanical engineering only now a thing? It should have always been a thing," he said. "We need to organize around solving problems. And a small part of all of us is better than a whole lot of just a few."

It's about perspective, Martin II said. When people say it's hard for the school to get certain students because they are first-generation, urban, low-income to excel because they lack the more solid educational background, he says, "nonsense."

"It's about continual learning. A 2.5 (GPA) student who's striving to get to where the 4.0 student came in has a positive trajectory and research shows they maintain that," he said. "It's not that they aren't ready for us, it's that we aren't ready for them."

"And while we're at it," Martin II continued, "let me say this about diversity. I'm convinced the way we achieve diversity is to stop talking about diversity and start talking about unity. The federal government has spent $30 billion and diversity and high school interest in sciences has actually gone down. Focus on unity in the community as a more compelling place. Right now, no one is talking about building the palace. They're just laying brick."

(Christian Morrow, Courier Staff Writer / Pittsburg Courier, 25 October 2018, https://newpittsburghcourieronline.com/2018/10/25/engineering-the-new-age-a-conversation-with-james-martin-ii/)

σ.σ. Μπορεί κάποιοι να συμφωνούν και κάποιοι όχι. Ας αρχίσουμε μια συζήτηση.

ΑΠΩΛΕΙΕΣ

Δυστυχώς το φθινόπωρο δεν άρχισε καλά για την γεωτεχνική οικογένεια. Δύο διακεκριμένα μέλη της, ο Γιάννης Θανόπουλος και ο Νίκος Μουτάφης έφυγαν από την ζωή μέσα σε μια εβδομάδα. Αιωνία η μνήμη τους.

Γιάννης Θανόπουλος
1953 - 2018

Ο Γιάννης, έφυγε από την ζωή στις 28 Σεπτεμβρίου 2018 στην Λάρισα, χτυπημένος από την επάρατη νόσο. Η κηδεία του έγινε στην Λάρισα στις 29 Σεπτεμβρίου 2018, παρουσία απαρηγόρητων συγγενών, θλιμμένων φίλων και πολλών συναδέλφων.

Ο Γιάννης γεννήθηκε στην Λάρισα, τον Δεκέμβριο του 1953. Ήταν το δεύτερο, από τα δύο παιδιά της οικογένειας Θανόπουλου. Πολύ νωρίς έφυγε από την ζωή το πρώτο παιδί της οικογένειας και ο Γιάννης έμεινε η μόνη ελπίδα και το στήριγμα των γονιών του. Ο πατέρας του ήταν γεωπόνος της Υπηρεσίας Εγγείων Βελτιώσεων του Υπουργείου Γεωργίας στη Λάρισα με σημαντική συμβολή στην αρδευτική ανάπτυξη της Θεσσαλικής Γεωργίας. Κοντά του ο Γιάννης, νεαρός ακόμη, μυήθηκε στην μεγαλοσύνη της μηχανικής και στην κοινωνική χρησιμότητα των μεγάλων υδραυλικών έργων.

Ο Άκης των παιδικών και εφηβικών του χρόνων, γίνεται γνωστός και αγαπητός στην κοινωνία της Λάρισας, τόσο, για τις μαθητικές του επιδόσεις, όσο και με την κιθάρα του και τα τραγούδια του. Το 1971, μετά από εισαγωγικές, βρίσκεται φοιτητής στους Πολιτικούς Μηχανικούς του ΕΜΠ. Συνεχίζει τις επιτυχείς σπουδές του την εποχή της χούντας, έχοντας παράλληλες πολιτικές και κοινωνικές ανησυχίες. Αμέσως, μετά παρακολουθεί μεταπτυχιακό στην Εδαφομηχανική και εκπονεί Διδακτορική διατριβή στη Υδραυλική, στην Γκρενόμπλ της Γαλλίας, κλείνοντας έναν σημαντικά μεγάλο κύκλο συναφών και υψηλού επιπέδου σπουδών για την μετέπειτα επιτυχή ενασχόλησή του με τα υδροηλεκτρικά έργα. Στις αρχές της δεκαετίας του 80 βρίσκεται υπάλληλος της ΔΕΗ/ΔΑΥΕ και ασχολείται με την επίβλεψη κατασκευής του ΥΗΕ Αώου με τα δύο φράγματα και τα πολλά υπόγεια έργα. Το 1986 μετατίθεται στο Κλιμάκιο της ΔΕΗ/ΔΑΥΕ στο Μουζάκι της Θεσσαλίας και ασχολείται με μελέτες και επιβλέψεις του φαραωνικού και τελικά ημιτελούς έργου πολλαπλής σκοπιμότητας, της Εκτροπής του ποταμού Αχελώου στην Θεσσαλία, με τα τέσσερα φράγματα και τα πολλά υπόγεια έργα. Έγινε από νωρίς γνωστός για την ενδελεχή επιστημονική κατάρτισή του, τόσο, στα γεωτεχνικά, όσο και υδραυλικά θέματα, αλλά και για την ευρεία κοινωνικότητα και πάντοτε ανθρωπιστική προσέγγιση των πραγμάτων. Σε εποχή δύσκολη, μέσα από την παραγωγή των έργων, ετοίμασε και δημοσίευσε επιστημονικά θέματα που υπήρξαν συμβολές στην γνώση των κατασκευών μεγάλων έργων. Οι συνάδελφοι από τα έργα της ΔΕΗ τον γνώρισαν με την τέλεια επιστημονική κατάρτιση, τις επιτυχείς συμβολές στα έργα, την μελωδική κιθάρα του που συνόδευε τα χειμωνιάτικα βραδινά στο προκεχωρημένο οικισμό της ΔΕΗ στο Παχτούρι της ορεινής Πίνδου. Παράλληλα με την εργασία, υπήρξε λάτρης της ελληνικής ορεινής φύσης, την οποία «όργωσε» με την εντούρο μηχανή και τα χιονοπέδιλά του και δεινός ταξιδευτής των θαλασσών, τις οποίες πολλές φορές έσκισε με το ιστιοφόρο του.

Ήταν ο εμπνευστής και ο Πρόεδρος της Οργανωτικής Επιτροπής του 1ου Ελληνικού Συνεδρίου Φραγμάτων που έγινε στην Λάρισα το 2009, που έγινε η απαρχή σειράς των υψηλού επιπέδου σχετικών ελληνικών συνεδρίων.

Μετά την συνταξιοδότησή του από την ΔΕΗ, την τελευταία πενταετία, ασχολήθηκε αποτελεσματικά με την παροχή συμβουλών σε μελέτες και κατασκευές φραγμάτων και άλλων μεγάλων τεχνικών έργων, τόσο στην Ελλάδα, όσο και στο εξωτερικό (Ινδία, Αλγερία κλπ).

Με την απώλειά του, άφησε χήρα την σύζυγό του Όλγα και την πολυαγαπημένη του κόρη Λουΐζα, στην ετοιμασία της διπλωματικής της εργασίας για την απόκτηση του Διπλώματος Αρχιτεκτονικής του ΕΜΠ. Παράλληλα, άφησε ένα μεγάλο και δυσαναπλήρωτο κενό στο χώρο της γνώσης της επιστήμης των φραγμάτων και των υδροτεχνικών έργων.

Θα το θυμόμαστε σαν τον, καλοσυνάτο συνομιλητή, τον ευγενή άνθρωπο, τον δεινό εραστή της φύσης, τον καλλιεργημένο μουσικό, τον εμβριθή επιστήμονα, τον έμπειρο και πολυκαταρτισμένο μηχανικό. Ας είναι ελαφρύ το χώμα που τώρα σε σκεπάζει.

Νίκος Μουτάφης
1946 - 2018

Ο Νίκος Μουτάφης γεννήθηκε στην Αθήνα το 1946, τελείωσε το Αμερικανικό Κολλέγιο το 1965, έλαβε το BSc in Civil Engineering από το London University το 1970, το MSc σε Soil & Rock Mechanics το 1971 και το PhD πάνω σε Anisotropic Elasticity το 1975 από το Aston University, UK. Εντάχθηκε στην

Δημόσια Επιχείρηση Ηλεκτρισμού (ΔΕΗ Α.Ε.) το 1976, στην οποία είχε μια άκρως επιτυχημένη σταδιοδρομία μέχρι το 1997. Κατά την διάρκεια της υπηρεσίας του στην ΔΕΗ συμμετέσχε στην μελέτη και κατασκευή πολλών μεγάλων υδροηλεκτρικών φραγμάτων, ενώ διετέλεσε και Διευθυντής του Κλάδου Μελετών της Διεύθυνσης Ανάπτυξης Υδροηλεκτρικών Έργων. Από το 1997 μέχρι το 2013 ήταν Λέκτορας στην Σχολή Πολιτικών Μηχανικών του Εθνικού Μετσοβίου Πολυτεχνείου (ΕΜΠ), ενώ παράλληλα προσέφερε υπηρεσίες ανεξάρτητου συμβούλου. Μετά την αποχώρησή του από το ΕΜΠ συνέχισε να προσφέρει συμβουλευτικές υπηρεσίες.

Διετέλεσε Πρόεδρος της Ελληνικής Επιτροπής Μεγάλων Φραγμάτων από το 1993 μέχρι το 2008 και Επίτιμος Πρόεδρος της στη συνέχεια. Συμμετείχε στις δραστηριότητες της International Committee on Large Dams (ICOLD) και ήταν ενεργό μέλος της Technical Committee on Cemented Material Dams. Τα φράγματα από κυλινδρούμενο σκυρόδεμα ήταν μία από τις αδυναμίες του, και συμμετείχε σημαντικά στην συγγραφή του σχετικού ICOLD Bulletin (σε μορφή σχεδίου επί του παρόντος).

Συνολικά, συμμετέσχε στην μελέτη 17 φραγμάτων σε στάδιο μελέτης σκοπιμότητας, 46 φραγμάτων σε στάδιο τελικής μελέτης, 41 φραγμάτων σε στάδιο κατασκευής στην Ελλάδα αλλά και στο εξωτερικό (Αιθιοπία, Ισημερινός, Περού, Βολιβία και Βενεζουέλα). Συμμετέσχε, επίσης, στην μελέτη υδροηλεκτρικών, υδραυλικών και γεωτεχνικών έργων, καθώς και στην μελέτη σηράγγων. Τέλος, μελέτησε και κατασκεύασε ένα μικρό φράγμα στην Λέσβο, τόπο καταγωγής των γονέων του, προκειμένου να καλυφθούν οι ανάγκες σε νερό μικρών χωριών του νησιού, στο οποίο φράγμα δόθηκε το όνομα του πατέρα του, Ιωάννης Μουτάφης.

Συνέγραψε μεγάλο αριθμό άρθρων, στα οποία παρουσίασε την μεγάλη του εμπειρία σε όλα τα θέματα που αφορούν στην μελέτη και κατασκευή φραγμάτων.

Ο Νίκος λάτρευε τα ταξίδια, επισκεπτόμενος μέχρι και τα Galapagos Islands και το Rapa Nui Island. Αγαπούσε το διάβασμα, την κλασική μουσική, την φύση και λάτρευε την οικογένειά του. Παντρεύτηκε την Δάφνη και απέκτησαν δύο κόρες, την Μαριάννα και την Τζοάνα.

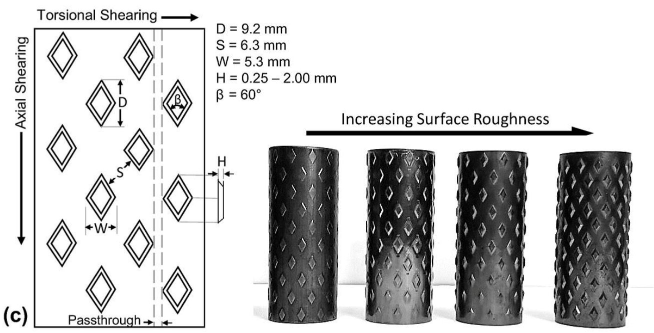
Θα τον θυμόμαστε με θαυμασμό και θα λείψει σε όλους μας.

Interface response-based soil classification framework

G.L. Hebeler, A. Martinez, J.D. Frost

Abstract

Current soil classification systems based on cone penetration testing (CPT) utilize a combination of the tip resistance (q_t), pore pressure (u_2), and friction sleeve (f_s) measurements as inputs. While the q_t measurements are typically normalized by the overburden stress, the f_s measurements are often normalized by the net tip resistance, leading to the use of parameters that are dependent on each other. This paper presents the development of a soil classification framework that utilizes a normalized multi-friction parameter (MFP) and the CPT normalized tip resistance. The MFP parameter is obtained from measurements with textured friction sleeves from soundings with multi-sleeve attachments. The use of textured friction sleeves allows for fundamental differences in soil–structure interface behavior and particle sizes to be captured due to the significant degree of shearing induced within the soil. This classification framework was developed with results from over 30 soundings at six different sites. The analysis of samples taken from the field indicates that the proposed framework provides a classification that better agrees with the grain-size distribution for residuum, calcareous and intermediate soils, as compared to existing CPT-based systems. The potential development of a simplified probe with just one additional friction sleeve sensor can provide appropriate classification results and would facilitate adoption for use in practice.



(Canadian Geotechnical Journal, https://doi.org/10.1139/cgj-2017-0498, Published on the web 13 March 2018, Corresponding author: Alejandro Martinez (email: amart@ucdavis.edu).

Performance of Taum Sauk Upper Reservoir Dam During Refill

Experts describe the refill process, the instrumentation monitored at the upper reservoir, the inspections conducted during the refill program, and the performance of the dam during the refill program.

Jared Deible, John Osterle, Charles Weatherford, Tom Hollenkamp, and Matt Frerking

The Taum Sauk Project consists of an upper reservoir and a lower reservoir connected by a vertical shaft, rock tunnel, and penstock. The powerhouse at the project has two pump-turbines with a total generation capacity of 450 MW. The original rockfill dike, constructed in 1963 to form the upper reservoir at the Taum Sauk Pump Storage Project, failed abruptly on Dec. 14, 2005. The original upper reservoir dam was removed and completely rebuilt from 2006 to 2010 as a 2.8 million cubic yard Roller Compacted Concrete (RCC) Dam in compliance with Federal Energy Regulatory Commission (FERC) regulations and Missouri environmental permitting regulations.

Paul C. Rizzo Associates, Inc. prepared a Dam Performance and Instrumentation Report in cooperation with AmerenUE to document and evaluate the performance of the Taum Sauk Upper Reservoir Dam and instrumentation during the refill of the reservoir.

The Taum Sauk Upper Reservoir was refilled in stages to assess the structure's performance at each step. Because it is a pumped storage project with no natural inflow, the reservoir level can be raised and lowered with the reversible pump turbines at the project. The reservoir levels, start dates, end dates, and approximate durations at each level are summarized in Table 1 (Pg. 30). It is noted that the floor of the upper reservoir is at approximately El. 1505 and the maximum operating level is El. 1597.

The primary objective of the Refill Program was to assess the behavior of the Dam under partial and full head by observing and measuring the following:

– Leakage and/or seepage into the Gallery, Adits, Main Access Tunnel, and Toe Ditches.

– Piezometric pressures in piezometers in the Gallery and downstream of the Gallery at the Adits, and at critical locations in the foundation throughout the Dam.

– Alignment changes (horizontal and vertical), if any, of monuments on the Crest Road.

– Deformation of the dam (downstream/upstream, along the dam axis direction, and vertical) as measured with Joint Meters installed at the Crest and Gallery at each Monolith Construction Joint.

Instrumentation and Inspections

What follows is a description of the dam safety instrumentation monitored during the refill program, the monitoring frequency, and a summary of the inspections performed. Instrumentation at the site includes 24 vibrating wire piezometers, 10 leakage flumes, and 23 surface monuments. Inspections at the site during the refill program included a complete inspection of the upper reservoir every 12 hours.

Piezometers

A total of 24 vibrating wire piezometers are located at 11 stations throughout the dam. The piezometers are designed to measure uplift at the RCC/Rock interface at several sections, and uplift along defects in the foundation in several locations.

Twenty of the 24 piezometers at the upper reservoir are connected to the Upper Reservoir Distributed Control System (DCS). The DCS enables the piezometers to be read automatically at specified intervals. Hourly readings were reported for the piezometers connected to the DCS during the refill program. The four piezometers not connected to the DCS were read manually four times per day (approximately every 6 hours) during the refill program.

Flumes

A total of ten trapezoidal flumes were installed at five locations in the gallery at the upper reservoir. A pair of flumes is located at each Gallery outlet so that the total outflow from the drainage gallery is measured.

The flumes are located in the drainage gallery trench so that leakage from crest-to-gallery drains, foundation drains, and any other leakage into the gallery flows through the flumes. Flume readings were taken twice a day, once every 12 hours.

Surface Monuments

Twenty-three surface monuments were installed along the Crest of the Upper Reservoir Dam. Two monuments are located at each monolith joint, one on each side of the monolith joint. Two additional monuments are located at critical sections of the dam.

The survey system also includes benchmarks off the dam. The surface monuments are designed to measure any significant deformations of the dam. The monuments are surveyed with a robotic total station and a digital level.

A baseline survey was conducted before the beginning of the refill program, and surveys were conducted at Time Steps 1, 3, 5, and 7 during the refill program. The surveys taken during the refill program were compared to the baseline survey to estimate total displacements.

Joint Meters

Joint meters at the Taum Sauk Upper Reservoir consist of three pins set in the concrete around a construction joint. The gages allow displacements across the joint to be accurately measured and compared to previous readings to detect trends.

The distance between each of the three pins is measured with a caliper, and each joint meter allows measurement of movement in the vertical and horizontal directions.

Two joint meters are located at each monolith construction joint in the dam. Ten joint meters are located on the Crest of the Upper Reservoir Dam and ten joint meters are located at the same joints in the Gallery. The joint meters were installed to monitor differential displacements between Monoliths.

Inspections

Visual inspections were conducted every 12 hours during the Upper Reservoir Refill Program by Rizzo and AmerenUE personnel. The following key items were included in the inspections:

– Leakage/Seepage in Gallery, Adits, Access Tunnel, and Toe Ditches, including an evaluation of the turbidity.

– Visual inspection of instrumentation pipe anchorages.

– Visual observation of Upper Reservoir Staff Gage.

Assessment of Dam Performance

The following sections discuss the performance of the Upper Reservoir Dam and Instrumentation during the refill program for each of the key parameters monitored.

In accordance with FERC guidelines, threshold levels and design basis values were established for instrumentation, where appropriate, prior to the start of the refill program.

Threshold levels are defined by FERC as the reading that indicates a significant departure from the normal range of readings and prompts an action. The design basis value is defined by FERC as the value that is used in the design analysis for the project.

Design basis values were established for piezometers based on stability analysis conducted for the project. Design basis values were not established for flumes, joint meters, or surface monuments because there was no design analysis involving these instruments.

Preliminary threshold levels were established for all instrumentation for the refill program based on expected values. Threshold levels were established based on expected values because historic data was not available for the new upper reservoir to establish a range of expected values. For piezometers, the threshold levels established corresponded to a drain efficiency of 60 percent.

Table 1 — Refill Program Summary

Time Step	Reservoir Level (El.	Begin Date	End Date	Duration at Level (Days)
1	El. 1528	2/26/10	3/1/10	3
2	El. 1505	3/1/10	3/3/10	2
3	El. 1550	3/3/10	3/6/10	3
4	El. 1525	3/7/10	3/8/10	1
5	El. 1570	3/8/10	3/12/10	4
6	El. 1525	3/13/10	3/14/10	2
7	El. 1597	3/15/10	3/20/10	5
8	El. 1598	3/20/10	3/20/10	<1
9	El. 1528	3/23/10	-	-

The Taum Sauk Project was assessed at each of the hold points listed above to ensure the structure was performing as expected.

Piezometers and Uplift Pressures

All piezometer readings were below threshold and design basis values during the refill program. Threshold levels were set based on a drain efficiency of 60 percent, and piezometer readings during the refill program indicate that actual uplift pressures on the dam were less than expected values.

An analysis of the refill program piezometer data indicates the drain efficiency varied from 79 percent to 100 percent for the uplift pressures at the RCC/Rock interface.

To verify that the piezometers at the upper reservoir were functioning correctly, the piezometer readings and reservoir elevations were plotted vs. time. The plots showed all piezometers responded to changes in reservoir elevation during the upper reservoir refill. This indicates that all piezometers were working correctly.

Movements and Structural

Visual Inspections

Visual inspections did not indicate any signs of structural distress during the refill program. No movement between monoliths was observed, and there was no cracking or any other sign of structural distress observed during the refill program inspections.

Joint Meters

All displacements between Monoliths measured by joint meters were less than the threshold levels established for the refill program.

The maximum measured displacement was 0.09 in. or approximately 2.3 millimeters (mm) in the horizontal (joint opening/closing) direction, and -0.38 in. or 9.7 mm in the upstream/downstream (joint shear) direction.

Joint meters did not show any trends that would indicate significant displacement occurred between monoliths during the refill program.

Survey System

Survey data indicate the dam performed as expected with respect to movements during the refill program. All measured displacements, both horizontal and vertical, were less than the threshold levels developed for the refill program.

A review of the survey data indicates no significant movement of the dam occurred during the refill program, and there were no trends indicating movement in the horizontal or vertical direction. The maximum measured displacement was 0.29 inches. This is within the accuracy that was estimated for the survey system.

Taum Sauk Upper Reservoir following the completion of the refill program.

Leakage and Seepage

Visual Inspections at Downstream Toe

Visual inspections did not indicate any major seepage or leakage at the toe of the dam during the refill program. Several wet spots were observed and one minor slough was noted a significant distance downstream from the toe. It is suspected that the wet spots and the associated minor slough were associated with a combination of sources including snow and ice melt, ponded water, and seepage through the floor of the dam.

Foundation Drain Flows

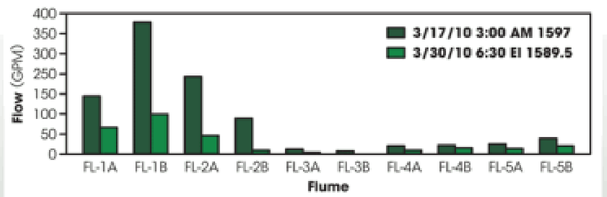
Leakage from foundation drains during the refill program was minimal and observed in approximately 15 of the 677 foundation drains installed during construction. The measured values for leakage from the foundation drains were below threshold levels established for the refill program. All drain flows were clear and no turbidity was observed.

Crest-to-Gallery Drain Flows

Leakage from crest-to-gallery drains was highly variable during the refill program, with some drains being completely dry and others leaking considerably, especially in Monolith Nos. 1, 2, and 4.

The major causes of the difference in the amount of leakage between monoliths was likely the difference in the design of the waterstops installed in these Monoliths and the presence of a horizontal cold joint in monoliths 1 and 2.

FIGURE 1 Flume Flows Before and After Sealing



As shown above, the sealing significantly reduced leakage in FL-1A, FL-1B, FL-2A, and FL-2B in monoliths 1 and 2. The total leakage through the flumes continues to decrease with time, and at the time of writing, the total leakage at the upper reservoir had decreased to approximately 100 gpm with the reservoir full. The continuing decrease in leakage is likely due to healing and silting of horizontal and vertical joints.

A cold joint was present in Monoliths 1 and 2 where a lift joint was left exposed for approximately one year, and flows from the crest to gallery drains in Monoliths 1 and 2 were significantly higher than in other monoliths.

The design of the vertical waterstops was changed early in the project, and the revised design allowed for more stable and restrained placement of the associated crack inducer board. With the early waterstops, there was a tendency for the crack inducer plate to move laterally, away from the water stop bulb. With the re-design, the crack inducer plate was fixed more rigidly and unable to move.

Leakage was also observed at several construction joints during the refill program.

The majority of construction joints where leakage was observed are located in Monolith 1and 2 where, as mentioned above, the older style of waterstop was used.

Flumes

The flumes in the drainage trench capture all of the flow from the foundation drains, crest-to-gallery drains, and construction joints. They provide a measure of the cumulative leakage from the Reservoir for all sources, except for losses through the floor of the Reservoir.

The flume data showed that the cumulative leakage peaked at about 1,080 gpm on March 18, 2010, when the Upper Reservoir level reached El. 1597 for the first time.

More than 80 percent of the flow was passing through flume Nos. 1 and 2 in Monoliths 1 and 2. After the reservoir reached El. 1597 for the first time, the cumulative flow of all flumes and the individual flows from each flume decreased as the reservoir elevation was held constant.

At the completion of the refill program, the upper reservoir was dropped to approximately El. 1500. This allowed sealing of horizontal joints and vertical joints in the upstream face of the upper reservoir.

Over a period of several days, approximately 15,000 lineal feet of horizontal joints and 34 vertical joints were sealed. After sealing, the total leakage through the flumes with a full upper reservoir had decreased to approximately 300 gpm.

A comparison of the flow through each flume prior to and after sealing of the upstream face of the upper reservoir is provided in Figure 1 (Pg. 32). Each set of leakage readings in the plot in Figure 1 were taken when the upper reservoir was near full.

Summary

The performance of the upper reservoir during the refill program was monitored with dam safety instrumentation and inspections. The reservoir was filled through a series of time steps and the performance was assessed at each step.

The dam performed as intended at each time step. Instrumentation readings were generally consistent with expected values and no dam safety issues were identified during the visual inspections. The Taum Sauk Upper Reservoir was returned to operation successfully.

After completion of the Refill Program, the leakage at the upper reservoir remained at or below levels observed during the Refill Program through the summer of 2010. During the winter of 2011, the leakage at the upper reservoir increased above levels observed during the program. This increase in leakage was attributed to opening of joints as the temperature of the RCC decreased.

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(Hydro Review, Vol. 30, Issue 3, April 2011, http://www.hydroworld.com/articles/hr/print/volume-30/issue-3/articles/civil-works-performance-of-taum-sauk-upper-reservoir-dam-during-refill.html)

Dam Safety: Stability and Rehabilitation of "Smaller" Gravity Dams

Gravity dams about 100 feet high and smaller often require special considerations when evaluating stability and rehabilitation of these structures. Three case histories are presented that illustrate some of the unique challenges in the stability evaluation and upgrading of these dams.

Gregory S. Paxson, David B. Campbell, Michael C. Canino, and Mark E. Landis

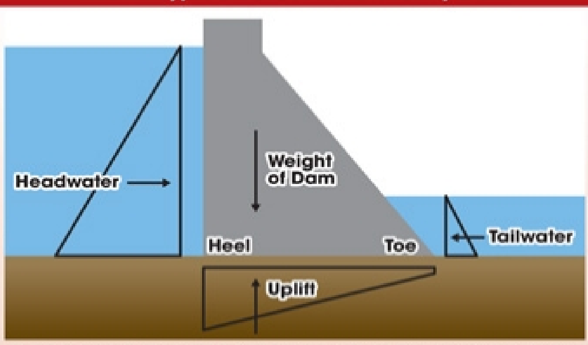
This article has been evaluated and edited in accordance with reviews conducted by two or more professionals who have relevant expertise. These peer reviewers judge manuscripts for technical accuracy, usefulness, and overall importance within the hydroelectric industry.

For many, the terms "gravity dam" and "concrete dam" conjure images of large structures, such as the Hoover and Grand Coulee dams. However, most masonry and concrete gravity dams in the U.S. are much smaller structures. According to the National Inventory of Dams, 90 percent of gravity dams categorized as high or significant hazard structures are less than 100 feet tall.[1]

Design features common to large gravity dams often are not incorporated into these smaller structures. For example, many smaller dams do not include foundation drainage systems. In addition, large dams in steep canyons typically are keyed into bedrock at the abutments, while for smaller structures the non-overflow sections may only extend a limited distance beyond the original ground surface and many times are not abutted into sound rock.

Geologic investigations and methods for stability evaluation often are less rigorous and complex for smaller structures. The behavior of larger dams necessitates a better understanding of the foundation conditions and a more in-depth analysis of the performance of the structure under various loading conditions, including finite element and deformation analyses. This article discusses the stability analysis and rehabilitation of smaller (less than 100 feet tall) gravity dams.

FIGURE 1 Typical Forces for a Gravity Dam



For any size of gravity dam, typical forces included in a two-dimensional stability analysis include headwater and tailwater, weight of the dam, and uplift.

Gravity dam stability analysis

The most common failure mode for gravity dams is sliding or overturning along or beneath the dam/foundation interface.[2] Stability analysis for gravity dams often is simplified into a two-dimensional rigid body analysis of a cross section of the structure (see Figure 1) and is focused on stability against sliding. In this analysis, overturning of the dam is considered within the context of its potential influence on sliding. Overturning tendencies express themselves through development of tensile stresses at the heel of the dam. In these cases, sliding stability is analyzed considering a cracked base, which reduces sliding resistance. While the gravity dam stability analysis often is simplified to evaluate failure along the base, it is important to consider kinematically feasible failure mechanisms along joints, foliations and bedding planes or within the rock mass.[3]

In addition to failures through the foundation and along the dam/foundation interface, the stability analysis should consider failure through the dam, commonly along horizontal construction joints. This "partial section" analysis usually is performed using the same methods applied to the stability evaluation of the entire structure.

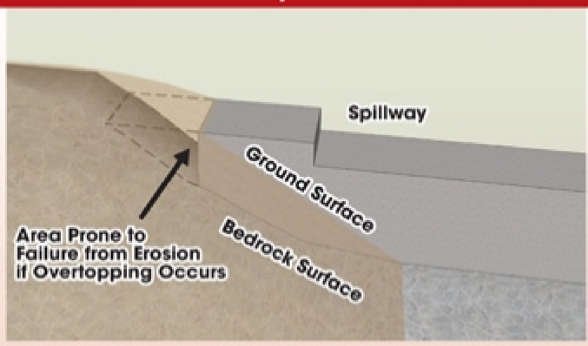
Guidance documents for the evaluation and design of gravity dams have been developed by U.S. agencies that own or regulate dams, including the Federal Energy Regulatory Commission, Bureau of Reclamation, and U.S. Army Corps of Engineers. In Canada, the Canadian Dam Association and BC Hydro provide similar guidance for the evaluation of gravity dams.[3,4]

Material properties

The selection of physical and mechanical properties of the dam and foundation are critical to the stability evaluation of a gravity dam. Unit weight of the concrete or masonry is a key component of the analysis. Estimates of the shear and tensile strength of concrete in the dam can be estimated from laboratory testing of representative samples and/or using available guidance documents.[4,5,6]

The shear strength along the dam-foundation interface or through the foundation is probably the most important parameter to define. Shear strength is comprised of the friction angle and cohesion of the material(s) or interface. Typical shear strength values are available.[6,7,8] Friction angle often is estimated using material testing and/or correlation with empirical data for similar materials. Estimating cohesion (or adhesion along the base of the dam) is more difficult, and the selected value has a significant effect on the stability analysis results. FERC recognizes the difficulty in accurately defining cohesion along the base of the dam and provides alternate requirements for stability if cohesion is not relied upon in the analysis.[9]

FIGURE 2 Gravity Dam Abutment



The area between the end of a gravity dam and the bedrock surface is susceptible to failure from erosion during extreme floods when overtopping would occur.

Loading conditions and safety factors

Most regulatory agencies, including FERC, categorize loading conditions as "usual," "unusual" and "extreme," and the required safety factor increases with the probability of a given loading condition. Typical loading combinations to be considered include normal operating conditions (usual), flood discharge loading (unusual or extreme), loading from ice (unusual) and earthquake forces (unusual or extreme).

The stability analysis for flood conditions should consider a range of floods to identify the combined reservoir (headwater) and tailwater loading that results in the lowest safety factor. The largest hypothetical flood, or probable maximum flood, is not always the most critical flood loading scenario.

As noted earlier, FERC guidelines allow a reduction in the required safety factor if cohesion is not considered in the analysis. For example, the minimum required safety factor for normal operating conditions is 3.0 if cohesion is included but otherwise only 1.5.

Uplift forces within the dam, on the base of the structure, and within the foundation rock mass are important in stability evaluations. For structures without an internal drainage system or other special features, and with fairly uniform foundation conditions, it is typical to assume that uplift varies linearly from full headwater at the heel to full tailwater at the toe of the dam. For dams with a drain system, reduction in these pressures should only be allowed when it can be verified that the drain system is effective.

Cracked section analysis

The gravity method of analysis requires that the resultant of all forces acting on the dam lie within the middle one-third of the base to avoid tensile stresses at the heel. When the resultant lies outside the middle one-third, tensile stresses are assumed to develop along the base of the dam. Most regulatory agencies (including FERC) require a cracked section (or cracked base) analysis when tension develops at the heel of the dam. Full uplift is then assumed to act on the cracked section of the base (except under seismic loading, where full uplift is assumed not to develop due to the rapid cycling from seismic loads), and the analysis is revised to reflect this modified uplift distribution, with cohesion, if considered, acting only along the uncracked portion of the base.

Most agency guidance suggests an iterative approach to the cracked section analysis for static loadings. However, the crack length and reaction pressure at the toe of the dam can be solved explicitly.[10,11] For earthquake forces, the crack length can more easily be computed.

Rehabilitation of gravity dams

The most common methods for rehabilitation of gravity dams that do not meet stability criteria include buttressing or anchoring. Buttressing consists of adding mass to the downstream portion of the structure to resist sliding. This can be accomplished using conventional mass or roller-compacted concrete. High-capacity post-tensioned rock anchors have been used to stabilize gravity dams since the 1960s, with more than 300 dams in North America being anchored.[12] Vertically installed post-tensioned anchors add normal force, increasing the sliding frictional resistance and preventing the development of tension at the heel of the dam. Anchors installed at an angle will provide additional sliding resistance by directly offsetting applied horizontal forces, but installation can be more costly than vertical anchors.

Gravity dams with inadequate spillway capacity can be allowed to overtop during extreme floods, provided the dam meets stability criteria under the flood loading conditions and overtopping flows can be shown not to erode foundation support from the toe of the dam or abutments.

For many smaller gravity dams, the non-overflow sections do not extend to bedrock at the abutments but are simply buried in the earth abutment (see Figure 2). This typically is acceptable, provided the fill materials are satisfactory and the spillway can pass the design flood without overtopping the non-overflow sections or abutments. If these sections do overflow, there is potential for erosion and failure of the earth abutment, resulting in a potential dam failure or loss of reservoir. In some cases, these dams have cutoff walls that extend further into the abutments than the gravity section. However, these walls typically are intended to reduce abutment seepage rather than prevent erosive failure from overtopping. Dams lacking non-overflow sections that tie into bedrock abutments may require modifications to prevent overtopping or erosion of the earthen abutment.

Case histories

The following case histories include discussion of the gravity dam stability analysis, the importance of parameter selection, rehabilitation to address stability issues and the potential for abutment erosion and failure.

Sugar Hollow Dam

Rivanna Water and Sewer Authority owns Sugar Hollow Dam near Charlottesville, Va. This 80-foot-high concrete gravity dam was completed in 1947 and consists of spillway and non-overflow gravity sections, with cutoff walls extending into earth abutments. In the mid-1990s, the Virginia Dam Safety program identified the dam as having inadequate spillway capacity, and analyses indicated that the dam did not meet stability criteria for extreme flood loadings.

The authority planned to install 30 vertical multi-strand, post-tensioned rock anchors through the gravity sections to increase the frictional resistance and prevent overturning under extreme flood conditions. Anchor sizes ranged from five to 36 strands, with a maximum design load of about 1300 kips. Anchors were designed, installed and tested in accordance with Post-Tensioning Institute standards.[13]

Because the non-overflow sections would overtop during the PMF, there was potential for erosion and failure of the earth abutments and cutoff walls. Alternatives to address this concern included armoring the abutments, stabilizing the cutoff walls assuming downstream soils eroded, and raising the abutments to prevent overtopping flows of these areas. Raising the earthen abutments by 10 feet with earthfill was found to be the most cost-effective approach. The ends of the non-overflow sections were also raised with concrete to confine overflow to the central valley.

The project received the Association of State Dam Safety Officials award for National Rehabilitation Project of the Year in 2000.

Stony Creek Dam

Stony Creek Dam is a 35-foot-high concrete gravity dam constructed in the late 1920s for water supply. The dam, owned and operated by the City of Burlington, N.C., has a 200-foot-long spillway section with concrete non-overflow sections that tie out to earth abutments. State dam safety regulations require safe passage of half of the PMF. Although the concrete of the dam is in good condition, the non-overflow sections and abutments overtop at about the 100-year storm event, and stability analyses demonstrate the dam does not meet the required safety factor for events greater than an estimated 300-year storm. For the modeled half PMF, the abutments overtop by 12 feet, which would result in a breach of the reservoir.

The rehabilitation design for Stony Creek Dam includes post-tensioned anchors installed in the spillway and non-overflow sections, spaced 10 feet apart with design loads up to nearly 800 kips. The left abutment will be protected by constructing a concrete gravity section extension, and the right abutment will be reinforced by the installation of a 48-inch-diameter secant shaft wall with steel H sections placed in alternate shafts and socketed 15 feet into rock and secondary shafts terminated at the top of rock. The secant wall is designed to provide cantilever resistance at half PMF water levels, with erosion to rock on its downstream side.

A concrete gravity section was built at Stony Creek Dam to tie the dam into the bedrock at the left abutment (foreground). The right abutment will be reinforced using a secant shaft wall, and the spillway will be stabilized with post-tensioned rock anchors.

Construction of the upgrades to Stony Creek Dam began in spring 2011, and this work is expected to be completed by the end of the year.

Green Lane Dam

Green Lane Dam is a 103-foot-high, 800-foot-long concrete gravity dam northwest of Philadelphia. The dam, owned by Aqua Pennsylvania, was constructed in the mid-1950s for water supply. The design flood for this high hazard dam is the PMF, which was re-evaluated in the late 1990s and found to overtop the non-overflow sections of the dam by about 2 feet. A preliminary stability evaluation indicated that the dam did not meet generally accepted criteria, and the owner's previous consultant recommended performing more in-depth field explorations and analyses to support a rehabilitation design. Initial estimates for stabilizing the dam with post-tensioned rock anchors were $1 to $3 million.

At Green Lane Dam, subsurface information obtained and detailed analysis indicated the dam met stability criteria of the Pennsylvania Department of Environmental Protection.

As-built drawings and original construction photos indicated that significant rock excavation (15 to 30 feet) was performed. Concrete at the base of the dam was cast against the bedrock, indicating that sliding could not occur without mobilizing a significant rock wedge (shear through bedrock). In addition, the roller bucket energy dissipater in the spillway section has a minimum 5-foot concrete thickness and is anchored into the foundation bedrock, thereby providing supplemental sliding resistance.

A subsurface exploration indicated that the dam's concrete was of good quality. Most of the horizontal construction joints were unidentifiable by visual inspection, indicating bond at these joints. However, the rock at the concrete/bedrock interface was highly fractured, suggesting that cohesion at the interface could not be relied upon in a stability analysis.

Laboratory testing included unit weight and compressive strength tests of the concrete and rock samples. Concrete samples had an average dry unit weight of 157 pounds per cubic foot (pcf), compared to the typical unit weight of good quality mass concrete of 145 pcf to 155 pcf.

More detailed analyses were performed to estimate downstream flood levels because tailwater can have a significant effect on stability. The HEC-RAS river modeling package, developed by the Corps, was used to model flow in the creek and floodplain downstream of the dam. For the spillway section, the tailwater computed using HEC-RAS was adjusted to reflect effective tailwater against the dam, as influenced by high-velocity flow through the spillway and roller bucket.

Corps guidance suggests that the effective tailwater force downstream of a spillway can be reduced to as little as 60 percent of the depth in the downstream channel, a default value used when supporting documentation is not provided. Using model studies performed as part of the original design and guidance provided by the Corps,[14] the effective tailwater for the Green Lane Dam roller bucket was estimated to be about 85 to 90 percent of the downstream tailwater depth.

The findings of the documentation review, subsurface exploration, laboratory testing and hydraulic analysis provided information that contributed to a refined evaluation of the stability of the structure, including:

- Unit weight of the concrete was higher than expected;
- Tailwater levels during the PMF were higher than assumed in previous analyses; and
- The dam is "keyed" into the rock foundation.

An updated analysis was performed in 2004 incorporating these findings, and the results demonstrated that Green Lane Dam meets the Corps criteria for gravity dam stability, eliminating the need for an upgrade.

Summary and conclusions

Smaller gravity dams commonly are evaluated using simplified two-dimensional analyses with conservative assumptions for strength along the dam/foundation interface and within the foundation rock. For dams not meeting stability criteria, stabilization is often performed using post-tensioned rock anchors or buttressing. In addition to stability concerns, many smaller gravity dams are not "keyed in" to bedrock at the abutments, creating the potential for abutment erosion and failure.

These case histories demonstrate approaches for the rehabilitation of gravity dams with stability issues or potential for abutment erosion. The case history for Green Lane Dam illustrates the importance of detailed review of dam construction records, advanced hydraulic analysis for estimating effective tailwater, and laboratory testing (especially related to unit weight and bond) when it comes to stability analysis results.

Notes

[1] National Inventory of Dams website, https://nid.usace.army.mil.

[2] Douglas, K.D., M. Spannagle, and R. Fell, "Analysis of Concrete and Masonry Dam Incidents," *International Journal of Hydropower and Dams*, Volume 6, No. 4, 1999, pages 108-115.

[3] *Guidelines for the Assessment of Rock Foundations of Existing Concrete Gravity Dams*, BC Hydro Report No. MEP67, Vancouver, British Columbia, Canada, 1995.

[4] *Dam Safety Guidelines*, Canadian Dam Association, Moose Jaw, Saskatchewan, Canada, 2007.

[5] *Draft Engineering Guidelines for the Evaluation of Hydroelectric Projects*, Federal Energy Regulatory Commission, Division of Dam Safety and Inspection, Washington, D.C., 2000.

[6] *Uplift Pressures, Shear Strengths and Tensile Strengths for Stability Analysis of Concrete Gravity Dams*, EPRI Report TR-100345, Electric Power Research Institute, Palo Alto, Calif., 1992.

[7] *Engineering and Design Rock Foundations*, EM 1110-102908, U.S. Army Corps of Engineers, Washington, D.C., 1994.

[8] Khabbaz, H., and R. Fell, *Concrete Strength for Stability Analysis of Concrete Dams*, unpublished report, School of Civil and Environmental Engineering, University of New South Wales, Sydney, Australia, 1999.

[9] *Engineering Guidelines for the Evaluation of Hydropower Projects,* Federal Energy Regulatory Commission, Washington, D.C., 2002.

[10] Campbell, D., "Gravity Dam Stability Analyses," *Proceedings of the ASDSO 6th Annual Conference*, Association of State Dam Safety Officials, Lexington, Ky., 1989.

[11] Paxson, G., T. Fernandes, and D. Campbell, "Green Lane Gets Green Light: Parameter Sensitivity in Gravity Dam Stability Analysis," *Dam Safety 2005 Proceedings*, Association of State Dam Safety Officials, Lexington, Ky., 2005.

[12] Bruce, D.A., and J. Wolfhope, "Rock Anchors for North American Dams: The National Research Program Bibliography and Database," Institution of Civil Engineers, London, England, 2007.

[13] *Recommendations for Prestressed Rock and Soil Anchors*, Fourth Edition, Post-Tensioning Institute, Phoenix, Ariz., 2004.

[14] *Hydraulic Design of Spillways*, U.S. Army Corps of Engineers, Washington, D.C., 1990.

Acknowledgments

The authors thank the Rivanna Water and Sewer Authority, City of Burlington, and Aqua Pennsylvania, owners of the dams referenced in the case histories of this article.

Greg Paxson, PE, a principal with Schnabel Engineering, was a designer for the Sugar Hollow Dam project, performed stability analysis for Green Lane Dam and served as a reviewer for the Stony Creek Dam project. Dave Campbell, PE, director of dam engineering for Schnabel, was the principal-in-charge for the Sugar Hollow and Green Lane Dam projects. Mike Canino, PE, the West Chester, Pa., branch leader for Schnabel, has been involved with the evaluation of numerous gravity dams. Mark Landis, PE, a principal with Schnabel, is the project manager for the Stony Creek Dam project.

(Hydro Review, Vol. 30, Issue 6, September 2011, http://www.hydroworld.com/articles/hr/print/volume-30/issue-6/articles/dam-safety-stability-and-rehabilitation-of-smaller-gravity-dams.html)

ΝΕΑ ΑΠΟ ΤΙΣ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ

The **International Commission on Large Dams** celebrates its

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ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

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

Energy and Geotechnics The First Vietnam Symposium on Advances in Offshore Engineering, 1-3 November 2018, Hanoi, Vietnam, https://vsoe2018.sciencesconf.org

ACUUS 2018 16th World Conference of Associated Research Centers for the Urban Underground Space "Integrated Underground Solutions for Compact Metropolitan Cities", 5 – 7 November 2018, Hong Kong, China, www.acuus2018.hk

ICSE 2018

The 9th International Conference on Scour and Erosion

November 5-8, 2018, Taipei, Taiwan

www.icse2018.com

The 9th International Conference on Scour and Erosion will take place in Taipei, Taiwan from 5-8 November 2018. The conference provides a platform for scientists and engineers from around the world to exchange ideas and share advances in research and practice on the scientific and engineering challenges related to scour and erosion.

The broad topics covered in ICSE conferences include fundamental mechanisms of erosion and scour, modelling (both physical and numerical) of erosion and scour processes and engineering applications that involve scour and erosion processes. The ICSE conferences have been well attended by scientists and engineers from broad areas such as civil engineering, hydraulic engineering, coastal and offshore engineering. One of the strong features of the ICSE conferences has been the cross disciplinary collaborations between geotechnical and hydraulic engineers.

The ICSE conference series was initiated by the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) in 2002 and is currently run by the Technical Committee TC213 (Scour and Erosion). National Chiao Tung University is delighted to be organizing ICSE 2018 on behalf of TC213.

Conference topics:

- Internal erosion
- River, coastal, estuarine and marine scour and erosion
- Rock scour and erosion
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- Soil erosion, restoration mechanisms and conservation
- Terrestrial scour and erosion
- Hillslope conservation and debris flow
- Geotechnical issues related to scour and erosion
- Field observation and analyses
- Scour and erosion testing and experiment
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ISRBT2018 International Seminar on Roads, Bridges and Tunnels - Challenges and Innovation, 9-15 November 2018, Thessaloniki, Greece, http://isrbt.civil.auth.gr

International Symposium Rock Slope Stability 2018, 13-15 November, 2018, Chambéty, France, www.c2rop.fr/symposium-rss-2018

PIARC International Seminar on "The Best Practices for Earthworks and Rural Roads", Tunis, Tunisia, November 14-16, 2018, https://www.piarc.org/ressources/documents/INTERNATIONALS-SEMINARS-PROCEEDINGS/International-Seminar-TC-D4-Tunis-Tunisia-November-2018/29086,International-Seminar-First-Announcement-TC-D4-Rural-Roads-and-earthworks-Tunisia-November-2018-World-Road-Association-PIARC.pdf

SASORE 3rd South American Symposium on Rock Excavations, November 19-20-21, Santiago, Chile, www.sasore.com

GeoMEast 2018 International Congress and Exhibition: Sustainable Civil Infrastructures, 24 - 28 November 2018, Cairo, Egypt, www.geomeast.org

AR AUSROCK The Fourth Australasian Ground Control in Mining Conference, 28–30 November 2018, Sydney, Australia, http://ausrock.ausimm.com

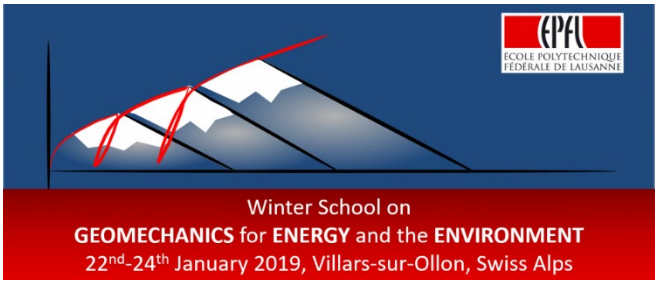
The 1st International Symposium on Debris flow mechanisms and mitigation for sustainable development, Hong Kong

2nd December 2018

Landslides are difficult to predict and monitor. They endanger infrastructure and human lives in mountainous regions worldwide, including Canada, China, Hong Kong, Italy and Switzerland. Understanding landslide mechanisms and developing effective mitigation measures are thus urgently needed. This international symposium aims to advance scientific knowledge of landslide mechanisms and mitigation measures for safe and sustainable development. The sessions will include: (i) interaction between flows and structural countermeasures; (ii) mobility and flow mechanisms; and (iii) risk assessment of landslides.

No prior registration is required. For enquires, please contact Clarence Choi (email: ceclarence@ust.hk)

Second JTC1 Workshop on Triggering and Propagation of Rapid Flow-Like Landslides, 03-05 December 2018, Hong Kong, Email: ceclarence@ust.hk



https://gete-school.epfl.ch

Welcome

Following the success of our 2018 **Winter School dedicated to Geomechanics for Energy and the Environment**, we are pleased to announce the 2nd edition in winter 2019 in the same location (Villars-sur-Ollon, Switzerland).

Geomechanics, Environment and Energy are increasingly related and contemporary themes. The goal of the school is to provide the participants with a deep understanding on selected topics in Geomechanics which are fundamental for applications related to Energy and the Environment.

Morning lectures are scheduled in the first part of the day. Extended breaks are given to review the course material, to go skiing, or to enjoy the wonderful landscape of the Swiss Alps at Villars-sur-Ollon. Late-afternoon gatherings are foreseen for the second set of lectures of the day. Evening sessions will be devoted to presentations from the participants to share ideas with the experts.

This Winter School is organized in the framework of the international journal Geomechanics for Energy and the Environment.

The flyer of the event can be downloaded here.

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  Geomechanics for nuclear waste disposal
- ***Alessio Ferrari*** *(EPF Lausanne)*
  Hydro-mechanical behaviour of shales and gas shales
- **Joseph Labuz** (University of Minnesota)
  Experiments on strength and softening response of rock
- **Lyesse Laloui** (EPF Lausanne)
  The Geomechanics of CO2 sequestration
- **Kerry Rowe** (Queen's University)
  Barrier systems for limiting contaminant migration
- **Tomasz Hueckel** (Duke University)
  Evaporation, Drying, Cracking in Energy Geomechanics

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ORGANIZERS
Prof. Lyesse Laloui, Prof. Alessio Ferrari
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The application of environmentally friendly technologies that exploit renewable energy sources is key to follow international agreements for the development of low-carbon buildings and infrastructures. Energy geostructures are an innovative, multifunctional technology that can be used to address the aforementioned challenge. By coupling the role of the ground structures with that of the geothermal heat exchangers, energy geostructures can serve as structural supports as well as heating and cooling elements for buildings and infrastructures.

The analysis and design of energy geostructures require the integrated knowledge of various aspects in the broad field of engineering. How can energy geostructures be analysed and designed from an energy point? What will be the energy performance of energy geostructures over time? How can energy geostructures be analysed and designed from a geotechnical and structural point of view? How can the coupled action of thermal and mechanical loads be considered through current standards and latest international recommendations?

Objectives

- Understand and analyse the thermal and mechanical behaviour of energy geostructures, with reference to the latest scientific achievements
- Be able to perform the energy, geotechnical and structural design of energy geostructures
- Learn how to exploit current standards available at the European level (e.g., the so-called "Eurocodes") for the design of energy geostructures
- Be able to perform all of the key steps involved in the analysis and design process of energy geostructures with practical application exercises

Programme

PART A – Introduction *(Day 1)*

- **Renewable energy exploitation for a sustainable development**
  Governmental incentives and goals at the European level. Geothermal energy and geothermal systems.

- **Energy geostructures: the technology**
  Projects worldwide. The three main components of Ground Source Heat Pump Systems. Typical operations and applications. Challenges.

PART B – Energy aspects *(Day 1)*

- **Heat and mass transfers in the context of energy geostructures**
  Principles and modes of heat transfer. Energy conservation equation. Initial and boundary conditions. Principles and modes of mass transfer. Mass conservation equation. Initial and boundary conditions for energy conservation equation.

- **Analytical modelling of steady state heat and mass transfers**
  The thermal resistance concept for time-independent solutions. Heat transfer in energy piles and other circular heat exchangers. Heat transfer and storage capacity of energy piles. Heat transfer in energy walls and other plane heat exchangers.

- **Analytical modelling of transient heat transfer**
  The thermal resistance concept for time-dependent solutions. Heat transfer around energy piles and other circular heat exchangers. Heat transfer around energy walls and other plane heat exchangers.

- **Estimation of thermal potential of sites and design parameters**
  Thermal response test. Other relevant experimental laboratory tests for energy design.

- *Application exercise session on the analysis of the thermo-hydraulic behaviour of an energy geostructure.*

PART C – Geotechnical and structural aspects *(Day 2)*

- **Thermo-mechanical behaviour of single and groups of energy piles**
  Effects caused by the application of thermal and mechanical loads to energy piles. Group effects. Thermo-mechanical schemes. The load-transfer concept. The Thermo-Pile software for the analysis and design of energy piles.

- **Thermo-mechanical behaviour of energy walls and energy tunnels**
  Effects caused by the application of thermal and mechanical loads to energy walls and energy tunnels.

- **Thermo-hydro-mechanical behaviour of soils**
  Effects caused by the application of thermal and mechanical loads to coarse- and fine-grained soils.

- **Thermo-mechanical behaviour of soil-concrete interfaces**
  Effects caused by the application of thermal and mechanical loads to coarse- and fine-grained soil-concrete interfaces.

- *Application exercise session on the analysis of the thermo-mechanical behaviour of an energy geostructure.*

- *Visit of laboratory experimental facilities.*

PART D – Integrated energy, geotechnical and structural design *(Day 3)*

- **Development of projects of energy geostructures**
  Presentation of realised projects by practitioner companies: Mr. Tony Amis for GI-Energy and Mr. Didier Mülhauser for Marti SA.

- **Performance-based design in the framework of Eurocodes**
  The Eurocode programme. Limit states and design situations to consider in the design of energy geostructures. Actions. Verification of requirements through partial factor method. Combinations of actions at ultimate and serviceability limit states. Partial factors for thermal loads acting on energy geostructures. Geotechnical and structural verifications.

- *Application exercise session on the geotechnical and structural performance-based design of an energy geostructure.*

CONTACT

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25th – 27th March 2019, Singapore
http://email.marcusevans-lse.com/files/amf_marcus_evans/project_3935/AS-IF5039_-_Catherine.pdf

Underground space development plays a critical role in cities, connecting spaces, people and goods, thereby creating a new urban fabric that contributes to the liveability and character of cities. Overwhelming growth of cities in developing countries, shifting demographics and aging infrastructure in older cities engaged with the demand for improved liveability and environmental protection are creating a strong demand for new underground infrastructure. The importance of urban planning, sustainable development and urban resilience for urban underground space and how this links to the new urban agenda is crucial.

Underground spaces are certainly not limited to transport infrastructure. They are also equally significant when it comes to integrated water and sanitation management. Most cities have limited understanding of the potential of underground space and there is little clarity on the importance of a planning approach to this space. The potential of underground space is typically overlooked or neglected in planning processes. The use of underground space can help cities remain compact, energy efficient or find the space needed to include new functions in the existing city landscape.

The sustainable development of urban underground space is an issue which often gets overlooked. The use of underground space, or rather its' lack of use in our cities is something that urban planners and governments need to look into.

There is so much that can be done below the surface of our cities. Underground space is an undervalued and a precious asset that has a role to play in the future of our cities. It provides urban areas with additional space when surface space runs out and can add quality to the urban fabric if done right whilst at the same time, the creation of underground space faces many challenges both from a human design perspective and in terms of technical and cost challenges.

This conference is specially designed to meet all underground and tunnelling practitioners' demands to secure and guarantee their investments. This conference will cover various aspects of urban underground planning and design as well as innovative construction methods and technologies to maximise efficiency. The least understood aspect remains the fact that the subsurface, depending on the type of geology, delivers an ecosystem that is key to human survival. An urban underground future is something many look forward to as an untapped potential where the underground space will become vital for our survival.

Stream 1
Underground Space Design & Development

This stream will focus on the immense potential that urban underground space can contribute to the sustainable and resilient development of cities. Despite this, the importance of the ground beneath cities is still under-recognised and often overlooked. This stream will focus on the planning and design aspects of urban underground space which would mainly cover the masterplanning and design aspects, sustainable growth of cities and the liveability of urban population in new underground spaces.

Stream 2
Innovative Tunnelling Construction & Technologies

This stream will highlight engineering and construction technicalities, TBM issues and challenges, operational, monitoring and maintenance aspects of underground structures, incorporating innovative technologies and advancements for effective and efficient underground tunnelling developments.

Workshop
Project Financing & Delivery

This specially design workshop will help you advance your knowledge of innovative project finance and benefit from practical insights that will enable you to successfully arrange long-term financing for infrastructure projects to make them more bankable.

Register
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International Conference on Advances in Structural and Geotechnical Engineering 2019

25 - 28 March 2019, Hurghada, Red Sea, Egypt
http://icasge.com/conference/308

The conference shall provide a forum for researchers and professionals from various fields related to the theory of structures, soil mechanics and foundation engineering, reinforced concrete constructions, properties and testing of materials, environmental engineering, steel constructions, construction management, etc…, as well as other related areas, to exchange and discuss the latest findings and experiences. The Conference program includes invited keynote lectures, a limited number of oral presentations, and poster presentations.

The articles received by the conference will go through a peer review process and the passed articles shall be published in a conference proceeding. Moreover, selected articles will be published in a relevant international journal.

All participants will have a chance to build professional networks, talk with speakers and organizers, make new contacts and enjoy the conference. The organizing committee hope to assist senior and young engineers, researchers, and specialized academics to come together and update their knowledge and understanding regarding the advances in structural and geotechnical engineering issues.

Topics

1. Geotechnical Engineering
2. Reinforced Concrete Structures
3. Materials
4. Structural Analysis
5. Steel Structures
6. Construction Management
7. Others

The topics of interest include but not limited to:

- Soil Behavior and Modeling
- Soil Improvement
- Problematic Soils
- Geosynthetics
- Deep Foundations
- Underground Constructions
- Environmental Geotechnics
- Soil Dynamics and Earthquake Geotechnical Engineering
- Slope Stability
- Rock Mechanics
- Analysis, Modeling and Design
- Structural Stability
- Steel and Composite Structures
- Innovative Structural Conservation, Repair and Strengthening
- Reinforced Concrete Design and Codes
- Rehabilitation and Strengthening of buildings and structures
- Extending the Life of Structures
- Innovative Construction Materials
- Sustainable and Green Construction Materials
- Durability and Life Prediction of Structures
- Structural Health Monitoring
- Earthquake Engineering
- Active and Semi Active Structural Control
- High Performance Structures and Systems
- Smart Structural Systems
- Construction Planning and Scheduling
- Safety, Quality and Environmental Management
- Risk Analysis and Decision Making
- Building Information Modeling (BIM)
- Case Records of Failures
- Construction and Demolition Waste Manegement

Contact information

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13th Australia New Zealand Conference on Geomechanics 2019, 01 ÷ 03-04-2019, Perth, Australia, http://geomechanics2019.com.au

AFRICA 2019 Water Storage and Hydropower Development for Africa, 2-4 April 2019, Windhoek, Namibia, www.hydropower-dams.com/pdfs/africa19.pdf

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EGU General Assembly 2019

NH9.12
Natural hazard impacts on technological systems and infrastructures
7–12 April 2019, Vienna, Austria
https://meetingorganizer.copernicus.org/EGU2019/session/32510

Critical infrastructures and other technological systems such as transportation systems, telecommunications networks, pipelines, and reservoirs are at risk of natural hazards (e.g., landslides, earthquakes, floods) in many urban and rural areas worldwide. A key to safe and affordable operations of these types of infrastructure is an in-depth knowledge of their exposure and vulnerability to natural hazards and the impact of damage experienced either locally or across the network. Fundamental understanding of hazard and risk involves (i) systematic identification and mapping of potential infrastructure exposure, (ii) integrated assessment of impact as result of damage, repair and/or mitigation, (iii) indirect losses from infrastructure disruption, (iv) consideration of interactions between hazards and/or cascades of hazards. This session welcomes contributions with a focus on natural hazards risk assessment for critical infrastructures and technological systems, and compilation of databases to record impact and elements at risk. We also encourage abstracts addressing the development and application of tools for cost modeling. The session is dedicated to contributions with national, regional, and local perspective and intends to bring together experts from science and practice as well as young scientists. We encourage poster submissions, and foresee a lively poster session couple with oral talks, and will, if appropriate, have an associated splinter discussion session.

Convener: Elena Petrova
Co-conveners: Maria Bostenaru Dan, Michal Bíl, Elisabeth Krausmann

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OMIŠ 2018 8th Conference of Croatian Geotechnical Society with international participation Geotechnical challenges in karst - Karl Terzaghi and karst in Croatia 110 years ago, 11.-13. April 2019, Omiš, Split, Croatia, www.hgd-cgs.hr/savjetovanja/omis-2019

IICTG 2019 2nd International Intelligent Construction Technologies Group Conference "Innovate for Growth, Collaborate for Win-Win", 23-04-2019 - 25-04-2019, Beijing, China, www.iictg.org/2019-conference

WTC2019 Tunnels and Underground Cities: Engineering and Innovation meet Archaeology, Architecture and Art and ITA - AITES General Assembly and World Tunnel Congress, 3-9 May 2019, Naples, Italy, www.wtc2019.com

2019 Rock Dynamics Summit in Okinawa, 7-11 May 2019, Okinawa, Japan, www.2019rds.org

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International Conference on Silk-roads Disaster Risk Reduction and Sustainable Development
May 11-12, Beijing, China
www.sidrr.com

The Silk Road, beginning in the Han Dynasty (207 BC-220 BC), crosses more than 70 countries and affects some 4.4 billion people (63% of the world). For centuries, the Silk Road has played an essential role in connecting the East and the West, through the exchange of trade, science technology and civilization. However, due to active underlying geological structures, including rapid tectonic uplift, climate change, and natural hazards (e.g., earthquakes, landslides, floods, typhoons, tsunamis, etc.) that occur frequently, these conditions place threats on both social development and livelihoods along the Silk Road. Furthermore, numerous challenges related to disaster risk reduction exist in this area, including a lack of background information and data sharing mechanism, as well as an absence of a scientific risk assessment method, and mitigation countermeasures, etc.

As a result of this serious situation, and integrated with the **Sendai Framework for Disaster Risk Reduction** and **the Sustainable Development Goals 2030**, there is an urgent need to promote international cooperation in disaster risk reduction and sustainable development along the Silk Road. Resilience against natural hazards must be improved and an international platform for joint research and information sharing relevant to disaster risk reduction and sustainable development is needed. Therefore, an international research program for the disaster risk reduction along the Silk Roads is being implemented under the umbrella of **SiDRR** (**Si**lk-roads **D**isaster **R**isk **R**eduction) by Chinese Academy of Sciences.

The implementation of this program will enhance disaster prevention and will contribute to our ability to guarantee the security of livelihood of the affected countries. Based on this understanding, the Chinese Academy of Sciences (CAS), China Association for Science and Technology, and United Nations Environment Programme (UNEP) and International Scientific Partners will jointly host **the International Conference on Silk-roads Disaster Risk Reduction and Sustainable Development** in Beijing, on May 11-12, 2019.

The secretariat of the *International Conference on Silk-roads Disaster Risk Reduction and Sustainable Development* invites representatives from all the hosts, organizers and co-organizers, as well as renowned experts and researchers from all continents to participate in this Conference. The Conference will consist of plenary sessions and symposiums. We anticipate some 500 participants.

Theme: Towards Safe, Green, and Resilient Silk Roads

Topics:

- Hazard information detection and data sharing
- Mechanisms and physical process
- Risk analysis and management
- Monitoring and early warning
- Hazard prevention and mitigation
- Emergency management and post-disaster reconstruction
- Cross-border disasters
- Sustainable development

Contact us: **sidrr@imde.ac.cn**

CS ED

4th Joint International Symposium on Deformation Monitoring (JISDM), 15 to 17 May, 2019, Athens, Greece, www.jisdm2019.survey.ntua.gr

CS ED

TRANSOILCOLD 2019
Transportation Soil Engineering in Cold Regions
20 –23 May 2019, St. Petersburg, Russia
http://conf-geotech.wixsite.com/transoilcold2019

The "cold regions" of the world cover large areas in the northern hemisphere, including Canada, Alaska, Finland, Norway, Sweden, vast portion of China and Russia, and all the northern tier of the United States. Cold regions cover 50% of the world's total land area.

Transportation infrastructure in cold regions faces great technical challenges due to ground freeze-thaw or permafrost degradation. New transportation infrastructure on embankments, such as high-speed railways on slab tracks or highways, requires high geometry standards.

TRANSOILCOLD2019 aims to provide a broader look at the overall problems faced by designers, contractors, and infrastructure owners during planning and building of transport infrastructure in cold regions.

Conference programme includes Young Geotechnical Engineers Symposium.

TRANSOILCOLD2019 is organized as the follow-up to TRANSOILCOLD symposiums, held in 2013 (Xining, China), 2015 (Novosibirsk, Russia) and 2017 (Gui-de, China).

Main Topics and Tracks

- problems of design, construction and operation of transportation infrastructure in Arctic and cold regions (ICR);
- design, construction and exploitation of high speed railway subgrade (HSS);
- geophysical techniques for geological survey and diagnostics (GT);
- geological studies for construction and design in permafrost regions (GP);
- disaster prevention in geotechnical structures (DP);
- stability of slopes, landslides, debris flows and avalanches (SSL);
- soil dynamics and earthquake engineering (SD);
- geotechnical modelling of the transport facilities base (GM);
- use of geosynthetics in construction and reconstruction of transport facilities (GS);
- techniques of earth foundation strengthening (FS);
- geoenvironmental technologies in construction and reconstruction of transport facilities (GE);
- geotechnical problems of underground construction in complex conditions (UC);
- transport facilities influence on underground structures (IUS);
- frost heave and thaw weakening of subgrade, ballasted subgrade and base of slab track (FH);
- experience in construction and maintenance of subgrade in cold regions (SCR);
- artificial ground freezing in transportation (AF);
- cracking of pavement caused by the natural influences and due to repeated cars passages (PC);
- construction, reconstruction and maintenance of bridges and tunnels (BT);
- permafrost dynamics in changing climate and under technogenic impact (PD);
- transport infrastructure safety (TIS).

Contact Us

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CS ED

Underground Construction Prague 2019, June 3–5, 2019, Prague, Czech Republic, www.ucprague.com

VII ICEGE ROMA 2019 - International Conference on Earthquake Geotechnical Engineering, 17 - 20 June 2019, Rome, Italy, www.7icege.com

ICONHIC2019 - 2nd International Conference on Natural Hazards and Infrastructure, 23-26 June 2019, Chania, Crete Island, Greece, https://iconhic.com/2019/conference

CS ED

COMPDYN 2019
7th International Conference on
Computational Methods in Structural Dynamics and

Earthquake Engineering
24-26 June 2019, Crete, Greece

COMPDYN 2019 is the **seventh edition of the International Conference on Computational Methods in Structural Dynamics and Earthquake Engineering** and one of the Thematic Conferences of the European Community on Computational Methods in Applied Sciences (ECCOMAS) and a Special Interest Conference of the International Association for Computational Mechanics (IACM). It has also been promoted by the European Committee on Computational Solids and Structural Mechanics (ECCSM) of ECCOMAS. COMPDYN 2019 will be held in conjunction with the **3rd International Conference on Uncertainty Quantification in Computational Sciences and Engineering (UNCECOMP 2019)**, also an ECCOMAS Thematic Conference.

Objectives

The increasing necessity to solve complex problems in Structural Dynamics and Earthquake Engineering requires the development of new ideas and innovative methods for providing accurate numerical solutions in affordable computing times.

The purpose of this Conference series is to bring together the scientific communities of Computational Mechanics, Structural Dynamics and Earthquake Engineering in an effort to facilitate the exchange of ideas in topics of mutual interest and to serve as a platform for establishing links between research groups with complementary activities. The communities of Structural Dynamics and Earthquake Engineering will benefit from this interaction, acquainting them with advanced computational methods and software tools which can highly assist in tackling complex problems in dynamic/seismic analysis and design, while also giving the Computational Mechanics community the opportunity to become more familiar with very important application areas of great social impact.

Sessions related to specific topics of the Conference will be introduced by Keynote Lectures which will be complemented by invited Minisymposia, organized by recognized experts in research areas of current interest, as well as by contributed papers

Conference Topics

The conference topics include (the list is indicative):

- Aeroelasticity
- Algorithms for structural health monitoring
- Constitutive modelling under earthquake loading
- Dynamics of concrete structures
- Dynamics of coupled problems
- Dynamics of micro systems
- Dynamics of steel structures
- Geotechnical earthquake engineering
- Impact dynamics
- Inverse problems in structural dynamics
- Multi-body dynamics
- Nonlinear dynamics
- Numerical simulation methods for dynamic problems
- Optimum design and control in structural dynamics and earthquake engineering
- Parallel and distributed computing – Cloud computing
- Performance-based earthquake engineering
- Reliability of dynamic systems
- Repair and retrofit of structures
- Seismic isolation
- Seismic risk and reliability analysis
- Soft computing applications
- Soil dynamics
- Soil-structure interaction
- Solution strategies for dynamic problems
- Sound and vibration
- Steel structures
- Stochastic dynamics
- Structural acoustics and vibro-acoustics
- Wave propagation

Accepted Minisymposia (*)

Minisymposium 2

"Recent advances and challenges in geotechnical earthquake engineering"
Castorina Silva Vieira (University of Porto, Portugal), cvieira@fe.up.pt
Yiannis Tsompanakis (Technical University of Crete, Greece), jt@science.tuc.gr
More Info »

Minisymposium 3

"Experimental measurements and numerical simulation on problems in the field of Earthquake Engineering and Structural Dynamics"
George C. Manos (Aristotle University of Thessaloniki, Greece), gcmanos@civil.auth.gr
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Minisymposium 5
"Numerical simulations of Soil Structure Interation case studies"
Davide Forcellini (Università della Rep. Di San Marino, Italy) davide.forcellini@unirsm.sm
Liam Wotherspoon (University of Auckland, New Zealand), l.wotherspoon@auckland.ac.nz
More Info »

Minisymposium 6

"Seismic Safety Assessment of Structures"
Pedro Delgado (Universidade do Porto, Portugal), pdelgado@estg.ipvc.pt
António Arêde (Universidade do Porto, Portugal), aarede@fe.up.pt
Raimundo Delgado (Universidade do Porto, Portugal), rdelgado@fe.up.pt

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Minisymposium 7

"Recent Advances in the Development of Approximate Mathematical Techniques for Solving Complex Simulation-Based Problems Involving Uncertainty"
Hector Jensen (Department of Civil Engineering, Santa Maria University, Valparaiso, Chile), hector.jensen@usm.cl
Michael Beer (Institute for Risk and Reliability, Leibniz University, Hannover, Germany), beer@irz.uni-hannover.de
Jianbin Chen (Department of Structural Engineering, Tongji University, China), chenjb@tongji.edu.cn
Francisco Alejandro Diaz de la O (Institute for Risk and Uncertainty, University of Liverpool, United Kingdom), f.a.diazdelao@liverpool.ac.uk
Marcos Valdebenito (Department of Civil Engineering, Santa Maria University, Valparaiso, Chile), marcos.valdebenito@usm.cl
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Minisymposium 9

"Non-Linear Dynamics, Wave Propagation and Contact-Impact Problems"
Jiri Naprstek (Institute of Theoretical and Applied Mechanics, The Czech Academy of Sciences, Czech Republic),

naprstek@itam.cas.cz
Anton Tkachuk (Institute for Structural Mechanics, University of Stuttgart, Germany), tkachuk@ibb.uni-stuttgart.de
Jose Gonzalez (Universidad de Sevilla, Camino de los Descubrimientos, Spain), japerez@us.es
Radek Kolman (Institute of Thermomechanics, The Czech Academy of Sciences , Czech Republic), kolman@it.cas.cz
K .C. Park (University of Colorado, United States), kcpark@colorado.edu
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Minisymposium 10

"Progress and Challenges in Rail Track Dynamics"
Lukas Moschen (Acoustics and Rail Dynamics, VCE Vienna Consulting Engineers, Austria), moschen@vce.at
Günther Achs (Acoustics and Rail Dynamics, VCE Vienna Consulting Engineers, Austria), achs@vce.at
Christoph Adam (Unit of Applied Mechanics, University of Innsbruck, Austria), christoph.adam@uibk.ac.at
Anastasios Sextos (Department of Civil Engineering, University of Bristol, United Kingdom), a.sextos@bristol.ac.uk
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Minisymposium 11

"Post-earthquake assessment for buildings and infrastructures and reparability decisions"
Maria Polese (Department of Structures for Engineering and Architecture, University of Naples Federico II, Italy), maria.polese@unina.it
Marco Di Ludovico (Department of Structures for Engineering and Architecture, University of Naples Federico II, Italy), marco.diludovico@unina.it
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Minisymposium 12

"Repair and Retrofit of Structures"
Ciro Del Vecchio (Department of Structures for Eng. and Architecture University of Napoli "Federico II", Italy), ciro.delvecchio@unina.it
Marco Di Ludovico (Department of Structures for Eng. and Architecture University of Napoli "Federico II", Italy), marco.diludovico@unina.it
Alper Ilki (Istanbul Technical University Civil Engineering Faculty, Turkey), ailki@itu.edu.tr
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Minisymposium 14

"A matter of scale: from real-time monitoring to area-wide seismic risk assessment"
Konstantinos G. Megalooikonomou (Department of Civil and Environmental Engineering, University of Cyprus, Cyprus), kmegal01@ucy.ac.cy
More Info »

Minisymposium 15

"Advances in Numerical Methods for Linear and Non-Linear Dynamics and Wave Propagation"
Alexander Idesman (Texas Tech University, United States), alexander.idesman@ttu.edu

More Info »

Minisymposium 16

"Dynamic Time History Analysis of structures with nonlinear soil-structure interaction in near-source earthquakes"
Naveen Choudhary (IIT Delhi, India), ce1150346@iitd.ac.in
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Minisymposium 19

"Dynamic Soil-Structure Interaction: Recent advances and challenges"
Emmanouil Rovithis (Institute of Engineering Seismology and Earthquake Engineering (EPPO-ITSAK), Greece), rovithis@itsak.gr
Raffaele Di Laora (University of Campania "Luigi Vanvitelli", Italy), raffaele.dilaora@unicampania.it
Maria Iovino (Università degli Studi di Napoli "Parthenope", Italy), maria.iovino@uniparthenope.it
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Minisymposium 20

"High-performance Computing for Structural Mechanics and Earthquake / Tsunami Engineering"
Shinobu Yoshimura (Department of Systems Innovation, The University of Tokyo, Japan), yoshi@sys.t.u-tokyo.ac.jp
Naoto Mitsume (Department of Systems Innovation, The University of Tokyo, Japan), mitsume@sys.t.u-tokyo.ac.jp
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Minisymposium 21

"Title to be announced"

Gian Paolo Cimellaro (Department of Structural, Geotechnical & Building Engineering (DISEG) Politecnico di Torino, Italy), gianpaolo.cimellaro@polito.it

Minisymposium 22

"Innovative Methods and Models to optimize the Use and reuse of historical cultural heritage exposed to Natural risks and Social dynamics"
Marco Vona (School of Engineering, University of Basilicata, Italy), marco.vona@unibas.it
Benedetto Manganelli (School of Engineering, University of Basilicata, Italy), benedetto.manganelli@unibas.it
Beniamino Murgante (School of Engineering, University of Basilicata, Italy), beniamino.murgante@unibas.it
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Minisymposium 25

"Special design and analysis of structures"
Georgios S. Papavasileiou (University of Applied Sciences of Thessaly, Greece), gpapav@teilar.gr
Nikos G. Pnevmatikos (University of West Attica, Greece), pnevma@teiath.gr
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Minisymposium 26

"Recent Advances on Energy-Based Seismic Design"
Fabrizio Mollaioli (Sapienza University of Rome, Italy), fabrizio.mollaioli@uniroma1.it
Amadeo Benavent-Climent (Universidad Politécnica de Madrid, Spain), amadeo.benavent@upm.es
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Minisymposium 27

"Advances in model reduction techniques in computational structural dynamics"
Jin-Gyun Kim (Kyung Hee University, Korea (South)), jingyun.kim@khu.ac.kr
K.C. Park (University of Colorado Boulder, United States), kcpark@colorado.edu
Roger Ohayon (Conservatoire National des Arts et Metiers (CNAM), France), roger.ohayon@cnam.fr
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Minisymposium 29

"Aftershock Risk Assessment: State of the Art and Future Challenges"

Fatemeh Jalayer (University of Naples Federico II, Italy), fatemeh.jalayer@unina.it
Hossein Ebrahimian (University of Naples Federico II, Italy), ebrahimian.hossein@unina.it
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Minisymposium 34

"Seismic Input Characterization for Engineering Structures: Models, Tools and Methodologies"
Georgios Baltzopoulos (University of Naples Federico II, Italy), georgios.baltzopoulos@unina.it
Eugenio Chioccarelli (Pegaso Telematic University, Italy), eugenio.chioccarelli@unipegaso.it
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Minisymposium 36

"Seismic assessment of existing structures before and after strengthening"
Stefanos Dritsos (University of Patras, Greece), s.dritsos@upatras.gr
Andreas Kappos (City, University of London, UK, and Aristotle University of Thessaloniki, Greece), ajkap@civil.auth.gr
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Minisymposium 37

"Full and Small scale dynamic tests to increase confidence in numerical and analytical models for SSI analysis"

Francesca Dezi (University of San Marino, San Marino), francesca.dezi@unirsm.sm
Sandro Carbonari (Università Politecnica delle Marche, Italy), s.carbonari@staff.univpm.it
Fabrizio Gara (Università Politecnica delle Marche, Italy), f.gara@univpm.it
Michele Morici (University of Camerino, Italy), michele.morici@unicam.it
Graziano Leoni (University of Camerino, Italy), graziano.leoni@unicam.it
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(*) Παρουσιάζονται μόνο αυτά που ενδεχομένως ενδιαφέρουν τα μέλη της ΕΕΕΕΓΜ.

☙ ❧

IS-GLASGOW 2019 - 7th International Symposium on Deformation Characteristics of Geomaterials, 26 - 28 June 2019, Glasgow, Scotland, UK, https://is-glasgow2019.org.uk

cmn 2019 -Congress on Numerical Methods in Engineering, July 1 - 3, 2019, Guimarães, Portugal, www.cmn2019.pt

☙ ❧

7th Asia-Pacific Conference on Unsaturated Soils

August 23~25, 2019, Nagoya, Japan
www.jiban.or.jp/e/activities/events/20190823-25-seventh-asia-pacific-conference-on-unsaturated-soils

Following the success of the last conference held in Guilin, China, in 2015, the Japanese Geotechnical Society and ISSMGE TC106 are pleased to host, on this great tradition of conference series, the 7th Asia-Pacific Conference on Unsaturated Soils (AP-UNSAT2019) in Nagoya City, the geographical center of Japan. The organize committee of AP-UNSAT2019 also hope that all events during the conference may provide an easy-access bridge between the theoretical researches and the practical applications related to unsaturated soils. In particular, young researchers and engineers dealing with unsaturated soils from Asia-Pacific region and beyond are warmly encouraged to attend the conference and submit their papers. Well-documented case histories from the region are also particularly welcome.

Conference Themes

A. Fundamental soil behavior
A-1 Micro-and macro structure
A-2 Water-retention
A-3 Stress-strain behavior
A-4 Multi-physic couplings
A-5 Monotonic/Cyclic behavior

B. New equipment and testing methods
B-1 Advanced and new testing equipment
B-2 Sensors for suction/moisture measurements
B-3 In-situ/field testing

C. Modelling
C-1 Constitutive modelling
C-2 Numerical modelling and analysis

D. Geotechnical engineering problems
D-1 Case histories
D-2 Hazards

D-3 Foundations

E. Energy and environmental issues
E-1 Soil-atmospheric interaction
E-2 Capillary barriers
E-3 Nuclear waste disposal
E-4 Gas hydrate
E-5 CO_2 sequestration

CONTACT: JGS International Affairs Department, ap-unsat2019@jiban.or.jp

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The 17th European Conference on Soil Mechanics and Geotechnical Engineering, 1st - 6th September 2019, Reykjavik Iceland, www.ecsmge-2019.com

SECED 2019 Conference Earthquake risk and engineering towards a resilient world, 9-10 September 2019, Greenwich, London, U.K., www.seced.org.uk/2019

3rd International Conference "Challenges in Geotechnical Engineering" CGE-2019, 10-09-2019 - 13-09-2019, Zielona Gora, Poland, www.cgeconf.com

14th ISRM International Congress, 13-18 September 2019, Iguassu Falls, Brazil, www.isrm2019.com

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1st MYGEC
1st Mediterranean Young Geotechnical Engineers Conference
Double Events - MYGEC & EYGEC
23-24th September, 2019
Kefaluka Resort Hotel Bodrum, Muğla-Turkey

http://mygec2019.org

It is my pleasure to invite you to the "1st Mediterranean Young Geotechnical Engineers Conference" which will be organized by the Civil Engineering Department of Muğla Sıtkı Koçman University. 1st MYGEC will be held on 23-24th September, 2019 at Kefaluka Resort Hotel (www.kefalukaresort.com) Bodrum, Muğla-Turkey. Bodrum is a fascinating holiday spot and the site of the ancient city of Halikarnassus, the location of the famous Mausoleum of Halikarnassus (built after 353 BCE) - one of the Seven Wonders of the Ancient World.

The conference will be organized under the auspices of Turkish Geotechnical Society and ISSMGE with the intention of bringing young geotechnical engineers and researchers from Mediterranean countries together and encouraging them to present their work and reinforce their connections. An excellent platform will be provided for the young participants to meet and interact, to exchange knowledge and new ideas and to share interests and experiences while enjoying natural beauty of Bodrum, Muğla, Turkey.

With this event, the creation of future collaborations and networks is aimed between young researchers and fellow colleagues while the geotechnical topics are discussed.

The dates and venue of this conference offers the attendees a special chance to follow double international and significant events one after another. The 1st MYGEC will be followed by the "27th European Young Geotechnical Engineers Conference" which will take place on the 26th to 27th of September, 2019; also at Kefaluka Resort Hotel Bodrum. In this way, a blended atmosphere, a bigger get together and a larger platform of collaboration will be provided for the attendees.

Topics

- Site investigation
- Testing and instrumentation methods for laboratory and field
- Soil properties and soil behavior
- Ground improvement and reinforcement
- Geosynthetics
- Constitutive, numerical and physical modelling
- Recent advances in numerical modeling
- Recent advances in physical modeling
- Selection of design parameters
- Foundation engineering
- Deep excavations and retaining structures
- Tunneling and underground structures
- Infrastructure projects
- Embankments, levees, or dams
- Slopes and landslides
- Earth structures
- Port and marine structures
- Transportation geotechnics
- Environmental geotechnics
- Energy geotechnics
- Soil-structure interaction
- Offshore structures - wind farms, oil and gas facilities
- Lifelines - pipelines, communications, and transportation systems
- Resiliency - emergency response, land use planning, and recovery
- Earthquake engineering
- Seismic hazard assessments
- Ground motions and site response
- Multi-hazard considerations - hurricane, tsunami, flood, sea-level rise
- Physical modeling - centrifuge, shaking table, or field scale
- Numerical analyses - dynamic or simplified
- Performance based design methodologies - probabilistic frameworks
- Performance based design - codes and guidance
- Sustainability and life cycle cost analyses
- Liquefaction
- Challenging soils
- Vibration isolation
- Education

Contact

Scientific Secretariat

Altuğ SAYGILI
Selda DURMAZ
Onur TOYGAR

Phone:+90 252 211 1942
E-mail: secretariat@mygec2019.org

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27th EYGEC
27th European Young Geotechnical Engineers Conference
Double Events - MYGEC & EYGEC
26-27th September, 2019
Kefaluka Resort Hotel Bodrum, Muğla-Turkey

http://eygec2019.org/info

It is my pleasure to invite you to the "27th European Young Geotechnical Engineers Conference" which will be organized by the Civil Engineering Department of Muğla Sıtkı Koçman University. 27th EYGEC will be held on 26-27th September, 2019 at Kefaluka Resort Hotel (www.kefalukaresort.com) Bodrum, Muğla-Turkey. Bodrum is a fascinating holiday spot and the site of the ancient city of Halikarnassus, the location of the famous Mausoleum of Halikarnassus (built after 353 BCE) - one of the Seven Wonders of the Ancient World.

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3rd ICTITG International Conference on Information Technology in Geo-Engineering, Sep. 29-02 Oct., 2019, Guimarães, Portugal, www.3rd-icitg2019.civil.uminho.pt

11th ICOLD European Club Symposium, 2 - 4 October 2019, Chania Crete – Greece, www.eurcold2019.com

4º Πανελλήνιο Συνέδριο Αντισεισμικής Μηχανικής και Τεχνικής Σεισμολογίας *20 Χρόνια Μετά...*, Αθήνα, 4-6 Οκτωβρίου, 2019, www.eltam.org

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XVII African Regional Conference on Soil Mechanics and Geotechnical Engineering

07-10 October 2019, Cape Town, South Africa

The South African Institution of Civil Engineering cordially invites all our colleagues from Africa and beyond to attend the 17th African Regional Conference on Soil Mechanics and Geotechnical Engineering.

Hosted in one of the continent's most iconic cities, this conference will serve practitioners, academics and students of all geotechnical backgrounds. The conference will take place at the Cape Town International Convention Centre (CTICC) offering world class conferencing facilities in the heart of South Africa's mother city and will offer extensive opportunities for Technical Committee Meetings, Workshops, Seminars, Exhibitions and Sponsorships. Exciting Technical Visits, including tours to the famous Robben Island, await.

The 7th African Young Geotechnical Engineers' Conference (8 – 10 October 2019) will commence on 8 October 2019, the day following the African Regional Conference (ARC) opening. The conference venue will be shared with the ARC delegates to initiate dialogue between junior and senior engineers while young geotechnical engineers acquaint themselves with the industry standards, new geotechnical developments and resources available to further their careers. The YGE conference provides an approachable audience within a vibrant environment where young presenters under the age of 35 are encouraged to exercise their presentation and technical writing skills on a continental platform.

Organiser: SAICE
Contact person: Dr Denis Kalumba
Email: denis.kalumba@uct.ac.za

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XVI Asian Regional Conference on Soil Mechanics and Geotechnical Engineering, 21 - 25 October 2019, Taipei, China www.16arc.org

XVI Panamerican Conference on Soil Mechanics and Geotechnical Engineering, 18-22 November 2019, Cancun, Quintana Roo, Mexico, http://panamerican2019mexico.com/panamerican

YSRM2019 - The 5th ISRM Young Scholars' Symposium on Rock Mechanics and REIF2019 - International Symposium on Rock Engineering for Innovative Future - Future Initiative for Rock Mechanics and Rock Engineering - Collaboration between Young and Skilled Researchers/Engineers – 1-4 December 2019, Okinawa, Japan, www.ec-pro.co.jp/ysrm2019/index.html

15th International Conference on Geotechnical Engineering, and
9th Asian Young Geotechnical Engineers Conference
05-12-2019 ÷ 07-12-2019, Lahore, Pakistan

Organiser: Pakistan Geotechnical Engineering Society (PGES)
Contact person: Dr. Muhammad Irfan (for 15ICGE); Dr. Jahanzaib Israr (for 9AYGEC)
Address: Civil Engineering Department, UET Lahore, Pakistan
Phone: +92 306 66 666 010; +92 334 413 2808
Email: 15icge@uet.edu.pk , 9aygec@uet.edu.pk

14th Baltic Sea Geotechnical Conference 2020
25 ÷ 27 May 2020, Helsinki, Finland

Organiser: Finnish Geotechnical Society
Contact person: Leena Korkiala-Tanttu
Email: leena.korkiala-tanttu@aalto.fi
Website: http://www.ril.fi/en/events/bsgc-2020.html
Email: ville.raassakka@ril.fi

Nordic Geotechnical Meeting
27-29 May 2020, Helsinki, Finland

Contact person: Prof. Leena Korkiala-Tanttu
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Phone: +358-(0)50 312 4775
Email: leena.korkiala-tanttu@aalto.fi

EUROCK 2020
Hard Rock Excavation and Support
June 2020, Trondheim, Norway

Contact Person: Henki Ødegaard, henki.oedegaard@multiconsult.no

DFI Deep Mixing 2020
15 to 17 June 2020, TBD, Gdansk, Poland

Organizer: Deep Foundations Institute
Contact person: Theresa Engler
Address: 326 Lafayette Avenue, Hawthorne, NJ 07506, USA
Phone: 19734234030
Fax: 19734234031
Email: tengler@dfi.org
Website: http://www.dfi.org
Email: staff@dfi.org

4th European Conference on Unsaturated Soils - Unsaturated Horizons
24-06-2020 ÷ 26-06-2020, Lisbon, Portugal

Organiser: IST, TUDelft and UPC
Contact person: info@EUNSAT2020.tecnico.ulisboa.pt
Website: http://www.EUNSAT2020.tecnico.ulisboa.pt

Geotechnical Aspects of
Underground Construction in Soft Ground
29 June to 01 July 2020, Cambridge, United Kingdom

Organiser: University of Cambridge
Contact person: Dr Mohammed Elshafie
Address: Laing O'Rourke Centre, Department of Engineering, Cambridge University
Phone: +44(0) 1223 332780
Email: me254@cam.ac.uk

16th International Conference of the International Association for Computer Methods and Advances in Geomechanics – IACMAG
29-06-2020 ÷ 03-07-2020, Torino, Italy

The 16th International Conference of the International Association for Computer Methods and Advances in Geomechanics (15IACMAG) will be held in Turin, Italy, 29 June - 4 July 2020. The aim of the conference is to give an up-to-date picture of the broad research field of computational geomechanics. Contributions from experts around the world will cover a wide range of research topics in geomechanics.

Pre-conference courses will also be held in Milan and Grenoble.

Contact Information

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cs so

EUROGEO WARSAW 2020 7th European Geosynthetics Congress, 6-9 September 2020, Warsaw, Poland, www.eurogeo7.org

cs so

6th International Conference on Geotechnical and Geophysical Site Characterization
07-09-2020 ÷ 11-09-2020, Budapest, Hungary
www.isc6-budapest.com

Organizer: Hungarian Geotechnical Society
Contact person: Tamas Huszak
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Email: huszak@mail.bme.hu
Website: http://www.isc6-budapest.com
Email: info@isc6-budapest.com

cs so

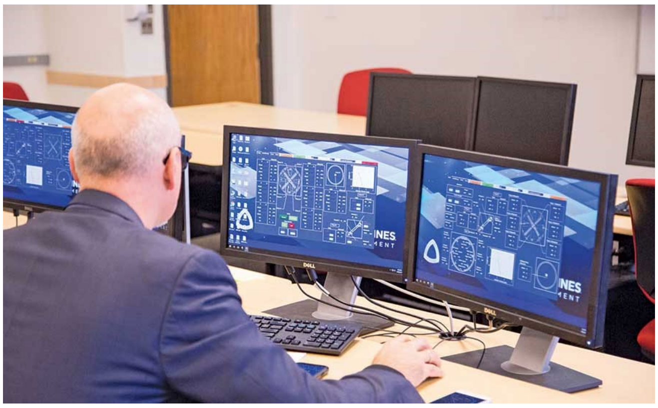
5TH World Landslide Forum Implementation and Monitoring the USDR-ICL Sendai Partnerships 2015-2015, 2-6 November 2020, Kyoto, Japan, http://wlf5.iplhq.org

cs so

UNSAT2022
8th International Conference on Unsaturated Soils
June or September 2022, Milos island, Greece

ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

New Research Aims to Elevate Tunneling Success



Tunneling engineers learn to operate an earth-pressure balance TBM simulator to help understand real-world TBM-ground interactions

As builders of infrastructure burrow below grade, the stakes grow higher. Underground conditions aren't always clear before excavation, and irregularities can prove costly, slowing progress on projects valued in the billions of dollars. As a result, industry and academia are investigating new technologies, including greater automation of tunneling systems and the imaging of terrain that lies ahead of them, to ensure operations proceed as efficiently and safely as possible.

Particularly challenging are the multiple moving parts and attendant monitoring involved in excavating larger underground tunnels. Tunnel-boring machines (TBMs)—the massive, wormlike systems that chew through earth to create openings for rail, road, water, wastewater, utility systems and the like—produce continuous streams of sensor-generated data as they navigate complex, shifting ground conditions, sometimes hundreds of feet beneath the earth's surface.

In addition to thrust, steering and ground conditioning, TBM operators must digest and respond to real-time information about surface and subsurface settlement, vibrations, cutterhead speed and rotation, and screw-conveyor activity. Those are among the outputs collected by the machine's central control system, frequently a programmable logic controller (PLC).

However, studies indicate that a typical operator can't optimally control more than three to four of the more than two dozen independent parameters that TBMs generate, says Michael Mooney, professor of civil engineering and the Grewcock chair of underground construction and tunneling at Colorado School of Mines' (CSM) Center of Underground Construction and Tunneling in Golden, Colo.

Complexity is amplified in urban settings, "where there is little margin for error due to allowable settlements of just ¼ to ½ inch for overlying utilities, streets and buildings, and for projects involving tunnel excavations of up to 700 inches in diameter," Mooney says.

"You're operating a system where conditions—ground, torque, thrust, vibrations—are changing all the time," concurs Randy Essex, executive vice president with London-based engineer and tunneling specialist Mott MacDonald Group. He is also an executive council member with the International Tunneling and Space Association (ITSA). "It's too much for humans to handle, so technology is stepping in to assist us," Essex says.

Multiple Partners

Many entities—members of academia, CSM included—are working among themselves and with industry leaders to advance automation in TBMs. The goals: improve tunneling performance and productivity. In particular, CSM is deploying artificial intelligence—pattern recognition in data from operator-generated inputs and performance-related outputs—to understand the physics of TBM ground interactions.

To do so, researchers gather data from thousands of sensors placed throughout the TBM, and on ground surfaces and other targets, then analyze that information via CSM-generated algorithms to detect or "tease out" patterns in data otherwise difficult to distinguish.

"It's really about identifying relationships between the inputs and outputs—what works or doesn't as well in actions between the two," Mooney says. "To achieve a better output—say in advanced speed—you need to specify a better input. Through pattern recognition, AI may suggest the input changes to advance the speed."

All told, "we're ideally identifying the best combination of parameters to optimize the TBM's performance or keep abreast of when conditions change," says Mooney. Assuming that patterns are identified early and updated as the TBM progresses, tunnelers can use that to improve performance throughout the project.

"To some extent, most TBMs already implement automation via PLCs that respond to a given output with a given input," says Richard McLane, chief mechanical engineer with Evansville, Ind.-based Traylor Bros. The contracting firm specializes in large tunneling projects, including the West Side Subway Extension in Los Angeles, a 3.92-mile undertaking. Like other large firms, Traylor has dabbled in automation-related boring, including elements of ground conditioning.

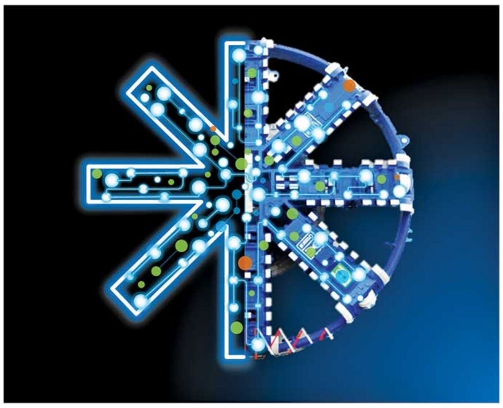
The advances come at a time when infrastructure providers, particularly those in urban areas, find they have only one direction left to go. In 2016, worldwide tunneling expenditures totaled $100 billion and projects achieved 3,200 miles, according to ITSA. In addition, activity is growing at an average annual rate of 7%, twice that of the global construction market.

As a result, the time is ripe for CSM to move its AI-related activity lab to the field. If all goes as planned, the CSM team will introduce AI as a project element for the upcoming excavation of the $600-million Northeast Boundary Tunnel (NEBT) in Washington, D.C. It is the largest portion of city's multibillion-dollar Clean Rivers Project, says Daniele Nebbia, project manager with Lane Construction Corp. The Cheshire, Conn.-based contractor is partnering on NEBT with Milan, Italy-based controlling contractor Salini Impregilo.

Identifying Inefficiencies

Having done tunneling for a previous phase of Clean Rivers, the two firms provided CSM with TBM-generated data from the project. That may help to maximize AI on the 27,000-ft-long, 23-in.-dia NEBT, where depths will extend 50 ft to 160 ft below ground. "Ideally, we'd be riding along virtually, also analyzing TBM data generated from excavating NEBT," says Mooney.

"We're attempting to identify the inefficiencies in our parameters and minimize downtime," adds Nebbia. "As contractors, we want to be as efficient and productive as possible and, in this instance, manage settlement at the same time."



Based on data from sensors in cutter heads and other tunneling components, researchers hope to generate TBMs capable of autonomous operation

However, the road to complete TBM automation may prove to be slow. For the foreseeable future, "industry will likely rely on systems in which AI contributes to operator-assisted decision making," Mooney says. "In time, given the reliability of intelligence, the operator may allow 5% AI-generated decisions, then 25% or 50%, and, finally, 100%. Think of it like the development and acceptance of a self-driving car," he says.

Meanwhile, the emphasis is on improving imaging ahead of TBMs. Although project teams may bore 6-in.-dia test holes every 100 to 200 yd, those don't result in a complete map of below-grade conditions.

To better illuminate conditions, CSM is working with radar that reflects water, fracturing and other conditions before the TBM encounters them. CSM recently introduced the technique for a 700- to 900-ft-deep bypass to the leaking Rondout-West-Branch Tunnel. For the project, located in New York's Orange and Dutchess counties, "joint venture contractors Kiewit and Shea are drilling 2.5-inch-diameter horizontal probe holes through about 200 to 300 feet of ground, then routing a radar-emitting probe through the boreholes," Mooney says. To date, the technology has proved useful, though it remains to be seen how it performs in difficult terrain with groundwater, faults, fractures, solution cavities, etc. in the limestone.

The CSM lab also is researching imaging from the injection of low levels of electricity into the ground ahead of a TBM's cutter head. The technology is key for urban settings, given that electrical currents can identify spatial contrast in conductivity, not only from changes in rock and soil types, but also from pipes, foundations, abandoned wells and other anomalies, Mooney says.

However, moving the technology from lab to field may prove problematic. "We're working on creating more robust instrumentation that can withstand the rigors of a destructive environment," he says.

(John Gregerson / ENR Engineering News Record, September 26, 2018, https://www.enr.com/articles/45247-new-research-aims-to-elevate-tunneling-success)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΣΕΙΣΜΟΙ

UC San Diego's earthquake simulator will soon give truer sense of deadly temblors

Spectators take a look at a five-story building that was constructed on UC San Diego's big shake table in Scripps Ranch, shortly before the structure was shaken hard during an earthquake simulation in 2012.

UC San Diego's outdoor shake table in Scripps Ranch will soon give engineers a truer sense of the fury that's released when big earthquakes erupt in places around the globe from the San Fernando Valley to the mountains of Afghanistan.

The National Science Foundation gave the campus $16.3 million to upgrade the center so it can more accurately simulate quakes, a complex phenomenon that in some years kills hundreds of thousands of people worldwide.

The table is the largest of its kind and has conducted experiments that have led to tougher building and design codes for bridges and housing. But it can only move structures backward and forward. Quakes can move the ground in many directions.

Engineers will modify the table so that it also can move up and down, right and left, and simulate the pitch, roll and yaw that can come with ground motion. Collectively, these movements are called the "six degrees of freedom."

The upgrade involves adding pistons and power to a table that's used by researchers from around nation to simulate quakes big enough to send seismic waves coursing through the earth for weeks.

"We will be able to reproduce earthquake motions with the most accuracy of any shake table in the world," said Joel Conte, the UC San Diego structural engineer who is overseeing the project.

"This will accelerate the discovery of the knowledge engineers need to build new bridges, power plants, dams, levees, telecommunication towers, wind turbines, retaining walls, tunnels, and to retrofit older structures. It will enhance the resiliency of our communities."

The upgrade comes at a worrisome time in California.

In June, the U.S. Geological Survey said that 38 high-rise buildings in San Francisco that were constructed between 1964 and 1994 could buckle if they were hit by the type of earthquake that devastated the city in 1906. The list includes the famed Transamerica Pyramid in the Financial District.

There's also concern about a newer skyscraper, the 58-story Millennium Tower, which has been sinking and tilting, making it more vulnerable to big quakes.

San Diego is on shaky ground as well.

In 2017, the Earthquake Engineering Research Institute released a report that says that 2,000 people could die in San Diego if a 6.9-magnitude quake erupts on the Rose Canyon fault, which runs through the heart of the city. Potential property damage: $40 billion.

The EERI emphasized that the figures are mere estimates because modeling the complexities of earthquakes is hard to do with existing models and technology.

Even so, engineers have made progress.

Since it opened in the late 1980s, UC San Diego's Powell Laboratories has been heavily involved in developing and testing key portions of roads and bridges, leading to changes in building codes.

The shake table was added in 2004 to give scientists and engineers better ability to test large structures, ranging from wood-frame buildings to bridge columns to a 70-foot wind turbine.

The need for such a table had been apparent for decades.

The 6.7-magnitude Northridge quake in 1994 appears to have caused the ground to move vertically as well as horizontally. That vertical movement may be the reason that some bridge support columns rose upward and pierced the decks of bridges.

Such wild ground motions weren't unknown to engineers. The 1971 San Fernando earthquake, which measured 6.6, appears to have caused the soil to rotate in some areas. That, in turn, may have caused some buildings to turn like corkscrews.

The movement contributed to the billions of dollars in property damage inflicted by the quake.

The table has been used to relive some of these jarring events, notably the Northridge quake.

That temblor caused the thunderous collapse of a parking garage at Cal State Northridge. Engineers from the University of Arizona built a similar garage in 2008, then shook it harder than the real quake.

The experiment revealed a great deal about how such structures absorb and distribute energy, leading to a strengthening of national building codes.

More recently, a team led by UC San Diego built and tested a five-story building that had many of the features of a hospital — such as an ICU and a surgery suite — as well as a working elevator and a sprinkler system. The goal was to understand what would happen inside a hospital during a catastrophic quake.

To ensure they didn't miss anything, engineers placed 500 sensors in and around the building, and installed 70 cameras.

Then they simulated several high-intensity earthquakes, and later set part of the building on fire to replicate a frequent after-effect of temblors.

"What we are doing is the equivalent of giving a building an EKG," lead engineer Tara Hutchinson later told the media.

The experiment helped lead to the design of safer hospitals, and it was followed by a project that focused on a subject of great concern in California — four-story wood-frame residential buildings that have garages on the first floor.

The structures — mostly built in the 1920s, 30s and 40s — are now seen as vulnerable to collapse in a huge quake.

In 2013, Colorado State University constructed one of the structures on the shake-table and outfitted it with various types of retrofitting to see what would happen.

The result was good, and bad.

The building survived shake tests with the retrofitting in place. When it was taken out, calamity followed.

"There was creaking and crunching, then a thunderous collapse, followed by dust and debris floating up," said John W. van de Lindt, the CSU engineer who led the project.

Today, Lindt is drawing up plans for a 10-story building that will be built on the same spot. But this time, he'll be able to move the building any direction he wants.

"The U.S. and California have really been at the forefront of this kind of research," Lindt said. "The upgrade will help us keep pace with the world. We really need this."

(Gary Robbins / The San Diego Union-Tribune, October 12, 2018, http://www.sandiegouniontribune.com/news/science/sd-me-earthquakes-ucsd-20181008-story.html)

Τσουνάμι στον κόλπο Palu της Ινδονησίας. Αναλογίες στον ελλαδικό χώρο.

Το ***τσουνάμι*** *(κύμα του λιμανιού στα ιαπωνικά) ή* **θαλάσσιο σεισμικό κύμα,** που εσφαλμένα ονομάζεται παλιρροϊκό, δεν έχει καμία σχέση με τα μεγάλα θαλάσσια κύματα του ωκεανού, με μετεωρολογική επίδραση που δημιουργούνται επιφανειακά. Τα τσουνάμι είναι κύματα που δημιουργούνται ξαφνικά σε ανοικτές θάλασσες, από τη βίαιη ανακατάταξη των πετρωμάτων στο βυθό, συνήθως υποθαλάσσιων σεισμών ή ηφαιστειακών εκρήξεων, τα οποία μετακινούν όγκους νερού ανάλογα με το βάθος της θάλασσας. Στα ανοικτά η ταχύτητά τους είναι πολύ μεγάλη, έως 800 km/h, στις αβαθείς ακτές 90-50 km/h, ενώ τα παράκτια εδάφη πλήττονται με 40-30 km/h. Το τσουνάμι είναι ένα **στιγμιαίο κύμα ορμής** που αποτελείται από μια τεράστια **στήλη νερού** και ταξιδεύει ως **μοναχικό κύμα** (σολιτόνιο)**,** αποτελούμενο από διάφορες φάσεις συχνοτήτων. Το μήκος, το πλάτος και η ταχύτητα του θηριώδους αυτού κύματος μεταβάλλονται συνεχώς σε όλη τη διαδρομή του, αφού εξαρτώνται από το βάθος και τη μορφολογία του θαλάσσιου πυθμένα. Κοντά στις ακτές αυξάνεται το ύψους τους. Καμιά μαθηματική σχέση δεν μπορεί να περιγράψει πλήρως αυτή την κίνηση, αν και ευφυή μοντέλα σε υπολογιστές την προσεγγίζουν ικανοποιητικά και ερμηνεύουν τις μετρήσεις. Παράλληλα, ένας **πολύπλοκος εσωτερικός στροβιλισμός** ανασκάπτει το βυθό, ανασηκώνει άμμο και μικροοργανισμούς, καταστρέφει πανίδα και χλωρίδα και σαν μαύρος τοίχος, ξεσπά στις ακτές με τη μορφή «κεφαλής κόμπρας». Είναι ένα **μοναχικό κύμα υψηλής ταχύτητας** και **χαμηλών απωλειών ενέργειας.** Σε κλειστούς κόλπους γίνεται ιδιαίτερα επικίνδυνο. Το τσουνάμι σκοτώνει άμεσα και όχι έμμεσα όπως οι σεισμοί.

Μέχρι πρόσφατα πιστεύαμε ότι τα τσουνάμι προκαλούνται κυρίως από υποθαλάσσιους σεισμούς μεγέθους μεγαλύτερου από 6.5 και εστιακού βάθους μικρότερο από 50 km, αν και παρατηρήθηκαν στο παρελθόν τσουνάμι αποκλειστικά από υποθαλάσσιες κατολισθήσεις, όπως στον Κορινθιακό το 1963. Δευτερευόντως από υποθαλάσσιες ηφαιστειακές εκρήξεις.

Ο τελευταίος όμως σεισμός της 28ης Σεπτεμβρίου Μ 7.5 στο νησί της Ινδονησίας Sulawesi, προβλημάτισε ιδιαίτερα την επιστημονική κοινότητα. Το επίκεντρο βρισκόταν κοντά στην ακτή στην προέκταση του σεισμογόνου ρήγματος (strike-slip) 50km βόρεια της πόλης Palu, τη διέσχιζε και επεκτεινόταν υποθαλάσσια. Ένα πιθανό τσουνάμι θα ήταν λογικό να συμβεί ταυτόχρονα με το σεισμό ή σε λίγα λεπτά της ώρας, αντίθετα συνέβη αργότερα, όταν έληξε και ο προειδοποιητικός συναγερμός. Με **ύψος 2 – 6m,** κινήθηκε στον κλειστό κόλπο και σχεδόν αφάνισε το μεγαλύτερο τμήμα της πόλης 350.000 κάτοικων, όπου οι νεκροί πλησιάζουν τους 2.000. Σε πολλές περιπτώσεις έφτασε και τα 8m, όπως στην Talise Beach, όπου εισχώρησε 50m έφτασε τα 7-8m από το έδαφος και τα 10m από το επίπεδο της θάλασσας. Η πλημμύρα έφτασε στα 300m, ενώ οι καταστροφές σε μια ζώνη 200m. Η αιτία του ήταν ο σεισμός; Επειδή συνδέεται με ένα ρήγμα οριζόντιας μετατόπισης (strike-slip), τα οποία κατά κανόνα δεν συνδέονται με τσουναμι, τι το προκάλεσε; μήπως ο σεισμός διέγειρε μια ώριμη υποθαλάσσια κατολίσθηση; ήταν μόνο κατολίσθηση και πού; Γιατί δημιουργήθηκε σε τόσο ρηχή θάλασσα (ασυνήθιστο φαινόμενο); Ήταν συνδυασμός πολλών παραγόντων; χωρίς να αποκλείεται ο μετεωρολογικός. Ακόμη δεν δόθηκε ικανοποιητική απάντηση, και ως συνήθως η φύση θέτει νέα προβλήματα.

Στο Νότιο Αιγαίο τα τσουνάμι δεν είναι σπάνια. Στη Σαντορίνη, το πρώτο παγκόσμια καταγραμμένο στους διεθνής καταλόγους, είναι εκείνο της μεγάλης έκρηξης της Ύστερης εποχής του Χαλκού, 1613 π.Χ., γνωστής και ως μινωικής. Για το τσουνάμι αυτό έχουν προταθεί αρκετά μοντέλα, που το αποδίδουν είτε στην τεράστια έκρηξη, ή στην κατάρρευση του ηφαιστειακού οικοδομήματος και τμήματος του νησιού, ή ακόμη στην δυναμική κίνηση των πυροκλαστικών υλικών, που κινήθηκαν με μεγάλες ταχύτητες στο θαλασσινό νερό. Τελευταία όλο και συχνότερα φαίνεται ότι ο παράγων υποθαλάσσιες κατολισθήσεις είτε διεγείρονται από σεισμούς είτε όχι, είναι εξίσου σημαντικός. Τόσο η Σαντορίνη περιμετρικά, όσο και ο ευρύτερος χώρος του Νότιου Αιγαίου έχουν απότομα υποθαλάσσια πρανή και τάφρους επιρρεπείς σε κατολισθήσεις. Τίθενται λοιπόν νέοι προβληματισμοί για τα παράλια των νησιωτικών συμπλεγμάτων, ιδιαίτερα με κλειστούς κόλπους.

Αν και στο Βόρειο Αιγαίο δεν είναι συχνά τα τσουνάμι, ειδικότερα στον Θερμαϊκό, έχουμε το πρώτο παγκόσμια καταγραμμένο ιστορικά από τον Ηρόδοτο μεγάλο κύμα του 479 π.Χ., κατά τη διάρκεια της πολιορκίας της Ποτίδαιας από τους Πέρσες του Αρτάβαζου, για το οποίο επίσης δεν γνωρίζουμε αν οφειλόταν σε σεισμό ή σε κατολίσθηση από τα απότομα βάθη της Τάφρου του Βορείου Αιγαίου. Σήμερα φαίνεται ότι πρέπει να συνέβησαν και τα δύο. Κλασική περίπτωση σε κλειστό κόλπο αποτελεί ο σεισμός του 425 π.Χ., στο Βόρειο Ευβοϊκό, όπου ο Θουκυδίδης που το περιγράφει διατυπώνει τον πρώτο ορισμό του.

Παρά την σπανιότητα των παραπάνω φαινομένων απαιτείται διερεύνηση τους και επιστημονική γνώση, καθώς και ουσιαστική προετοιμασία και καλύτερος σχεδιασμός για την αντιμετώπισή τους, ιδιαίτερα για παραθαλάσσιες πόλεις σε κλειστούς κόλπους, όπως πολλές ελληνικές.

Σπύρος Παυλίδης
Ομότιμος καθηγητής Γεωλογίας Α.Π.Θ.
16 Οκτωβρίου 2018

GeoSEA array records sliding of Mount Etna's southeastern flank

Helmholtz Centre for Ocean Research Kiel (GEOMAR)

Volcano flank moves under water -- Tsunami is a possible consequence

As Europe's most active volcano, Mount Etna is intensively monitored by scientists and Italian authorities. Satellite-based measurements have shown that the southeastern flank of the volcano is slowly sliding towards the sea, while the other slopes are largely stable. To date, it has been entirely unknown if and how movement continues under water, as satellite-based measurements are impossible below the ocean surface. With the new GeoSEA seafloor geodetic monitoring network, scientists from the GEOMAR Helmholtz Centre for Ocean Research Kiel, the Kiel University, priority research area Kiel Marine Science, and the Istituto Nazionale di Geofisica e Vulcanologia (INGV) have now been able to detect for the first time the horizontal and vertical movement of a submerged volcanic flank.

The results confirm that the entire southeastern flank is in motion. The driving force of flank movement is most likely gravity, and not the ascent of magma, as previously assumed. Catastrophic collapse involving the entire flank or large parts of it cannot be excluded and would trigger a major tsunami with extreme effects in the region. The results of the study have been published today in the international journal *Science Advances*.

"At Mount Etna we used a sound based underwater geodetic monitoring network, the so-called marine geodesy, on a volcano for the first time ", says Dr. Morelia Urlaub, lead author of the study. She led the investigations as part of the "MAGOMET - Marine geodesy for offshore monitoring of Mount Etna" project. In April 2016, the GEOMAR team placed a total of five acoustic monitoring transponder stations across the fault line that represents the boundary between the sliding flank and the stable slope. "We placed three on the sliding sector and two on the presumably stable side of the fault line," says Dr. Urlaub.

During their mission each transponder was sending an acoustic signal every 90 minutes. Since the speed of sound in water is known, the travel time of the signals between transponders gave information on the distances between transponders on the seafloor with a precision of less than one centimeter. "We noticed that in May 2017 the distances between transponders on different sides of the fault clearly changed. The flank slipped by four centimeters seawards and subsided by one centimeter within a period of eight days," explains Dr. Urlaub. This movement can be compared to a very slow earthquake, a so-called "slow slip event". It was the first time that the horizontal movement of such a slow slip event was recorded under water. In total, the system delivered data for about 15 months.

A comparison with ground deformation data obtained by satellite showed that the southeastern flank above sea level moved by a similar distance during the same observation period. "So the entire southeast flank changed its position," says Dr. Urlaub.

"Overall, our results indicate that the slope is sliding due to gravity and not due to the rise of magma," she continues. If magma dynamics in the centre of the volcano triggered flank deformation, displacement of the flank would be expected to be larger onshore than below water. This is crucial for hazard assessments. "The entire slope is in motion due to gravity. It is therefore quite possible that it could collapse catastrophically, which could trigger a tsunami in the entire Mediterranean," explains Professor Heidrun Kopp, coordinator of the GeoSEA array and co-author of the study. However, the results of the study do not allow a prediction whether and when such an event might occur.

"Further basic research is needed to understand the geological processes at and around Etna and other coastal volcanoes. Our investigation shows that the sound-based geodetic monitoring network can be a tremendous help in this respect," summarises Dr. Urlaub.

(EurekAlert!, 10 Oct. 2018, https://www.eurekalert.org/pub_releases/2018-10/hcfo-gar101018.php)

Gravitational collapse of Mount Etna's southeastern flank

Morelia Urlaub, Florian Petersen, Felix Gross, Alessandro Bonforte, Giuseppe Puglisi, Francesco Guglielmino, Sebastian Krastel, Dietrich Lange and Heidrun Kopp

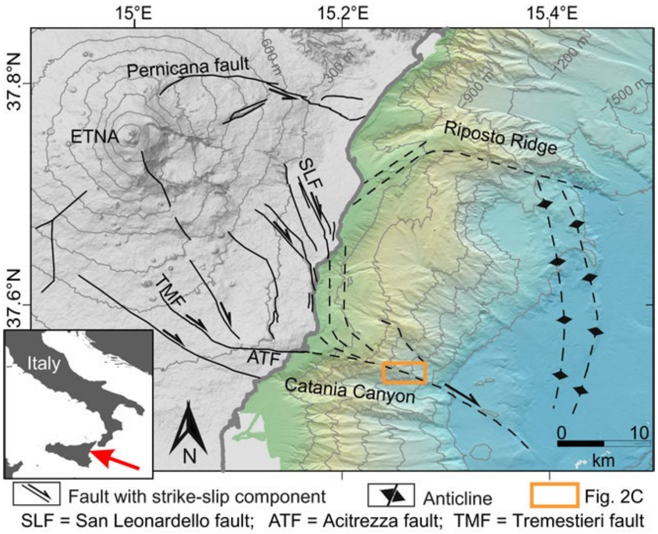


Fig. 1 Morphologic map of Mount Etna including tectonic features of the southeastern flank.

Onshore topography in gray and offshore bathymetry in green to blue colors. Contour line interval is 300 m. Main features are shown as dashed and solid black lines. The thick gray line delineates the coastline. The orange rectangle marks the location of the seafloor geodetic network.

Abstract

The southeastern flank of Etna volcano slides into the Ionian Sea at rates of centimeters per year. The prevailing understanding is that pressurization of the magmatic system, and not gravitational forces, controls flank movement, although this has also been proposed. So far, it has not been possible to separate between these processes, because no data on offshore deformation were available until we conducted the first long-term seafloor displacement monitoring campaign from April 2016 until July 2017. Unprecedented seafloor geodetic data reveal a >4-cm slip along the offshore extension of a fault related to flank kinematics during one 8-day-long event in May 2017, while displacement on land peaked at ~4 cm at the coast. As deformation increases away from the

magmatic system, the bulk of Mount Etna's present continuous deformation must be driven by gravity while being further destabilized by magma dynamics. We cannot exclude flank movement to evolve into catastrophic collapse, implying that Etna's flank movement poses a much greater hazard than previously thought. The hazard of flank collapse might be underestimated at other coastal and ocean island volcanoes, where the dynamics of submerged flanks are unknown.

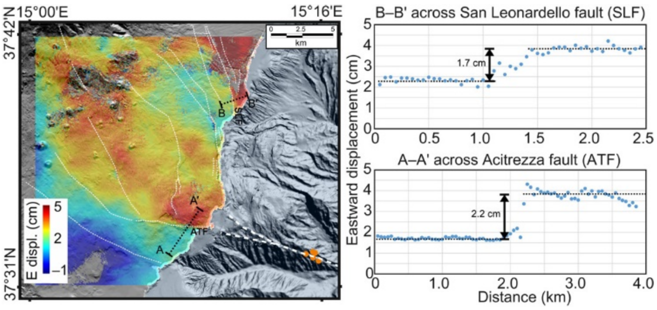


Fig. 3 Eastward displacement of the southeastern flank of Mount Etna from April 2016 to July 2017.

The map is obtained by integrating GPS and InSAR analysis using the SISTEM method. White dashed lines show principal faults. Dots show locations of the seafloor geodetic transponders.

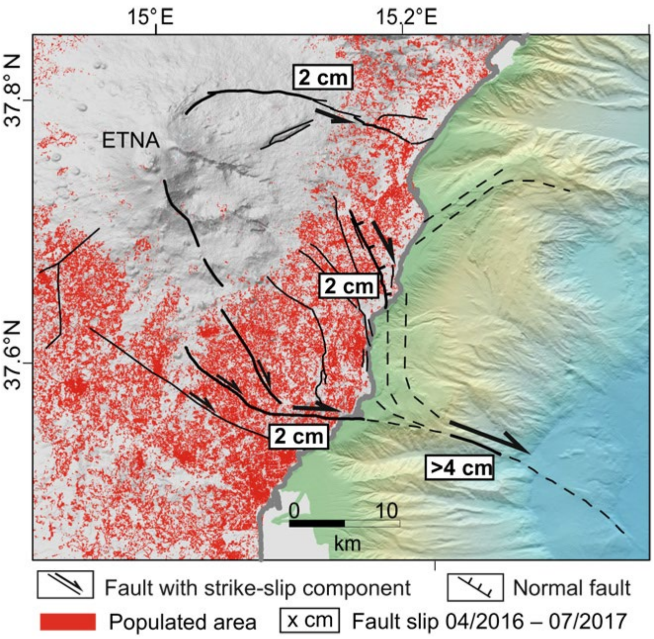


Fig. 4 Shoreline-crossing fault slip representation of Mount Etna's southeastern flank movement.

Populated areas are obtained from a Landsat-8 classification on a 30 m by 30 m grid (Landsat-8 image courtesy of the U.S. Geological Survey). Bold lines represent main active features during the observation period.

(*Science Advances*, 10 Oct 2018: Vol. 4, no. 10, eaat9700 DOI: 10.1126/sciadv.aat9700, http://advances.sciencemag.org/content/4/10/eaat9700)

Tiny Beetle Entombed in Amber 99 Million Years Ago Reveals How Continents Shifted

Propiestus archaicus, a new species of rove beetle from 99 million years ago, is frozen in ancient amber.

A minuscule beetle trapped in amber for 99 million years reveals that Myanmar was once one with South America.

The rare find, a new species called *Propiestus archaicus*, is an ancestor of detritus-dwelling rove beetles, which are found today only in South America and in southern Arizona. The discovery of this anthropod ancestor from the Cretaceous period in Myanmar (formerly Burma) helps clarify when and how the continents shifted from two huge land masses then to the seven continents we know today.

"Although *Propiestus* went extinct long ago, our finding probably shows some amazing connections between [the] Southern Hemisphere and Myanmar," lead study author Shuhei Yamamoto, a researcher at the Chicago Field Museum, said in a statement.

Tiny treasure

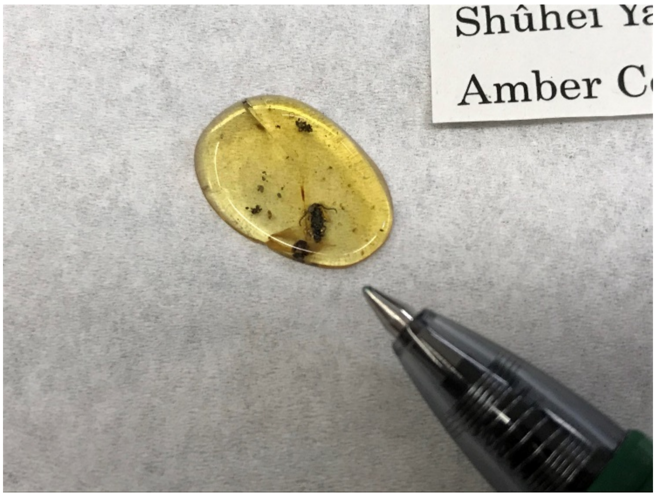
Yamamoto coaxed the beetle fossil from a penny-size piece of amber found in the Hukawng Valley of northern Myanmar. The amber is hardened tree sap from the Late Cretaceous period, which was dirtied and opaque from ages of accumulated dirt and organic material. Yamamoto used delicate tools and sandpaper to cut and polish the amber just enough to make the beetle visible.

The insect is a mere 0.1 inch (3 millimeters) long, about the length of a ballpoint pen tip. It is black, with segmented fuzzy antennae that are nearly as long as its body. These antennae were probably highly sensitive, to help the beetle feel its way around its habitat, the narrow space beneath the bark of rotting trees.

"There wouldn't have been a lot of space available in the beetle's habitat, so it was important to be able to detect everything," Yamamoto said.

Modern relatives

Today, rove beetles are a huge group, with more than 63,650 species found worldwide. The subfamily that *P. archaius* belongs to, *Piestus*, is today exclusively a Southern Hemisphere phenomenon, except for one species found in southern Arizona, the researchers reported today (Oct. 30) in the Journal of Systematic Palaeontology. This is the first time a member of the subfamily has been found in Burmese amber, the researchers wrote, though a couple of related fossils have been found in rock in northeastern China.



The rove beetle *Propiestus archaicus* is only 0.1 inches (3 millimeters) long. Its modern relatives are found in South America, except for one species from Arizona.

Along with other fossils of insects found in Burmese amber, the tiny new beetle suggests that Myanmar was once part of Gondwanaland, a sprawling megacontinent that formed after the breakup of Pangea. It consisted of much of the continental mass that makes up the Southern Hemisphere continents today. During the Cretaceous period, Gondwanaland itself was rifting apart into land masses more recognizable as today's continents. Tracing the location of today's species and their fossil ancestors can help pinpoint when those rifts occurred. Though DNA evidence would be necessary to truly pin down *Piestus*' historical journeys, the researchers wrote, it seems possible that the group originated in Gondwanaland.

"Our finding fits well with the hypothesis that, unlike today, Myanmar was once located in the Southern Hemisphere," Yamamoto said.

(Stephanie Pappas, Live Science Contributor, LIVESCIENCE, October 30, 2018, https://www.livescience.com/63966-beetle-amber-continental-shift.html?utm_source=ls-newsletter&utm_medium=email&utm_campaign=20181031-ls)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΛΟΙΠΑ

Sagrada Família to Pay Off $41 Million Debt to Barcelona for Building Permits

The trustees of Barcelona's historic Sagrada Família have reached an agreement with the city council to pay off $41 million in debt for not having the appropriate building permits. As the New York Times reports, the saga has continued for more than a century, as an original building permit issued in 1885 by Sant Martí de Provençals was no longer valid when the town was absorbed into the city of Barcelona. Designed by Catalan architect Antoni Gaudí in 1882, the Sagrada Família is still under construction 136 years later.

Church officials have agreed to pay off the debt over a 10 year period in installments. In exchange, they plan for the permit to help improve public transportation in the surrounding areas. "The Sagrada Família is an icon and the most visited monument in our city," Ada Colau, mayor of Barcelona, tweeted on Thursday. "After two years of dialogue we have made an agreement that will guarantee the payment of the license, secure access to the monument and facilitate local life with improvements to public transport and redevelopment of the nearby streets."

One of the best known structures of Catalan Modernisme, the Sagrada Família draws over three million visitors annually. Gaudi worked on the project until his death in 1926, in full anticipation he would not live to see it finished. Once completed, La Sagrada Familia will feature eighteen towers presenting a unique view of the temple from any single vantage point. Even as construction continues, older portions are undergoing cleaning and restoration. The temple has relied entirely on private donations since its inception, and has seen many delays due to lack of funding.

The Sagrada Família is set to be complete in 2026, the centennial of Gaudí's death.

(arch-daily, 22 October, 2018, https://www.arch-daily.com/tag/barcelona)

The World's 10 Most Deadly Minerals

Precious minerals make the modern world go 'round—they're used in everything from circuit boards to tableware. They're also some of the most toxic materials known to science, and excavating them has proved so dangerous over the years, some have been phased out of industrial production altogether. Listed below are the 10 most deadly minerals on earth. These rocks do not need to be thrown to hurt you!!

Chalcanthite - $CuSO_4·5H_2O$

Natural Chalcanthite from Planet Mine, Buckskin Mts, La Paz Co., Arizona, USA

Chalcanthite is a hydrated water-soluble copper sulfate. The mineral is used to ore copper, however it's necessary to keep the environment dry as the mineral can easily dissolve and recrystallize in a wet environment. It is water soluble and will crystallise out again from solution. The copper in this mineral is very bio-available and is toxic to plants and in high quantities toxic to humans.

Stibnite - Sb_2S_3

Stibnite is a toxic antimony sulfide mineral with an orthorhombic crystal lattice and a source of metalloid antimony. Stibnite paste has been used for thousands of years for cosmetics to darken eyebrows and lashes. The mineral was also used to make eating utensils, causing poisoning from antimony ingestion.

Stibnite and Calcite From Herja Mine, Chiuzbaia (Kisbanya), Baia Mare, Maramures Co., Romania.

Asbestos - $Mg_3Si_2O_5(OH)_4$

Asbestos

You have likely heard of the mineral asbestos and associate it with lung cancer. Asbestos is not one mineral but six defined separate minerals. Unlike the other minerals in the top 10 deadliest. This silicate mineral grows thin fibers crystals that can easily break off and form dust particles. And it was once widely used for a variety of commercial and industrial applications thanks to its strong, fire-resistant, and flexible nature—from ceiling tiles and roofing materials to flooring and thermal insulation. The fibers can cause lung cancer, mesothelioma, and asbestosis. 222

Torbernite - $Cu(UO_2)_2(PO_4)_2·8$ - 12 H_2O

Torbernite from Musonoi Mine, Congo

Torbernite is a dangerous mineral composed of hydrated green copper, phosphate, and uranyl. The mineral is often found in granites that contain uranium and is dangerous due to its radioactive nature. The mineral releases radon naturally and can cause lung cancer if exposure is long enough. This is one mineral you do not want on your display cabinet shelf.

Cinnabar – HgS

Cinnabar is a deep red mercury sulphide mineral that provides much of the world's elemental mercury. When oxidized, this element will produce methyl mercury and dimethyl mercury, two toxic compounds that cause irreparable harm to the nervous systems of children. It is deadly in small concentrations and can be absorbed through the respiratory tract, intestines, or skin.

Cinnabar from Wanshan mine, China. credit: Dakota Matrix Minerals

Galena - PbS

Galena From Denton Mine, Hardin Co., Illinois, United States.

Galena is one of the most abundant and widely distributed sulfide minerals. Galena is the principle ore of lead, and forms glistening silver cubes with almost unnaturally perfect shapes. Although lead is normally extremely flexible, the sulfur content of galena makes it extraordinarily brittle and reactive to chemical treatment. It's not as bad as mercury, which will kill you immediately outright, but lead doesn't get flushed out of your system. It accumulates over the years, eventually reaching toxic levels. Once that happens both you and your kids pay the price, as lead toxicity is carcinogenic to you and is teratogenic (causing severe birth defects) to your offspring.

Hutchinsonite - $(Tl,Pb)_2As_5S_9$

Hutchinsonite from Quiruvilca Mine, Peru

Hutchinsonite is a form of arsenic sulfide with thallium and lead that can be found in hydrothermal vents. Thallium salts are nearly tasteless and highly toxic and have been used in rat poison and insecticides. The thallium inclusion in this arsenic sulfide combines two extremely dangerous and deadly minerals. Exposure to this mineral can potentially lead to death.

Orpiment - As_2S_3

Orpiment from Twin Creeks mine, Humboldt Co., Nevada

Orpiment is another arsenic sulfide mineral with a stunning orange-yellow color. The mineral is found naturally in hydrothermal vents, hot springs, and fumaroles. Strangely, this mineral was once used medicinally in China despite its toxicity and in alchemy in search for a way to create gold. The arsenic, especially if it is allowed to oxidize, will lead to arsenic poisoning if handled incorrectly.

Riebeckite - $Na_2(Fe^{2+}{}_3Fe^{3+}{}_2)Si_8O_{22}(OH)_2$

Blue Asbestos (Crocidolite).

The finely fibrous variety, known as Crocidolite, usually originates from altered metamorphic rocks. It was once widely used for a variety of commercial and industrial applications thanks to its strong, fire-resistant, and flexible nature—from ceiling tiles and roofing materials to flooring and thermal insulation. The fibers can cause lung cancer, mesothelioma, and asbestosis.

Arsenopyrite – FeAsS

Arsenopyrite is an iron arsenic sulfide with a brilliant steel metallic color often found in hydrothermal vents and pegma-

Arsenopyrite

tites. The arsenic leads to a number of environmental and human damages and can sometimes be associated with gold deposits. Oxidation of arsenopyrite leads to soluble arsenic in water and subsequent acid mine drainage.

(http://www.geologyin.com/2015/01/killer-minerals-worlds-10-most-deadly.html#3cgE0Trh0ocEE2Qz.99)

cs ꝏ

Persian Gulf Bridge Construction Animation

Πολύ ενδιαφέρουσα ταινία κινουμένων σχεδίων για την σύνδεση της μεγαλύτερης νήσου του Περσικού / Αραβικού Κόλπου Qeshm με το ηπειρωτικό Ιράν με γέφυρα, μήκους 3,420 m: https://www.youtube.com/watch?v=eERltKG9_1c.

Animation Studio pooyanegar Tolou, Published on Sep 18, 2016

cs ꝏ

Επτά εντυπωσιακές θαλάσσιες σπηλιές για βουτιές στην Ελλάδα

Ονειρεμένα νερά με εντυπωσιακά χρώματα που μεταβάλλονται ανάλογα με τους ιριδισμούς του φωτός, ιδιόμορφοι γεωλογικοί σχηματισμοί και μια μυστηριακή ατμόσφαιρα συνθέτουν υπόγεια τοπία απίστευτης φυσικής ομορφιάς, για εσάς που αναζητάτε ξεχωριστές εμπειρίες που θα κάνουν τις διακοπές σας αξέχαστες.

Σας παρουσιάζουμε 7 μαγευτικές θαλάσσιες σπηλιές, για μυθικές βουτιές στα ελληνικά νησιά!

Γαλάζιες Σπηλιές **Ζάκυνθος**

Πολυφωτογραφημένες και ειδυλλιακές, οι περίφημες Γαλάζιες Σπηλιές είναι από τα μέρη που πρέπει να δει οπωσδήποτε κανείς στη Ζάκυνθο. Αποτελούνται από διαδοχικούς θαλάμους, τη Μεγάλη και τη Μικρή Σπηλιά, ενώ το νερό έχει ένα ιδιαίτερο βαθύ μπλε χρώμα. Το εντυπωσιακό είναι πως οτιδήποτε βρίσκεται κάτω από την επιφάνειά του νερού, ακόμα και τα βράχια του βυθού, παίρνει την ίδια απόχρωση, δημιουργώντας μια παραμυθένια αίσθηση στον επισκέπτη.

Σπήλαιο Παπανικολής **Λευκάδα**

Μόλις 12 ναυτικά μίλια ανατολικά από τη Λευκάδα, στο Μεγανήσι βρίσκεται το μεγαλύτερο – και από τα πιο εντυπωσιακά θαλάσσια σπήλαια παγκοσμίως- καθώς η είσοδος οδηγεί σε μια σήραγγα μήκους 120 και πλάτους 60 μέτρων που βαθμιαία στενεύει για να φτάσει τα 23 μέτρα. Λόγω του μεγάλου μεγέθους του προσφέρει απάνεμο καταφύγιο στα σκάφη όταν έχει κακοκαιρία ενώ, σύμφωνα με το μύθο, κατά τη διάρκεια του Β'ΠΠ χρησιμοποιήθηκε ως καταφύγιο και ορμητήριο του ομώνυμου υποβρυχίου. Καταγάλανα και διάφανα, τα νερά του σπηλαίου αποκαλύπτουν την σιωπηλή ομορφιά του βυθού ακόμη και με γυμνό μάτι, ενώ οι σταλακτίτες και η παραμυθένια αμμουδιά στο εσωτερικό ολοκληρώνουν το μαγευτικό σκηνικό.

Γράβες **Παξοί**

Γράβες, όπως λέμε θαλάσσια σπήλαια! Η δυτική πλευρά των Παξών, άγρια, απόκρημνη, με κατακόρυφους γκρεμούς σχηματίζει 40 εκπληκτικές γράβες σε εντυπωσιακούς βραχώδεις σχηματισμούς. Ανάμεσα τους, μεγαλύτερη είναι η σπηλιά της Υπαπαντής την οποία μπορείτε να εξερευνήσετε και με μικρό σκάφος, ενώ ξεχωρίζουν επίσης ο Τρυπητός, σχηματισμός βράχων με αψιδωτό σχήμα, ο Ορθόλιθος, κατακόρυφος βράχος καρφωμένος στα διάφανα νερά και το περίφημο Γαλάζιο

Σπήλαιο, μια συστάδα 3 σπηλαίων που επικοινωνούν μεταξύ τους.

Οι σπηλιές της Ναυσικάς **Κέρκυρα**

Μια από τις πιο τραγουδισμένες περιοχές της Κέρκυρας, η Παλαιοκαστρίτσα, περιτριγυρίζεται από ψηλά βράχια τα οποία σχηματίζουν μικρά θαλάσσια σπήλαια με κρυστάλλινα νερά. Το πιο γνωστό από αυτά έχει πάρει το όνομα του από τη Ναυσικά, κόρη του μυθικού βασιλιά των Φαιάκων, η οποία σύμφωνα με την Οδύσσεια περιέθαλψε εδώ τον Οδυσσέα. Οι ακτίνες του ήλιου που αντανακλώνται στους βράχους και ο ιδιαίτερος φωτισμός που μοιάζει να ξεπηδά από το βυθό, θα σας προκαλέσουν σε μυθικές βουτιές!

Κλέφτικο και Συκιά **Μήλος**

Ξακουστή για τους ιδιαίτερους γεωλογικούς σχηματισμούς, η Μήλος κρύβει από τα πιο εντυπωσιακά θαλάσσια σπήλαια σκορπισμένα στο πολύμορφό της ανάγλυφο. Το Κλέφτικο, το πιο φωτογραφημένο αξιοθέατο της Μήλου, είναι μια συστάδα θαλάσσιων σπηλαίων γύρω από έναν τεράστιο αψιδωτό βράχο που καρφώνεται στη θάλασσα και κάποτε αποτελούσε, πράγματι, λημέρι πειρατών. Εδώ σας περιμένουν απίθανες βουτιές και μαγευτικές εξερευνήσεις από σπηλιά σε σπηλιά! Στη θαλάσσια διαδρομή για το Κλέφτικο, θα συναντήσετε τη Συκιά, μια μεγάλη θαλάσσια σπηλιά παραμυθένιας ομορφιάς με έναν τεράστιο κρατήρα στην οροφή, στο βάθος της οποίας υπήρχε κάποτε μια συκιά. Κολυμπώντας στο εσωτερικό της ως την άλλη άκρη, θα φτάσετε σε μια λιλιπούτεια παραλία από πολύχρωμα βότσαλα.

Θαλασσινές Σπηλιές **Κουφονήσια**

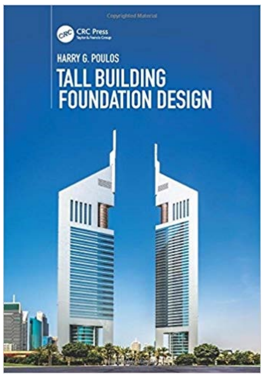
Στο Πάνω Κουφονήσι, πίσω από την παραλία Πορί και προσβάσιμες μόνο από τη θάλασσα, βρίσκονται οι θαλασσινές σπηλιές. Εδώ, τα απόκρημνα βράχια σχηματίζουν σπήλαια και μικρές παραλίες, που μπορούν να αποτελέσουν την προσωπική σας, φυσική πισίνα για αξέχαστες βουτιές!

Μελισσάνη **Κεφαλονιά**

Πρόκειται για ένα λιμνοσπήλαιο μοναδικής φυσικής ομορφιάς στην ανατολική πλευρά του νησιού, που δεν πρέπει να χάσετε αν βρεθείτε στην Κεφαλονιά! Κατεβείτε τα σκαλιά της εισόδου και αφήστε τους βαρκάρηδες να σας οδηγήσουν σε έναν μαγευτικό υπόγειο κόσμο, με καφετί-μελιά τοιχώματα διάστικτα από αμέτρητους σταλακτίτες. Το φως που εισέρχεται από την οροφή, καθώς αντανακλάται στα ήρεμα νερά της λίμνης δημιουργεί έναν μαγευτικό χρωματικό καμβά σε όλες τις πιθανές αποχρώσεις του μπλε. Δυστυχώς, λόγω της ιδιαιτερότητας της μορφολογίας του σπηλαίου, το κολύμπι δεν επιτρέπεται αλλά η ομορφιά του θα σας ανταμείψει.

(Παρασκευή 8 Ιουνίου 2018, https://www.reader.gr/life/travel/taxidiotikes-protaseis/256754/7-mageytikes-thalassies-spilies-gia-makrovoytia)

ΝΕΕΣ ΕΚΔΟΣΕΙΣ ΣΤΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΠΙΣΤΗΜΕΣ



Tall Building Foundation Design 1st Edition

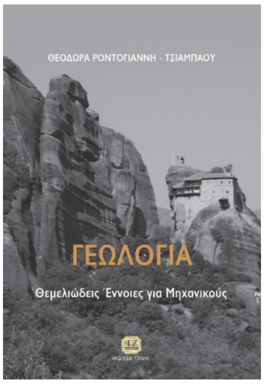
Harry G. Poulos

This book provides a comprehensive guide to the design of foundations for tall buildings.

After a general review of the characteristics of tall buildings, various foundation options are discussed followed by the general principles of foundation design as applied to tall buildings. Considerable attention is paid to the methods of assessment of the geotechnical design parameters, as this is a critical component of the design process. A detailed treatment is then given to foundation design for various conditions, including ultimate stability, serviceability, ground movements, dynamic loadings and seismic loadings. Basement wall design is also addressed. The last part of the book deals with pile load testing and foundation performance measurement, and finally, the description of a number of case histories.

A feature of the book is the emphasis it places on the various stages of foundation design: preliminary, detailed and final, and the presentation of a number of relevant methods of design associated with each stage.

(CRC Press, 2017)



ΓΕΩΛΟΓΙΑ
Θεμελιώδεις Έννοιες για Μηχανικούς

Θεοδώρα Ροντογιάννη – Τσιαμπάου (*)

Το βιβλίο αναφέρεται στις βασικές γεωλογικές έννοιες και στις διεργασίες που διαμορφώνουν την επιφάνεια της γης και συμβάλλουν στην εξέλιξή της. Περιλαμβάνει στοιχεία για τη δομή της γης, τις ιδιότητές της, τον γεωλογικό χρόνο, τα επιφανειακά και υπόγεια νερά, τα είδη των πετρωμάτων, τις κινήσει και παραμορφώσεις του στερεού φλοιού της γης, τα ηφαίστεια, τα ενεργά ρήγματα και τους σεισμούς. Πραγματεύεται, δηλαδή, συνοπτικά τους εξωγενείς και ενδογενείς παράγοντες που επηρεάζουν τον πλανήτη μας, των οποίων η συνδυαστική δράση δίνει την εικόνα της γης σε κάθε στιγμή της μακρόχρονης ιστορίας της. Δίνει, επίσης, στοιχεία για τη γεωλογική δομή της Ελλάδας και τη γεωδυναμική της εξέλιξη, ενώ, τέλος, αναφέρεται και στους γεωλογικούς χάρτες, οι οποίοι δίνουν την πιο συμπυκνωμένη πληροφόρηση για τη γεωλογική δομή μιας περιοχής. Επικεντρώνεται στα στοιχεία εκείνα της Γεωλογίας που αφορούν στην αλληλεπίδραση της Γης με τις δραστηριότητες και τα έργα του ανθρώπου, στα οφέλη από αυτή, αλλά και στους γεωλογικούς κινδύνους, θέματα δηλαδή που ενδιαφέρουν ιδιαίτερα τους μηχανικούς.

Απευθύνεται στους φοιτητές των Πολυτεχνικών Σχολών, αλλά και σε φοιτητές άλλων Σχολών που το αντικείμενο των σπουδών τους άπτεται των Γεωεπιστημών. Αποτελεί, επίσης, χρήσιμο βοήθημα για κάθε μηχανικό που θέλει να γίνει κοινωνός των γεωλογικών αρχών και διεργασιών και να γνωρίσει τη γεωλογική δομή και τη γεωδυναμική της χώρας μας.

(*) Η Θεοδώρα Ροντογιάννη – Τσιαμπάου είναι Καθηγήτρια στη Σχολή Μηχανικών Μεταλλείων – Μεταλλουργών του Εθνικού Μετσοβίου Πολυτεχνείου, με ειδικότητα στη Γεωλογική Χαρτογράφηση και στη Νεοτεκτονική – Σεισμοτεκτονική.

(Εκδόσεις ΤΖΙΟΛΑ, 2018)

Handbook - Soil mix walls: Design and execution

1st Edition

Nicolas Denies, Noël Huybrechts

For several decades now, the deep mixing method has been used for ground improvement works.

A more recent application is the use of soil mix as structural elements for the construction of earth-water retaining structures and cut-off walls. Since 2000, due to the economic and environmental advantages of the method, these particular applications have shown an amazing growth. Nevertheless, in practice, no pragmatic standards or guidelines were available for the design, the execution, the quality control and the maintenance of this kind of applications. This is the reason why the present publication was initiated.

The **Handbook - Soil mix walls** is based on existing literature and the knowledge and experiences of committee members, and includes an extensive description of the design and execution processes.

It also establishes the link between the conditions of use (functional requirements), the design and the quality control of the final soil mix structure that is especially important in the construction of soil mix walls.

Based on a large test campaign, a methodology is proposed for the design of the soil mix walls for which the interaction between steel and soil mix can possibly be taken into account dependent upon the application. Each potential function of the soil mix wall is described (e.g. earth retaining wall, cut-off wall, bearing capacity, etc.) and the temporary or permanent character of the application (its lifetime) is always considered. Furthermore, the design methodology presented in this handbook is in agreement with the Eurocodes.

The **Handbook - Soil mix walls** also includes aspects such as the hydromechanical characterisation and the durability of the soil mix material, the interaction between steel and soil mix and the monitoring and quality control of soil mix structures. The purpose of this publication is to contribute to the realisation of soil mix walls of high quality and to minimise the risk of calamities or damage.

This manual has been drawn up under the responsibility of a joint committee of SBRCURnet (the Netherlands) and the Belgian Building Research Institute (BBRI, Belgium). There is a certain difference in the design approach between Belgium and the Netherlands. These differences are also discussed in this handbook.

(CRC Press, Published July 13, 2018)

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ

https://www.issmge.org/filemanager/article/587/ISSMGE_BULLETIN_2018_OCT_FINAL.pdf

Κυκλοφόρησε το Τεύχος No. 5, του Τόμου 12 (Οκτωβρίου 2018) του Newsletter της International Society for Soil Mechanics and Geotechnical Engineering με τα παρακάτω περιεχόμενα:

President's message

Young Member Arena

Conference report

- The 7th International Conference on Unsaturated Soils (UNSAT2018), Hong Kong
- The 9th International Conference in Physical Modelling in Geotechnics (ICPMG2018), London, UK
- The 26th European Young Geotechnical Engineers Conference, Reinischkogel, Austria
- The international geotechnical seminar for Megacities and New capitals, Kazakhstan

Hot news

- Handbook – Soil mix walls
- The 1st International Symposium on Debris flow mechanisms and mitigation for sustainable development, Hong Kong

Obituary - Prof. Abdul-Kareem Ismet Zainel

ISSMGE Foundation reports

Event Diary

Corporate Associates

Foundation Donors

www.icevirtuallibrary.com/toc/jgein/25/5

Κυκλοφόρησε το Τεύχος 5 του Τόμου 25 (Οκτωβρίου 2108) του Geosynthetics International της International Geosynthetics Society με τα παρακάτω περιεχόμενα:

Comparison of three inclusions in reducing lateral swelling pressure of expansive soils, L.-L. Wan, W.-L. Zou, X.-Q. Wang, Z. Han, 25(5), pp. 481–493

Numerical study of earth pressures on rigid pipes with tire-derived aggregate inclusions, P. Ni, X. Qin, Y. Yi, 25(5), pp. 494–506

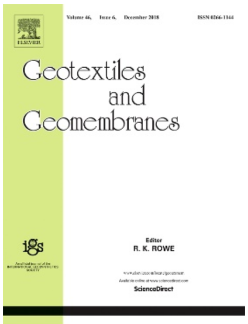
Design and consolidation analysis of geotextile tubes for the Saemangeum project in Korea, H. J. Kim, T. W. Park, P. R. Dinoy, H. S. Kim, H. J. Kim, 25(5), pp. 507–524

17-year elevated temperature study of HDPE geomembrane longevity in air, water and leachate, A. M. R. Ewais, R. K. Rowe, S. Rimal, H. P. Sangam, 25(5), pp. 525–544

Field monitoring and numerical modeling of 4.4 m-high mechanically stabilized earth wall, M. A. Salem, M. A. Hammad, M. I. Amer, 25(5), pp. 545–559

Announcements

Best *Geosynthetics International* Paper for 2017, R. J. Bathurst, 25(5), pp. 560



www.sciencedirect.com/journal/geotextiles-and-geomembranes/vol/46/issue/5

Κυκλοφόρησε το Τεύχος 5 του Τόμου 46 (Οκτωβρίου 2108) του Geotextiles and Geomembranes της International Geosynthetics Society με τα παρακάτω περιεχόμενα:

Life cycle assessment of a geosynthetic-reinforced soil bridge system – A case study, Karmen Fifer Bizjak, Stanislav Lenart, Pages 543-558

Exploring the effects of geotextiles in the performance of highway filter drains, L.A. Sañudo-Fontaneda, S.J. Coupe, S.M. Charlesworth, E.G. Rowlands, Pages 559-565

Experimental evaluation of the effect of compaction near facing on the behavior of GRS walls, S.H. Mirmoradi, M. Ehrlich, Pages 566-574

Preloading using fill surcharge and prefabricated vertical drains for an airport, Jun Wang, Ziquan Fang, Yuanqiang Cai, Jinchun Chai, ... Xueyu Geng, Pages 575-585

Load-settlement response of shallow square footings on geogrid-reinforced sand under cyclic loading, Jia-Quan Wang, Liang-Liang Zhang, Jian-Feng Xue, Yi Tang, Pages 586-596

Geosynthetic-sheet pile reinforced foundation for mitigation of earthquake and tsunami induced damage of breakwater, Babloo Chaudhary, Hemanta Hazarika, Akira Murakami, Kazunori Fujisawa, Pages 597-610

Investigation of load transfer mechanisms in granular platforms reinforced by geosynthetics above cavities, Minh-Tuan Pham, Laurent Briançon, Daniel Dias, Abdelkader Abdelouhab, Pages 611-624

An observational method for consolidation analysis of the PVD-improved subsoil, Wei Guo, Jian Chu, Wen Nie, Pages 625-633

Numerical study on maximum reinforcement tensile forces in geosynthetic reinforced soil bridge abutments, Yewei Zheng, Patrick J. Fox, John S. McCartney, Pages 634-645

Stabilization of soft clay using short fibers and poly vinyl alcohol, Mehdi Mirzababaei, Arul Arulrajah, Suksun Horpibulsuk, Amin Soltani, Navid Khayat, Pages 646-655

Stress-controlled direct shear testing of geosynthetic clay liners I: Apparatus development, Shahin Ghazizadeh, Christopher A. Bareither, Pages 656-666

Stress-controlled direct shear testing of geosynthetic clay liners II: Assessment of shear behavior, Shahin Ghazizadeh, Christopher A. Bareither, Pages 667-677

Discussions

"Laboratory tests on the engineering properties of sensor-enabled geobelts (SEGB)" by Cui et al., Geotextiles and Geomembranes 46 (2018) 66–76, Hessam Yazdani, Kianoosh Hatami, Pages 678-680

"Laboratory tests on the engineering properties of sensor-enabled geobelts (SEGB)"- A reply to the discussion, Xinzhuang Cui, She-qiang Cui, Yi-lin Wang, Jun Li, Pages 681-683

☙ ❧

https://powow4.iroquois.fr/web_browser.php?p=YT0zMDU0MTA4ODtiPTQ0O2M9NDQ7ZD04MzU0MjQ7ZT0zMDYzMzUwMDtmPTE0MDQwOTU2O2g9

Κυκλοφόρησε το Τεύχος #29, Οκτωβρίου 2018, του Newsletter του ITACET με τα παρακάτω περιεχόμενα:

President's address

Editorial: Tunnelling: a pathway for the development of nations

Training session reports

- The Management of User Safety in Underground Railway Facilities
- Sharing Experience on the Construction of Long Tunnels at Great Depth
- Main opportunities and technical issues in tunneling

Forthcoming sessions

- Tunnelling 4.0 - WTC2019 - Naples - May 2019
- Communication - WTC2019 - Naples - May 2019

Other events in preparation

- Nigeria - **"Introduction to tunnelling – From design to construction"** - March 2019
- Kenya - **"Underground Space Use"** - date not yet fixed
- Nepal - **"Operation and maintenance of hydro tunnels"** - date not yet fixed
- India- **"Structural use of fibre reinforced concrete in precast segments"** - date not yet fixed
- Malaysia - **"Education and training"** - date not yet fixed
- Mexico - date not yet fixed

Foundation scholarship recipients

- A Rewarding Year

Other news

- Prof. Dr.-Ing. Alfred Haack Honoured With Itacet Award 2018
- The GDPR – the General Data Protection Regulation
- The Itacet Foundation 'Private Area'

ΕΚΤΕΛΕΣΤΙΚΗ ΕΠΙΤΡΟΠΗ ΕΕΕΕΓΜ (2015 – 2018)

ΕΕΕΕΓΜ
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