



Γεράκι Λακωνίας

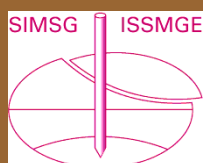


ΕΛΛΗΝΙΚΗ
ΕΠΙΣΤΗΜΟΝΙΚΗ
ΕΤΑΙΡΕΙΑ
ΕΔΑΦΟΜΗΧΑΝΙΚΗΣ
& ΓΕΩΤΕΧΝΙΚΗΣ
ΜΗΧΑΝΙΚΗΣ

Τα Νέα της Ε Ε Ε Ε Γ Μ

176

Αρ. 176 – ΙΟΥΝΙΟΣ 2023



Αγία Θεοδώρα – Βάστα Αρκαδίας

ISSN: 2732-7248

Π Ε Ρ Ι Ε Χ Ο Μ Ε Ν Α

Άρθρα	4	ACUUS 2023: ITA President as one of the six keynote speakers 27 June 2023	29
- Γεώτοπος - νήσος Λήμνος	4	Scooped by ITA-AITES #94, 13 June 2023	29
- Limitations of Simplified Methods for Evaluating Liquefaction, Settlement and Lateral Spreading in Earthquakes	5	Scooped by ITA-AITES #95, 27 June 2023	29
- Effect of the Physical Characteristics of Sands on the Undrained Shear Behavior in the Steady State	10	- British Tunnelling Society	29
- What Geotechnical Engineers Want to Know about Reliability	11	Design of Watertight Structures - Can we rely on the self-healing of cracks in Concrete?	29
- Beneath our feet: conservation and empowerment of Europe's underground heritage	12	British Tunnelling Society Young Members	30
- Η Ελλάδα στον χάρτη της ανθρώπινης εξέλιξης - Μυστικά 700.000 ετών στη Μεγαλόπολη	15	Road Tunnel Operation	30
Συνεχής η ανθρώπινη παρουσία, η Ελλάδα δεν ήταν ένα πέρασμα	16	- International Geosynthetics Society	30
Παλαιολιθικά οστά ελεφάντων και ρινόκερων ανακαλύφθηκαν στο λιγνιτωρυχείο της Μεγαλόπολης	17	Calculating and limiting geomembrane strain	30
- Τσιμέντο και νερό βουλιάζουν τις πόλεις - Οι περιοχές στην Ελλάδα που απειλούνται	19	News	31
Νέα από τις Ελληνικές και Διεθνείς Γεωτεχνικές Ενώσεις	21	- Associazione Geotecnica Italiana	32
- Ελληνική Επιστημονική Επιτροπή Εδαφομηχανικής και Γεωτεχνικής Μηχανικής	21	Prof. Michele Jamiolkowski	31
The 8th International Conference on Unsaturated Soils "Towards Unsaturated Soils Engineering" Milos, Greece	21	- Διακρίσεις Ελλήνων Γεωτεχνικών Μηχανικών	33
Διάλεξη Καθηγητή Arvin Farad	25	Χάιδω (Γιούλη) Δουλαλα-Rigby Αντιπρόεδρος της British Geotechnical Association	33
- International Society for Soil Mechanics and Geotechnical Engineering	25	Λίζα Μπενσασσών Αντιπρόεδρος (Ευρωπαϊκή Ζώνη) της ICOLD-CIGB	33
ISSMGE News & Information Circular October 2021	25	Προσεχείς Γεωτεχνικές Εκδηλώσεις:	34
Teaching material samples for Environmental Geotechnics: The collection is growing!	26	- ICTUS23 - The 2023 International Conference on Tunnels and Underground Spaces	34
Announcing the grand opening of the ISSMGE IDEA Zone: We want to hear from you!	26	- Underground Singapore 2023	34
Education of the next generation of geotechnical professionals in ANZ	26	- Underground Built Heritage as Catalyser for Community Valorisation	35
Proceedings of the 9th International Congress on Environmental Geotechnics released in open access through the ISSMGE Online Library on the first day of the Congress	27	- InFUM - 1st International Symposium on Fiber Shotcrete for Underground Mining	35
New TC211 Webinar on "Concrete for Rigid Inclusions" by Dr. Martin Larisch	27	- XVIIth International Congress AFTES 2023	36
- International Society for Rock Mechanics and Rock Engineering	28	- 11 th International Symposium on Ground Freezing	37
News	28	- 4th International Tunnelling and Underground Space Conference- Lagos, 2023	38
42nd ISRM Online Lecture by Professor Antonio Bobet is now online! 2023-06-22	28	- Tunnelling Asia 2023	38
Deadline for abstract submission to Eurock 2024 in Alicante, Spain, extended to 31 July 2023-06-23	28	- IEMTA Southeast Asian Conference and Exhibition on Tunnelling and Underground Space 2024 (SEACE-TUS2024)	38
15th International ISRM Congress, Salzburg, Austria - early bird registration fee until 10.07.2023 2023-06-25	28	- GeoShanghai 2024	39
ISRM International Symposium 2024 and ARMS13, 22-27 September 2024, New Delhi, India - abstracts sub-mission deadline is 31 August 2023-06-25	28	- 2nd annual Conference on Foundation Decarbonization and Re-use	40
- International Tunnelling Association	28	- NGM 2024 19 th Nordic Geotechnical Meeting	41
NEWS - ITA ACTIVITIES	28	- ISRM International Symposium 2024 & 13 th Asian Rock Mechanics Symposium (ARMS12)	42
ITACET Lunchtime Lecture Series #27 21 June 2023	28	- World Tunnel Congress 2025	43
NGS 2023 - 10th Nordic Grouting Symposium: Stockholm, Sweden 22 June 2023	28	Ενδιαφέροντα Γεωτεχνικά Νέα	45
		- The fathers of soil mechanics	45
		- The causes of the 30 December 2020 Gjerdrum landslide in Norway	45
		- World's largest earthquake early warning system announced in China	46
		- Millennium Tower: Engineer says \$100 million fix has improved S.F. building's famous lean	46
		- 200 new geotechnical investigation and design software added to DCodes	47
		Ενδιαφέροντα - Σεισμοί & Αντισεισμική Μηχανική	48
		- Artificial Intelligence and Human-Induced Seismicity: Initial Observations of ChatGPT	48
		- AI could help refine tsunami early warning systems	48
		- Landslide Induced Tsunami Hazard at Volcanoes: the Case of Santorini	50
		Ενδιαφέροντα - Γεωλογία	51

- Is Africa splitting into two continents?	51
- Παναφρικανική ορογένεια	52
Ενδιαφέροντα – Περιβάλλον	53
- Οι πέντε περιοχές στην Ελλάδα που κινδυνεύουν με «καταβύθιση»	53
- Climate change causes a mountain peak frozen for thousands of years to collapse	54
- Part of the Thames Tideway Tunnel turned into “Loo Gardens”	55
Ενδιαφέροντα - Λοιπά	57
- Metro Tunnel trials recycled glass in concrete	57
Ηλεκτρονικά Περιοδικά	58

Γεώτοπος - νήσος Λήμνος

Τον Οκτώβριο 2022, επισκέφτηκα τη νήσο Λήμνο με το μικρό μου γιό. Είχε για το σχολείο μια άσκηση για κάποιο γεώτοπο και το συνδύασα με την επίσκεψη που είχα να κάνω στο νησί.



Πραγματικά είναι ένα καταπληκτικό νησί, με πολύ ενδιαφέρουσα γεωλογία. Εύκολα μπορεί κανείς να αναζητήσει στο διαδίκτυο πληροφορίες και βιβλιογραφία.



Τα ηφαιστειακά, εναλλάσσονται με τη γεωλογική ιστορία και τη μυθολογία σχετικά με τον Ήφαιστο.



Σου στέλνω ορισμένες φωτογραφίες από την επίσκεψη στο γεωλογικό πάρκο Φαρακλού, στο βόρειο τμήμα του νησιού.



Ηφαιστειακά υλικά, ενώθηκαν με τους ψαμμίτες και με την αύρα της θάλασσας.



Αποστόλης Ρίτσος, 12 Ιουνίου 2023

Limitations of Simplified Methods for Evaluating Liquefaction, Settlement and Lateral Spreading in Earthquakes

Robert Pyke Ph.D., G.E.

The first step in any evaluation of liquefaction and its consequences should be studies of the regional geology and seismicity, and answering the question "is there any evidence of earthquake-induced liquefaction and settlement or lateral spreading of similar soils in a similar tectonic environment? See Pyke (1995, 2003, 2015) and Semple (2013). While there are rare instances of liquefaction being reported in Pleistocene age sands, the vast majority of well-documented case histories have occurred in geologically recent cohesionless soils and man-made fills, particularly hydraulically placed fills.

The widespread belief that "one has to show a calculation" tends not to promote better geotechnical engineering practice but rather worse practice. A good screening analysis should emphasize common sense and experience. For example, it did not require any analyses to conclude that the Marina District in San Francisco was susceptible to liquefaction prior to the 1989 Loma Prieta earthquake, or that the areas with recent alluvium along the Avon River in Christchurch NZ were susceptible to liquefaction prior to the 2010-11 Christchurch earthquakes.

In conducting simplified analyses, all soil layers that have "clayey" descriptors should be tested as necessary to confirm that description and should be excluded. Also, soils that are older than several thousand years or are known to be over-consolidated should be excluded. See for instance Arango et al. (2000). Sand "layers" seen in individual borings or soundings that are shown to be discontinuous by adjacent borings or soundings should also be excluded. See Pyke (1995) for further discussion of this point. Layers with a measured shear wave velocity exceeding 720 fps should also be excluded. See Andrus et al. (2009). And, if measured shear wave velocities are not available, layers that would be otherwise characterized as "dense" or "very dense" should also be excluded. Layers that are characterized as "dense" may still be susceptible to excess pore pressure development under strong shaking, but few if any adverse consequences of liquefaction have been observed when the normalized clean sand SPT blow-count exceeds 15. See for instance Ishihara (1993), Youd et al. (2002). Finally, a clayey or otherwise non-liquefiable crust overlying a potentially liquefiable layer will limit any adverse consequences of liquefaction. See for instance Ishihara (1985) and Youd and Garris (1995). While lateral spreads triggered by liquefaction of layers under a crust as thick as 10 m are not totally unknown, they are limited to very large earthquakes such as have occurred off the coasts of Alaska, Chile and Japan.

This technical note only addresses liquefaction, settlement and lateral spreading in earthquakes under a horizontal or gently sloping ground surface. Simplified procedures for estimating displacements of steep slopes also have shortcomings, but these are not addressed in this note.

More specifically the following seven factors limit the accuracy of simplified methods of analysis and tend to make the results very conservative:

1. The "cyclic stress ratio" computed working backwards from the peak ground surface acceleration is invariably much greater than that computed using a nonlinear effective stress site response analysis which takes into account the specific layering and properties of the site. Pyke (2019) and Crawford et al. (2019) show examples of the comparison of the cyclic stress ratios computed using the simplified and more accu-

rate methods and found that the cyclic stress ratio computed using site response analyses can be as low as one half that computed using the simplified method. This reduction also results from the fact that triggering of liquefaction in one layer reduces the amplitudes of the ground motion above that layer.

2. The correction of penetration resistance measured using either the SPT or the CPT for fines content is generally inadequate. Fines, and especially clayey fines, can dramatically reduce the penetration resistance while improving the behavior under cyclic loadings.

3. The correction of penetration resistance measured using either the SPT or the CPT for "thin layer" and "transition" effects is also generally inadequate. Recent work by Boulanger and DeJong (2018) and Yost et al. (2021) provides some guidance on these effects, but they are rarely accounted for in practice.

4. Penetration resistance also does not fully reflect the effect of aging, including pre-straining, and over-consolidation on improving the soil response to cyclic loading.

5. There is growing evidence that the cyclic stress ratios that trigger liquefaction in a given number of cycles that are obtained as a function of the penetration resistance from the standard charts that are used in simplified methods may be overly conservative. See for instance Stokoe (2023), whose team conducted relatively well-controlled studies of silty sands following the earthquakes in Christchurch NZ. By comparison, the case histories on which the standard curves are based are not so well documented.

6. There is also a growing consensus that the occurrence of liquefaction can only be understood by conducting nonlinear effective stress analyses in which excess pore pressure development and dissipation is tracked. See Ntritsos et al. (2018), Cubrinovski (2019), Hutabarat and Bray (2019), Kramer (2019), Olson et al. (2020) and Cubrinovski and Ntritsos (2023). It further turns out that such analyses, which account for the re-distribution and dissipation of excess pore pressures, are needed to properly understand the case histories on which the simplified, empirical methods are based.

7. Analyses based on a single boring or CPT may include what are logged as "layers" but are in fact lenses or portions of a sinuous backfilled channel. Such lenses or segments of a channel cannot respond to earthquake ground motions independently as is assumed in simplified analyses or even in standard one-dimensional site response analyses. If such "layers" do tend to develop excess pore pressures, they become "soft inclusions" and the shear strains and hence the shear stresses are controlled by the response of the surrounding materials (again, see Pyke (1995)).

The last of the issues listed above can now be simulated in my own site response analysis program, TESS2, by applying the displacement histories generated by running the site response calculation representing the site as a whole to a column that includes the potentially liquefiable "layer". This level of effort is not justified for all projects as knowledge of the depositional environment and common-sense should be sufficient on most projects, but where regulators require a "calculation", it is now possible to provide a meaningful calculation.

I might never have finished writing this note were I to spell out all the particular limitations of individual simplified methods of analysis, and you would never read them, but I will just note that there are many of them and it is not easy for practicing engineers to be fully cognizant of them or to evaluate their impact on any given analysis. These limitations include the applicability of correlations of properties to pene-

tration resistance measured in calibration chamber tests on “baby” sands, that is freshly placed, clean washed sands, and other correlations involving the shear modulus and penetration resistance. It is important that practicing engineers understand that not everything that is published in a journal is correct for every situation, and that some methods of simplified analysis may never be correct!

Simplified methods for estimating settlements caused by earthquake loadings are particularly bad. For sands above the water table, this results in part from the use of inappropriate laboratory test results. Neither Harry Seed nor I thought that settlements of non-saturated sands was a major problem, but I nonetheless completed my Ph.D. thesis on this subject for other reasons, including achieving a better general understanding of the behavior of sands under cyclic loadings, as explained in Pyke (2022). For sands below the water table, this excessive conservatism results not only from the use of Ishihara and Yoshimine (1992), which was later noted by Ishihara et al. (2016) to be conservative, but even more because simplified analyses often suggest that a great depth of sand may reach the point of initial liquefaction and trigger larger settlements on reconsolidation, whereas a nonlinear effective stress analysis will indicate a much more limited depth of liquefaction. See Crawford et al (2019) and Pyke (2020) for further observations.

The relationships for lateral spreading developed by Les Youd and his colleagues - Bartlett and Youd (1995) and Youd et al. (2002) are the best of the simplified methods, if applied with respect for the geology of the site as illustrated in Youd (2018). But even so, there is quite large scatter in the empirical data and a more advanced analysis, such as is described in Pyke (2019b), may be justified on more critical or high value projects. The method of Zhang et al. (2004) makes no sense at all as it relies on a correlation between cyclic strains in tests conducted without initial shear stresses and permanent strains developed in the field where there are initial shear stresses, and it should not be used.

It is for all these reasons that Dr. Peter Robertson, the technical advisor to the developer of the program C-LIQ, has suggested to me that C-LIQ should be used primarily as a screening tool and should not be used to obtain the final answer on “high value” projects.

A good example of the limitations of simplified analyses of liquefaction and its effects is provided by Jon Bray in his 2022 Seed Lecture. Much of that lecture is based on studies conducted in Christchurch, New Zealand, following the 2010 and 2011 earthquakes. Most of those studies were conducted along the Avon River whose floodplain is underlain by recent alluvial deposits. While of some academic interest, those studies did not add a great deal of practical value because many of these alluvial deposits were clear examples of soils that would be susceptible to liquefaction in even moderate earthquakes. However, there were some sites that showed no surface manifestations of liquefaction, and in particular no ejecta.

The sites that did show surface effects of liquefaction, which are shown in red, were found to contain thick deposits of clean sands that had a typical I_c , the soil behavior index obtained from cone penetration tests, of consistently less than 1.8. The sites that did not show surface effects of liquefaction, shown in blue, may have contained some cleaner sand layers but were generally finer grained and typically had I_c values greater than 1.8. The CPT traces in blue in the above figure were obtained on sites which showed no surface effects or ejecta. As Professor Bray correctly says in his lecture, it all goes back to geology. The sites that generally had I_c values greater than 1.8 had been deposited in back-water swamps. While these soils were often characterized as silty sands, they

in fact tended to have clean sand layers separated by silt or even clay layers. For some years I have advised clients that they should not rely on simplified analyses if the values of I_c generally exceed 2.05, the generally accepted upper limit for clean sands (see Pyke and North (2019)). This does not necessarily mean that there is no problem, but it does mean that you should not automatically accept the results of simplified analyses and that more detailed site investigations, and more advanced analyses, are called for on high-value or critical projects. Further support for Bray’s limiting value of I_c of 1.8 for classic liquefaction with surface effects was provided by Robertson and Wride (1998) who found that the need to correct penetration resistances to “clean sand” values started at an I_c value of 1.7, and by the case history described by Boulanger et al. (2016), so that applying a limit on I_c of 2.05 in simplified analyses may be too conservative.

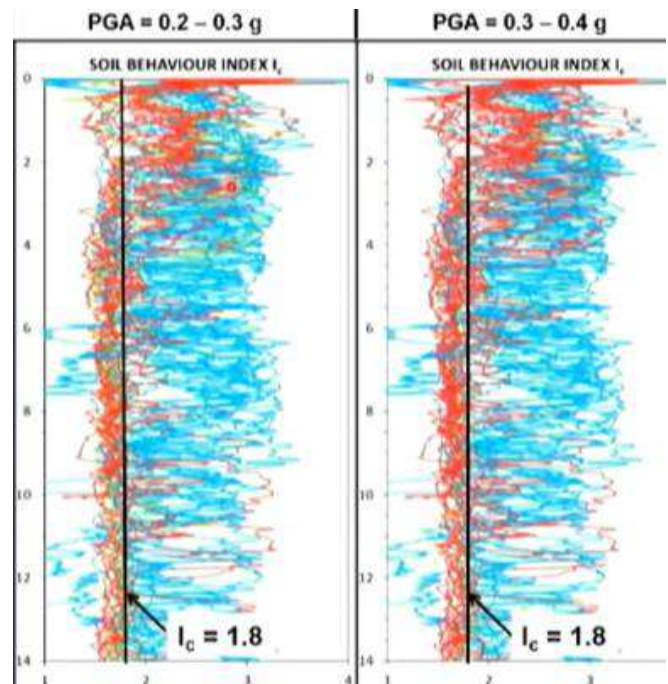


Figure 1 – From Bray (2022)

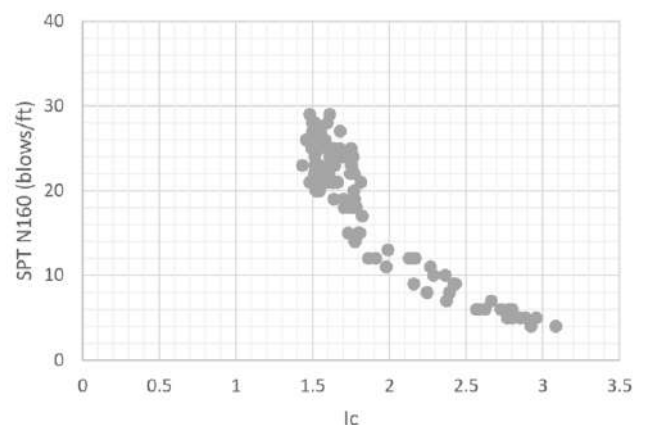


Figure 2 – Sensitivity of SPT Blowcounts to I_c

Figure 2 shows a typical pattern of SPT blowcounts interpreted from the results of CPTs in the San Francisco Bay Area where the Bayshore deposits typically result from over-lapping alluvial fans with occasional creek and levee deposits cutting through them. This results in lenses or pockets of cleaner sands within layers of more silty and clayey materials that are not continuous over a wide area. Such deposits have

not exhibited historic liquefaction, but simplified methods often predict liquefaction and significant seismic settlements.

The figure shows that below an I_c value of about 1.8 the interpreted SPT blowcounts are between about 15 and 30. These materials, which are cleaner sands, may develop some excess pore pressures under cyclic loading but are most unlikely to produce consequences of engineering significance – as noted previously, engineering consequences are unlikely above a clean sand blowcount of 15. Beyond I_c values of about 1.8, the interpreted SPT blowcounts fall off as a function of the I_c value but this reflects increasing fines content and lower penetration resistance rather than increased susceptibility to adverse performance under cyclic loadings.

Additional factors that should be considered, even in screening analyses, include greater emphasis on the method of deposition, and the significance of complete saturation. The method of deposition is critical for both natural and man-made deposits. As illustrated in Pyke (1973) and in basic texts on sedimentary geology, a denser rain of particles leads to looser packing and lower densities. Conversely a less dense rain of particles leads to tighter packing. Some of the effects of this are reflected in penetration resistance, but not all of the effects. The impact of the method of deposition can be seen for instance in the difference in the behavior of older hydraulic fills, which were largely dumped, or otherwise deposited with a dense rain of particles, compared with newer hydraulically placed fills in which the placement is more distributed and there is some compactive effort applied by spreading and grading operations using heavy equipment. See Pyke et al. (1978) for an example. Also, it should not be assumed that sands below the current water table are “fully saturated”. In the laboratory it takes quite high back pressures to obtain a B factor approaching 1.0. This can easily be checked in the field by measuring the compression wave velocity – see Stokoe (2023) for an example. And see Banister et al. (1976) for an example where simplified analyses had predicted liquefaction in a large-scale field experiment, but liquefaction did not occur. This was attributed in part at least to seasonal fluctuations in the water table and the need for longer-term saturation, ideally with some flow of water, to obtain complete saturation.

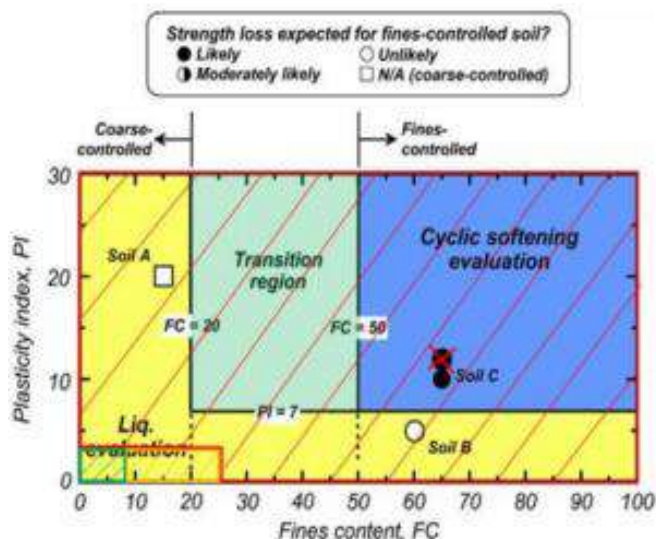


Figure 3 – From Gingery (2022)

Finally, it should be noted that the academic criteria for delineating soils that are susceptible to liquefaction are likely very conservative. These criteria define soils that might develop significant excess pore pressures under the worse conditions such as those under buildings constructed on shallow foundations on loose sands or silts with a high water table,

when rocking of the building can add to the cyclic shear stresses and strains in the soil. Figure 3 was sent to me by Jim Gingery of Keller North America in response to a question that I asked during his recent presentation to CalGeo.

Jim’s accompanying text said: “There is a domain of soil types that are liquefiable but not densifiable. This is generally non-plastic to low-plasticity silty sands and sandy silts. I tried to illustrate this in the figure above from Armstrong and Malvick (2016) by overlaying zones of compactable (green hatch - small rectangle in bottom left-hand corner), marginal (orange hatch - longer rectangle in bottom left-hand corner) and not compactable (red hatch). The figure’s proportions make it look like the domain for compactable and marginally compactable liquefiable soils is small, but there are plenty of such soils.” Jim’s statement that there are soils that are liquefiable but not densifiable, is likely correct in a general sense, but it might be more correct to say that such soils can still develop some excess-pore pressures and show “cyclic mobility”, but they are unlikely to exhibit significant consequences of this behavior unless, for instance, they are under buildings with shallow or no foundations, or are adjacent to large diameter piles of piers, which apply additional cyclic shear stresses and strains to the underlying or adjacent soils.

Concluding Remarks

When I was a graduate student in the early nineteen-seventies it was possible to read essentially all the relevant published papers on any topic of interest, but that is impossible for practicing engineers today. Further, the published papers are largely by academics who have to publish or perish. And both research funding and publication processes tend to favor new findings and problems, rather than consolidation of existing knowledge and focusing on practical engineering solutions. For example, the big lesson from the Niigata and Kocaeli earthquakes is not so much the details of the liquefaction processes that were involved, but that it is not a good idea to construct apartment blocks with shallow foundations on loose sands or silts when there is a high water table! But in this note I have tried to pull together some important findings that come out of both research papers and observations of performance in earthquakes over a period of 50 years.

These can be broadly summarized as follows:

- It’s the geology stupid! Or, more specifically, the method of deposition. Don’t forget to ask: “is there any evidence of earthquake-induced liquefaction and settlement or lateral spreading of similar soils in a similar tectonic environment?”
- The simplified methods for evaluation liquefaction, settlement and lateral spreading are at best screening tools. No responsible engineer should use any of the simplified methods for evaluating liquefaction or settlement unless they are familiar with each step in the procedure, the limits of applicability of that step and whether the site in question fits within the limits of the overall applicability of the method.
- More detailed site investigations and more advanced analyses are called for on high-value or critical projects.

References

- Andrus, R.D., Hayati, H. and Mohanan, N.P., “Correcting Liquefaction Resistance for Aged Sands Using Measured to Estimated Velocity Ratio”, *Journal of Geotechnical and Geoenvironmental Engineering*, ASCE, Vol 135, No 6, pp 735-744, 2009
- Andrus, R.D., Stokoe, K.H., and Juang, C.H., “Guide for Shear-Wave Based Liquefaction Potential Evaluation”, *Earthquake Spectra*, Vol. 20, No. 2, May 2004

Arango, I., Lewis, M.R. and Kramer, C., "Updated Liquefaction Potential Analysis Eliminates Foundation Retrofitting at Two Critical Structures", Soil Dynamics and Earthquake Engineering, Vol 20, pp 17-25, 2000

Armstrong, R.J., and Malvick, E.J., "Practical Considerations in the Use of Liquefaction Susceptibility Criteria", Earthquake Spectra, Vol. 32, No. 3, August 2016

Banister, J.R., Pyke, R., Ellet, D.M., and Winters, L., "In-situ Pore Pressure Measurements at Rio Blanco," Journal of the Geotechnical Engineering Division, ASCE, Volume 102, No. GT10, October 1976

[Bartlett, S. F., and Youd, T. L., "Empirical prediction of liquefaction-induced lateral spread", Journal of Geotechnical Engineering, ASCE, Vol. 121, No. 4, 1995](#)

Bwambale, B., and Andrus, R.D., "State of the art in the assessment of aging effects on soil liquefaction", Soil Dynamics and Earthquake Engineering, 125, 2019

Boulanger, R.W., and DeJong, J.T., "Inverse Filtering Procedure to Correct Cone Penetration Data for Thin Layer and Transition Effects" in Cone Penetration Testing 2018, CRC Press, 2018

Boulanger, R.W., et al., "Evaluating Liquefaction and Lateral Spreading in Interbedded Sand, Silt and Clay Deposits Using the Cone Penetrometer", Geotechnical and Geophysical Site Characterization 5, Australian Geomechanics Society, Sydney, Australia, 2016

Bray, J.D., "Evaluating the Effects of Liquefaction", [\(1049\) Geo-Congress 2022: H. Bolton Seed Lecture: Jonathan Bray - YouTube](#)

Crawford, C., Tootle, J., Pyke, R. and Reimer, M., "Comparison of simplified and more refined analyses of seismic settlements", Proc. 7th International Conference on Earthquake Geotechnical Engineering, Rome, June 2019

Cubrinovski, M., Keynote Lecture 09, "Key aspects in the engineering assessment of soil liquefaction", Proc. 7th International Conference on Earthquake Geotechnical Engineering, Rome, June 2019

Gingery, J., "Design Elements of Ground Improvement for Liquefaction Mitigation", Presentation to CalGeo, July 29, 2021

Ishihara, K., "Liquefaction and flow failure during earthquakes", Geotechnique, Vol.43, No. 3, 1993

Ishihara, K., "Stability of Natural Deposits During Earthquakes", Proceedings of the 11th International Conference on Soil Mechanics and Foundation Engineering, San Francisco, Vol. 1, pp 321-376, 1985

Ishihara, K., and Yoshimine, M., "Evaluation of Settlements in Sand Deposits Following Liquefaction During Earthquakes", Soils and Foundations, Vol.32, No.1, pp.173-188, March 1992

Ishihara, K., et al., "Post-liquefaction settlement analyses based on the volume change characteristics of undisturbed and reconstituted sands", Soils and Foundations, Vol. 56, No. 3, 2016

Hutabarat, D., and Bray, J.D., "Effective stress analysis of liquefiable site in Christchurch to discern the characteristics of sediment ejecta", Proc. 7th International Conference on Earthquake Geotechnical Engineering, Rome, June 2019

Kramer, S., Keynote Lecture 08, "The use of numerical analysis in the interpretation of liquefaction case histories", Proc. 7th International Conference on Earthquake Geotechnical Engineering, Rome, June 2019

Ntritsos, N., et al., "Evaluation of Liquefaction Case Histories from the 2010-2011 Canterbury Earthquakes Using Advanced Effective Stress Analysis", Geotechnical Earthquake Engineering and Soil Dynamics V ASCE Geotechnical Special Publication 290, 2018

Olson, S.M., et al. "Nonlinear Site Response Analysis with Pore-Water Pressure Generation for Liquefaction Triggering Evaluation", Journal of the Geotechnical and GeoEnvironmental Division, ASCE, Vo. 146, No. 2, 2020

Pyke, R., "Settlement and Liquefaction of Sands Under Multi-Directional Loading," Ph.D. Thesis, University of California, Berkeley, 1973

Pyke, R., "Practical Aspects of the Evaluation of Liquefaction Potential", Earthquake Geotechnical Engineering, Ishihara (ed.), Balkema, 1995

Pyke, R., Discussion of "Liquefaction Resistance of Soils: Summary Report From the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils", Journal of Geotechnical and Geoenvironmental Engineering, ASCE, Vol. 129, No.3, pp 283-284, 2003

Pyke, R., "Evaluating the Potential for Earthquake-Induced Liquefaction in Practice", 6th International Conference on Earthquake Geotechnical Engineering, Christchurch, New Zealand, November 2015

Pyke, R., "Improved analyses of earthquake-induced liquefaction and settlement", Proc 7th International Conference on Earthquake Geotechnical Engineering, Rome, June 2019

Pyke, R., "Improved Analysis of Potential Lateral Spreading Displacements in Earthquakes", Presented at the 2nd Ishihara Colloquium, San Diego State University, August 22-23, 2019(b) <https://www.linkedin.com/pulse/improved-analysis-potential-lateral-spread-earthquakes-robert-pyke/>

Pyke, R., "Limitations of Simplified Methods for Estimating Seismic Settlements", 2020 <https://www.linkedin.com/pulse/limitations-simplified-methods-estimating-seismic-settlements-pyke/>

Pyke, R., "Lessons learned from the observed seismic settlement at the Jensen Filtration Plant in the San Fernando Earthquake", ASCE Lifelines 21-22 Conference, Los Angeles, February 2022

Pyke, R., Knuppel, L.A, and Lee, K.L., "Evaluation of Liquefaction Potential at Los Angeles and Long Beach Harbors," Journal of the Geotechnical Engineering Division, ASCE, Volume 104, No. GT11, November 1978

Pyke, R., and North, J., "Shortcomings of simplified analyses of earthquake-induced liquefaction and settlement", Proc. 7th Int. Conference on Earthquake Geotechnical Engineering, Rome, June 2019

Robertson, P.K., and Wride, C.E., "Evaluating cyclic liquefaction potential using the cone penetration tests", Canadian Geotechnical Journal, Vol. 35, pp. 442-459, 1998

Semple, R., "Problems with Liquefaction Criteria and Their Application in Australia", Australian Geomechanics, Vol. 48, No. 3, pp 15-48, September 2013

Stokoe, K.H., "UTexas Field and Laboratory Liquefaction Activities", Presentation delivered at the Dobry Symposium, Rensselaer Polytechnic Institute, Troy NY, May 2023

Yost, K.M., et al., "Assessment of the Efficacies of Correction Procedures for Multiple Thin Layer Effects on Cone Penetration Tests", Soil Dynamics and Earthquake Engineering, Vol. 144, 2021

Youd, T.L., and Garbis, C.G., "Liquefaction-Induced Ground-Surface Disruption", ASCE Journal of Geotechnical Engineering, Vol. 121, No. 11, 1995

Youd, T.L., Hansen C.M., and Bartlett, S.F., "Revised Multilinear Regression Equations for Prediction of lateral Spread Displacements", Journal of Geotechnical and GeoEnvironmental Engineering, ASCE, Vol. 128, No.128, December 2002

Youd, T.L., "Application of MLR Procedure for Prediction of Liquefaction-Induced Lateral Spread Displacement", Journal of the Geotechnical and GeoEnvironmental Division, ASCE, Vol. 144, No. 6, 2018

Zhang, G., Robertson, P.K., and Brachman, R.W.I., "Estimating Liquefaction-Induced Lateral Displacements Using the Standard Penetration Test or Cone Penetration Test", Journal of Geotechnical and GeoEnvironmental Engineering, ASCE, Vol. 130, No. 8, August 2004.

Published by

Robert Pyke, Individual Consultant, Geotechnical and Earthquake Engineering, June 18, 2023

This is a technical note explaining the limitations of simplified methods for the analysis of the potential for liquefaction of cohesionless soils and its consequences. An important point to consider is that simplified methods are very approximate. They generally err on the conservative side, but this may not be good engineering and may not be in the interest of the client.

<https://www.linkedin.com/pulse/limitations-simplified-analyses-robert-pyke>

Effect of the Physical Characteristics of Sands on the Undrained Shear Behavior in the Steady State

Zhaocheng Wang and Mitsutoshi Yoshimine

Liquefied soil contains fine particles; this was discovered by researchers after the 1976 Tangshan Earthquake in China and confirmed after several subsequent earthquakes including the 1989 Loma-Prieta earthquake in California. In 1995, after Japan's Great Hanshin earthquake, scientists discovered that sand and gravel of various sizes were contained in the liquefied foundation in addition to fine particles. Since that time, there have been many studies on the effects that fine-grained soils and different particle sizes have on post-liquefaction residual shear strength. Most have shown that shear strength is influenced by sand and particles' physical properties.

A new paper in the *Journal of Geotechnical and Geoenvironmental Engineering* explores the relationship further by looking at the different physical properties and the steady-state strength. Researchers Zhaocheng Wang and Mitsutoshi Yoshimine performed undrained triaxial compression tests on sands with different physical properties. Using relative density, equivalent granular void ratio, and equivalent granular relative density, they created a unique steady-state line. The authors selected two types of silica sand and then combined those in different percentages of fines contents to test the undrained shear strength of the sand. The paper, "Effect of the Physical Characteristics of Sands on the Undrained Shear Behavior in the Steady State," provides a means of predicting the steady-state strength for different physical properties of sand. Learn more about this research at <https://doi.org/10.1061/JGGEFK.GTENG-10620>. The abstract is below.

Abstract

The steady-state shear strength of sands is affected by the physical properties of the sand. If the correlation between physical properties of sands and their steady-state strength is known, the steady-state strength can be obtained directly without mechanical experiments. Thus, the correlation has engineering significance for the prediction of liquefaction phenomena. This study explored the relationship between different physical properties and steady-state strength by conducting undrained triaxial compression tests on sands with different mean particle sizes, particle-size ranges, and fines contents. The results show that the steady-state strength of clean sands decreases with increasing mean particle size or particle-size range. The steady-state strength of nonplastic fines mixes is lowest when the fines contents is about 30% if their densities are the same, and increases gradually thereafter with increasing fines contents. When we used relative density instead of void ratio or dry density to evaluate steady state, the effects of grain size and its range of the host sand were diminished, whereas the effect of fines contents remained. On the other hand, when equivalent granular void ratio was used, the influence of fines contents ceased but the effects of grain-size distribution remained. In order to take advantage of both relative density and equivalent void ratio, the concept of the equivalent granular relative density is proposed, which is beneficial for evaluating the steady-state of sands with different physical characteristics, including the grain size and its range of host sand and fines content. The significance of this result is that the steady-state strength of various sands can be predicted to some extent from the density and grain-size distribution of the sand as well as the maximum and minimum densities of the host sand alone.

Explore the new way to predict sands' strengths in the ASCE Library: <https://doi.org/10.1061/JGGEFK.GTENG-10620>.

(ASCE / Civil Engineering Source, 4/3/2023, <https://www.asce.org/publications-and-news/civil-engineering-source/article/2023/04/03/predicting-the-steady-state-strength-of-sand-and-its-potential-shear-behavior>)

What Geotechnical Engineers Want to Know about Reliability

Kok-Kwang Phoon

Abstract

The purpose of this paper is to address the “what,” “why,” and “how” questions posed by engineers who are not familiar with geotechnical reliability and have not kept abreast of recent rapid developments in this field. Geotechnical reliability can be broadly defined as a methodology that enhances decision making at different life-cycle stages covering design, construction, operation and maintenance, retrofit, and decommission/reuse by exploiting the richer characterization of data using probabilistic models. Besides engineered systems, it also covers the risk assessment and management of geohazards such as earthquakes and landslides. Various application areas related to the design and construction stages of engineered systems can be put in context in the form of an uncertainty-informed Burland Triangle. Among these application areas, the estimation of a characteristic value, load and resistance factor design (LRFD), resistance factor calibration for simplified reliability-based design (RBD), and first-order second-moment (FOSM) reliability analysis do not need in-depth knowledge/expertise in reliability and a significant amount of information exists to support these applications in practice. This paper argues for their adoption because they will nudge a mindset shift to be more responsive to data. Data infrastructure is now considered to be as important as physical infrastructure. The concern that there are insufficient data for probabilistic analysis has also been largely and comprehensively resolved by recent advances in Bayesian machine learning methods that can deal with MUSIC-3X (Multivariate, Uncertain and Unique, Sparse, Incomplete, and potentially Corrupted with “3X” denoting 3D spatial variability) site data directly. Sparsity (insufficient data) is only one out of six attributes in a real-world MUSIC-3X data set. Geotechnical reliability is now pictured as one important step toward digital transformation and engaging complex new challenges posed by climate change and resilience engineering. This paper urges the geotechnical engineering profession to lay aside its questions on quantity, quality, and/or other “ugly” attributes and offer our data an opportunity to speak for itself. There is prima facie evidence to warrant a thorough exploration of data-centric geotechnics.

ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering, [Volume 9, Issue 2, June 2023](#), <https://doi.org/10.1061/AJRUA6.RUENG-1002>

(<https://ascelibrary.org/doi/10.1061/AJRUA6.RUENG-1002>)

Beneath our feet: conservation and empowerment of Europe's underground heritage

Have you travelled into the depths of Europe's most enchanting caves at the [Caves of Han-sur-Lesse](#), or immersed yourself in the lunar-like landscape of [Göreme-Cappadocia](#)'s ancient rock cones and historic cave dwellings? These remarkable underground sites have captivated countless visitors and stand as testaments to our rich heritage. However, their conservation is more than preserving the past; it is a gateway to knowledge, a catalyst for local prosperity, and a bridge to sustainable cultural and economic transformations.

The COST Action [Underground Built Heritage as catalyser for Community Valorisation](#) (Underground4value) aimed to promote the preservation and valorisation of Underground Built Heritage. At a recent [COST Academy](#) event in Brussels, Giuseppe Pace, Chair of Underground4value from the Institute for Studies on the Mediterranean, shared insights on the significance of conserving the underground heritage and the Underground4value options to empower local communities.

Get ready to unearth the hidden treasures beneath our feet and embark on a journey of discovery and preservation.



S. Gennaro Catacombs, Naples



Goreme, Turkey

Opportunities of Underground Built Heritage valorisation for urban and rural development

The Underground Built Heritage encompasses various underground structures and landscapes such as caves, tunnels, mines, settlements, and associated objects and practices with historical, cultural, architectural, ecological, and archaeological significance. These sites offer valuable insights into past communities and civilisations, contributing to a better understanding of our shared human history and heritage. At

the same time, they are connected to the above-ground communities as part of the same ecology. Their preservation contributes to environmental protection and the conservation of biodiversity. It also allows people of all ages to engage in experiential learning and interact with history, science, and culture, serving as valuable educational resources. By safeguarding these sites, we not only ensure that future generations have access to these educational assets, but also drive economic development by attracting tourists and creating employment.



Camerano, Italy

[The Caves of Han](#), for example, have a rich Bronze Age history and have attracted over 23 million visitors. Another successful example is Naples, recognized as a UNESCO World Heritage site and celebrated for its touristic routes, where the underground heritage includes the restored [S. Gennaro Catacombs](#) managed by a local cooperative, which exemplify the potential of bottom-up valorisation policies.

Underground spaces also serve as commercial areas, such as underground shopping malls, restaurants, and bars. They also host transportation and infrastructure, helping to alleviate surface congestion and environmental issues. The [Göreme-Cappadocia](#) region exemplifies the successful implementation of underground valorisation. With its unique landscape of rock cones and historic cave dwellings, it has become a popular tourism destination, driving economic development. The conservation and development efforts in the region have led to the establishment of hotels, wineries, restaurants, pottery workshops, and other tourism-related facilities.

However, it is crucial to carefully manage the diverse uses of underground spaces, as they can sometimes conflict with each other. Planning and decision-making processes should involve local communities to ensure their quality of life, cultural heritage, and economic opportunities are considered.



"Participatory approach to urban and rural regeneration can lead to more livable, sustainable, and economically vibrant communities, concerned about their past, but open to co-create new cultural spaces, combining community's sense of identity and pride with innovation in economy, society, and culture."

Giuseppe Pace, Chair of Underground4value

Challenges to underground valorisation

There are several challenges to making use of underground spaces. One is that we often lack sufficient knowledge of these sites. Additionally, clear laws and regulations governing their use are not always in place. It can also be difficult to find funding for projects related to underground heritage. Also, some people may not be aware of their value. Finally, there can be differences in perspectives between local and global communities about the importance of these sites. All of these challenges require careful consideration and planning to overcome.

Contribution of Underground4value to balanced and sustainable approaches for the conservation of underground heritage

Underground4value has made significant contributions to balanced and sustainable approaches for valorising underground heritage. Since April 2019, over 200 experts from 30 countries have collaborated, sharing methodologies, case studies, and best practices with an interdisciplinary focus.



Ancona, 2019 Underground4value meeting

The Underground4value network has developed a step-by-step methodology called the Strategic Transition Practice. This approach is flexible and adaptable to different contexts and levels of maturity. It considers the value attributed to heritage by local cultures, planning regulations, and community empowerment. The Action has collected national planning legislations and organisations related to underground heritage, along with approaches for engaging communities and involving them in the conservation process, including management, financing, and required skills and technologies.

This methodology has been tested and implemented in twelve [case studies](#), establishing living labs. For example, Underground4value examined sustainable and responsible tourism in underground built heritage. It focused on managing visitor numbers, minimising environmental impacts, and ensuring local communities benefit from tourism.



Naples, 2020 Underground4value meeting



Ankara, 2022 Underground4value meeting



Atomic Bunker in Albania – now a history museum and contemporary art gallery

The knowledge gathered has been used to develop three primary outcomes. Firstly, a multi-language platform called www.u4v.org provides information on underground heritage objects and routes. Secondly, a digital toolbox will support local communities, private and public actors, and promoters in the valorisation, development, and management of cultural landscapes. Thirdly, an e-learning platform will offer training on underground built heritage and community engagement for monitoring, valorisation, and conservation.



Postojna caves in Slovenia, unique habitat for troglobitic species, example of regeneration and valorisation

Underground4value has been productive in terms of [publications](#), releasing two handbooks and various books on its case studies. Additionally, a Sustainability Special Issue titled 'Going Underground. Making Heritage Sustainable' has published multiple papers, with more to come.

cost EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY
U4V (Action Underground4value), 05.06.2023,
<https://www.cost.eu/underground4value-built-heritage/>

Η Ελλάδα στον χάρτη της ανθρώπινης εξέλιξης – Μυστικά 700.000 ετών στη Μεγαλόπολη

Μυστικά 700.000 ετών στη Μεγαλόπολη

Του Νικόλα Ζώη



Τα ευρήματα της αρχαιολογικής έρευνας στη Μεγαλόπολη τοποθετούν την αρχαιότερη ανθρώπινη παρουσία στην Ελλάδα πριν από 700.000 χρόνια και δείχνουν ότι αποτελούσε και σημαντικό οικολογικό καταφύγιο για ελέφαντες, ιπποπόταμους και ελαφοειδή. Φωτ. ΠΑΝΑΓΙΩΤΗΣ ΚΑΡΚΑΝΗΣ.

Μια «γέφυρα» προς την **Ευρώπη** φαίνεται πως ήταν το **Αιγαίο** για τους ανθρωπίδες που μετακινούνταν από την **Αφρική** των **παλαιολιθικών χρόνων**. Τα ευρήματα της αρχαιολογικής έρευνας στη Μεγαλόπολη τοποθετούν την αρχαιότερη ανθρώπινη παρουσία στην **Ελλάδα** πριν από 700.000 χρόνια και δείχνουν ότι αποτελούσε και σημαντικό οικολογικό καταφύγιο για ελέφαντες, ιπποπόταμους και ελαφοειδή.

Φανταστείτε μια κατάφυτη πεδιάδα, που στο κέντρο της ξεχωρίζει μια μεγάλη, κρύα λίμνη. Στις βαλτώδεις όχθες της κρύβονται προϊστορικά πουλιά, ενώ τριγύρω ζουν γιγαντιαία ελάφια, ελέφαντες, ακόμα και μακάκοι. Κυνηγιούνται από προγόνους του ανθρώπου, που επιβιώνουν με τη βοήθεια των λίθινων εργαλείων τους και που έχουν καταφύγει εδώ για να προστατευτούν από τις πολύ χαμηλές θερμοκρασίες του βορρά. Το κρύο γενικά κυριαρχεί· μέχρι κι ένα βουνό στα νότια της πεδιάδας έχει κορυφή καλυμμένη με παγετό.

Στα αλήθεια προκαλεί δέος μια ενδεικτική αναπαράσταση της παλαιολιθικής Μεγαλόπολης. Και όμως, έτσι πρέπει να έμοιαζε η πεδινή Αρκαδία κάτι λιγότερο από ένα εκατομμύριο χρόνια πριν. Και καθώς μια τέτοια εικόνα είναι γνωστή στους παλαιοντολόγους, ακόμα πιο εντυπωσιακά αποδεικνύονται τα νέα ευρήματα για τη συγκεκριμένη περιοχή της Πελοποννήσου, τα οποία έφερε στο φως το πενταετές πρόγραμμα επιφανειακής και γεωαρχαιολογικής έρευνας που ολοκλήρωσαν πρόσφατα το **υπουργείο Πολιτισμού** και η **Αμερικανική Σχολή Κλασικών Σπουδών**: όπως όλα δείχνουν, στο λιγνιτωρυχείο και στη λεκάνη της Μεγαλόπολης υπήρχε ένα από τα νοτιότερα οικολογικά καταφύγια της Ευρώπης στη διάρκεια των παγετωδών περιόδων του Μέσου Πλειστόκαινου. Μία αρχαιολογική θέση ειδικά, που ονομάζεται «Κυπαρίσσια 4» και εντοπίστηκε στο λιγνιτωρυχείο, κερδίζει πλέον τον τίτλο της παλιότερης χρονολογημένης αρχαιολογικής θέσης στην Ελλάδα. Η ηλικία της; Περίπου 700.000 ετών.

«Με αυτή την ανακάλυψη βάζουμε τον ελλαδικό χώρο στο «παιχνίδι» της εξέλιξης του ανθρώπου και της αποίκησης της Ευρώπης από τους ανθρωπίδες, κάτι με το οποίο η Ελλάδα δεν είχε σχέση μέχρι πρότινος», λέει ο **Παναγιώτης Καρκάνας**, γεωαρχαιολόγος της Αμερικανικής Σχολής Κλασικών Σπουδών, που συνδιηύθυνε το πρόγραμμα μαζί με την Ελένη Παναγοπούλου-Καράμπελα της Εφορείας Παλαιοανθρωπολογίας-

ας-Σπηλαιολογίας του ΥΠΠΟΑ και την Κατερίνα Χαρβάτη του Πανεπιστημίου του Τίμπινγκεν. Εξίσου σημαντικό, συνεχίζει, είναι ότι δεν βρέθηκε μία, αλλά πέντε νέες θέσεις, συναφείς στρωματογραφικά, που «δένουν» τα αποτελέσματα της έρευνας. Σε αρκετές εντοπίστηκαν κατάλοιπα και οστά από εξαφανισμένα ζώα (από εκείνα τα γιγαντιαία ελάφια και τους μακάκους, αλλά και από προϊστορικούς ελέφαντες, ρινόκερους και ιπποπόταμους), καθώς και λίθινα εργαλεία που είχαν ενίοτε χρησιμοποιηθεί στην επεξεργασία των οστών των ζώων.



Στο λιγνιτωρυχείο της Μεγαλόπολης εντοπίστηκαν κατάλοιπα και οστά από εξαφανισμένα ζώα (γιγαντιαία ελάφια, μακάκους, προϊστορικούς ελέφαντες, ρινόκερους και ιπποπόταμους), καθώς και λίθινα εργαλεία τα οποία είχαν ενίοτε χρησιμοποιηθεί στην επεξεργασία των οστών των ζώων. [ΠΑΝΑΓΙΩΤΗΣ ΚΑΡΚΑΝΑΣ]

«Ένα ερώτημα που θέσαμε», προσθέτει, «ήταν κατά πόσο ο ελλαδικός χώρος αποτέλεσε την περιοχή μέσω της οποίας έγινε η αποίκηση της Ευρώπης από τους πρώιμους ανθρώπους. Διαπιστώνοντας συνεχή ανθρώπινη παρουσία σε ένα τόσο νότιο σημείο, για τόσο μεγάλο διάστημα και συνδυάζοντάς τη με τη γνώση μας ότι η στάθμη του Αιγαίου κατέβαινε πολύ στις παγετώδεις περιόδους –τόσο που οι Κυκλάδες σχεδόν ενώνονταν με την Αττική– συμπεράναμε ότι υπάρχει μεγάλη πιθανότητα το Αιγαίο να αποτελούσε μια «γέφυρα» για το πέρασμα των ανθρώπων στην ευρωπαϊκή ήπειρο».



Βραχιόνιο οστό ελέφαντα, που βρέθηκε στο λιγνιτωρυχείο της Μεγαλόπολης.

«Υπάρχει μεγάλη πιθανότητα το Αιγαίο να αποτελούσε μια «γέφυρα» για το πέρασμα των ανθρώπων στην Ευρώπη», λέει ο γεωαρχαιολόγος Παναγιώτης Καρκάνας.

Μία ακόμα θέση που εντοπίστηκε στο λιγνιτωρυχείο της Μεγαλόπολης και η οποία χρονολογείται περίπου 300.000 χρόνια

πριν, είναι η «Χωρέμη 7». Σημειώνει ο κ. Καρκάνας για τη σημασία της: «Είναι ίσως από τις παλαιότερες της Ευρώπης με λιθοτεχνία της λεγόμενης Μέσης Παλαιολιθικής περιόδου. Τότε αλλάζει ο τρόπος που κατασκευάζαν εργαλεία οι πρώιμοι άνθρωποι. Βλέπουμε λοιπόν ότι ο ελλαδικός χώρος δεν ήταν στο περιθώριο της συγκεκριμένης εξέλιξης, αλλά έπαιξε σημαντικό ρόλο στη νέα αυτή φάση. Δεν ήταν ένα "αποπαίδι", που κάποια στιγμή υποδέχθηκε απλώς τη νέα τεχνολογία».

Και τα ζώα όμως, δεν ήταν λιγότερο ικανοποιημένα. Όπως λέει ο κ. Καρκάνας, παρόλο που η μέση ετήσια θερμοκρασία ήταν τότε χαμηλότερη κατά δέκα περίπου βαθμούς Κελσίου, παρόλο που η κορυφή του Ταϋγέτου ήταν καλυμμένη με παγετώνες, οι μικροσυνθήκες της Μεγαλόπολης ευνοούσαν την επιβίωση. «Τα ζώα αυτά είχαν μεγάλη ικανότητα προσαρμογής, αρκεί να μην ήταν παγωμένο το νερό. Το περιβάλλον ήταν κρύο, αλλά και πολύ ιδιαίτερο. Το γνωρίζουμε επειδή η κατάσταση διατήρησης των ευρημάτων είναι τρομακτικά καλή. Βρήκαμε μέχρι και βιοχημικά υπολείμματα λιπιδίων καθώς και ολόκληρα έντομα, που μας δείχνουν με ακρίβεια τη θερμοκρασία του χώματος και του νερού».



Εικόνα από το επιστημονικό περιοδικό Proceedings of the National Academy of Sciences. Απεικονίζει παλαιολιθικό τοπίο της Κεντρικής Ευρώπης σε μια πιο θερμή εποχή και θα μπορούσε να μοιάζει αρκετά με αντίστοιχο τοπίο της Πελοποννήσου, αλλά σε μια πιο κρύα εποχή.

Η Γιγαντομαχία

Η θερμοκρασία αυτή ήταν στις πιο σύγχρονες περιόδους πιο υψηλή. Το έδαφος έβγαζε ατμούς, που σε συνδυασμό με κάποια μεγάλα απολιθώματα έκαναν τις επόμενες γενιές να πιστεύουν ότι εκεί είχε συμβεί ένα μυθικό γεγονός. «Οι αρχαίοι γνώριζαν ότι εκεί είχαν ζήσει μεγάλα, περίεργα πλάσματα», λέει ο κ. Καρκάνας. «Το αναφέρει νομίζω και ο Πausanias: λόγω των τεράστιων οστών και των καπνών από τις αναφλέξεις του λιγνίτη, οι άνθρωποι πίστευαν ότι εκεί έγινε η Γιγαντομαχία».



Η κάτω γνάθος γιγάντιου ελαφοειδούς. [ΠΑΝΑΓΙΩΤΗΣ ΚΑΡΚΑΝΑΣ]

Σε κάθε περίπτωση, τα ευρήματα είναι τέτοια, που θα ακολουθήσουν αρκετές δημοσιεύσεις και μελέτες. Η ομάδα πιθανότατα θα επιστρέψει στη Μεγαλόπολη. Τα μέλη της είχαν και τύχη, καθώς η θέση «Κυπαρίσσια 4» εντοπίστηκε 70 μέτρα κάτω από την επιφάνεια, όπου είναι αδύνατον να φτάσει άνθρωπος: «Ακολουθήσαμε κυρίως τις εγκαταλελειμμένες βαθμίδες του λιγνιτωρυχείου», εξηγεί ο κ. Καρκάνας. Όχι ότι έλειπε το όραμα: «το όλο πράγμα ξεκίνησε 20, 30 χρόνια πριν», καταλήγει, «μέσα από συζητήσεις και σκέψεις μιας ομάδας ανθρώπων πολύ νεότερων τότε, που είχαμε την ιδέα να βάλουμε την Ελλάδα στον χάρτη της πρώιμης αποίκησης της Ευρώπης. Είχαμε επιμονή, υπομονή και μακροπρόθεσμο σχέδιο. Επειτα από τόση δουλειά, το να επιτυγχάνεις κάποια στιγμή, σου δίνει χαρά και ενθουσιασμό».



Οι δύο πιθανές διαδρομές των ανθρωπιδών από την Αφρική προς την ευρωπαϊκή ήπειρο, την περίοδο του Μέσου Πλειστόκαινου. Με κόκκινο χρώμα αποτυπώνεται η διαδρομή μέσω Μαύρης Θάλασσας, η οποία θεωρούνταν η πιθανότερη από την επιστημονική κοινότητα. Με μαύρο χρώμα αποτυπώνεται η πρόταση των Καρκάνα-Τουρλούκη. Σύμφωνα με γεωλογικές έρευνες, η στάθμη του Αιγαίου χαμήλωνε πολύ στις παγετώδεις περιόδους - οι Κυκλάδες σχεδόν ενώνονταν με την Αττική.

Η ΚΑΘΗΜΕΡΙΝΗ

Συνεχής η ανθρώπινη παρουσία, η Ελλάδα δεν ήταν ένα πέρασμα

Του Σάκη Ιωαννίδη

Η πρώτη αρχαιολογική θέση στη Μεγαλόπολη, η «Μαραθούσα 1», ανακαλύφθηκε το 2013 υπό τη διεύθυνση της Ελένης Παναγοπούλου του ΥΠΠΟΑ και τοποθέτησε τα ίχνη ανθρώπινης παρουσίας στην περιοχή πριν από 450.000 χρόνια. Οι νέες θέσεις που ανακάλυψε η ομάδα, σχολιάζει η Κατερίνα Χαρβάτη, «έσπρωξαν» την αρχαιότερη μέχρι τώρα γνωστή παρουσία των ανθρωπιδών στον ελλαδικό χώρο κατά 250.000 χρόνια πιο πίσω και μαρτυρούν ότι οι άνθρωποι ζούσαν στην περιοχή για μεγάλες χρονικές περιόδους.

«Με τα ευρήματά μας πλησιάζουμε τις θέσεις από άλλα μέρη της Ευρώπης, όπου ο άνθρωπος εμφανίζεται πριν από ένα εκατομμύριο χρόνια, όπως στην Ιβηρική Χερσόνησο για παράδειγμα. Το γεγονός ότι πλέον έχουμε εντοπίσει αρχαιολογικές θέσεις σε όλη τη στρωματογραφική ακολουθία του ορυχείου, σε συνδυασμό με την ένδειξη ότι οι ανθρωπίδες επέζησαν και στις παγετώδεις περιόδους, είναι μια πολύ ισχυρή ένδειξη ότι κατά πάσα πιθανότητα υπήρξε συνεχής ανθρώπινη παρουσία στην περιοχή και ότι δεν ήταν μόνο πέρασμα αλλά ένα ιδανικό περιβάλλον για τους ανθρωπίδες επί εκατοντάδες χιλιάδες χρόνια».

«Οι άνθρωποι πληθυσμοί επέζησαν, ενώ εξαφανίστηκαν από πιο βόρειες περιοχές της Ευρώπης», λέει η καθηγήτρια στο Πανεπιστήμιο του Τίμπινγκεν, Κατερίνα Χαρβάτη.

Η καθηγήτρια Παλαιοανθρωπολογίας στο Πανεπιστήμιο του Τίμπινγκεν της Γερμανίας χαρακτηρίζει «εκπληκτική» τη διατήρηση των οργανικών στοιχείων στα ιζήματα της Μεγαλόπολης. Εκτός από τα οστά των μεγαλόσωμων ζώων βρέθηκαν ακόμη στοιχεία μικρών θλαστικών, πουλιών, ψαριών, αμφιβίων, υπολείμματα ξύλου, καρποί, φυτικά κατάλοιπα, έντομα. «Τα στοιχεία αυτά μας δίνουν μια εικόνα υψηλής ανάλυσης του παλαιοπεριβάλλοντος και του κλίματος στη διάρκεια του Μέσου Πλειστόκαινου, σε σχέση με την ανθρωπινή παρουσία και τις δραστηριότητες των ανθρωπιδών στο λεκανοπέδιο», σημειώνει η κ. Χαρβάτη και προσθέτει ότι η περιοχή λειτουργήσε ως ασφαλές καταφύγιο για τους πληθυσμούς. «Οι ανθρωπίνοι πληθυσμοί επέζησαν, ενώ εξαφανίστηκαν από πιο βόρειες περιοχές της Ευρώπης».

Ρωτάμε την καθηγήτρια εάν τα λίθινα εργαλεία μαρτυρούν ότι οι πρόγονοι του ανθρώπου που έζησαν στην περιοχή ήταν κυνηγοί. «Σίγουρα ναι, προς το τέλος της ακολουθίας, δηλαδή τις σχετικά νεότερες περιόδους που καλύπτει η στρωματογραφία. Για τις παλαιότερες θέσεις δεν είναι σίγουρο ότι ήταν κυνηγοί, μπορεί δηλαδή να είχαν πρόσβαση σε ήδη νεκρά ζώα – έχουμε ισχυρές ενδείξεις με ίχνη κοπής σε ελέφαντες και ιπποπόταμους άλλα και σε ελάφια και άλλα ζώα».

Στην Ελλάδα η επιστήμη της παλαιοανθρωπολογίας είναι σε «νηπιακό στάδιο», όπως έχει πει η κ. Χαρβάτη σε συνέντευξή της στην «Κ» (17.5.2021), και με αφορμή τα νέα ευρήματα τη ρωτάμε εάν τέτοιες ανακαλύψεις δίνουν ώθηση στο ενδιαφέρον των νέων επιστημόνων. «Ελπίζω πως ναι», σημειώνει, «ήδη υπάρχει πολύ μεγαλύτερο ενδιαφέρον απ' ό,τι στο παρελθόν, με πολλούς νέους επιστήμονες να ενδιαφέρονται για την Παλαιολιθική περίοδο. Πιστεύω πως η έρευνα σε αυτόν τον τομέα έχει ακόμα να δώσει πολλά σημαντικά ευρήματα στο μέλλον, και η έρευνα βέβαια συνεχίζεται».

(Η ΚΑΘΗΜΕΡΙΝΗ, 10.06.2023,
<https://www.kathimerini.gr/society/562460794/i-elladaston-charti-tis-anthropinis-exelixis-mystika-700-000-eton-sti-megalopoli>)

Παλαιολιθικά οστά ελεφάντων και ρινόκερων ανακαλύφθηκαν στο λιγνιτωρυχείο της Μεγαλόπολης

Τα ευρήματα μας παρέχουν πλούτο πληροφοριών σχετικά με τις τεχνολογικές εξελίξεις κατά την εποχή των παγετώνων αλλά και της εκμετάλλευσης των ζώων.



Ένα κρανίο που ανήκει σε ελάφι της εποχής των παγετώνων βρέθηκε στις παλαιολιθικές τοποθεσίες της Μεγαλόπολης (Υπουργείο Πολιτισμού)

Αρκετές παλαιολιθικές θέσεις που χρονολογούνται πριν από 700 χιλιάδες χρόνια ανακαλύφθηκαν κατά τη διάρκεια ανασκαφών στο λιγνιτωρυχείο της Μεγαλόπολης, στην Αρκαδία.

Σύμφωνα με ανακοίνωση του υπουργείου Πολιτισμού: «οι πέντε καινούριες θέσεις που βρέθηκαν στο λιγνιτωρυχείο της Μεγαλόπολης διασώζουν πολιτισμικά και πανίδικά κατάλοιπα σε στρωματογραφική συνάφεια και προσφέρουν μια μοναδική ευκαιρία διαχρονικής διερεύνησης της ανθρωπίνης συμπεριφοράς, για μια σημαντική περίοδο στην ιστορία της ανθρωπίνης εξέλιξης και σε μια περιοχή που έως τώρα είχε ελάχιστα ερευνηθεί».

Η παλαιότερη θέση που εντοπίστηκε είναι τα **Κυπαρίσσια 4**, η οποία χρονολογείται περίπου 700 χιλιάδες χρόνια πριν και βρίσκεται 70 περίπου μέτρα κάτω από την σημερινή επιφάνεια του εδάφους. Η θέση περιέχει λίθινα τέχνηρα της Κατώτερης Παλαιολιθικής, μαζί με κατάλοιπα εξαφανισμένων ζώων, όπως **γιγαντιαίου ελαφιού** (Praemegaceros), **ιπποπόταμου**, **ρινόκερου**, **ελέφαντα**, καθώς και ενός δοντιού του **κερκοπίθηκου Μακάκου**.

Η «νεότερη» κοντινή θέση **Κυπαρίσσια 3** απέδωσε κυρίως οστά **ελέφαντα** σε συνδυασμό με **λίθινα εργαλεία**. Στη θέση Μαραθούσα 2, η οποία χρονολογείται πριν από περίπου 450 χιλιάδες χρόνια, βρέθηκε τμήμα σκελετού ιπποπόταμου με σημάδια **κοπής** μαζί με **υπολείμματα λίθινων εργαλείων** και αποτελεί σπάνιο παράδειγμα **εκμετάλλευσης** ιπποπόταμου στην Ευρώπη κατά την περίοδο του Πλειστόκαινου.

Το **Πλειστόκαινο**, πιο γνωστό ως Εποχή των Παγετώνων είναι η γεωλογική περίοδος που περιλαμβάνει τη χρονική περίοδο 2.588.000 με 11.700 χρόνια περίπου πριν.



Οι θέσεις Κυπαρίσσια 3 και 4 στη στρωματογραφική ακολουθία των λιγνιτών (Υπουργείο Πολιτισμού)

Λίθινα εργαλεία και θραύσματα οστών στις παλαιολιθικές θέσεις

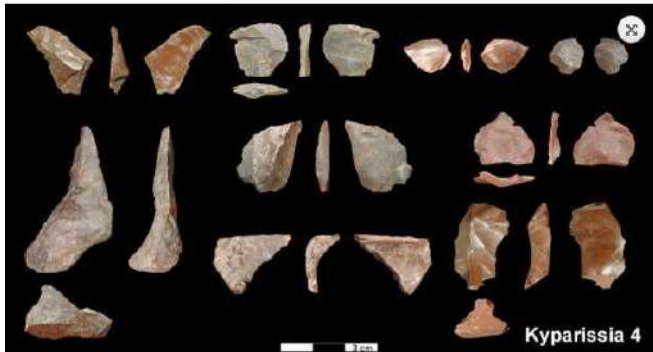
Σύμφωνα με το Υπουργείο Πολιτισμού μεγάλης σημασίας είναι η ανακάλυψη της θέσης **Τριπόταμος 4**, η οποία βρίσκεται περίπου 15 μέτρα κάτω από τη σημερινή επιφάνεια.

Η θέση χρονολογείται περίπου στα 400 χιλιάδες χρόνια πριν από σήμερα και χαρακτηρίζεται από σχετικά μεγάλη συγκέντρωση λίθινων εργαλείων, τα οποία παρουσιάζουν νέα στοιχεία στις τεχνικές κατεργασίας του λίθου σε σχέση με τις παλαιότερες θέσεις, καθιστώντας τη θέση σημαντικό σημείο στις τεχνολογικές εξελίξεις της ύστερης **Κατώτερης Παλαιολιθικής**.

Η θέση **Χωρέμη 7** βρέθηκε στο ανώτερο τμήμα της γεωλογικής ακολουθίας, 8 περίπου μέτρα κάτω από την σημερινή επιφάνεια και χρονολογείται στα 280 χιλιάδες χρόνια περίπου. Η λιθοτεχνία της θέσης περιλαμβάνει τυπολογικά και τεχνολογικά χαρακτηριστικά της **Μέσης Παλαιολιθικής**. Το πανι-

δικό σύνολο της θέσης αποτελείται κυρίως από θραύσματα οστών κυρίως ελαφοειδών, ορισμένα από τα οποία φέρουν ίχνη ανθρώπινης επεξεργασίας.

Η προκαταρκτική μελέτη των παλαιοπεριβαλλοντικών και παλαιοκλιματικών δεικτών δείχνει ότι όλες οι θέσεις έχουν βρεθεί σε περιβάλλοντα της εποχής των παγετώνων, και μάλιστα, χρονολογικά, **εντοπίζονται σε όλες σχεδόν τις εποχές των παγετώνων** του Μέσου Πλειστόκαινου.



Λίθινα εργαλεία της θέσης Κυπαρίσσια 4 και Χωρέμη 7
(Υπουργείο Πολιτισμού)

Τα ευρήματα αυτά δείχνουν ότι η λεκάνη της Μεγαλόπολης αποτελούσε ένα από τα **νοτιότερα οικολογικά καταφύγια** στην **Ευρώπη** κατά τη διάρκεια των παγετωδών περιόδων, όπως αναφέρει το υπουργείο.



Επιφανειακή έρευνα στις τεχνητές βαθμίδες του
λιγνιτορυχείου της Μεγαλόπολης (Υπουργείο Πολιτισμού)

(Newsroom— HuffPost Greece, 02/06/2023,
https://www.huffingtonpost.gr/entry/apolithomata-elefan-ton-kai-rinokeron-anakalefthekan-sto-liynitorecheio-tes-megalopoles_qr_6478be20e4b091b09c31320b)

Τσιμέντο και νερό βουλιάζουν τις πόλεις – Οι περιοχές στην Ελλάδα που απειλούνται

Μάχη Τράτσα



Φωτ.: Shutterstock

Ποιες μητροπόλεις κινδυνεύουν να «σβηστούν» από τον χάρτη – Η γη κάτω από τις μεγαλουπόλεις υποχωρεί προς το επίπεδο της θάλασσας υπό το βάρος των κατασκευών.

Οι μεγαλουπόλεις βυθίζονται. Οι λίστες με τα αστικά κέντρα και τις περιοχές που κινδυνεύουν σταδιακά να βρεθούν κάτω από την επιφάνεια της θάλασσας διαρκώς μακραίνουν, όπως πολλαπλασιάζονται και οι επιστημονικές έρευνες που καταγράφουν και μελετούν το φαινόμενο. Και ο λόγος δεν είναι μόνο ο προφανής, δηλαδή η κλιματική αλλαγή.

Δεν φταίει μόνο η κλιματική αλλαγή

Η θάλασσα αγκαλιάζει κάθε χρόνο ολοένα και πιο σφιχτά τις πόλεις, αλλά και το αντίστροφο, δηλαδή οι πόλεις... χαμηλώνουν αγγίζοντας τα νερά της. Αφενός, λόγω της υπερθέρμανσης του πλανήτη οι πάγοι λιώνουν, οι θάλασσες «φουσκώνουν» και εισβάλλουν στις πόλεις. Αφετέρου, τα μεγάλα αστικά κέντρα, λόγω ανθρωπογενών παρεμβάσεων που οδηγούν σε καθιζήσεις, γέρνουν υπό το βάρος του τσιμέντου προς το επίπεδο της θάλασσας.

Ετσι, μπορεί παράκτιες πόλεις όπως το Μαϊάμι των ΗΠΑ και η Καντόνα της Κίνας να αντιμετωπίζουν την προοπτική τεράστιων πλημμυρών όσο η στάθμη της θάλασσας ανεβαίνει, λόγω της κλιματικής αλλαγής, ωστόσο μελέτη που δημοσιεύτηκε στο έγκυρο επιστημονικό περιοδικό «Geophysical Research Letters» και εξέτασε 99 πόλεις ανά τον κόσμο, προσδιόρισε μια πιο επείγουσα απειλή.

Όπως αποκάλυψαν οι επιστήμονες, οι μεγαλουπόλεις του πλανήτη βυθίζονται ταχύτερα από τον ρυθμό που ανεβαίνει η στάθμη της θάλασσας. Κι αυτό διότι η γη υποχωρεί και καθιζάνει πολλά εκατοστά κάθε χρόνο εξαιτίας αλλαγών στο υπόδαφος που προκαλούνται από διάφορες δραστηριότητες. Για παράδειγμα, με τις υπεραντλήσεις υπόγειων υδάτων, το νερό βγαίνει στην επιφάνεια, η γη συμπιέζεται και οι κατασκευές που είναι χτισμένες στην κορυφή βουλιάζουν σταδιακά, πλησιάζοντας το επίπεδο της θάλασσας.

Συναγερμός στη Νοτιοανατολική Ασία

Τουλάχιστον 33 πόλεις «χαμηλώνουν» πάνω από ένα εκατοστό ετησίως, δηλαδή με ρυθμό πέντε φορές μεγαλύτερο από εκείνον της ανόδου της στάθμης της θάλασσας. Εκείνες που κινδυνεύουν να γίνουν ταχύτερα «υποβρύχια» βρίσκονται συγκεντρωμένες στη Νότια και Νοτιοανατολική Ασία και ήδη αναγκάζονται να προσαρμοστούν. Η Ινδονησία, για παρά-

δειγμα, μεταφέρει την πρωτεύουσά της από την Τζακάρτα, μια μεγαλούπολη 10,5 εκατομμυρίων κατοίκων, σε μια νεόκτιστη πόλη στο Βόρνεο, 2.000 χλμ. μακριά, για διάφορους λόγους, μεταξύ των οποίων και η σταδιακή βύθιση της πόλης. Μάλιστα, το 2022 η τοπική κυβέρνηση της Βόρειας Τζακάρτα απαγόρευσε την εξόρυξη υπόγειων υδάτων στην περιοχή.

Οι δέκα ταχύτερα βυθιζόμενες πόλεις στον πλανήτη (από το σύνολο των 99 που μελετήθηκαν) είναι η Τιεντσίν της Κίνας με 5,22 εκατοστά τον χρόνο (cm/έτος), η Σεμαράνγκ και η Τζακάρτα της Ινδονησίας (3,96 cm/έτος και 3,44 εκατ./έτος αντίστοιχα), η Σαγκάη (2,94 cm/έτος), η Χο Τσι Μινχ και το Ανόι του Βιετνάμ (2,81 cm/έτος και 2,44 cm/έτος αντίστοιχα), το Τσιταγκόνγκ του Μπαγκλαντές (2,35 cm/έτος), το Κόμπε της Ιαπωνίας (2,26 cm/έτος), η Κεράλα της Ινδίας (1,96 cm/έτος) και το Χιούστον των ΗΠΑ (1,95 cm/έτος).

Παράλληλα, σύμφωνα με νέα έρευνα που δημοσιεύθηκε στις 8 Μαΐου στο επιστημονικό έντυπο «Earth's Future», και η πιο emblematicή πόλη των ΗΠΑ, η Νέα Υόρκη, βουλιάζει υπό το βάρος των εκατοντάδων ουρανοξυστών. Υπολογίστηκε ότι πέρα από την άνοδο της θαλάσσιας στάθμης, η αμερικανική μητρόπολη χάνει κάθε χρόνο 1 με 2 χιλιοστά από το ύψος της λόγω καθιζήσης. Μάλιστα, από το 1950 έως σήμερα το νερό στη Νέα Υόρκη έχει ανέβει κατά περίπου 22 εκατοστά.

Αντιστοίχως, και η Βομβάη υποχωρεί έως και 0,8 εκατοστά ετησίως ενώ ανάλυση κινδύνου που έγινε πέρυσι κατέδειξε ότι σχεδόν 2.500 κτίρια στην ινδική μητρόπολη κινδυνεύουν να καταστραφούν από την άνοδο της στάθμης της θάλασσας έως το 2050.

Σύμφωνα με τους επιστήμονες της Διακυβερνητικής Επιτροπής για την Κλιματική Αλλαγή (Intergovernmental Panel on Climate Change – IPCC) του ΟΗΕ, χωρίς μείωση των εκπομπών αερίων που ευθύνονται για την κλιματική αλλαγή, τα επίπεδα της θάλασσας παγκοσμίως θα ανέβουν κατά ένα μέτρο έως το 2100, απειλώντας τα μεγαλύτερα αστικά κέντρα του πλανήτη, αλλά και αγροτικές περιοχές, θέρετρα κ.λπ. που βρίσκονται σε επαφή με το νερό. Η «εισβολή» αλμυρού νερού μπορεί να καταστρέψει βασικούς κλάδους της οικονομίας. Σύμφωνα με τον Παγκόσμιο Μετεωρολογικό Οργανισμό (WMO) η παγκόσμια μέση στάθμη της θάλασσας έχει αυξηθεί ταχύτερα από το 1900 έως σήμερα από ό,τι σε οποιονδήποτε προηγούμενο αιώνα τα τελευταία 3.000 χρόνια.

Μάλιστα, σύμφωνα με τον γενικό γραμματέα του ΟΗΕ **Αντόνιο Γκουτέρες**, ακόμη και αν η αύξηση της θερμοκρασίας της Γης συγκρατηθεί ως εκ θαύματος στους 1,5 βαθμούς Κελσίου, η θάλασσα θα συνεχίσει να «φουσκώνει» ενώ εάν αυξηθεί κατά 2 βαθμούς Κελσίου, τότε η άνοδος της θαλάσσιας στάθμης θα μπορούσε να διπλασιαστεί απειλώντας μεγαλουπόλεις, όχι μόνο στην Ασία, αλλά σε κάθε άλλη ήπειρο, όπως είναι το Κάιρο, το Λάγος, το Μαπούτο, η Ντάκα, η Κοπεγχάγη, το Λονδίνο, το Λος Άντζελες, η Νέα Υόρκη, το Μπουένος Άϊρες, το Σαντιάγο κ.ά.

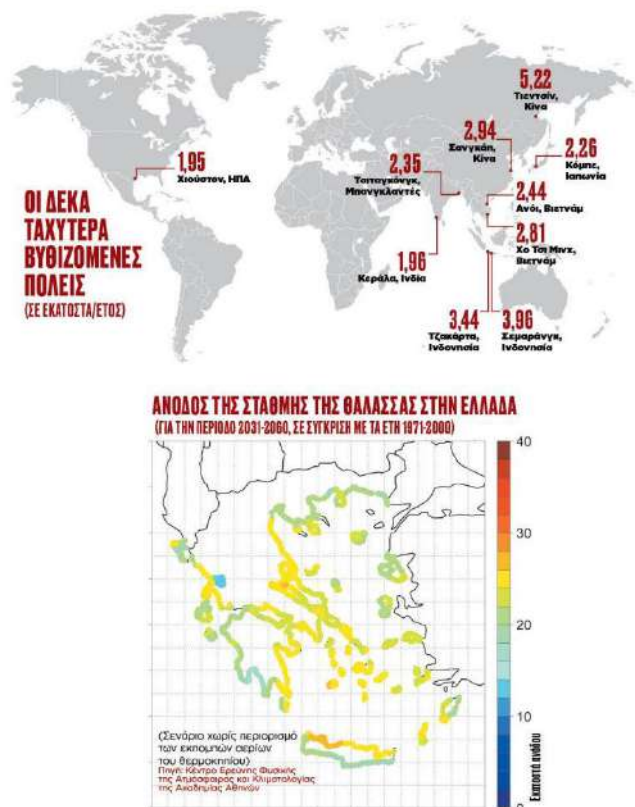
Σχεδόν 900 εκατομμύρια άνθρωποι – το 10% του παγκόσμιου πληθυσμού – ζουν σε παράκτιες ζώνες, με τον πληθυσμό στα μικρά νησιωτικά αναπτυσσόμενα κράτη του Δυτικού Ειρηνικού να αντιμετωπίζουν μια άνοδο της στάθμης της θάλασσας έως και τέσσερις φορές μεγαλύτερη από τον παγκόσμιο μέσο όρο.

Υπό βύθιση περιοχές και στην Ελλάδα

Οι κλιματικές μεταβολές δεν έχουν αφήσει ανεπηρέαστη την Ελλάδα. Ήδη επιστήμονες έχουν καταγράψει επίδραση τόσο στην παραγωγικότητα των καλλιεργειών, αλλά και στο τουριστικό προϊόν, δηλαδή στους δύο βασικούς «πυλώνες» της ελληνικής οικονομίας.

Μάλιστα, όπως αναφέρει ο ακαδημαϊκός κ. **Χρήστος Ζερε-**

Φός, επικεφαλής του Κέντρου Ερεύνης Φυσικής της Ατμόσφαιρας και Κλιματολογίας της Ακαδημίας Αθηνών, ένα από τα πιο χαρακτηριστικά παραδείγματα αποτελεί το Καλοχώρι Θεσσαλονίκης, ο άλλοτε λαχανόκηπος της περιοχής, από τους βυζαντινούς χρόνους.



Οι συνέπειες των μακροχρόνιων μεταβολών της θαλάσσιας στάθμης σε συνδυασμό με παροδικές ακραίες κυματικές καταστάσεις θα επηρεάσουν πολλούς κλάδους της ελληνικής οικονομίας (τουρισμό, χρήσεις γης, μεταφορές, κ.λπ.). Και όσο οι προσπάθειες της παγκόσμιας κοινότητας για μείωση των επικινδυνών για το κλίμα εκπομπών θα συνεχίζονται, απαιτείται παράλληλα άμεση ενίσχυση της άμυνας των παράκτιων περιοχών και πόλεων ώστε να σταθούν όρθιες στα «χτυπήματα» των κλιματικών φαινομένων που, ούτως ή άλλως, έρχονται.

Στην Ελλάδα το έργο του πολεοδομικού σχεδιασμού για το σύνολο της ελληνικής επικράτειας βρίσκεται στο στάδιο της προκήρυξης των μελετών για τα Τοπικά Πολεοδομικά Σχέδια (ΤΠΣ), τα οποία σχεδιάζεται να ολοκληρωθούν εντός τριετίας με χρηματοδότηση από το Ταμείο Ανάκαμψης.

Το «φράγμα» της Βενετίας

Για αιώνες στη Βενετία μεγάλες παλίρροies βύθιζαν τα σοκάκια, πλημμύριζαν τα κτίρια, εμποδίζαν την κίνηση των σκαφών κάτω από τις γέφυρες. Εδώ και μια τριετία όμως η ζωή των κατοίκων και των εμπορών έχει βελτιωθεί. Το πρόβλημα της βύθισης της πόλης προφανώς δεν λύνεται με το φράγμα, παρά ταύτα η ζωή των κατοίκων γίνεται κάπως ευκολότερη.

Το έργο υδραυλικής μηχανικής (γνωστό με το ιταλικό ακρωνύμιο «MOSE») ολοκληρώθηκε με τεράστιες καθυστερήσεις, έπειτα από δύο δεκαετίες και πλέον λειτουργεί και προστατεύει τη Βενετία και τη λιμνοθάλασσά της.

Σε κάθε περίπτωση, δεν λείπουν οι «γκρίνιες» για τη χρησιμότητα του φράγματος που κόστισε 5,5 δισεκατομμύρια ευρώ. Μελέτη του 2021 προέβλεψε άνοδο της στάθμης του νερού στη λιμνοθάλασσα της Βενετίας μεταξύ 32 και 110 εκατοστών έως το 2100, ανάλογα με το πόσο δραστικά θα περιοριστούν οι εκπομπές άνθρακα.

(ΤΟ ΒΗΜΑ, 05.06.2023, <https://www.tovima.gr/print/society/tsimento-kai-nero-lfvouliazoun-tis-poleis>)

Όπως εξηγεί, εξαιτίας των αλλαγών στο κλίμα, πλέον η μέση στάθμη της θάλασσας βρίσκεται στο ίδιο υψόμετρο με το έδαφος, το αλμυρό νερό διεισδύει με συνέπεια να παρατηρείται υφαλάτωση της γης, η οποία είναι καταστροφική για την αγροτική παραγωγή.

Το ίδιο συμβαίνει σήμερα σε χιλιόμετρα ακτογραμμών με χαμηλό υψόμετρο, σε δέλτα ποταμών όπως του Νέστου, του Αξιού, του Αλιάκμονα, ή στα παράλια του Μεσολογίου κ.λπ.

Στο σενάριο ενός ήπιου μετριασμού των εκπομπών αερίων, στο μεγαλύτερο μέρος της χώρας για την περίοδο 2031 – 2060 προβλέπεται σημαντική άνοδος της στάθμης της θάλασσας. Περισσότερο θα επηρεαστούν τα νησιά του Κεντρικού Αιγαίου στο βόρειο και νοτιοδυτικό τμήμα της Κρήτης, η ακτογραμμή του Ιονίου της ηπειρωτικής χώρας όπου η άνοδος της στάθμης θα φτάσει έως και τα 30 εκατοστά.

Αλλά και στο σύνολο της ελληνικής ακτογραμμής υπολογίζεται μια άνοδος της στάθμης των θαλασσινών υδάτων από 10 έως 20 εκατοστά. Για την ίδια τριακονταετία, σύμφωνα με το πιο δυσμενές σενάριο, δηλαδή χωρίς περιορισμό των θερμοκηπικών αερίων, διαφαίνεται ότι σχεδόν σε όλη την ελληνική ακτογραμμή η θάλασσα θα ανέβει από 20 και σε ορισμένες περιοχές έως 30 εκατοστά.

Σύμφωνα με τον καθηγητή, είναι δεδομένο ότι στις περιοχές όπου η στάθμη της θάλασσας θα ανεβαίνει, οι ακτές θα διαβρώνονται και θα χάνονται οι αμμουδιές. Στην Ελλάδα ήδη σήμερα το 20% της ακτογραμμής κινδυνεύει από την άνοδο της στάθμης της θάλασσας, η οποία έχει επιταχυνθεί τα τελευταία 10 χρόνια, κατατάσσοντας τη χώρα μας στην πρώτη πεντάδα των ευρωπαϊκών χωρών ως προς την παράκτια τρωτότητα.

ΝΕΑ ΑΠΟ ΤΙΣ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ



The 8th International Conference on Unsaturated Soils "Towards Unsaturated Soils Engineering" Milos, Greece

1. Introduction

The 8th International Conference on Unsaturated Soils "Towards Unsaturated Soils Engineering" took place at the George Iliopoulos Conference Centre on the Island of Milos, Greece, between 2 and 6 of May 2023, and was organised by the Hellenic Society for Soil Mechanics and Geotechnical Engineering (HSSMGE).

More than two hundred participants registered for the Conference and more than one hundred and fifty papers were included in the Proceedings along with the written versions of 8 Keynote Lectures, 1 plenary lecture and the 3rd Blight Lecture.

The Proceedings were published open access by E3S Web of Conferences as Volume 382 (2023) and may be found at the following link: <https://www.e3s-conferences.org/articles/e3sconf/abs/2023/19/con-tents/contents.html>.

2. Pre-conference events

The conference was preceded by two pre-conference events:

- The pre-conference short course "Introduction to Unsaturated Soil Mechanics and its importance in Geotechnical Practice" in English on the evening of the 2nd of May 2023. This was an event in support of non-expert delegates attending the 8th International Conference on Unsaturated Soils so as they would be able to follow presentations during the conference. It included two lectures, one by Dr Michael Bardanis "Fundamental characteristics and shear strength of unsaturated soils" and one by Prof. Dimitrios Loukidis "Swelling and collapse due to partial saturation changes". This Short Course shows the model for welcoming non-experts in specialized conferences like a conference on Unsaturated Soils that HSSMGE adopts in its events and proposes it for specialized conferences, in order to promote various subjects to the wider engineering community.

- The pre-conference workshop "Long-term measurement of soil suction in the field and its modelling" which included the visit of the workshop participants at the field suction measurement station *that was installed in the conference venue*

specifically for the conference thanks to the generosity of our Silver Sponsor METER GROUP and other conference supporters. Exposure to the station and its details was extended to the rest of the participants of the conference that showed interest into it. The presentations of the workshop were:

- On the long-term measurement of suction in the field and its importance for the evolution of Un-saturated Soil Mechanics, by Dr Michael Bardanis
- Advances in field measurements of soil water content, by Dr Doug Cobos
- Advances in technology and techniques for monitoring soil suction in the field and the lab, by Dr Leo Rivera
- Long-term performance of conventional tensiometers installed in the Adige River flood embankment in Italy, by Prof. Alessandro Tarantino
- Measurement and monitoring of soil matric suction using High Capacity Tensiometers, by Assist. Prof. Joao Mendes
- Experiences from the long-term measurement of suction in Cyprus expansive soils, by Assoc. Prof. Dimitrios Loukidis, and
- Numerical modelling of suctions in the field, by Dr Katerina Tsiampousi

The powerpoint presentations of the workshop will be compiled soon in a pdf format volume and made public through HSSMGE social media accounts and by e-mail to all conference delegates.



Coffee and cookies during the workshop break, along with hands-on experience of the station inside the conference venue and the tuffs the sensors were installed in!



More opportunities for hands-on experience of the tuffs in the existing cut in the conference venue!

3. Conference Sessions

The conference was organised in 24 sessions (including a panel discussion session) plus two plenary sessions for invited lectures, and a poster presentation session in a parallel hall. Sessions were organised in a climaxing order from fundamentals on the subject towards more specialised themes on the subject and themes interplaying with other subjects. Eight of the sessions included the eight themed lectures of the conference. The sessions were:

- Shrink-swell & collapse
- Fundamental Soil Behavior - Part I
- Cyclic & dynamic behaviour of unsaturated soils
- Fundamental Soil Behavior - Part II
- Advances in testing techniques, methods and equipment
- Understanding the effect of climate change on the environment and infrastructure through unsaturated soil behaviour
- Foundations
- Unsaturated Soil Mechanics instruction: Guiding the non-specialist instructor. A panel discussion (with the support and collaboration of TC306 on Geo-education and its Chair, Assoc. Prof. Marina Pantazidou)
- Water Retention Curves
- Physical, numerical and constitutive modelling - Part I
- Effects of microstructure
- Unsaturated soils of fills, levees, embankments, dams, roads & pavements, railways and other pieces of infrastructure
- Slope stability & landslides
- Hydro-mechanical and thermal properties of bentonites and bentonite-based mixtures - Part I
- Physical, numerical and constitutive modelling - Part II
- Partial saturation and tailings
- Unsaturated soil mechanics in the preservation and pathology of historic monuments (with the support and collaboration of TC301 on Historic Sites and its Chair, Prof. Alessandro Flora)
- Multi-phase media and multi physical coupling - Part I
- Hydro-mechanical and thermal properties of bentonites and bentonite-based mixtures - Part II
- Multi-phase media and multi physical coupling - Part II
- Geoenvironmental and geo-energy applications of unsaturated soil mechanism - Part I
- Long-term measurements of suction in the field and their relation to climatic parameters - Part I
- Geoenvironmental and geo-energy applications of unsaturated soil mechanism - Part II
- Long-term measurements of suction in the field and their relation to climatic parameters Part II

Emphasis was placed on the maximum possible collaboration with other Technical Committees resulting in the “Unsaturated Soil Mechanics instruction: Guiding the non-specialist instructor” panel discussion session (TC306) and the “Unsaturated soil mechanics in the preservation and pathology of historic monuments” session (TC301). Other sessions too constituted ‘bridges’ with the subjects of other Technical Committees as well, although they were created after the papers had been received under other themes and their number proved adequate to support a specific session on particular subjects (for instance the session “Partial saturation and tailings”). Special thanks must be given to Associate Professor Marina Pantazidou, Chair of Technical Committee TC306 “Ge-

oenvironmental Education”, and Professor Alessandro Flora, Chair of Technical Committee TC301 “Preservation of Historic Sites”.



The discussion panel during the “Unsaturated Soil Mechanics instruction: Guiding the non-specialist instructor” session. From left to right: M. Pantazidou, John McCartney, Sandra Houston and Alessandro Tarantino

4. Keynotes, Plenary and the 3rd Blight Lecture

The Conference included eight Themed Lectures by invited speakers incorporated in the sessions, plus a plenary lecture by Prof. Charles Ng and the 3rd Blight Lecture by Prof. Eduardo Alonso. The Themed Lectures were:

- A Unified Two Independent Stress Variable Approach to Shrink-Swell and Collapse, by Prof. Sandra Houston (written version may be accessed here: https://www.e3s-conferences.org/arti-cles/e3sconf/abs/2023/19/e3sconf_unsat2023_01001/e3sconf_unsat2023_01001.html)
- When nature meets technology: AI-informed discovery of root-soil physical interactions, by Assoc. Prof. Anthony Leung (written version may be accessed here: https://www.e3s-conferences.org/arti-cles/e3sconf/abs/2023/19/e3sconf_unsat2023_21001/e3sconf_unsat2023_21001.html)
- Seismic Compression of Unsaturated Soils, by Prof. John McCartney (written version may be accessed here: https://www.e3s-conferences.org/arti-cles/e3sconf/abs/2023/19/e3sconf_unsat2023_03001/e3sconf_unsat2023_03001.html)
- Effects of microstructure on thermo-hydro-mechanical behaviour of geomaterials, by Prof. Jean-Michel Pereira (written version may be accessed here: https://www.e3s-conferences.org/arti-cles/e3sconf/abs/2023/19/e3sconf_unsat2023_11001/e3sconf_unsat2023_11001.html)
- New challenges in experimental unsaturated soil mechanics, by Prof. Enrique Romero (written version may be accessed here: https://www.e3s-conferences.org/arti-cles/e3sconf/abs/2023/19/e3sconf_unsat2023_05001/e3sconf_unsat2023_05001.html)
- Milos, the minerals island and its important asset: Bentonite, by Prof. Stamatakis (written version may be accessed here: https://www.e3s-conferences.org/arti-cles/e3sconf/abs/2023/19/e3sconf_unsat2023_19001/e3sconf_unsat2023_19001.html)¹
- Plant-based hydrological reinforcement of slopes, by Prof. Alessandro Tarantino (written version may be accessed here: https://www.e3s-conferences.org/arti-cles/e3sconf/abs/2023/19/e3sconf_unsat2023_13001/e3sconf_unsat2023_13001.html)
- Calibration of BBM Parameters using the Modified State Surface Approach, by Prof. Xiong Zhang (written version may be accessed here: https://www.e3s-conferences.org/arti-cles/e3sconf/abs/2023/19/e3sconf_unsat2023_15001/e3sconf_unsat2023_15001.html)

¹ Unexpected circumstances did not allow Prof. Stamatakis to deliver the lecture in Milos and Dr K. Aspiotis was kind

enough to substitute for him both for the presentation of the lecture and for accompanying the delegates in the technical field trip on May the 6th.

Prof. Charles Ng's lecture was titled "Effects of thermal cycles on soil behaviour: theoretical and experimental studies".² The written version can be accessed here: https://www.e3s-conferences.org/arti-cles/e3sconf/abs/2023/19/e3sconf_unsat2023_00003/e3sconf_unsat2023_00003.html.

² Unexpected circumstances did not allow Prof. Ng to deliver the lecture in Milos and a recording of the lecture by Prof. Ng was presented during the conference. The recorded lecture is expected to be uploaded soon via HSSMGE social media presence.

The highlight of the 8th International Conference on Unsaturated Soils was the 3rd Blight Lecture by Eduardo Alonso, Emeritus Professor of UPC, Barcelona. The title of the lecture was "The positive history of an error. Modelling the heave of a nuclear power station" and its written version can be accessed here: https://www.e3s-conferences.org/arti-cles/e3sconf/abs/2023/19/e3sconf_unsat2023_00002/e3sconf_unsat2023_00002.html. The lecture has been recorded and is currently being edited. It will be uploaded soon at the ISSMGE site and HSSMGE social media. The lecture was superbly delivered and extremely welcomed by the audience, leaving a footprint exceeding the boundaries of Unsaturated Soil Mechanics and probably Geotechnical Engineering, an absolute 'must' for all geotechnical engineers to watch when it will be up-loaded.



Professor Eduardo Alonso delivering the 3rd Blight Lecture

5. Field trips

On the 6th of May two field trips were organised. One to the obsidian outcrops of the Nichia area on the island, the bentonite depos close to the Alikes area and the Aggeria Bentonite mine and Voudia bentonite process plant. Participants benefited from the presentations by IMERYs personnel that explained on site the details and brief history of the Aggeria Mine. The other field trip had cultural content allowing participants to visit the Ancient Theatre and the Catacombs as well as the iconic landscape of the island in Sarakiniko area. The organisers are grateful to Mr Gatsios and Mr Spiridakis of IMERYs for guiding us in the Aggeria Mine.



Stunning view of the Aggeria bentonite mine



Participants in the field trip at the Aggeria Mine view area

6. Social events

The conference included coffee and lunch breaks in an informal and casual fashion promoting social inter-action between participants in a relaxed environment. These were complemented by a Welcome Reception in the Conference Venue in the evening of May the 2nd after the pre-conference short course and a much enjoyed Conference Dinner at a popular restaurant of the island under the sound of the popular band 'Dog in the Fog'. The weather was unfortunately not the best of allies during many of these activities, but most probably it helped delegates remain faithful to the sessions in the halls rather than giving in to the tempting landscapes of the island!

7. Organisation, TC106 activities, sponsors, benefactors and footprint in the local and international engineering community

The conference was organised by the Hellenic Society for Soil Mechanics and Geotechnical Engineering (HSSMGE). Conference Chair was Dr Michael Bardanis, President of HSSMGE, and local organising committee members were Dr George Belokas, Secretary General HSSMGE, and Mr George Doulis, Treasurer of HSSMGE. The organising committee benefitted from the cooperation of an International Technical/Scientific Committee which included the following colleagues:

Eduardo Alonso (Spain)
Charles Augarde (United Kingdom)
Marc Ballouz (United States)
Christopher Beckett (United Kingdom)
Abdelmalek Bouazza (Australia)
Bernardo Caicedo (Colombia)
Rafaela Cardoso (Portugal)
Yu-Jun Cui (France)
Tacio de Campos (Brazil)
Pierre Delage (France)
Alessandro Flora (Italy)
Delwyn Fredlund (Canada)
Domenico Gallipoli (Italy)
Georgios Gazetas (Greece)
Antonio Gens (Spain)
Sandra Houston (United States)
Laureano Hoyos (United States)
Ioannis Ioannou (Cyprus)
Cristina Jommi (The Netherlands)
Apiniti Jotisankasa (Thailand)
Lyesse Laloui (Switzerland)
Eng Choon Leong (Singapore)
Anthony Leung (Hong Kong)
William Likos (United States)
Dimitrios Loukidis (Cyprus)
Claudio Mancuso (Italy)
David Masin (Czech Republic)
Fernando Marinho (Brazil)
Farimah Masrouri (France)
John McCartney (United States)
Gerald Miller (United States)
Charles Ng (Hong Kong)
Tomoyoshi Nishimura (Japan)

Seong-Wan Park (South Korea)
Marina Pantazidou (Greece)
Hariato Rahardjo (Singapore)
Sathiyamoorthy Rajesh (India)
Enrique Romero-Morales (Spain)
Adrian Russell (Australia)
Marcello Sanchez (United States)
Daichao Sheng (Australia)
Panagiotis Sitarenios (Greece)
Sekharan Sreedeeep (India)
Alessandro Tarantino (United Kingdom)
Kartal Tokar (Turkey)
David Toll (United Kingdom)
Hirofumi Toyota (Japan)
Christos Tsatsanifos (Greece)
Katerina Tsiampousi (Greece)
Sai Vanapalli (Canada)
Changfu Wei (China)
Simon Wheeler (United Kingdom)
Ioannis Zevgolis (Greece)

At the suggestion of the members of the Technical/Scientific committee the following colleagues assisted also with the review of papers:

Panagiotis Alyaliotis	Jean-Jacques Fry	Bruna de Carvalho	Bakytul Serikbek
Apostolopoulos	Suriya Prakash	Faria Lima Lopes	Radhey Sharma
Gerardo Davin	Ganesan	Shengmin Luo	Jimmy Shen Yuanjie
Aventian	Omid Ghasemi-Fare	Vasileios Mantikos	Xinye Song
Anitra Banerjee	Majid Ghayoomi	José Muñoz-Castellano	Dimitris Sotiriadis
R. Beshoy	Gibson de F.N.	Saonkle Nam	Mengxi Tan
David Boldrin	Gitiirana JR	Hyunjun Oh	Anh Minh Tang
Philipp Braun	Benjamin Guo	Ujjwal Kumar D. Patil	Alexandros Theodoris
Jean François Bruchon	Liu Hengshuo	Giuseppe Pedone	Danai Tyri
Agostino Walter Bruno	Zeynep Karataa	Matteo Pedrotti	Ploutarchos Tzampoglou
Rifat Bulut	Anna Karatzetou	Diego D. Pérez-Ruiz	Raul Velasquez
Junnan Cao	Ali Akbar Karimzadeh	Eleni Petala	Srajan Mugaia
Xinting Cheng	Melih Burhan	Alexandros Petalas	Viswanath Zhao Yan
Bhaskar Chittoori	Kenanoglu	Xavier Pintado	Xinbao Yu
Julia E. Colmenares	Ali Khasravi	Saranya Rangarajan	Caudia Zapata
Araujo de Sousa Raul Batista	Leonardo Maria Lalicata	Eve Roberts-Self	Qi Zhang
Alexandros Deliveris	Maria Sandro Lemos	Roger Augusto Rodrigues	
Guillaume Flood-Page	Machado Yao Li	Uday Sagar	

The conference organisers benefited from the cooperation of the conference management company ERAS-MUS S.A.

In the evening of May the 3rd, the TC106 meeting took place under the Chairmanship of Prof. Enrique Romero, TC106 Chair. The meeting was hybrid allowing TC106 members not in Milos to participate. It included an agenda previously distributed to members and the presentation of the only proposal to host the 9th International Conference on Unsaturated Soils in Boston, USA.

UNSAT2023 was privileged to have the ELLAKTOR GROUP as its Gold Sponsor, the METER GROUP as its Silver Sponsor, and ARCHIMEDES S.A., EDAFOS S.A., GDS, MACCAFERRI and VJ TECH as its partners. HSSMGE is grateful for the generosity and support of these companies.

The Organising Committee takes pride in having offered complimentary and discounted registrations to participants at early stages of their careers facing financial difficulties to attend, as well as the ISSMGE Foundation which supported many young colleagues to come to Milos and attend the conference (you may read their reports here: <https://www.issmge.org/issmge-foundation/recipients-reports>). We believe that the ISSMGE Foundation is one of the most important institutions of the ISSMGE and we strongly encourage colleagues and companies to support its work to the benefit of many colleagues and events around the world including the 8th International Conference on Unsaturated Soils.

From the beginning of the planning of the event, the Organising Committee set the target to try to disseminate research carried out in the field of Unsaturated Soil Mechanics to as many members of the local and international engineering community as possible. Activities in this direction included:

- The organisation of a workshop on Unsaturated Soils in Athens, Greece, on July the 1st 2019 with printed proceedings in Greek distributed for free to all participants of the event and electronically through the linkedin account of HSSMGE with recordings of the presentations uploaded to the HSSMGE youtube channel (<https://www.youtube.com/@thechannelofhssmge5899/playlists>). Prof Eduardo Alonso honoured us with delivering a lecture that was also recorded and can be found on the HSSMGE youtube channel (<https://www.youtube.com/watch?v=FtJCjEOYgK8&t=610s>).
- The organisation of a special session on Unsaturated Soils from Greece and Cyprus during the 8th Hellenic Conference on Geotechnical Engineering on November the 7th 2019 with participations from both Greece and Cyprus. The papers from this session were included in the Conference Proceedings.
- The organisation of the pre-conference short course "Introduction to Unsaturated Soil Mechanics and its importance in Geotechnical Practice" in English on the evening of May the 2nd 2023. This was an event in support of non-expert delegates attending the 8th International Conference on Unsaturated Soils so as they would be able to follow presentations during the conference more easily.
- The organization of the pre-conference workshop "Long-term measurement of soil suction in the field and its modelling" which included the visit of the workshop participants at the field suction measurement station that was built in the conference venue specifically for the conference thanks to the generosity of our Silver Sponsor METER GROUP. Exposure to the station and its details was extended to the rest of the participants of the conference that showed interest into it.
- An activity in the same direction was the session "Unsaturated Soil Mechanics instruction: Guiding the non-specialist instructor. A panel discussion" with the support and collaboration of TC306 on Geo-education and its Chair, Assoc. Prof. Marina Pantazidou. A standard item of discussion in the field of Un-saturated Soils is how we are going to attract more geotechnical engineers to the subject and promote its dissemination. This session focused on the non-specialist instructors of Geotechnical Engineering as an effort to help them become the people disseminating basic understanding of Unsaturated Soil Mechanics to undergraduate students.

The actual 'footprint' of this effort is recorded in the large number of non-experts in Unsaturated Soils that were attracted to attend the conference.

Dr Michael Bardanis
 President of the Hellenic Society for Soil Mechanics and Geotechnical Engineering
 and Conference Chair



Διάλεξη Καθηγητή Arvin Farad

Η Ελληνική Επιστημονική Εταιρεία Εδαφομηχανικής και Γεωτεχνικής Μηχανικής (ΕΕΕΕΓΜ) και ο Τομέας Γεωτεχνικής του ΕΜΠ διοργάνωσαν διάλεξη του Καθηγητή Arvin Farad τη Δευτέρα 19/6/2023 στις 6:00μμ στην Αίθουσα Εκδηλώσεων του ΤΕΕ, Σύνταγμα, Νίκης 4, α' όροφος με τίτλο:

Electromagnetic Waves For Geotechnical / Geoenvironmental Applications

Η διάλεξη μεταδόθηκε και διαδικτυακά ζωντανά στο κανάλι της ΕΕΕΕΓΜ.

Περίληψη Διάλεξης

Electromagnetic (EM) waves have long been used to detect and monitor anomalies in soils. This talk will review various aspects and fundamentals of the use of electromagnetic (EM) waves for radarbased geophysical detection and characterization, including numerical modeling and setting up successful experiments, and the development of sensors. In addition, the use of EM waves to control various mechanisms (e.g., induce contaminant flow, control airflow, alter hydraulic conductivity) to improve or expedite the geoenvironmental process of cleaning up soil and groundwater or geotechnical applications (e.g., liquefaction mitigation) will be discussed at the laboratory scale within resonant cavities. Numerical simulation, experimental validation, and solving the inverse problem to reach governing equations of these phenomena and the relevant multiphysics processes will then be explained. The resulting governing models to correlate EM waves' characteristics and the flow and hydraulic-conductivity alteration and potential for liquefaction mitigation will also be explained.

Σύντομο Βιογραφικό Σημείωμα Ομιλητή

Dr. Arvin Farid is a Professor of the Civil Engineering Department and the Director of the SENS-GPS Program, sponsored by the U.S. National Science Foundation, at Boise State University. He is also the chair of the Geoenvironmental Engineering Technical Committee of the American Society of Civil Engineers (ASCE) Geo-Institute (GI) and an editor of the Environmental Geotechnics Journal of the Institute of Civil Engineers (ICE). He also serves on several national and international committees. He received his Ph.D. from Northeastern University, Boston, MA, and his M.Sc. and B.Sc. degrees from Shiraz (formerly Pahlavi) University, Shiraz, Iran. He has pioneered the leading edge of research on the use of electromagnetic (EM) fields for geoenvironmental/geotechnical applications. His research includes EM-induced remediation, EM waves' effect on soil properties, energy geo-storage, wildfire research, recycling and reuse of industrial by-products, material characterization, power infrastructure vulnerability, and liquefaction mitigation, among others. His most recent research focuses on wildfires' impacts, resilience against them, restoration and remediation post-fire, and recycling waste. Dr. Farid was awarded several research grants from the U.S. National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA) among others. He has published in several prestigious civil and electrical engineering journals and presented at numerous international civil engineering, electrical engineering, and geophysics conferences.



International Society for Soil Mechanics and Geotechnical Engineering

ISSMGE News & Information Circular June 2023

www.issmge.org/news/issmge-news-and-information-circular-June-2023

1. ISSMGE HERITAGE TIME CAPSULE (HTC) UPDATE

Between May and July 2023, a process of fast tracking of HTC contributions is underway, whereby relevant articles published in the ISSMGE Bulletin are uploaded to the HTC webpage to kick start the Member Society or Technical Committee's work on HTC contributions. In May 2023, bulletin articles were authorised for uploading in Part A of the HTC (<https://www.issmge.org/the-society/time-capsule/part-a>) for the following,

- Albanian Geotechnical Society,
- Hungarian Geotechnical Society,
- Nigerian Institution of Geotechnical Engineers,
- TC104 Physical Modelling, and,
- TC215 Geo-Environmental.

Also, in May 2023, the Discoverer report from Sonia H. M. Marques, Portugal was uploaded in Part C of the HTC (<https://www.issmge.org/the-society/time-capsule/part-c>).

2. ISSMGE BULLETIN

The latest edition of the ISSMGE Bulletin (Volume 17, Issue 1, April 2023) is available from the [website](#).

3. ISSMGE FOUNDATION

The next deadline for receipt of applications for awards from the ISSMGE Foundation is the 30th September 2023. Click [here](#) for further information on the ISSMGE Foundation.

4. CONFERENCES

[Member Societies, Technical Committees, Sister Societies and related organisations may add their events directly to the ISSMGE Events database via the link + Submit Event at the top of the EVENTS page](#)

For a complete listing of all ISSMGE and ISSMGE supported conferences, and full information on all events, including deadlines, please go to the Events page at <https://www.issmge.org/events>. For updated information please refer to that specific events website.

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

ISSMGE EVENTS

14TH AUSTRALIA AND NEW ZEALAND CONFERENCE ON GEOMECHANICS- 02-07-2023 - 05-07-2023 Cairns Con-

vention Centre, Cairns, Australia; Language: English ; Organiser : Australian Geomechanics Society (AGS); Contact Information: David Lacey; Address: PO Box 1241, QLD 4004; Phone: 049981991; Email: dlacey@fsg-geotechnics.com.au; Website: <http://www.anzgeo2023.com.au>; Email : anzgeo2023@arinex.com.au

7TH INTERNATIONAL CONFERENCE SERIES ON GEOTECHNICS, CIVIL ENGINEERING AND STRUCTURES (CIGOS) - 04-04-2024 - 05-04-2024 Ho Chi Minh City, Vietnam; Language: English; Organiser: Association of Vietnamese Scientists and Experts (AVSE Global) and University of Architecture Ho Chi Minh City (UAH); Auspices ISSMGE TC309; Contact person: cigos2024@sciencesconf.org; Website: <https://cigos2024.sciencesconf.org/>

EUROPEAN YOUNG GEOTECHNICAL ENGINEERS CONFERENCE 2024 - 25-06-2024 - 29-06-2024 Skopje, Republic of North Macedonia; Language: English; Organiser: Macedonian Association for Geotechnics; Contact person: Ms. Elena Angelova; Address: Blvd. Partizanski odredi No.24; Email: mag@gf.ukim.edu.mk; Website: <https://mag.net.mk>

5TH EUROPEAN CONFERENCE ON PHYSICAL MODELING IN GEOTECHNICS - 02-10-2024 - 04-10-2024 Delft, Netherlands; Language: English; Organiser: Delft & Delft University of Technology; Contact person: Suzanne van Eekelen & Miguel Cabrera; Email: organisa-tion.ecpmg24@gmail.com;

NORDIC GEOTECHNICAL MEETING - NGM 2024 - 18-09-2024 - 20-09-2024 Lindholmen Science Park, Göteborg, Sweden; Language: English; Organiser: Swedish Geotechnical Society; Contact Information: Victoria Svahn; Address: Sveaborgsvägen 16; Email: info@sqf.net; Website: <http://www.ngm2024.se>;

XVIII AFRICAN REGIONAL CONFERENCE ON SOIL MECHANICS AND GEOTECHNICAL ENGINEERING - 06-10-2024 - 09-10-2024 Algiers, Algeria; Languages: English & French; Organiser: Algerian Geotechnical Society; Contact Information: Algeos; Address: USTHB, Faculty of Civil Engineering BP 32 El-Alia - Bab-Ezzouar; Phone: (213) 66130 954; Fax: (213) 21247224 ; Email: secretariat18ARC@al-geos-dz.com; Website : <https://algeos-dz.com/18ARC.html>

5TH INTERNATIONAL CONFERENCE ON TRANSPORTATION GEOTECHNICS - 20-11-2024 - 22-11-2024 Sydney Masonic Centre, 66 Goulburn Street Sydney NSW 2000 Australia; Language: English; Organiser: UTS Transport Research Centre (<https://www.uts.edu.au/research/transport-research-centre>); Contact person: Dr Chamindi Jayasuriya ; Address: 15 Broadway; Email: chamindijaya-suriya@gmail.com; Website: <http://www.ictg2024.com.au>; Email: Cholachat.Rujikiatkamjorn@uts.edu.au

NON-ISSMGE EVENTS

16TH INTERNATIONAL CONFERENCE ON STRUCTURAL AND GEOTECHNICAL ENGINEERING - 27-12-2023 - 28-12-2023 Triumph Luxury Hotel, New Cairo, Egypt; Language: English; Organiser: Faculty of Engineering- Ain Shams University; Contact person: Mohamed Abdelmotaal; Address: 1 ElSarayat street, Waili; Email: ICSGE16@eng.asu.edu.eg; Website: <https://eng.asu.edu.eg/icsge/overview>;

Teaching material samples for Environmental Geotechnics: The collection is growing!

Marina Pantazidou / [TC306](#) / 07-06-2023

In the context of the collaboration between TC215 (Environmental Geotechnics), which organizes the 9th Int. Congress on Environmental Geotechnics ([9ICEG](#)) in June 25-28, 2023, in Chania, Greece, and TC306 (Geo-Education), creators of any kind of educational material about which they feel proud about are encouraged to submit small samples - choice morsels of their work and to highlight their special features.

You are invited to [browse submitted samples](#) and submit comments. There is still time to contribute samples (attending the conference is not a requirement). Please spread the word among your environmental geotechnics colleagues.

Submitted samples should be accompanied by the following required metadata: (1) the name and type of course where the submitted sample is used, (2) 2-3 key words for the course emphasis, (3) a descriptive title for the sample and (4) a brief teaching note. For more details on the required accompanying information, see [here](#). The compilation of samples will be presented during a [Lecture on Education](#) on June 27. Samples submitted according to specifications will be publicized through the 9ICEG website, through TC306-Geoworld and through TC215.

Announcing the grand opening of the ISSMGE IDEA Zone: We want to hear from you!

ISSMGE IT Administrator / General / 21-06-2023



The ISSMGEs Innovation and Development Committee (IDC) is pleased to announce the new Innovations and Developments for Exploration and Advancement (IDEA) Zone to solicit ideas on what new IDEAs you would like to see the ISSMGE explore. What can the ISSMGE implement that would further provide value to you, the society, its members, and the profession across the world?! You tell us!

The [ISSMGE IDEA Zone](#) is a simple form that you can fill out explaining your IDEA. You can choose to remain anonymous or not. We welcome all feedback and will consider all IDEAs submitted. Maybe you'll see your IDEA come to life within ISSMGE!

Education of the next generation of geotechnical professionals in ANZ

ISSMGE IT Administrator / Time Capsule Project / 21-06-2023

If you are attending [Australia and New Zealand Conference on Geomechanics 2023](#) (ANZ2023), we invite you to join the HTC session about Geo-Education and have your say!

The [Heritage Time Capsule](#) (HTC) project team from the International Society for Soil Mechanics and Geotechnical Engineering ([ISSMGE](#)) is organising sessions at all regional conferences of ISSMGE in 2023-24. The HTC session during the upcoming (ANZ2023) will be held on Monday 3 July, between 4:30 and 6:00 pm, in Cairns, Australia.

This session will explore the topic of education of the next generation of geotechnical engineers along with the current state of geotechnical engineering programs in ANZ universities. The panel has been confirmed and consists of a young graduate, an industry representative and an academic from both Australia and New Zealand.

Our panel members will provide well balanced, good depth and coverage, and timely information about the following three main topics:

- Education and training of the next generation of geotechnical professionals
- How does industry manage the resource planning and development?
- The graduates experience in the industry and how it relates to their university education.

Short presentations followed by panel discussions and lively feedback from the audience is planned.

The work started at this HTC session will continue post conference to develop an Australasian vision, mission and some strategic goals with achievable actions against each of the goals. In this way, we intend to deliver in the current ISSMGE presidential term (2022-2026), a tangible and valued outcome for the ISSMGE Australasian region.

If you would like to contribute your ideas and/or be part of the discussion at the ANZ2023, please contact Golnaz Ali-pour, golnaz.alipour@mq.edu.au.

Proceedings of the 9th International Congress on Environmental Geotechnics released in open access through the ISSMGE Online Library on the first day of the Congress

ISSMGE IT Administrator / General / 26-06-2023

9ICEG
25-28 June 2023

ISSMGE is pleased to announce that the 244 papers from the proceedings of the 9th International Congress on Environmental Geotechnics (ICEG2023) are made available in the ISSMGE Online Library, today, on the first day of the conference here:

<https://www.issmge.org/publications/online-library/conferences/iceg2023>

The abstracts and papers of the proceedings were reviewed through ISSMGEs Conference Review Platform which is part of its cyber-infrastructure aiming to support open access. The technical editors are Tugce Baser, Arvin Farid, Xunchang Fei and Dimitrios Zekkos.

ICEG2023 is being held in Chania, Crete, Greece from June 25th to June 28th in 2023.

New TC211 Webinar on "Concrete for Rigid Inclusions" by Dr. Martin Larisch

ISSMGE IT Administrator / [TC211](#) / 30-06-2023

About this Webinar

Rigid inclusions are used for ground improvement works and they are often designed as unreinforced concrete columns. The installation methods of rigid inclusions mainly involve full-displacement drilling methods or non-displacement techniques which both utilize pumped and pressurized in-situ concrete. Ground improvement with rigid inclusions often requires the use of low to medium strength concrete to achieve the project specific design criteria.

Concrete mix designs need to allow for sufficient workability and stability of the fresh concrete to be able to withstand external pressures from pumping and placement. In addition, the workability life and the early strength development also need to be considered to allow for high quality rigid inclusions as well as smooth and efficient column installation on site.

The presentation discusses the importance of adequate workability of the fresh concrete and the impacts of unsuitable concrete mix designs on the quality of the rigid inclusions as well as on potential disruptions in the construction process when the fresh concrete performance is inadequate. Fresh concrete properties like slump, spread, workability, stability, slump/ spread retention will be discussed and some common testing methods to assess the quality of fresh concrete for rigid inclusions are introduced. In addition, the presenter highlights some selected construction related aspects which may impact the quality of the rigid inclusions as a result of insufficient concrete placement and quality on site.



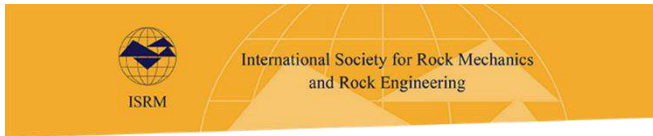
Dr. Martin Larisch is a Geotechnical and Ground Engineer-

ing Professional with more than 25 years of construction experience. He is currently based in Wellington, New Zealand, where he works as a consultant and independent expert for ground improvement and piling projects across the Asia Pacific Region. Martin obtained his University Degree in Civil Engineering in Germany, a Master of Advanced Concrete Technology in Leeds (UK) and a PhD in Geotechnical Engineering from The University of Queensland in Brisbane, Australia.

He has authored more than 30 technical papers on ground improvement, piling and concrete related topics and for the last decade, he has also been involved in the development of two international best practice guidelines for tremie concrete.

Martin is also the New Zealand nominated member of ISSMGE TC-211 Ground Improvement Technical Committee.

View for free Concrete for Rigid Inclusions Webinar at ISSMGE Virtual University: <http://virtualuniversity.issmge.org/courses/course-v1:ISSMGE+TC211-01+2023/about>



News

<https://www.isrm.net>

42nd ISRM Online Lecture by Professor Antonio Bobet is now online! 2023-06-22

The 42nd ISRM online lecture "The Mechanics and Imaging of Slip along Frictional Discontinuities" by Professor Antonio Bobet, from USA, is online at <https://isrm.net/page/show/1104>.



The 42nd ISRM online lecture will be delivered by **Professor Antonio Bobet**, from USA. The title of the lecture is: "**The Mechanics and Imaging of Slip along Frictional Discontinuities**". It will be broadcasted on 22 June 2023, 10 A.M. GMT at www.isrm.net.

Dr. Bobet is the Edgar B. and Hedwig M. Olson Professor in Civil Engineering at Purdue University. He

holds a bachelor's and master's degrees in Civil Engineering from Technical University of Madrid in Spain and a Doctor of Science degree from Massachusetts Institute of Technology in the US. He has extensive experience in practice. He was a senior geotechnical engineer at Euroestudios, consulting engineers, in Spain, for four years, and construction manager at Ferrovial, Spain, also for four years. Dr. Bobet's areas of interest include rock fracture mechanics, wave propagation through fractured media and underground structures.

Dr. Bobet was elected member of the Board of Directors of the American Rock Mechanics Association in 2009, and served as its President from 2013 to 2015. He was the Chair of the 2012 U.S. Rock Mechanics/Geomechanics Symposium and is a member of the Geotechnical Advisory Board (GAB) of the Panama Canal. He was appointed a High-end Foreign Expert by the Government of China in 2016.

He has received a number of awards, including the ASCE 2011 Ralph B. Peck Award, the 2012 National Award for Significant Contributions in Science and Technology - SENACYT Panama, the 2012 ARMA Research Award and is the recipient of the 2022 George F. Sowers Lecture. In 2016, he was elected Fellow of the American Rock Mechanics Association, where he served as Chair from 2018 to 2022. He is the Co-Editor in Chief of the Underground Space Journal.

The lecture will remain online so that those unable to attend at this time will be able to do it later. As usual, the attendees will be able to ask questions to the lecturer by e-mail during the subsequent five days. [All online lectures are available from this page](#).

Deadline for abstract submission to Eurock 2024 in Alicante, Spain, extended to 31 July 2023-06-23

The organizing committee of the ISRM European Rock Mechanics Symposium (Eurock 2024) has made the decision to extend the deadline for abstract submissions until the end of July 2024. This extension comes in response to numerous

requests from authors who require additional time to prepare their abstracts. We are looking forward to receiving your contributions!

More info: <https://eurock2024.com/>

15th International ISRM Congress, Salzburg, Austria - early bird registration fee until 10.07.2023 2023-06-25

The Organising Committee of the 15th International ISRM Congress to take place in Salzburg, Austria, 9-14 September 2023, decided to extend the deadline for the early bird registration fee to 10.07.2023, at 23.59. [REGISTER NOW](#)

ISRM International Symposium 2024 and ARMS13, 22-27 September 2024, New Delhi, India - abstracts submission deadline is 31 August 2023-06-25

The Call for abstract submission is open! - Please note that the deadline for abstracts is 31st August 2023.

Registration is open now! Take advantage of the early booking until 31st March 2024.

For more information, [click here to visit the ARMS13 website](#).



NEWS - ITA ACTIVITIES

<https://about.ita-aites.org/news>

ITACET Lunchtime Lecture Series #27 21 June 2023

Join us to the 27th instalment of the Lunchtime Lecture series on the topic of « Occupational health in tunnelling ». It will be run on Tuesday, July 11th and will begin at 13:00 CET time.

The episode will feature one lecture and finish with a Q&A session with all speakers:

Occupational Health and Welfare in Tunnelling - Donald Lamont & Eric Ball

Join us and sign up for a free subscription: [Forthcoming sessions | Itacet](#)

NGS 2023 - 10th Nordic Grouting Symposium: Stockholm, Sweden 22 June 2023

The 10th Nordic Grouting Symposium is organised by the Swedish Rock Engineering Association and will take place in Stockholm, Sweden, at the Hilton Stockholm Slussen, on 12-13 September 2023.

The venue is located close to two of Stockholm city greatest underground construction sites which gives an opportunity to get a sight of the building boom right in the city center. Together with leading actors in the field of grouting in hard rock, participants will get the latest insights and explore the future challenges.

A technical tour to visit the infrastructure mega project Bypass Stockholm will take place prior to the symposium in the afternoon of 11 September. To secure your participation in the tour please register to the symposium by June 30. The final symposium program is announced on the symposium website.

Program highlights: keynotes by Håkan Stille and Kunt Garshol, professional discussion & workshop, symposium dinner and technical tour.

Registration is open until 21 August. The Symposium is endorsed by ITA.

For more information click here to visit the conference website: [NGS 2023 – 10th Nordic Grouting Symposium](#)

ACUUS 2023: ITA President as one of the six keynote speakers 27 June 2023

Organized by SRMEG, the 18th Conference of the Associated Research Centers for the Urban Underground Space (ACUUS 2023 Singapore) will be held from 1 to 4 November 2023.

ACUUS 2023 will combine with the 2nd International Conference on the Exploration and Utilisation of Underground Space (EUUS-2). The EUUS conference series is an ACUUS initiative with a focus on urban geology and underground resources.

The main theme for ACUUS 2023 Singapore is "Underground Space – the Next Frontier." This theme was chosen to focus on the new opportunities and challenges in underground space use amid a re-focus on exploring and developing the underground space as a strategic resource and part of sustainable development. The new frontier presents unprecedented opportunities for simultaneously improving urban infrastructure, urban livability, and resilience.

Prof. Arnold Dix, the ITA President will be one of the six keynote speakers at the highly anticipated ACUUS 2023 Conference. Prof Dix's keynote address will provide an unparalleled opportunity to gain valuable insights into the future of underground space innovation. Be prepared to be captivated by his visionary ideas and forward-thinking strategies that will shape the industry.

We invite you to join the conference!

For more details click [here](#)

Early Bird Rates (ends 1 September 2023)

[ACUUS - Speaker Arnold Dix \(viewstripo.email\)](#)

Scooped by ITA-AITES #94, 13 June 2023

[Amtrak applies for \\$7.3B to improve Frederick Douglass Tunnel, Baltimore Penn Station | United States of America](#)

[First-ever undersea rail tunnel to be built in Thane Creek as part of Bullet Train Project | India](#)

[EU looks to boost efforts to store captured carbon underground](#)

[Venetia Underground Mine: an example of operational efficiency | South Africa](#)

[Seawater sent to Fukushima tunnel built for release of treated water from plant | Japan](#)

[Undersea tunnel of Shenzhen-Zhongshan link features special safety designs | China](#)

[State government propose another tolled tunnel to solve Brisbane's northside gridlock | Australia](#)

[Breaking records, breaking ground: The latest in European tunnelling projects](#)

[City Rail Link completes Maungawhau Station tunnels | Australia](#)

[Barhale to install concrete lining in London water main as protection from HS2 tunnelling works | UK](#)

Scooped by ITA-AITES #95, 27 June 2023

[Plans progress for tunnelled extension of DLR to Thamesmead | UK](#)

[NCRTC completes fifth underground tunnel in Meerut for Delhi-Meerut RRTS Corridor | India](#)

[Geothermal energy: Stormont borehole to tap into underground heat | Ireland](#)

[Europe to Africa high speed rail tunnel boosted by feasibility funding](#)

[HS2 unveils latest TBM for Bromford Tunnel in the West Midlands | UK](#)

[First railway tunnel under the Yangtze River commences crossing-the-river construction in Chongqing | China](#)

[First look inside the new tunnels for the Broadway Subway | Canada](#)

[North East Link Tunnels production well and truly underway | Australia](#)

[Finland's plan to bury spent nuclear fuel for 100,000 years](#)

[Furuya design weaves underground sake brewery into the lush landscape of Fukui | Japan](#)



Design of Watertight Structures - Can we rely on the self-healing of cracks in Concrete?

Speaker: Dr Carola Edvardsen

Thursday 15th June 2023, Institution of Civil Engineers
Online: <https://youtube.com/live/x5HaJ8SYbqQ?feature=share>

Structural engineers commonly use EN 1992-3 "Liquid retaining and containment structures", BS 8102 and also Ciria C775

for the design of watertight concrete structures such as basements, tunnels and water tanks exposed to one-sided water pressure. Following e.g. EN 1992-3 one may interpret that for water retaining structures, leaking full depth cracks is allowed. In good faith designers believe that depending on the hydraulic gradient full depth cracks between 0.05 and 0.20 mm are acceptable. However, this is only the case if the cracks heal themselves effectively within a relatively short time. Unfortunately, the self-healing of cracks does not always occur, and the reinforced concrete structures are at risk of serious reinforcement corrosion which could endanger the structural integrity without mitigation measures (e.g. injection).



The presentation will give some insight in the design of watertight structures, the self-healing effect of cracks and the presenter's own experience from several projects where relying on the self-healing of cracks as a design assumption had serious consequences for the structures, both with regard to durability and structural integrity.



Road Tunnel Operation

Speaker: John Nicholas

Thursday 08th June 2023, Institution of Civil Engineers



A quick canter through the subject of road tunnels, from the development of the need, the provision of asset and its facilities, considerations for maintenance, safe operation and emergency response, and applicable legislation and good practice, this should add greater context for those tunnellers who think it is all "muck, build, muck, build".



**TECHNICAL COMMITTEES ON
BARRIER SYSTEMS (TC-B)**



Live Webinar

Calculating and limiting geomembrane strain



Prof. Richard Brachman
Queens University, Canada

Time Zone 1: 28 June 2023, 14:00 EDT / 28 June 2023, 18:00 UTC /
28 June 2023, 13:00 CDT / 29 June 2023, 4:00 AEST / 28 June 2023, 20:00 CEST

Time Zone 2: 29 June 2023, 6:00 EDT / 29 June 2023, 10:00 UTC /
29 June 2023, 5:00 CDT / 29 June 2023, 20:00 AEST / 28 June 2023, 12:00 CEST

About the webinar:

Tensile strains in geomembranes need to be limited to achieve long service lives for environmental protection. The webinar will identify the factors affecting strains mobilized in bottom liner, cover (or cap) and pond applications. Since strain is often calculated from a deformed shape, recent advances in calculating strain will be presented and limitations of past simplifying assumptions will be discussed. Focus will then be placed on assessing the long-term effectiveness of protection layers to limit strain from overlying materials in bottom liner geomembrane liners.

About the speaker:

The phrase 'buried but not forgotten' captures Dr. Brachman's unique expertise on measuring the physical response of geosynthetic liners and buried polymer structures using innovative large-scale experiments, field studies and numerical analysis. His unique scholarly contributions are related to determining the effects of stress, temperature, chemicals and time on soil-structure interactions that directly impacts how well, and how long, these important components of our buried infrastructure perform their function. Dr. Brachman has made significant contributions on the assessment of service life and long-term strains in geomembranes, as well as geosynthetic clay liner hydration and dimensional stability and the field performance of exposed composite liners. He is a co-author of the prominent book *Barrier Systems for Waste Disposal Facilities*. He has received fifteen Best Paper Awards for works published in the *Canadian Geotechnical Journal*, *Geotextiles and Geomembranes*, and *Geosynthetics International*, in addition two IGS Awards from the International Geosynthetics Society. Dr. Brachman has been appointed as a Fellow by the Engineering Institute of Canada, for exceptional contributions to engineering in Canada.

Registration:

Time zone 1: 28 June 2023, 14:00 EDT / 28 June 2023, 18:00 UTC / 28 June 2023, 13:00 CDT / 29 June 2023, 4:00 AEST / 28 June 2023, 20:00 CEST

https://us06web.zoom.us/webinar/register/WN_Hy-BLWtAbTs2ndZ3mFy6iDA

Time Zone 2: 29 June 2023, 6:00 EDT / 29 June 2023, 10:00 UTC / 29 June 2023, 5:00 CDT / 29 June 2023, 20:00 AEST / 28 June 2023, 12:00 CEST

https://us06web.zoom.us/webinar/register/WN_jWPL8WpIQfe3iB-6SXI9XQ

News

[Watch New Geosynthetics Testing Video](#) June 1, 2023

The first of a series of new films putting geosynthetics to the test has been released. Videos show the main methodologies in laboratory tests used [Read More »](#)

[IGS Strategy Goal Series – Why Does The IGS Need To Be Influential?](#) June 6, 2023

Last month the IGS launched its exciting strategy plan for the next four years. The Strategy Report 2022-2026 sets out ambitious targets for the years [Read More »](#)

[IGS Delegation Strengthens Ties In China](#) June 9, 2023

Officers from the IGS discovered more about the thriving market for geosynthetics in China during a recent trip. A packed schedule saw IGS President Sam [Read More »](#)

[Register For Limiting Geomembranes Strains Webinar](#) June 13, 2023

Examine factors affecting strain limits in geomembranes at a webinar this month. Professor Richard Brachman, of Queens University, Canada, will be exploring 'Calculating and limiting [Read More »](#)

[IGS Greece Hosts Soil Reinforcement Seminar](#) June 15, 2023

Pietro Rimoldi shared the latest in geosynthetic reinforcement design and application with members of the Greek Chapter of the IGS. The Chapter, known locally as [Read More »](#)

[Young Engineers Gain Insight At Italy Geotechnical Conference](#) June 16, 2023

Historic Padua hosted the next generation of Italian engineers at the 12th Annual Conference of the Italian Young Geotechnical Engineers (IAGIG). The two-day event in [Read More »](#)

[IGS Strategy Goal Series – Strengthening Trust In The IGS](#) June 21, 2023

Trust is at the core of the IGS's ambitious new plans for the years ahead. Building a credible organization that attracts and maintains the confidence [Read More »](#)

[IGS Strategy Goal Series – Improving Representation In The IGS](#) June 21, 2023

The IGS is a global community made up of a diverse body of people involved in diverse markets. Ensuring the Society adequately supports the needs [Read More »](#)

[Crucial I-95 US Road Link Fixed In Weeks Thanks To Geosynthetics](#) June 26, 2023

Repairs to a crucial roadway using aggregates made from recycled glass and polymeric geosynthetic reinforcements have allowed commuters to get back on the road sooner [Read More »](#)

Notice Of General Assembly: 20 September 2023 - June 28, 2023

The IGS will hold a General Assembly (GA) on Wednesday, 20 September 2023 from 16:30-18:10 Central European Summer Time. The GA is open to members of the IGS and will take place during the 12th International Conference on

Geosynthetics (12ICG) in Rome. Please note, the meeting will be held in-person. IGS Secretariat at igssec@geosynthetics-society.org

[Championing Greener Choices With Geosynthetics At Morocco Conference](#) June 29, 2023

Innovations in sustainable geosynthetics were discussed at IGS Morocco's 5th Geosynthetics Meeting this month. Six eminent keynote speakers – Jorge Zornberg, Sam Allen, Jean-Pierre Gourc, [Read More »](#)



AGI

Associazione Geotecnica Italiana

Prof. Michele Jamiolkowski

Dear friends,

The Italian Geotechnical Society lost one of its most prominent members with the death, on June 15th 2023, of Prof. Michele Jamiolkowski. He had been appointed to receive the ISSMGE Lifetime Achievement Medal next September, selected from the attached letter of candidacy and Michele's CV.

To all his friends and colleagues and to his family we extend our heartfelt sympathy.

We all miss the man, the friend, the scientist.

Prof. Sebastiano Rampello
AGI President



Michele Jamiolkowski was born in 1932 in Poland, where he spent his early years; he studied at Warsaw Technical University, obtaining a master's degree in Soil Mechanics and Engineering Geology in 1959. As a young geotechnical engineer decided to forge strong international links, many of which have had a profound influence on his long and distinguished career. He undertook postgraduate studies at the University of Kiev, the Technical University of Torino in Italy, the University of Laval in Quebec, and at MIT in the USA.

In 1964 he founded the engineering consulting company Studio Geotecnico Italiano in Italy, which had become his adopted country. He remained very closely involved with Studio Geotecnico Italiano until his last moment.

In 1969 he was appointed to a professorship in the Department of Geotechnical Engineering at the University of Torino, at which he has continued to be based throughout his career and became Professor Emeritus.

In 1979 he was one of the founders of the first doctorate program in geotechnical engineering in Italy, and he pioneered much of the high-quality research in soil mechanics for which Italy is especially well known.

His primary research interests included the mechanical behavior of soils, laboratory and in situ testing, soil dynamics, bearing capacity and settlements of shallow foundations, and soil improvement.

He has always combined fundamental soil mechanics with practical geotechnical engineering. He was well-known for his early work on preloading of soft clays and the use of vertical drains for large oil tanks and embankments, and he produced an influential CIRIA report on the topic. He has always been a leader in the field of soil behavior – especially small strain stiffness – both through laboratory and in situ testing. There is barely an in-situ test for which Michele Jamiolkowski has not played a major role in advancing the state of the art, whether it be cone-penetration test (CPT), piezocone, dilatometer, self-boring pressuremeter tests or geophysics; he was particularly well known for his classical laboratory calibration chamber tests for investigating CPT behavior in sands. He has undertaken pioneering work on important ground treatment processes such as jet grouting.

Michele Jamiolkowski has been closely involved with many prestigious consulting projects around the world, too many to list them all, but he has been particularly celebrated for his presidency of the International Committee for Safeguarding the Leaning Tower of Pisa.

In 1990, when the Tower was leaning rather too far for comfort and the medieval tower in Pavia had collapsed the previous year, killing four people, Jamiolkowski was appointed by the Italian Government to lead a multidisciplinary commission of international experts to prevent the Pisa tower meeting the same fate and to take actions to stop the Leaning Tower of Pisa leaning any further. For more than a decade (1990–2001), working closely with outstanding colleagues, he ensured the safety of the Tower for a further 300 years, through the technique of underexcavation. Michele Jamiolkowski has always said that the Pisa project was the one that gave him the most sleepless nights and one of the toughest challenges in construction he has faced.

Jamiolkowski has also been geotechnical consultant for other hugely prestigious and world-famous projects, to name a few: the Venice defense system against high water (the MOSE project); the proposed suspension bridge over the Messina Straits; the restoration and strengthening of the bell tower at San Marco Square in Venice; the reconstruction and development of the nuclear power plant in Chernobyl. He has also chaired, for over a decade, the international panel of experts for the Development of the second world largest copper mine at Zelazny Most in Poland and the technical committee for safeguarding the Rome historic monuments during the construction of the tunnels for the new subway line C.

Michele Jamiolkowski has been invited to present numerous general reports at international conferences and to deliver many significant lectures throughout the world, including the James Forrest Lecture at the Institution of Civil Engineers in London; the Manuel Rocha Lecture in Lisbon; the Terzaghi Oration at the 15th ICSMGE Conference in Istanbul; the Szechy Memorial Lecture in Budapest. He was a keynote Lecturer at the Skempton Conference at Imperial College, the Ralph B. Peck Lecturer at the ASCE Geo-Institute, the

Zachieh Moh Lecturer in Taipei, the Victor de Mello Lecturer, the 1st Tachebotarioff Lecturer in St. Petersburg, the 6th J.K. Mitchell Lecturer and the 53rd Rankine Lecturer of the British Geotechnical Society in London.

He held many awards and honors, among them the De Beer Award from the Belgium Geotechnical Society; the Karl Terzaghi Award and the Ralph B. Peck Lecture Award, both from the ASCE; the Italian Award 'Savior of the Art. He was foreign associate of the US National Academy for Engineering, the citation being *"for the design and engineering of major projects on difficult soils, and for international leadership in geotechnical education and research"*. He was corresponding member of the Polish Academy of Sciences, Honorary International Member of the Japanese Geotechnical Society, Honorary Professor of the Academia Sinica of Guangzhou, China and Commendatore of the Italian Republic bestowed by the President of Italy.

But, in many ways, the most prestigious of all Jamiolkowski honors was his election to the Presidency of the International Society of Soil Mechanics and Geotechnical Engineering. He served as President from 1994 to 1997.

Michele Jamiolkowski was author of over 270 publications, many of them state-of-the-art keynote lectures or reports.

ΔΙΑΚΡΙΣΕΙΣ ΕΛΛΗΝΩΝ ΓΕΩΤΕΧΝΙΚΩΝ ΜΗΧΑΝΙΚΩΝ

Χάιδω (Γιούλη) Δουλαλα-Rigby Αντιπρόεδρος της British Geotechnical Association



At the [British Geotechnical Association](#) AGM Yuli became the [Vice Chair](#) of the [BGA](#)

Yuli is a Chartered Engineer (CEng), a Fellow of the Institution of Civil Engineers (FICE), a Fellow of the Permanent Way Institution (FPWI), the first non-military Fellow of the Institution of Royal Engineers (FInstRE), a member of the Hong Kong Institution of Engineers (MHKIE(G)), (Geotechnical Discipline), and a member

of the Institution of Materials, Minerals and Mining.

She has 25+ years experience in a variety of geotechnical and civil engineering projects around the world.

She obtained her first degree in Civil Infrastructure Engineering in Greece and her Master of Science (MSc) in Rock Mechanics and Foundation Engineering from the University of Newcastle upon Tyne in the UK.

Her work experience includes working as a Tunnelling Engineer for Balfour Beatty/AMEC JV at the Jubilee Line Extension Tunnelling project in London (1995-1996), as a Geotechnical Engineer for Mouchel Asia Limited in Hong Kong (1996-2005) and as the Chief Civil Engineer for Tensar International (2005-present).

Yuli is based in Tensars UK HQ and for > 10 years she held the overall responsibility of the Tensar Eastern Hemisphere Design Team with offices in Germany, Holland, France, Russia, United Arab Emirates, Saudi Arabia, Malaysia, Indonesia and China and representatives in Africa, Australia and New Zealand. While she is still involved in delivering training, project risk management and high-level technical advice to Tensars global design team, her focus is now largely diverted towards Business Development and educating the construction industry globally on the benefits of geosynthetics in Construction.

Yuli is the current (2021-2022) Chair of the Institution of Civil Engineers (ICE) for the Northwest region of the UK, a past Chair (2016-2018) of the UK Committee of the International Geosynthetics Society (IGS), a Liveryman and a Court Assistant of the Worshipful Company of Engineers and a passionate, registered STEM Ambassador.



Λίζα Μπενσασσών Αντιπρόεδρος (Ευρωπαϊκή Ζώνη) της ICOLD-CIGB



At the [ICOLD2023](#) 91st General Assembly, in Gothenburg on June 15th, Liza was elected Vice President (Europe Zone) of ICOLD for the term 2023-2026.

Over 20 years of experience in water supply and treatment, wastewater treatment, water management, design of hydraulic works and environmental studies, in Greece and abroad. Hydraulic, hydrologic & water management modelling. Coordinator for multidisciplinary teams and innovative projects, involving Client training and public consultation procedures. Expertise in Environmental Protection and Water Resource Management, including Implementation of EU water policy.

Αγαπητά μέλη της Ελληνικής Επιτροπής Μεγάλων Φραγμάτων

Είμαστε όλοι πολύ ενθουσιασμένοι που στην πρόσφατη Γενική Συνέλευση της ICOLD στο Gothenburg, η δική μας Λίζα Μπενσασσών εκλέχθηκε Αντιπρόεδρος της ICOLD για την Ευρώπη!

Συγχαρητήρια Λίζα, σιδεροκέφαλη!

Δε μπορούμε παρά να σχολιάσουμε την εκλογή δύο Ελληνίδων μηχανικών και μελών του Διοικητικού μας Συμβουλίου σε σημαντικές θέσεις στην ICOLD και στο Ευρωπαϊκό της Club. Τα αξιώματα αυτά, πέρα του ότι αναδεικνύουν την αξία των συναδέλφων, αποτελούν μια μεγάλη τιμή για τη χώρα μας και σε δεύτερη ανάγνωση, αναγνώριση του πολύ σημαντικού (και ίσως λίγο παραγνωρισμένου) ρόλου των γυναικών στο χώρο των φραγμάτων.

Ο κόσμος μας αλλάζει και εμείς όλοι είμαστε η κινητήριος δύναμη.

Το ΔΣ της ΕΕΜΦ

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

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

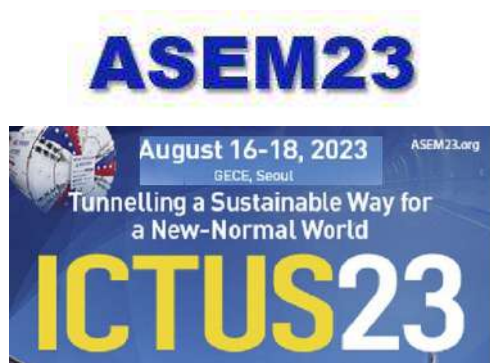
AFRICA 2023 - The Fourth International Conference and Exhibition on Water Storage and Hydropower Development for Africa, 10-12 July 2023, Lake Victoria, Uganda, www.hydropower-dams.com

GEO-RISK 2023 Advances in Theory and Innovation in Practice, July 23-26, Arlington, Virginia, USA, www.geo-risk.org

STPRFC 3rd Edition Short-Term Prediction of Rock Failure Competition August 2023, Taiyuan, China, aly-1001@163.com, zc-feng@163.com

S3: Slopes, Support and Stabilization Conference, August 8-10, 2023, Boston, USA, www.dfi.org/s32023

17ARC 17th Asian Regional Geotechnical Engineering Conference, 14-18 August 2023, Nur-Sultan, Kazakhstan, <https://17arc.org>



18 August 2023, Seoul, Korea
<http://asem23.org/>

ICTUS23 conference (The 2023 International Conference on Tunnels and Underground Spaces) will be held on August 16-18, 2023 under the ASEM 23 platform.

Themes

- Innovation in Mechanized Tunneling
- Improvements in Conventional Tunneling
- Tunneling and Underground Works in Extreme Conditions
- Developments in Underground Space Technologies

- Structural and Hydraulic Interaction in Underground Structures
- Resilience and Sustainability in Underground Space

Contact

2023 IASEM Conferences
P.O. Box 33, Yuseong, Daejeon 34186, Korea
Tel: +82 70-4231-7007
Email: info@asem23.org



ISMLG 2023 - 4th International Symposium on Machine Learning & Big Data in Geoscience, 29 August - 1 September 2023, University College Cork, Ireland, www.ismlg2023.com

IS-PORTO 2023 8th International Symposium on Deformation Characteristics of Geomaterials, 3rd - 6th September 2023, Porto, Portugal, www.fe.up.pt/is-porto2023

6th Meeting of EWG Dams and Earthquakes Workshop on Case studies, September 5, 2023, Interlaken, Switzerland, guillaume.veylon@inrae.fr

12th ICOLD European Club Symposium "Role of dams and reservoirs in a successful energy transition", 5 to 8 September 2023, Interlaken, Switzerland, www.ecsymposium2023.ch

NGS 2023 10th Nordic Grouting Symposium, 11 - 13 September, 2023, Stockholm, Sweden www.ngs2023.se

SUT OSIG 9th International Conference "Innovative Geotechnologies for Energy Transition", 12-14 September 2023, London, UK, www.osig2023.com, www.sut.org

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

TKZ2023 XX Technical Dam Control International Conference Safety of Hydraulic Structures, 12-15 September 2023, Chorzów Poland <https://tkz.is.pw.edu.pl>



www.tucss.org.sg/ugs/2

The Underground Singapore 2023 is the eleventh in a series of successful conferences held since 2001. The purpose of the

Conference is to provide a forum to share and discuss issues relevant to the planning, design and construction of underground projects in Singapore and the region. The aim is for contractors, engineers, owners and researchers to come together and contribute their experiences. Over 30 technical papers have been accepted and they will be presenting their research and findings at the 2 day conference.

Come join us for this biennial conference to learn more on tunnelling and underground construction in Singapore and the region.

Contact

Address: 60 Albert Street, #10-06 OG Albert Complex, Singapore 189969
Tel: +(65) 6336-2328
Mail Us: info@tucss.org.sg



The 11th International Conference on Scour and Erosion 17-21, September 2023, Copenhagen, Denmark, <https://icse11.org>

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

GROUND ENGINEERING SUSTAINABILITY, 21 September 2023, London, U.K., <https://sustainability.geplus.co.uk/sustainability/en/page/home>



UNDERGROUND4VALUE

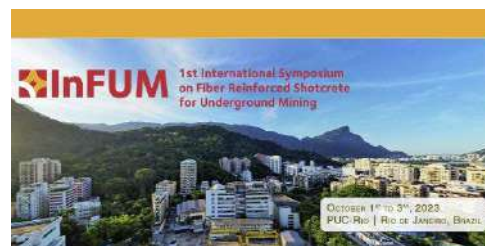
Underground Built Heritage as Catalyser for Community Valorisation
21 September 2023, Brussels, Belgium
www.underground4value.eu

The Management team of the COST Action CA18110 Underground4value would like to invite you to save the date and attend the Final Conference "Underground Built Heritage as Catalyser for Community Valorisation" on 21 September 2023 in Brussels, Belgium. The event will bring together Members of the European Parliament, representatives of the European Commission, and other European institutions, as well as international experts in Cultural Heritage, and members of Underground4value, to discuss the state of the art in the field and the achievements of the COST Action. A video on the main success-stories will be presented, as well as a demo session of the U4V Platforms for tourists and promoters will also be organised.



Charles-Augustin COULOMB : A geotechnical tribute, 25 – 26 September 2023, Paris, France, www.cfms-sols.org/organi-sees-par-le-cfms/charles-augustin-coulomb-geotechnical-tribute

GEOCASE 2023 International Conference on "Case Histories In Geotechnical Engineering" & 4th AsRTC6 Urban Geoengineering Symposium, September 25 - 28, 2023, Bandung, Indonesia, www.geocase2023.com



InFUM - 1st International Symposium on Fiber Reinforced Shotcrete for Underground Mining
October 1st to 4th, 2023, Rio de Janeiro, Brazil
<https://infum.com.br>

Welcome to the 1st International Symposium on Fiber Reinforced Shotcrete for Underground Mining (InFum).

The InFum will bring together all sectors related to the underground mining industry and the research community to share knowledge and practical experience. The symposium will be held in the vibrant city of Rio de Janeiro, Brazil on October 1st to 4th, 2023 at the campus of the Pontifical Catholic University of Rio de Janeiro (PUC-Rio).

SYMPOSIUM TOPICS

- Rebound and placement of shotcrete for tunnel linings
- Use of steel fiber reinforced sprayed concrete in the final lining of conventionally excavated tunnels
- Computer controlled application of shotcrete: new trends on the mechanization of the industry
- Latest innovations on shotcrete admixtures to the mix fresh and hardened properties
- Durability development in sprayed concrete for rock support
- Advancements on the shotcrete nozzle process
- On the methods for guaranteeing shotcrete placement quality control
- A general overview of the mechanical tests to design fiber reinforced shotcrete as ground support for underground mining works
- Application of the latest machine learning computational methods on the shotcrete lining properties evaluation





<https://aftes2023.com/en>

The French Tunnelling and Underground Space Association (AFTES) is organising its 17th International Congress from 2-4 October 2023 at the Palais des Congrès at the Porte Maillot in Paris.

The central theme of next year's event is "Underground space at the heart of transitions". Whether it is the low-carbon transition, the digital transition, resilience in the face of climate change or new technologies for deploying innovative and adapted solutions, our association hopes that this congress will show that the underground space has a role to play in these changes in our society.

This central theme will be discussed during the conferences, which will cover the structuring of underground space in order to meet new needs and facilitate transitions, in addition to project management and underground space and structure design, feedback and technological innovations in underground construction and, lastly, operating strategies for underground structures.

AFTES wishes its 2023 Congress to highlight the underground space industry's significant role in the wave of transitions currently rippling through society:

- Low-carbon transition
- resilience in the face of climate change
- digital transition
- new technologies for deploying innovative and adapted solutions

This conference aims to provide an opportunity for all underground developers and underground stakeholders (decision-makers, management contractors, developers, urban planners, infrastructure managers, designers, builders, suppliers, etc.) to share their experiences and projects and to contribute on the following aspects.

These contributions will be organised around the following topics:

A. The development of underground space to meet new needs and facilitate transitions

1. Considering underground space when addressing low-carbon mobility other and new uses, whether for new-build projects or for adaptations to existing infrastructure
2. Innovative urban and interurban logistics projects
3. Harnessing sub-surface resources and energy gains achieved by using the sub-surface
4. The role of underground infrastructure in regional resilience and adaptation to climate change

B. Changes in performance requirements, project management and the design of underground spaces and structures

1. Effective use of life cycle analysis when defining project performance requirements
2. Identifying transitions in development strategies

3. Changes in contracting processes intended to incorporate performance requirements and changes to standards
4. Ecodesign and anti-waste measures
5. Promoting rational design, reuse and recycling
6. Standardisation designed as a source of long-term savings
7. Digital transformation of design professions; CIM/BIM

C. Feedback, technological innovations, achieving the objective of carbon neutrality in underground construction

1. Technological innovations and feedback
2. The role of low-carbon materials
3. Lean construction and decarbonised construction sites
4. Managing excavated materials
5. Digital technology and IoT in the construction industry
6. Big Data
7. Health, safety and ergonomics
8. Robotisation and the role of artificial intelligence

D. Strategies for establishing underground structures

1. Climate change resilience-oriented facility operation
2. Development of digital twins and their uses
3. Harnessing artificial intelligence for operations support
4. Ongoing use of collected data: from design to operation
5. Resilience of facilities with regard to safety and security of their uses
6. Structural refurbishment and management of underground assets

Our Congress aims to offer a forum for all underground space stakeholders, and as such, we are willing to consider all proposed contributions, even if not directly related to the selected themes.



SEG23 Symposium on Energy Geotechnics, 3-5 October 2023, Delft, The Netherlands, <https://seg23.dryfta.com>



28th European Young Geotechnical Engineers Conference and Geogames 04 – 07 October 2023, Moscow, Russia

Organiser: Russian Society for Soil Mechanics, Geotechnics and Foundation Engineering

Contact person: PhD Ivan Luzin
Address: NR MSUCE, 26 Yaroslavskoye shosse
Phone: +7-495-287-4914 (2384)
Email: youngburo@gmail.com



GROUND ENGINEERING BASEMENTS AND UNDERGROUND STRUCTURES, 5 October 2023, London, U.K., <https://basements.geplus.co.uk/basements2023/en/page/home>

GROUND ENGINEERING SMART GEOTECHNICS, 5 October 2023, London, U.K., <https://smartgeotechnics.geplus.co.uk/smartgeotechnics2023/en/page/home>

MSL 2023 The Second Mediterranean Symposium on Landslides "Slope Stability in Stiff Fissured Clays and Soft Rocks", October 5-7, 2023, Hammamet, Tunisia, <https://msl-2023.webnode.fr>

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



13 October 2023, London, United Kingdom

www.iom3.org/events-awards/11th-international-symposium-on-ground-freezing.html

Following a 16-year hiatus, the 11th International Symposium on Ground Freezing (ISGF) will return to the UK for the first time since 1988 to present the latest research, innovations and concerns as well as challenges and opportunities in the fields of Artificial Ground Freezing, as well as the mechanics of Frozen Earth.

Spread across three days, the symposium provides a forum for ground freezing practitioners across the world including engineers, contractors, academics, and scientists to meet and exchange ideas, theories, and project case histories. Since the last conference held in Maine in 2006, Artificial Ground Freezing (AGF) has grown in popularity and its application has expanded to projects including shafts, tunnels including cross passages and large barrier walls with increased attention to soil-structure interaction in urban areas.

The technology itself has advanced tremendously in the last twenty years. The development of numeric modeling for heat transfer and structural analysis, more powerful and efficient refrigeration plants and new concepts in instrumentation have changed the approach to ground freezing projects. Yet, with these advancements the basic theories and mechanics have not changed. A new generation of engineers, project managers, academics and researchers have emerged and continue to advance the technology.

With these innovations and a new wave of professionals entering the industry, the key aim of the ISGF is to provide an opportunity for professionals from all six continents to meet and exchange ideas, participate in discussion, and share experiences on not only artificial ground freezing projects, but the mechanics of frozen earth.

The three-day symposium will feature a peer-reviewed technical programme on key topics impacting the industry, an

exhibition to promote new technologies as well as social events to collaborate and explore and enjoy our iconic host city of London.

Topics covered

The Conference will be particularly relevant to engineers involved in the construction of foundations, shafts and tunnels which require ground temporary support and water control measures during construction using AGF. Such projects require specialized site investigation and frozen soil testing measures to enable the appropriate ground engineering designs to be carried out for successful construction by contractors.

Frozen ground also occurs naturally near the surface, and deeper in permafrost susceptible regions, and hence frost heave and freeze thawing become important for near surface foundation and pavement design. The warming of Arctic regions has created immeasurable geotechnical issues and for this reason, an additional session focusing on Sustainability in Cold Regions will be featured. This symposium will provide a forum for the discussion of frozen earth mechanics as it relates to infrastructure in the Arctic regions.

Contact: events@iom3.org



HYDRO 2023 New Ideas for Proven Resources, 16-18 October 2023, Edinburgh, Scotland, www.hydropower-dams.com/hydro-2023

1-ICGTMW2023 1st International Conference on Geotechnics of Tailings and Mine Waste & GEOMIN 2023, 24th to 26th, October 2023, Ouro Preto, Minas Gerais, Brazil, <https://geominouropreto.com.br/2023/icgtmw2023>

SEAGC-AGSSEA 2023 21st Southeast Asian Geotechnical Conference & 4th AGSSEA Conference, 25th to 27th October 2023, Bangkok Thailand, <https://seagcagssea2023.com>

ACUUS SINGAPORE 2023 18th Conference of the Associated Research Centers for the Urban Underground Space "Underground Space – the Next Frontier", 1 - 4 Nov 2023, Singapore, www.acuus2023.com

ATC 2023 18th Australasian Tunnelling Conference: Trends and Transitions in Tunnelling, 5-8 November, 2023, Auckland, Aotearoa New Zealand <https://atc2023.com>

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





4th International Tunnelling and Underground Space Conference- Lagos, 2023
15-16 November 2023, Lagos, Nigeria
www.tunnellingnigeria.org



CREST 2023 – 2nd Construction Resources for Environmentally Sustainable Technologies, November 20-22, 2023, Fukuoka, Japan, <https://www.ic-crest.com>



International Conference on Climate Resilience and Sustainability in Tunnelling and Underground Space



22-23 November 2023, Mumbai India

<https://www.tai.org.in>



1st SLRMES Conference on Rock Mechanics for Infrastructure and Geo-Resources Development - an ISRM Specialized Conference, Colombo, Sri Lanka, December 2-7, 2023, www.slrmes.org

GEOTEC HANOI 2023 The 5th International Conference on Geotechnics for Sustainable Infrastructure Development, December 14-15, 2023 - Hanoi, Vietnam, <https://geotechn.vn>

9th International Symposium on RCC Dams and CMDs December, 2023, Guangzhou, China, www.chincold-smart.com/meetings/rcc2023



ICSGE

16th International Conference on Structural and Geotechnical Engineering
27 – 28 December 2-23, New Cairo, Egypt
<https://eng.asu.edu.eg/icsge>

After the rewarding success of the previous fifteen conferences, the Structural Engineering Department of the Faculty of Engineering, Ain Shams University cordially invites you to attend the 16th International Conference on Structural and Geotechnical Engineering (16th ICSGE) in Cairo, Egypt from the 27th to the 28th of December, 2023.

The conference discussions will focus on the exchange of information and ideas, in addition to the promotion of the recent development in Structural and Geotechnical Engineering. International keynote speakers will also present lectures in different fields.

An exhibition on the stem of construction projects, products and equipment will be held during the conference.

Conference Theme

The organizing committee invites authors to submit original technical papers reflecting practical application and/or research theories towards mega projects. Submitted papers shall fall within the following themes:

- Advanced analysis and design of structures
- Advances in construction materials: research and applications
- Bridges, tunnels and tall buildings design and construction
- Earthquake engineering and seismic design
- Geoengineering and Geo-environmental Engineering
- Project management and risk assessment
- Performance based design for tall buildings
- Rehabilitation and retrofitting of structures
- Sustainability of structures and fire resistance
- Structural health monitoring
- Soil improvement techniques
- Soil Dynamics: research and applications

Contact Us

Address: Faculty of Engineering, Ain Shams University
 Email: asueng@eng.asu.edu.eg



Southeast Asian Conference and Exhibition on Tunnelling and Underground Space 2024 (SEACETUS2024)

05 - 07 March 2024, Kuala Lumpur, Malaysia
<https://submit.confbay.com/conf/seacetus2024>

The Tunnelling & Underground Space Technical Division of the Institution of Engineers, Malaysia (IEM TUSTD) is hosting the Southeast Asian Conference and Exhibition on Tunnelling and Underground Space (SEACETUS2024) in Kuala Lumpur. The conference will offer case studies and strategies that demonstrate innovation, skills and best practices, and help delegates understand the technologies and techniques guiding the Tunnelling and Underground Space Development Industry. A wide range of high quality scientific and technical papers of International or Regional significance on Tunnelling and Trenchless Technology is expected.

SEACETUS2024 conference committee would like to welcome interested participants to submit paper that falls within but not limited to the topics of below:

1. Innovation in Tunnels and Tunnelling Technology
2. Innovation in Rock Support and Water Proofing Technology
3. Environment Sustainability and Strategic Use of Underground Space
4. Planning, Modelling, Design and Construction of Tunnels
5. Risk, Health and Safety, Contractual Practices and Project Management of Underground Construction
6. Instrumentation and Monitoring in Underground Construction
7. Conventional Tunnelling, Sprayed Concrete Use, Drill and Blast Excavation
8. Mechanised Tunnelling and Excavation (Hard Rock, Soft Rock and Soil)
9. Geological and Geotechnical Site Investigation and Ground characterization
10. Stability Assessment and Ground Stabilization in Underground Construction
11. Operation, Repair and Maintenance of Tunnels and Underground Structures
12. Design and Installation of Mechanical and Electrical Systems for Underground Structures
13. Information Modelling in Tunnelling and Underground Space Development
14. Projects and Case Histories
15. Others

Contact

Email: iemta@iem.org.my

Phone: +603 79582851

Address:

IEM Training Academy Sdn Bhd

(Wholly owned by The Institution of Engineers Malaysia and formerly known as IEM Training Centre Sdn Bhd)

Wisma IEM, First Floor

No. 21, Jalan Selangor

46150 Petaling Jaya, Selangor Darul Ehsan

MALAYSIA



7th International Conference Series on Geotechnics, Civil Engineering and Structures (CIGOS)

April 4-5, 2024, Ho Chi Minh City, Vietnam

Organiser: Association of Vietnamese Scientists and Experts (AVSE Global) and University of Architecture Ho Chi Minh City (UAH)

Contact person: cigos2024@sciencesconf.org

Email: cigos2024@sciencesconf.org



World Tunnel Congress 2024 19 to 25, April, 2024, Shenzhen China, www.wtc2024.cn

iCGE'24 International Conference of Geotechnical Engineering, April 25-27, 2024, Hammamet, Tunisia www.icge24.com

GEO AMERICAS 2024 5th Pan-American Conference on Geosynthetics Connecting State of the Art to State of Practice April 28 - May 1, 2024, Toronto, Canada, www.geoamericas2024.org

IFCEE 2024 International Foundation Congress and Equipment Expo, May 7 -10, 2024, Dallas, USA <https://web.cvent.com/event/c42dd622-dd91-409f-b249-2738e31c9ef5/summary>

8th International Conference on Earthquake Geotechnical Engineering (8ICEGE), 7-10 May, 2024 Osaka, Japan, <https://confit.atlas.jp/guide/event/icege8/top?lang=en>



GeoShanghai 2024

GeoShanghai International Conference 2024

May 26 - 29, 2024, Shanghai, China

www.geo-shanghai.org

GeoShanghai is a series of international conferences on geotechnical engineering held in Shanghai quadrennially. The conference was inaugurated in 2006 and was successfully held in 2010, 2014 and 2018, with more than 1600 participants in total. Since the last conference, the geotechnical community have witnessed many advances both in fundamental understandings and engineering practices. To demonstrate the latest developments and promote collaborations in geotechnical engineering and related fields, we launch the 5th GeoShanghai International Conference to be held in May 2024. We sincerely invite you to join in this long-anticipated grand event!

Themes

- Soil behavior
- Geomechanics from micro to macro
- Granular material
- Rock mechanics and rock engineering
- Unsaturated soil mechanics
- Seepage and soil erosion

- Geohazards
- Geosynthetics
- in-situ testing & monitoring
- Environmental geotechnics (Landfills and contaminated soil)
- Energy geotechnics (exploitation, storage, energy piles)
- Intelligent geotechnics (sensor, big data, AI, computer vision)
- Extraterrestrial Space colonization and extraterrestrial territory exploration
- Transportation Geotechnics (Pavement materials and structures railroad, airfield, pipeline) Offshore geotechnics
- Mining geotechnics
- Bio-mediated and bio-inspired geotechnics
- Ground improvement
- Soil dynamics & earthquake engineering
- Deep excavations & retaining structures
- Shafts & deep foundations
- Tunneling and underground constructions
- Sustainability in geotechnical engineering
- New frontiers in geotechnology
- Case studies

Contacts

Mingliang Zhou, Ph.D
Associate Professor
Department of Geotechnical Engineering, College of Civil Engineering,
Tongji University, Shanghai, China
Tel: +86-13918955481
Email: geoshanghai@tongji.edu.cn

Yu Qian, Ph.D
Associate Professor
Department of Civil and Environmental Engineering
The University of South Carolina Columbia, SC 29208
Office: (803)777-8184
Email: yqian@sc.edu



**2nd annual Conference on Foundation
Decarbonization and Re-use**
May 28-30 2024, Amsterdam, The Netherlands
<https://foundationreuse.com>

The Construction Industry is contributing significantly to the CO2 emissions, and so is the Deep Foundation Industry. With sustainability becoming more relevant each and every day, we, as a profession, have a role to play to reduce our emissions. Decarbonization is the first option: more efficient design reducing volumes of concrete or steel, and the use of different materials with lower carbon footprint. However, this should not be viewed as the only option available: the reuse of existing foundations must be considered as well, and even preferred as the most sustainable option.

In March 2023, DFI Europe and the Geotechnical Section of the KIVI organized a very successful 3-day conference to discuss these burning topics in Amsterdam, The Netherlands. This was the occasion to share recent experiences and good practices to raise the level of the industry in this challenging matter. The organizers want to keep the pace and the second conference on this topic is now scheduled for May 2024, once again in Amsterdam in the beautiful KIT. The choice of the KIT, as it was highlighted during the first edition, is driven by the fact that in 2017 the KIT launched the SDG (Sustainable Development Goals) House. It is home to more than 50 organizations and acts as a catalyst for sustainability initiatives, as a place to meet and exchange ideas on Sustainability.

In Amsterdam, the issue of the durability of the old timber pile foundations and their reuse is a recurring topic of endless debate, as was discussed already during the first edition. This can be because the loads have increased since the structure was first designed, as is the case with the bridges in Amsterdam, or because a new building is constructed to replace a structure that no longer meets the current requirements. This can provide insight for the many other places in the world where this issue is getting momentum, with urban centres being reconstructed and transformed, and the issue is also not limited to just timber piles. How do you address the remaining service life of steel piles that may have been subjected to corrosion? Or how do you assess the bearing capacity of any foundation pile, for which the original design and construction data is no longer available?

In this second edition of the International Conference all these aspects will be covered in four sessions that will focus on the overall concept of foundation decarbonization and reuse, the assessment of existing foundations, the design aspects associated with this topic, and finally the impact this approach will have on the construction phase. A special focus will be given to contractual and insurance aspects.

Topics

Session 1: The decision-making process regarding foundation decarbonization and reuse

Session 2: The inspection and testing of existing foundations to assess their suitability for reuse

Session 3: The design process when foundations are decarbonized or reused

Session 4: The construction phase when foundations are decarbonized or reused

Conference secretariat

All questions related to the conference should be addressed to the Conference Secretariat:
Mrs. Angelique van Tongeren
info@foundationreuse.com
Tel. +31(0)630095962



IS-Macau 2024 11th International Symposium of Geotechnical Aspects of Underground Construction in Soft Ground, June 14-17, 2024, Macao SAR, China, <https://is-macau2024.skli-otsc.um.edu.mo>

ISC'7 7th International Conference on Geotechnical and Geophysical Site Characterization "Ground models, from big data to engineering judgement", June 18-21, 2024, Barcelona, Spain, <https://isc7.cimne.com>



**28th European Young Geotechnical Engineers,
Conference 2024
25 to 29 June 2024, Skopje, North Macedonia**

Contact person: Ms. Elena Angelova
Address: Blvd. Partizanski odredi No.24,
Email: mag@gf.ukim.edu.mk
Website : <https://mag.net.mk>



WCEE2024 18th World Conference on Earthquake Engineering, June 30 - July 5, 2024, Milan, Italy, www.wcee2024.it

WCEE2024 18th World Conference on Earthquake Engineering, June 30 - July 5, 2024, Milan, Italy, www.wcee2024.it / Session SHR-7: When science meets industry: advances in engineering seismology stemming from engineering practice, olga.ktenidou@gmail.com

3rd ICPE 2024 Third International Conference on Press-in Engineering, 3-5 July 2023, Singapore, <https://2024.icpe-ipa.org>

IS Landslides 2024 International Symposium on Landslides "Landslides across the scales: from the fundamentals to engineering applications" & IS Rock Slope Stability 2024, July 7-12th, 2024, Chambéry, France, www.isl2024.com

EUROCK 2024 ISRM European Rock Mechanics Symposium New challenges in rock mechanics and rock engineering July 15-19, 2024, Alicante, Spain, www.eurock2024.com

ECSMGE 24 XVIII European Conference on Soil Mechanics and Geotechnical Engineering, 26-30 August 2024, Lisbon, Portugal, www.ecsmge-2024.com

ISIC 2024 4th International Conference of International Society for Intelligent Construction, 10 - 12 September 2024, Orlando, United States, www.is-ic.org/conferences/2024-isic-international-conference



**19th Nordic Geotechnical Meeting
18th - 20th of September 2024, Göteborg, Sweden
www.ngm2024.se**

The NGM's history goes back to 1950 when the first meeting was held here in Sweden, in Stockholm. Since this event has been held every 4th year with two exceptions; 1975 and 1984.

THEMES

NGM 2024 presents the following themes, with suggestions for content. A general focus for all themes is obstacles and potential solutions. We are looking for a wide range of presentations and papers from all Nordic countries.

A Sustainable foundations

- Energy, safety & environment
- LCA/LCC
- Recycling/reuse of material
- Alternative materials, eg. binders
- Costs for society
- Social aspects

B Digitalization/Visualization

- Digital twins
- Visualization 2D/3D
- Programming and automatization
- AI

C Challenges in the future

- Climate adaptation
- Innovation
- New methods and tools
- Adaptation to future social development

D Construction in urban areas

- Groundwater impact
- Mass displacement
- Vibrations and noise
- Source of disturbance
- Logistics

E Handbooks and guidance for the practicing geotechnical engineer

- Needs? What is missing?
- Differences between the Nordic countries
- New version of Eurocode – from code to practice

CONTACT INFORMATION

NGM2024
Sveaborgsvägen 16
S-439 73 Fjärås Sweden
Tel. +46 708137773, Email ngm2024@sqf.net



**ISRM International Symposium 2024 &
13th Asian Rock Mechanics Symposium (ARMS13)**

**Advances in Rock Mechanics -
Infrastructure Development**

22 to 27 September 2024, New Delhi, India
<https://arms2024.org>

On behalf of International Society for Rock Mechanics and Rock Engineering, it is an honour for me to invite our 60 ISRM National Groups to send delegates and their accompanying persons to the ISRM International Symposium and 13th Asian Rock Mechanics Symposium (ARMS13) being held from 22 to 27 September 2024 in New Delhi, the modern and vibrant capital city of India.

The ISRM National Group of India has prepared an excellent program in the exciting venue for the event.

Short courses and workshops are planned to be organized prior to the symposium for professionals, to update their knowledge about the present state-of-art, emerging trends and case studies in the area of rock mechanics and rock engineering.

I am looking forward to an exciting and memorable ISRM event based on the successful past ISRM International Symposium 2010 and 6th Asian Rock Mechanics Symposium, organized by ISRM India from 23 to 27 October 2010 at New Delhi.

The delegates of the ISRM International Symposium will also have the chance to participate in the Symposium on "Advances in Rock Mechanics – Infrastructure Development", which will focus on important topics such as advancement in site investigations and characterization of rocks and rock masses; application of geo-physical investigation techniques; innovation and application of IOT in rock engineering; geo-hazard and risk management, etc. The expected outcomes of ISRM International Symposium in India will certainly be indispensable for the global rock mechanics community.

In view of our challenge to further development of rock mechanics and rock engineering, addressing the problems and challenges posed in excavation of openings in rock for mining engineering, civil engineering and infrastructure development projects, the deliberations of the symposium will discuss solutions to overcome these problems. I am sure that ISRM India will arrange a high-quality technical content for the International Symposium along with attractive social and accompanying persons programme.

THEME

Advances in Rock Mechanics – Infrastructure Development

SUB- THEMES

1. Advancement in Site Investigations and Characterization of Rocks & Rock Masses
2. Application of Advance Geophysical Investigation Techniques
3. Constitutive Modelling of Rocks and Soils
4. Rock Excavation Techniques-Drilling, Blasting and Mechanical Cutting
5. Rock and Dump Slope Stability and Foundation Analysis
6. Rock Supports, Instrumentations and Ground Improvement

7. Design Methods and Analysis – Analytical and Numerical Modelling
8. Preservation and Restoration of Ancient Monuments
9. Deep Underground Mining Methods & Instrumentation
10. Underground Space Development for Storages and other purposes
11. Innovations and Applications of IOT in Rock Engineering
12. Structural Health Monitoring and Rehabilitation
13. Advancement in Laboratory Testing Techniques
14. Geo-hazards and Risk Management
15. Green Technologies for Zero Waste Generation and Sustainable Development
16. Case Studies.



IS-Grenoble 2024 Geomechanics from Micro to Macro, September 23-27, 2024, Grenoble, France, <https://is-grenoble2024.sciencesconf.org>



**5th European Conference on Physical Modelling
In Geotechnics**
02 to 04 October 2024, Delft, Netherlands

Organiser: Deltares & Delft University of Technology

Contact person: Suzanne van Eekelen & Miguel Cabrera

Email: organisation.ecpmg24@gmail.com



RMCC2023 1st International Rock Mass Classification Conference "Rock Mass Classification meets the Challenges of the 21st Century", 30-31 October 2024, Oslo, Norway, www.rmcc2024.com

PANAMGEO CHILE 2024 17th Pan-American Conference on Soil Mechanics and Geotechnical Engineering, 12-17 November 2024, La Serena, Chile, <https://panamge-ochile2024.cl>

ICTG 2024 5th International Conference on Transportation Geotechnics 2024 "Sustainable and Evolving Technologies for Urban Transport Infrastructure", 20 – 22 November 2024, Sydney, Australia www.ictg2024.com.au





World Tunnel Congress 2025
Tunnelling into a sustainable future – methods and technologies
9-15 May 2025, Srockholm, Sweden
www.wtc2025.se

Welcome to Sweden, we are excited to meet all of you in the spring of 2025

Sweden will shortly be one of the world's first sustainable and fossil free nations. By the year 2045, Sweden's net greenhouse gas emissions to the atmosphere will then be less than zero! This is a work in progress and development of technologies and methods is accelerating. As we have done in the past, we want to share our knowledge and experiences with all of you, and gain knowledge and experiences from you, this time by hosting the World tunnel congress 2025, WTC2025.

More than a hundred years ago we were the cradle where new technologies were nourished, the dynamite, effective machinery and production methods. Despite our relative small country we are still leading the way, building one of the most complex underground road tunnel networks, the Bypass Stockholm. A new metro with one of the deepest underground stations only accessible by elevators. And large rock caverns to store liquid hydrogen with the purpose to produce fossil free steel.

Sweden's experience of underground construction dates back more than a century. This development is sometimes referred to as being a result of good rock conditions and close cooperation between owners, consultants, contractors and machinery manufacturers.

Examples of early use of the underground, other than for mining purposes, include hydroelectric power plants, traffic tunnels and military facilities, including public shelters. The knowledge that has been gained has during the last century been shared with the rest of the world and then refined by all of you.

For questions please contact
 Meetagain AB
support@meetagain.se
 +46 (0)8 664 58 00



Eurock 2025
ISRM European Rock Mechanics Symposium
Expanding the underground space -
future development of the subsurface
- an ISRM Regional Symposium
16-20 June 2025, Trondheim, Norway

Contact Person Name

Henki Ødegaard

Email henki.oedegaard@multiconsult.no

Telephone +47 22 94 75 00

Address C/O Fredrik Stray, TEKNA, PO box 2312 Solli, Oslo, Norway



21st International Conference on
Soil Mechanics and Geotechnical Engineering
14 – 19 June 2026, Vienna, Austria

Organisers: Austrian Geotechnical Society and Austrian Society for Geomechanics

Contact person: Prof. Helmut F. Schweiger

Email: helmut.schweiger@tugraz.at



16th International Congress on Rock Mechanics
Rock Mechanics and Rock Engineering
Across the Borders
17-23 October 2027, Seoul, Korea

Scope

The scope of the Congress will cover both conventional and emerging topics in broadly-defined rock mechanics and rock engineering. The themes of the Congress include but not be limited to the following areas:

- Fundamental rock mechanics
- Laboratory and field testing and physical modeling of rock mass
- Analytical and numerical methods in rock mechanics and rock engineering
- Underground excavations in civil and mining engineering
- Slope stability for rock engineering
- Rock mechanics for environmental impact
- Sustainable development for energy and mineral resources
- Petroleum geomechanics
- Rock dynamics
- Coupled processes in rock mass
- Underground storage for petroleum, gas, CO2 and radioactive waste
- Rock mechanics for renewable energy resources
- Geomechanics for sustainable development of energy and mineral resources
- New frontiers & innovations of rock mechanics
- Artificial Intelligence, IoT, Big data and Mobile (AICBM) applications in rock mechanics
- Smart Mining and Digital Oil field for rock mechanics
- Rock Engineering as an appropriate technology

- Geomechanics and Rock Engineering for Official Development Assistance (ODA) program
- Rock mechanics as an interdisciplinary science and engineering
- Future of rock mechanics and geomechanics

Our motto for the congress is “Rock Mechanics and Rock Engineering Across the Borders”. This logo embodies the interdisciplinary nature of rock mechanics and challenges of ISRM across all countries and generations.

The fathers of soil mechanics

(June 4) in 1914, Sir Alec Skempton is born in Northampton, England. With Karl Terzaghi, he's known as one of the fathers of soil mechanics. He delivered the 1964 Rankine Lecture and was the 1981 recipient of the [American Society of Civil Engineers](#) Terzaghi Award. Skempton was knighted in 2000. He's shown in the photo on the left in 1946 with Rudolph Glossop and Karl Terzaghi, and on the right in 1953 with Ralph Peck.



(Geo-Institute of ASCE, <https://www.linkedin.com/company/geo-institute-of-asce/posts/?feedView=all>)



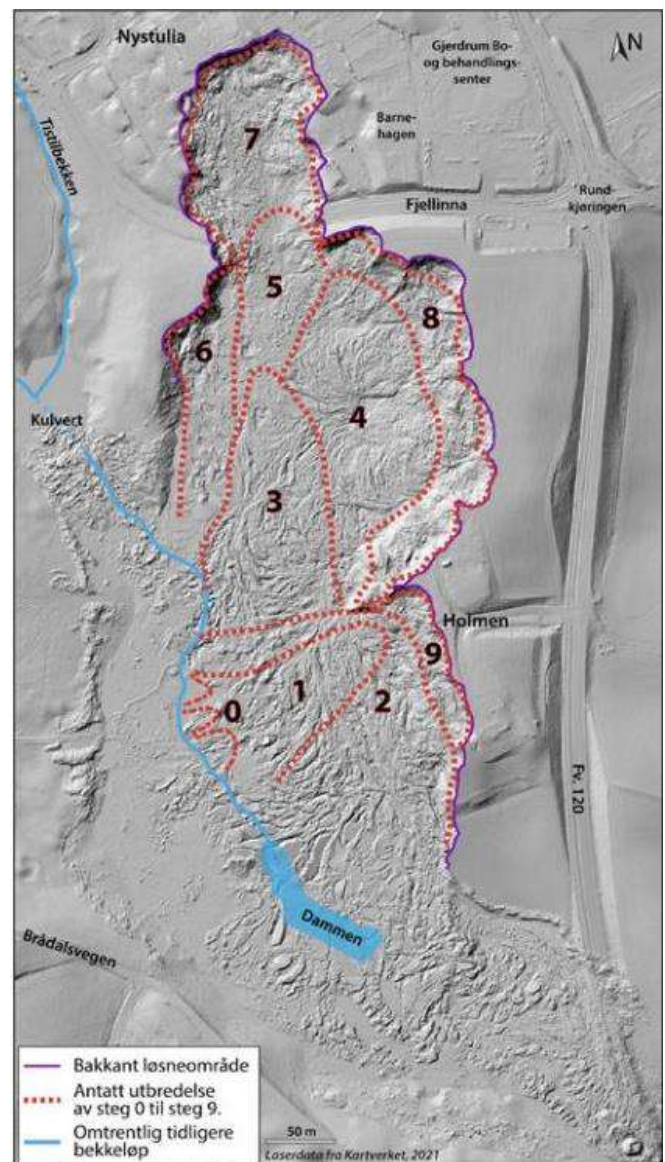
The causes of the 30 December 2020 Gjerdrum landslide in Norway

On 30 December 2020 the [Gjerdrum landslide](#) in Norway killed ten people. This large quick clay landslide occurred in the early hours of the morning following a wet autumn.

In the aftermath of the landslide public enquiry was established, which reported on 29 September 2021. [The report is available online](#), in Norwegian. [NK has a good summary](#), again in Norwegian, but Google Translate does a good job for those who are not well versed in that language.

The committee has determined that the trigger for the landslide was erosion of the banks of the stream that ran through the landslide area, called Tistilbekken. The heavy destruction in the area as a result of the landslide means that the exact nature of these small slips is not clear, but it is likely that they were associated with rainfall through a wet autumn. The committee noted that there is evidence from aerial imagery of high levels of erosion along the stream in the period from 2007 to 2015, which may have been associated with human activity, such as the installation of impervious surfaces and the removal of vegetation in the catchment.

Once an initial small failure occurred, the landslide underwent retrogression through a series of subsequent failures. The committee has presented this image showing the sequence of events, which is typical for a quick clay landslide:-



The postulated series of retrogressive failures in the 30 December 2020 Gjerdrum landslide in Norway. Image from the official investigation.

Event zero was the small slips on the banks of Tistilbekken. Removal of the toe allowed a small landslide to develop (event 1), and then the landslide retrogressed in a series of failures, eventually reaching the town.

Interestingly, the report states that:

"The committee believes that knowledge of erosion and the risk of landslides should have led to erosion protection measures in the lower part of Tistilbekken where the landslide started, which would have reduced the risk of a quick clay landslide."

([Dave Petley](#) / THE LANDSLIDE BLOG, 9 June 2023, <https://blogs.agu.org/landslideblog/2023/06/09/gjerdum-landslide-report/>)



World's largest earthquake early warning system announced in China



China's Earthquake Early Warning System (EEWS), the largest of its kind globally, has been completed, according to an announcement by Min Yiren, the head of the China Earthquake Administration (CEA), on June 8, 2023. The system is anticipated to be fully functional by the end of the year, covering more than 15 000 monitoring stations, three national centers, 31 provincial centers, and 173 prefectural and municipal information release centers.

Contrary to predicting earthquakes, the EEWS detects initial ground motions, signaling the onset of seismic activity, and immediately relays this data to processing centers. Utilizing advanced algorithms, the system determines the earthquake's location and magnitude, enabling rapid distribution of alerts across cities and towns. This early warning, ranging from a few seconds to a minute, can significantly impact survival rates during earthquakes.

Wang Tun, the head of a key earthquake early warning laboratory in Sichuan Province, shared with Global Times, "With an early warning of several seconds to 60 seconds, the death toll in an earthquake can be reduced by 30%."

China has been developing an earthquake early warning system since the 1990s and started constructing its earthquake early warning and instant seismic intensity reporting system in high-risk regions in 2018. The Northwestern Seismological Journal published research in 2002 showing that a three-second warning could reduce casualties by 14%, while a 10-second warning could reduce casualties by 39% and a 20-second warning could reduce casualties by 63%.

According to Yiren, the newly completed system significantly shortens earthquake information delivery time, from a minute to mere seconds post-earthquake initiation. Alerts can

be dispatched through various devices, including TVs, mobile phones, and other warning terminals.

Some quake-prone areas such as southwest China's Sichuan and Yunnan provinces, north China's Beijing and Tianjin municipalities, Hebei Province, and east China's Fujian Province have already begun trial operations for public early warning services. Yiren emphasized that the system has tackled several technical challenges, including multi-network integration and the ability to release information to a massive user base within one second.

Featured image credit: *The Watchers* (stock)

(THE WATCHERS, Monday, June 12, 2023, <https://watchers.news/2023/06/12/worlds-largest-earthquake-early-warning-system-announced-in-china/>)



Millennium Tower: Engineer says \$100 million fix has improved S.F. building's famous lean

J.K. Dineen

All 18 of the concrete piles meant to stabilize San Francisco's [famously leaning and sinking Millennium Tower](#) have now been driven into bedrock, completing the \$100 million fix of the luxury condo high-rise, according to the engineer overseeing the project.



The Millennium Tower was one of the premier residences in the city before engineers found that it had sunk 18 inches and was leaning 14 inches to the west (Noah Berger/Special to The Chronicle)

All 18 of the concrete piles meant to stabilize San Francisco's [famously leaning and sinking Millennium Tower](#) have now been driven into bedrock, completing the \$100 million fix of the luxury condo high-rise, according to the engineer overseeing the project.

On Monday, project engineer Ronald Hamburger said the engineering upgrade to stop the building from tilting and sinking has "succeeded" after the 18 piles were sent 275 feet below the street.

Each pile is designed to support 1 million pounds of weight — which means the new perimeter pile system has shifted a

total of 18 million pounds off of the tower's original foundation, relieving stress on soils that have compressed beneath the building.

Hamburger said the analysis of the foundation shows recovery of nearly 1 inch of tilt following the final load transfer. He said he expects the building will "continue to experience significant recovery of the tilting that has occurred following the final load transfer."

[Millennium Tower](#), completed in 2009, went from being the city's poshest condo tower to a symbol of the excesses of the city's tech gold rush five years later when it was revealed that the building was leaning 24 inches to the west and 7.9 inches to the north.

While the tower's tilt may have partially been caused by "de-watering" that had taken place during the construction of the Transbay transit terminal next door, most engineers agreed that the piles of the heavy concrete tower's foundation should have been driven all the way to bedrock.

The work has been overseen by the Department of Building Inspection and an independent panel of experts hired by the city. That panel — the Engineering Design Review Team — was charged with ensuring that the building remained safe for occupancy throughout the construction period, and that the retrofit conformed to the applicable building code requirements and approved construction documents. The tower's HOA has contracted with a surveyor to monitor the building's performance over the next decade.

"We will be monitoring it continually for the next 10 years," said Hamburger.

Millennium Tower Condo Association President Howard Dickstein said he is confident the "engineering upgrade will restore our building's reputation and the value of condominiums while putting to rest any lingering questions about the Tower's stability."

Over the next few months, construction workers will restore the Muni lines, pour new sidewalks and plant new trees — red maples, water gums, and Brisbane boxes — along Fremont and Mission streets. That work will be completed by the end of August.

"As an independent team of engineering experts concluded, this is an effective and practical approach to the settlement and tilting issues, and it preserves and enhances the building's safety," Hamburger said. "The fact that the building is responding positively and has stopped settling and is beginning to recover its tilt is very satisfying."

Hamburger said he doesn't see any more sinking towers — at least in San Francisco's Financial District. "San Francisco is pretty much requiring that new buildings in the area go to bedrock," he said.

(San Francisco Chronicle, June 21, 2023, <https://www.sfchronicle.com/sf/article/millennium-tower-lean-repair-18162030.php>)



200 new geotechnical investigation and design software added to DCOdes

The main resource hub for software, codes and scripts used in Design, Construction and Operation (DCO) of infrastructure and environmental protection.

Two hundred new software regarding geotechnical design and investigation, many of which are available for free, have been added to DCOdes.



They include solutions for data management, site and laboratory investigation, shallow and deep foundation design, geotechnical earthquake engineering and more.

You can explore the full geotechnical engineering software and script list [here](#).

June 28 2023

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΣΕΙΣΜΟΙ & ΑΝΤΙΣΕΙΣΜΙΚΗ ΜΗΧΑΝΙΚΗ

Artificial Intelligence and Human-Induced Seismicity: Initial Observations of ChatGPT

Miles P. Wilson, Gillian R. Foulger, Maxwell W. Wilkinson, Jon G. Gluyas, Najwa Mhana, Timur Tezel

Abstract

Freely available artificial intelligence (AI) tools, such as the Chat Generative Pre-trained Transformer (ChatGPT), offer an alternative method to online search engines for scientific results and opinions to be automatically collated into concise summary prose. We applied this approach to human-induced seismicity by asking ChatGPT common, earthquake-related questions before asking questions about natural, induced, and debated earthquakes. ChatGPT provided rudimentary descriptive distinction between natural and induced seismicity, and for clear-cut cases of each type provided a response giving the scientific consensus. For debated cases, a natural origin was implied by responses focusing on fault rupture and tectonic setting. The inclusion of the word "induced" in the question phrasing led to discussion on possible induced origins, but not all response information was consistent with our knowledge of the scientific literature. ChatGPT did not provide an answer to a case more recent than its training data. For most questions, ChatGPT tended to include irrelevant information to increase response length. Online AI tools could become a mainstream technology, particularly for nonspecialists, to obtain concise summaries of published science. However, it is important to recognize the limitations of the current technologies, particularly sensitivity to question wording and inability to correctly reference scientific material, especially where a definitive answer does not yet exist to the question asked.

Seismological Research Letters (2023),
<https://doi.org/10.1785/0220230112>

(June 13, 2023, <https://pubs.geoscience-world.org/ssa/srl/article-abstract/doi/10.1785/0220230112/623998/Artificial-Intelligence-and-Human-Induced?redirectedFrom=fulltext>)



AI could help refine tsunami early warning systems

Sarah Derouin, Ph.D.

The potentially dire effects of rumbling, underwater earthquakes are constant threats to many coastal communities. Even earthquakes that occur far from shore can produce deadly tsunamis that can wreck seaside cities, devastating buildings and killing thousands.

The risk of a tsunami forming is related to the characteristics of underwater earthquakes and how their displacement ripples outward. Collecting and analyzing information about earthquakes — from land or sea sensors — in real time is the key to calculating tsunami risks. These data are used for early warning systems that are crucial for coastal areas at risk of waves.

New research in [Physics of Fluids](#) shows the possibility of getting real-time earthquake information from underwater sensors to add more information to risk calculations. The researchers tested how [hydrophones](#) can pick up the unique acoustic radiation — that is, sound — from earthquakes. From these data, the team used artificial-intelligence-informed models to parse out the earthquake characteristics — including fault shape and slip type, uplift speed, and duration of shaking — which influence the size of tsunamis.

The researchers see their approach as another tool in tsunami forecasting and risk mitigation for coastal regions.

Careful monitoring

Although tsunamis can be triggered by landslides and volcanic eruptions, the vast majority of large waves are triggered by underwater faults that displace the water above. When the ocean crust suddenly ruptures, a rippling wave can spread across oceans, inundating coastlines thousands of kilometers away.

"Tsunamis can be highly destructive, causing huge loss of lives and devastating coastal areas," says Bernabe Gomez, Ph.D. and co-author of the new paper. He notes that understanding the nature of an earthquake is crucial for assessing the potential and characteristics of a tsunami. It is also important in order to issue early warnings and give ample time for evacuations.

Currently, forecasting tsunami risks is an iterative process that takes place over minutes to hours. "What we typically have to do is put out a forecast within five minutes based on seismic information alone. Then as we get more information and more sensors start to report, we're continually updating that forecast and making it more accurate," explains Christopher Moore, the deputy director of the National Oceanic and Atmospheric Administration's Center for Tsunami Research. (Moore was not involved in the research.)

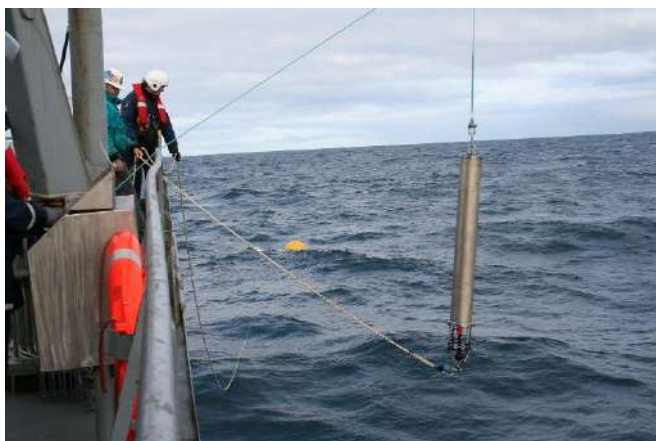


Deep-Ocean Assessment and Reporting of Tsunamis buoys are stationed all around the world, but especially in the seismically active Pacific Ocean. These sensors are real-time tsunami monitoring systems and play a critical role in tsunami forecasting. (Image courtesy of NOAA National Data Buoy Center)

Sensors can be on land (seismometers), circling the globe (global navigation satellite system), or on the ocean ([Deep-Ocean Assessment and Reporting of Tsunamis](#) buoys). The DART buoy array is a set of floating sensors placed around the world but is heavily concentrated within the seismically active Pacific Ocean region.

Moore explains that while DART gives highly accurate information, the sensors are expensive to place and maintain and as such are only placed in the most critical regions. "We've done our best to optimize DART buoy placement, according to not only where earthquakes occur, but where people live," he says. But the distance of the buoys from some earthquake epicenters means there can be a lag in new information of 10-90 minutes after an earthquake.

"We're continually trying to find new sensors to slot in between the time where we have seismic information and when we have that highly accurate DART buoy information," says Moore. This can include GNSS information, disruptions in [communication cables](#), or even hydrophones.



Hydrophones, like this one being lowered into the North Atlantic Ocean, listen to ocean sounds like whale songs or underwater explosions. New research recommends using hydrophones to listen for earthquake sounds to help with tsunami warnings. (Dave Mellinger/Oregon State University, Wikimedia)

Hydrophones are placed on the ocean floor and can detect sounds from all sorts of activities, from underwater eruptions to bomb testing to earthquakes. These sound waves, also called acoustic-gravity waves, travel at the speed of sound (1,500 m per second in seawater) and can often play off the ocean floor, doubling their speed.

"Sound carries information about the originating source, and its pressure field can be recorded at distant locations, even thousands of kilometers away from the source," says Gomez. "They carry information about the earthquake's characteristics and can be recorded by hydrophones in the far field."

Listening to earthquakes

Gomez and co-author Usama Kadri wanted to see if the sound signatures from different fault ruptures could be parsed out using machine learning algorithms. They looked at four tsunami scenarios that occurred within the Pacific Ocean. Their sample scenarios were limited by the availability of hydrophone recordings.

"From the available Comprehensive Nuclear-Test-Ban Treaty Organization database, which is managed by the International Monitoring System, we chose about 200 earthquakes in geographic locations with minimum noise," says Gomez. They used those historical data to train the machine learning

algorithms to classify the type and magnitude of earthquakes. This training allowed the team to back-calculate how acoustic waves could be used to present details of earthquakes' characteristics, including size, uplift speed, and duration.

Gomez says the approach was successful in creating a description of an earthquake in almost real time with extremely low computational efforts. "However, there are still some discrepancies between the retrieved effective characteristics and the actual ones," he says, adding that there are improvements that could be made to the modeling inputs. Gomez also notes that the "use of more data in the artificial intelligence training could decrease the associated uncertainties."

"My first response is this is definitely a novel thing and a new technology," says Yong Wei, Ph.D., ocean engineer researcher at the University of Washington and NOAA affiliate, who was not involved in the study. He adds that while the method is something to explore in the future, there should be more development of AI algorithms.

"When comparing their prediction with the DART measurements, you can see there are some discrepancies," notes Wei. He says that these differences are likely because of how the researchers trained their model. "They mentioned they used about 201 events — maybe that's not enough. Usually, when you do AI, you need a lot of data to train your model. When you don't have enough data, then your model accuracy will drop."

Moore says this research paper is trying to use an AI technique that could be used for the entire ocean. In contrast, he notes that NOAA Tsunami Research Center researchers have also been working on AI modeling in the Pacific Northwest. They have had some success, but he said it was because of a massive effort on a small area of coastline.

"It took the efforts of several seismologists to come up with a database of possible solutions, a data scientist and mathematician to train an AI model, Yong Wei to do modeling for all of those thousands of runs," says Moore. "It's very promising results, and it's super exciting work — and it's just a drop in the bucket."

Hydrophones and early warning

"Artificial intelligence can play a prominent role in the classification of earthquake types," Gomez says. "In combination with state-of-the-art acoustic-gravity wave technology, we can have a more reliable real-time tsunami warning system."

"This work is part of a larger project aiming at enhancing warning systems from natural hazards," says Gomez. "The nature of the developed technology is complementary, and as such we look forward to collaborating and complementing experts on further enhancing the system."

The method has the potential to be an innovative tool in tsunami forecasting, say Wei and Moore.

"We have hope that AI will lend itself to solve some of the problems we have in characterizing a tsunami generated from something like a landslide or a volcano," says Moore. Because these natural events do not have associated earthquakes, he says it is harder to characterize the location and size of a tsunami that might be generated.

Hydrophones and AI modeling could be useful tools in the development of tsunami warning systems. "We all know that new technology needs time to evolve," Wei says. "I think this technology has a great potential to be implemented in the future system."



Landslide Induced Tsunami Hazard at Volcanoes: the Case of Santorini

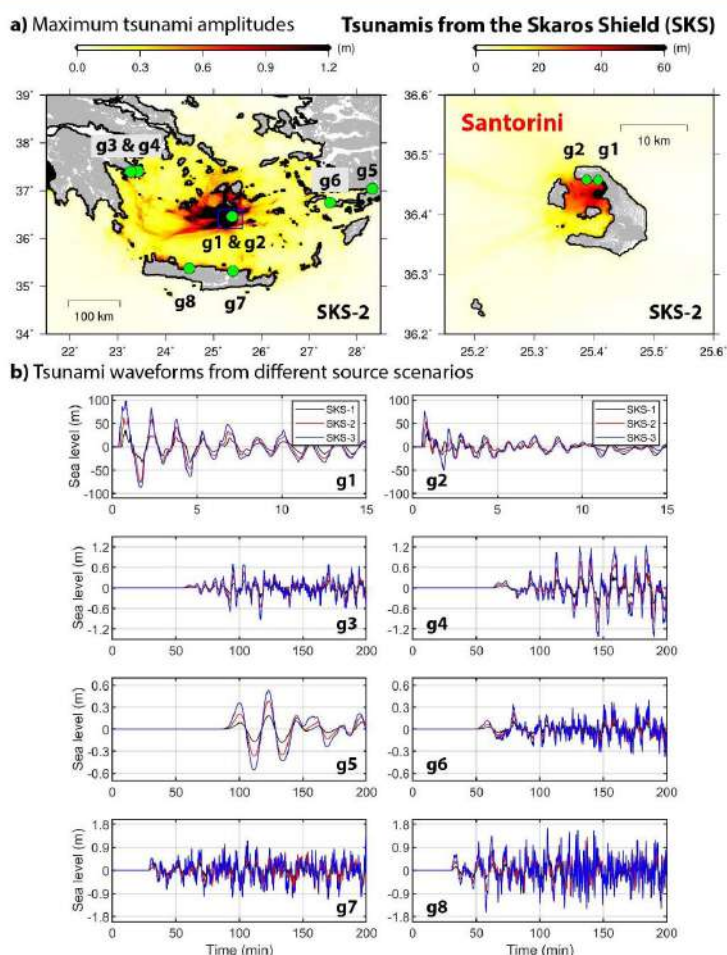
Ocal Necmioglu, Mohammad Heidarzadeh, Georgios E. Vougioukalakis & Jacopo Selva

Abstract

The destructive tsunami on 22 December 2018 due to the flank collapse of the Anak Krakatau volcano was a bitter reminder of large tsunami risks and of the shortcomings of the existing tsunami warning systems for atypical sources (tsunamis generated by non-seismic and complex sources). In

the Mediterranean, several tsunamis were generated by landslides associated with volcanic systems in the past. The volcanic unrest experienced in 2011–2012 on the Santorini volcanic island in the Southern Aegean Sea pointed out the need to identify and quantify tsunami hazard and risk due to possible flank instability which may be triggered as a result of volcanic unrest or nearby seismotectonic activities. Inspired from this need, in this study we examined three possible landslide scenarios in Santorini Island with tsunamigenic potential. The results show that the scenarios considered in our study are able to generate significant local tsunamis impacting Santorini and the nearby islands, as well as producing significant impact along the coasts of the Southern Aegean Sea. While maximum tsunami amplitudes/arrival time ranges are 1.2 m/30–90 min for locations in the Greek-Turkish coasts in the far field, they are in the order of ≈ 60 m/1–2 min for some locations at the Santorini Island. The extreme tsunami amplitudes and short arrival times for locations inside the Santorini Island is a major challenge in terms of tsunami hazard warning and mitigation. As an effort to address this challenge, a discussion on the requirements for local tsunami warning system addressing atypical sources in the context of multi-hazard disaster risk reduction is also provided.

Necmioglu, Heidarzadeh, Vougioukalakis & Selva (2023)
Pure and Applied Geophysics, <https://doi.org/10.1007/s00024-023-03252-8>



ΕΝΔΙΑΦΕΡΟΝΤΑ - ΓΕΩΛΟΓΙΑ

Is Africa splitting into two continents?

Charles Q. Choi

Will the East African Rift split the continent and create a new ocean, or will it fizzle out?



The East African Rift is a network of valleys that stretches from the Red Sea to Mozambique. Here, we see cultivated fields in the Rift Valley of Ethiopia. (Image credit: LuCaAr via Getty Images)

A giant rift is slowly tearing Africa, the second-largest continent, apart. This depression — known as the East African Rift — is a network of valleys that stretches about 2,175 miles (3,500 kilometers) long, from the Red Sea to Mozambique, according to the Geological Society of London.

So will Africa rip apart completely, and if so, when will it split? To answer this question, let's look at the region's tectonic plates, the outer parts of the planet's surface that can collide with each other, making mountains, or pull apart, creating vast basins.

Along this colossal tear in eastern Africa, the Somali tectonic plate is pulling eastward from the larger, older part of the continent, the Nubian tectonic plate, according to NASA's Earth Observatory. (The Somali plate is also known as the Somali plate, and the Nubian plate is also sometimes called the African plate.)

The Somali and Nubian plates are also separating from the Arabian plate in the north. These plates intersect in the Afar region of Ethiopia, creating a Y-shaped rift system, the Geological Society of London noted.

A slow break

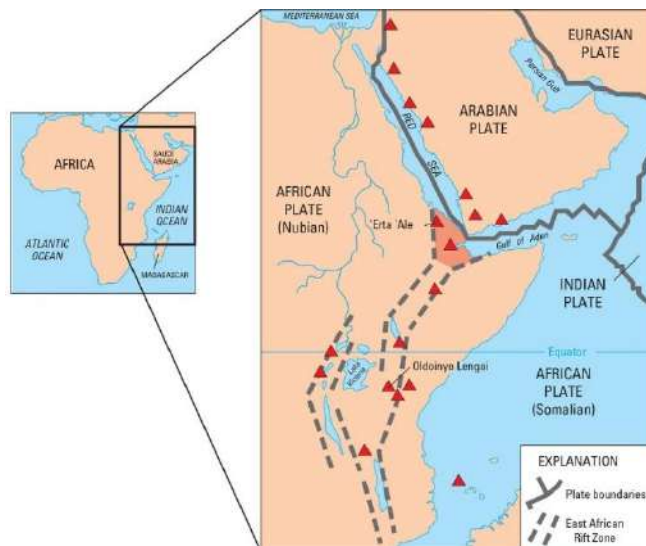
The East African Rift started forming about 35 million years ago between Arabia and the Horn of Africa in the eastern part of the continent, Cynthia Ebinger, chair of geology at Tulane University in New Orleans and a science adviser to the U.S. State Department's Bureau of African Affairs, told Live Science. This rifting extended southward over time, reaching northern Kenya by 25 million years ago.

The rift consists of two broadly parallel sets of fractures in Earth's crust. The eastern rift passes through Ethiopia and Kenya, while the western rift runs in an arc from Uganda to Malawi, the Geological Society of London noted. The eastern

branch is arid, while the western branch lies on the border of the Congolese rainforest, according to NASA's Earth Observatory.

The existence of the eastern and western rifts and the discovery of offshore zones of earthquakes and volcanoes indicate that Africa is slowly opening along several lines, which together amount to more than 0.25 inch (6.35 millimeters) per year, Ebinger said.

"The rifting right now is very slow, about the rate that one's toenails grow," Ken Macdonald, a distinguished professor emeritus of Earth science at the University of California, Santa Barbara, told Live Science.



A map showing tectonic plate boundaries (gray) as well as the East African Rift zone (dotted lines). (Image credit: U.S. Geological survey)

The East African Rift most likely formed because of heat flowing up from the asthenosphere — the hotter, weaker, upper part of Earth's mantle — between Kenya and Ethiopia, according to the Geological Society of London. This heat caused the overlying crust to expand and rise, leading to stretching and fracturing of the brittle continental rock. This led to substantial volcanic activity, including the formation of Mount Kilimanjaro, the highest mountain in Africa, NASA's Earth Observatory noted.

If Africa does rip apart, there are different ideas for how that might happen. One scenario has most of the Somali plate separating from the rest of the African continent, with a sea forming between them. This new landmass would include Somalia, Eritrea, Djibouti, and the eastern parts of Ethiopia, Kenya, Tanzania and Mozambique, Ebinger said. "Another scenario has only eastern Tanzania and Mozambique separating," Ebinger noted.

If the African continent does rupture, "the rift in Ethiopia and Kenya may split to create a Somali plate in the next 1 million to 5 million years," Ebinger said.

However, Africa may not split in two. The geological forces driving the rifting might prove too slow to separate the Somali and Nubian plates, Ebinger said. One notable example of a failed rift elsewhere on the globe is the Midcontinent Rift, which curves for about 1,900 miles (3,000 km) across the Upper Midwest of North America, according to a 2022 review in the journal *GSA Today*.

"Failed rifts mark continental landmasses worldwide," Ebinger said.

The eastern branch of the East African Rift is a failed rift, according to the Geological Society of London. However, the western branch is still active.

"What we do not know is if this rifting will continue on its present pace to eventually open up an ocean basin, like the Red Sea, and then later to something much larger, like a small version of the Atlantic Ocean," Macdonald said. "Or might it speed up and get there more quickly? Or it might stall out?"

(LIVESCIENCE / 16 June 2023, <https://www.livescience.com/planet-earth/geology/is-africa-splitting-into-two-continents>)



Παναφρικανική ορογένεια

Η Παναφρικανική ορογένεια ήταν μια σειρά από μεγάλες νεο-πρωτεροζωικές ορογενείς εκδηλώσεις που αφορούσαν τη διαμόρφωση των υπερήπειρων Gondwana και Pannotia περίπου 600 εκατομμύρια χρόνια πριν. Αυτή η ορογένεια είναι επίσης γνωστή ως Παν-Γοντβάν ή Σαλντανική Ορογένεια.

Η Παναφρικανική ορογένεια και η ορογένεια του Grenville είναι τα μεγαλύτερα γνωστά συστήματα ορογονίων στη Γη.

Το άθροισμα του ηπειρωτικού φλοιού που σχηματίζεται στην Παναφρικανική ορογένεια και την ορογένεια Grenville καθιστά το Νεοπρωτεροζωικό την περίοδο της ιστορίας της Γης που έχει παράγει τον μεγαλύτερο ηπειρωτικό φλοιό.



(LEARN Geology, <https://www.facebook.com/groups/1090462624321556/user/100087527913755>)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΠΕΡΙΒΑΛΛΟΝ

Οι πέντε περιοχές στην Ελλάδα που κινδυνεύουν με «καταβύθιση»

Η κλιματική αλλαγή απειλεί πέντε περιοχές στην Ελλάδα – Αντιμετωπίζουν κίνδυνο καταβύθισης



Τον κώδωνα του κινδύνου κρούουν οι ειδικοί για πέντε περιοχές της Ελλάδας που κινδυνεύουν με «καταβύθιση» μέσα στις επόμενες δεκαετίες.

Μιλώντας σε εκδήλωση με θέμα το περιβάλλον, οι επιστήμονες εξέπεμψαν σήμα κινδύνου για Αττική, Θεσσαλονίκη, Πελοπόννησο, Κρήτη και Δωδεκάνησα, που θεωρούνται ως «πιο ευάλωτες» σε κίνδυνο καταβύθισης αν δεν ληφθούν και αποδώσουν μέτρα αντιμετώπισης των επιπτώσεων της **κλιματικής αλλαγής**.

«Διαπιστώνουμε πως τριπλασιάστηκαν τα ακραία και σφοδρά καιρικά φαινόμενα στη Θεσσαλονίκη, σε σχέση με τα προηγούμενα χρόνια και οι συνέπειες τους εξαιτίας της κλιματικής αλλαγής, αλλά και εξαιτίας των ανθρωπογενών παρεμβάσεων και της ανυπαρξίας των αντιπλημμυρικών μέτρων» επισήμανε ο μετεωρολόγος Μιχάλης Σιούτας, στην εκδήλωση του ΤΕΕ/ΤΚΜ για την Παγκόσμια Ημέρα Περιβάλλοντος με θέμα: «Κλιματική Αλλαγή – Επιπτώσεις στην Παράκτια Ζώνη – Αντιπλημμυρική θωράκιση Θεσσαλονίκης». Τόνισε, δε, πως «αν διατηρηθούν οι σημερινές συνθήκες, με βάση το πιθανότερο σενάριο προβλέπεται να εμφανισθούν από πέντε έως οκτώ **πλημμυρικά** επεισόδια ανά έτος στην περιοχή της Θεσσαλονίκης την προσεχή δεκαετία, 2023-33».

Παλιότερα, όπως είπε, ακραία φαινόμενα συνέβαιναν μια με δύο φορές το χρόνο, ίσως και καμία, ενώ τα τελευταία χρόνια έχουμε έξι με επτά τέτοια επεισόδια με μεγάλης έκτασης επιδράσεις στη Θεσσαλονίκη. Το φυσικό και αστικό περιβάλλον έχει γίνει πολύ ευάλωτο στις φυσικές καταστροφές και στα έντονα καιρικά φαινόμενα με αποτέλεσμα να έχουμε συχνά πλημμυρικά φαινόμενα, κατολισθήσεις, αλλοιώσεις του περιβάλλοντος στις παράκτιες περιοχές, όπου εντοπίζουμε σημαντική διάβρωση.

Την εκδήλωση συντόνισε ο επικεφαλής της Διαρκούς Ομάδας Εργασίας Φυσικών, Τεχνολογικών και άλλων Καταστροφών του ΤΕΕ/ΤΚΜ, Πολιτικός Μηχανικός Βασίλης Λεκίδης. Χαιρετίζοντας, την εκδήλωση ο Πρόεδρος του ΤΕΕ/ΤΚΜ, Γιώργος Τσακούμης, υπογράμμισε πως η διάβρωση των ακτών είναι ένα θέμα που μάλλον πρόσφατα ξεκίνησε να απασχολεί με

τόση ένταση την επιστημονική κοινότητα, καθώς στο μέλλον αναμένεται να επηρεάσει σε σημαντικό βαθμό την οικονομική δραστηριότητα. Υπογράμμισε, δε, τον ρόλο του επιμελητηρίου στην υποβολή προτάσεων και στην προτροπή ταχείας λήψης μέτρων που θα αποσοβήσουν τους κινδύνους από τις εκτιμώμενες επιπτώσεις.

Ο αντιπεριφερειάρχης Τεχνικών Έργων της Περιφέρειας Κεντρικής Μακεδονίας και πρώην πρόεδρος του ΤΕΕ/ΤΚΜ, Πάρις Μπίλλιας, κατά τον χαιρετισμό – εκ μέρους και του Περιφερειάρχη, Απόστολου Τζιτζικώστα – αλλά και κατά την εισήγησή του, υπογράμμισε πως η ΠΚΜ έχει ήδη συστήσει παρατηρητήριο της εξέλιξης του φαινομένου της διάβρωσης των ακτών.

«Πρόκειται για κάτι που πάντα συνέβαινε. Η ακτογραμμή σήμερα δεν έχει καμία σχέση με αυτή που υπήρχε πριν εκατοντάδες χρόνια. Σήμερα όμως, και στο άμεσο μέλλον, οι επιπτώσεις καταγράφονται και θα είναι πολύ μεγαλύτερες, λόγω της μορφής και της έντασης της ανθρώπινης δραστηριότητας» υπογράμμισε και σημείωσε ότι «υπάρχει ασάφεια για το ποιος είναι ο φορέας που έχει ευθύνη για την διαχείριση και αντιμτώπιση του φαινομένου», ενώ «είναι πολύς ο απαιτούμενος χρόνος ωρίμανσης σχετικών έργων, αφού μια μελέτη ακτομηχανικής μπορεί να χρειαστεί έως τρία χρόνια, γεγονός που σίγουρα χρήζει νομοθετικής ρύθμισης».

Σε ότι αφορά στα αντιπλημμυρικά έργα, ο κ. Μπίλλιας τόνισε πως, «καλά είναι τα master plan που καταρτίζουμε, αλλά θα πρέπει να συνοδεύονται από τους αντίστοιχους πόρους και οικονομικούς, αλλά και από πλευράς επιστημονικού δυναμικού» και πρόσθεσε πως σε εξέλιξη βρίσκονται από το Υπουργείο Υποδομών και την ΠΚΜ 16 έργα και μελέτες που αφορούν την αντιπλημμυρική θωράκιση της Θεσσαλονίκης, ενώ έχουν υποβληθεί προτάσεις για 15 νέες μελέτες.

Την ανάγκη για άμεση λήψη μέτρων σημείωσε και ο Αντιδήμαρχος Τεχνικών Έργων του Δήμου Θεσσαλονίκης Εφραίμ Κυριζίδης, χαιρετίζοντας την εκδήλωση και εκ μέρους του Δημάρχου, Κωνσταντίνου Ζέρβα. Ο ίδιος σημείωσε πως ο Δήμος έχει καταθέσει αρκετές προτάσεις, ιδιαίτερα σε ότι αφορά τη διαχείριση των ρεμάτων, ένα θέμα που έχει δημιουργήσει πολλά αδιέξοδα, αφού μέχρι το 1990 τα ρέματα θεωρούνταν κατάλληλα για τη χωροθέτηση κατασκευών για κοινωφελείς σκοπούς.



Οι περιοχές με μεγαλύτερο κίνδυνο καταβύθισης

Σε κάθε περίπτωση, η Ελλάδα σύμφωνα με τα συμπεράσματα της εκδήλωσης, αντιμετωπίζει κίνδυνο «καταβύθισης» σημαντικών τμημάτων της ακτογραμμής σε διάφορες περιοχές (Αττική, Θεσσαλονίκη, Πελοπόννησος, Κρήτη, Δωδεκάνησα, κ.α.) μέσα στις επόμενες δεκαετίες – με το αντίστοιχο κόστος για την οικονομία και για τις τοπικές κοινωνίες – αν δεν ληφθούν και αποδώσουν μέτρα αντιμετώπισης των επιπτώσεων της κλιματικής αλλαγής.

Αναφερόμενος στις καταγεγραμμένες αλλά και στις εκτιμήσεις για μελλοντικές επιπτώσεις της κλιματικής αλλαγής, ο Μετεωρολόγος κ. Μιχάλης Σιούτας περιέγραψε μια Θεσσαλονίκη με μεγάλες εκτάσεις πέριξ του σημερινού Δέλτα του Αξιού, βυθισμένες από την άνοδο της στάθμης της θάλασσας σε βάθος 50-100 ετών, αλλά και την πλατεία Αριστοτέλους της Θεσσαλονίκης, βυθισμένη μέχρι και το ύψος της οδού Τσιμισκή.

Η πρόσφατη έκθεση του ΟΗΕ, ο κ. Σιούτας τόνισε πως ανέδειξε τα εξής: «Τα ακραία καιρικά φαινόμενα και η ανθρωπογενής κλιματική αλλαγή τα τελευταία 50 χρόνια, στοίχισαν τη ζωή σε δύο εκατομ. ανθρώπους κι έχουν προξενήσει ζημιές 4,3 τρισ. δολ. την περίοδο 1976-21. Στην περίοδο 1976-21 σημειώθηκαν 11.778 μεγάλες καταστροφές εξαιτίας της κλιματικής αλλαγής. Στη διετία 2020-21 οι θάνατοι που προκλήθηκαν από ακραία καιρικά φαινόμενα ήταν 22.607 σε παγκόσμιο επίπεδο, αλλά θα ήταν γύρω στις 50.000 αν δεν υπήρχαν οι έγκαιρες προειδοποιήσεις, που σώζουν ζωές».

Ο ίδιος τόνισε πως, περισσότερο από το 90% των θανάτων από τα φαινόμενα αυτά συνέβησαν στις φτωχότερες, αναπτυσσόμενες χώρες. Οι πλούσιες χώρες έχουν πληγεί περισσότερο σε οικονομικές, νομισματικές ζημιές. Οι θάνατοι μειώνονται, αλλά οι οικονομικές επιπτώσεις από καταστροφές που σχετίζονται με τις καιρικές συνθήκες έχουν εκτοξευθεί στα ύψη. Οι οικονομικές απώλειες είχαν 7πλασιαστεί από το 1970 έως το 2019, αυξανόμενες από 49 εκατομ. δολ. την ημέρα στη δεκαετία 1970-80 σε 383 εκατομ. δολ. την ημέρα στην τελευταία δεκαετία 2010-20.

Ο κ. Σιούτας συμπλήρωσε ότι, «Οι υποδομές όπως οι αγωγοί απορροής των όμβριων υδάτων ήταν σχεδιασμένες για μικρότερες ποσότητες νερού αλλά και πληθυσμού με αποτέλεσμα πλέον να είναι ανεπαρκείς. Πρέπει άμεσα να γίνουν τα απαραίτητα έργα αλλά και να χρησιμοποιηθούν νέα τεχνολογικά μέσα και έγκαιρες προειδοποιήσεις που σώζουν ζωές ώστε να αποτρέπονται οι κίνδυνοι να χάσουμε ανθρώπινες ζωές» υπογράμμισε.

Συναγερμός για Αξιό, Περαιά, Επανομή και αεροδρόμιο «Μακεδονία»

Ο Καθηγητής του Τμήματος Αγρονόμων και Τοπογράφων Μηχανικών του ΑΠΘ Γιώργος Βέργος, παρουσίασε τη μεθοδολογία και στοιχεία του Παρατηρητηρίου της Περιφέρειας Κεντρικής Μακεδονίας, που μέσω της επεξεργασίας γεωχωρικών και άλλων δεδομένων επιβεβαιώνουν τις εκτιμήσεις για τον κίνδυνο μελλοντικής καταβύθισης περιοχών της ακτογραμμής. Όπως είπε πιο συγκεκριμένα, «η περιοχή του Αξιού, καθώς και οι παράκτιες περιοχές της Περαιάς, της Επανομής και του αεροδρομίου «Μακεδονία» κινδυνεύουν από έντονες πλημμύρες στο μέλλον». Ο ίδιος μεταξύ των προτεινόμενων μέτρων παρέμβασης, ανέφερε την ανάγκη νέας πολεοδομικής νομοθεσίας με επανεξέταση των χρήσεων γης στις παράκτιες περιοχές, μέτρα για την αποκατάσταση παράκτιων οικοτόπων και νέους κώδικες και κανονισμούς για την κατασκευή υποδομών, που να αντέχουν στην παράκτια διάβρωση και στα κύματα των καταιγίδων.

Ο μελετητής Ακτομηχανικών - Λιμενικών - Υδραυλικών Έργων, Αντώνιος Βαλσαμίδης, παρουσίασε διάφορα μοντέλα προσομοιώσεων μέτρων προστασίας παράκτιων περιοχών, ενώ αναφερόμενος στις επιπτώσεις της κλιματικής αλλαγής σημείωσε πως «η γενική μορφοδυναμική τάση εξελίξεως των ακτών σε συνδυασμό με την άνοδο της στάθμης της θάλασσας θα μπορούσε να αφανίσει τις μισές αμμώδεις παραλίες παγκοσμίως μέχρι το τέλος του αιώνα», ενώ αντίθετα «η αισθητή μείωση των αερίων του θερμοκηπίου θα μπορούσε να απομειώσει κατά 40% την τάση υποχωρήσεως των ακτογραμμών».

Ο Προϊστάμενος της Διεύθυνσης Στρατηγικού Σχεδιασμού, Έργων και Ανάπτυξης της ΕΥΑΘ Αλέξανδρος Μεντές, παρου-

σίασε τις προσπάθειες της ΕΥΑΘ στο εκτεταμένο δίκτυο ύδρευσης και αποχέτευσης που ελέγχει, για τη συντήρηση και τον καθαρισμό του, ως μέτρο πρόληψης πλημμυρικών φαινομένων. Μιλώντας για τα προβλήματα που προκλήθηκαν τα τελευταία χρόνια στη Θεσσαλονίκη σε επεισόδια βροχής μεγαλύτερα των 15mm, ανέφερε 929 προβλήματα (77,4 ανά έτος περίπου) την περίοδο 2010-2022, που κυρίως αφορούν σε πλημμύρες ισογείων και υπογείων λόγω φραγμένων σχαρών ή φραγμένων αγωγών Αντίστοιχα για επεισόδια βροχής μεγαλύτερα από 25mm την ίδια περίοδο, καταγράφονται περίπου του κέντρου τουλάχιστον 75 σημεία στα οποία καταγράφηκε πλημμύρα περισσότερες από δύο φορές.

Ο επίκουρος Καθηγητής του Τμήματος Πολιτικών Μηχανικών του ΑΠΘ Ζήσης Μάλλιος, μιλώντας για της κοινωνικοοικονομικές επιπτώσεις της κλιματικής αλλαγής, παρουσίασε κλιματικά σενάρια για την επόμενη 50ετία, βάσει των οποίων στην Ελλάδα, η θερμοκρασία θα αυξηθεί από 2°C (RCP 2.6) έως 3.4°C (RCP 8.5), οι ημέρες με καύσωνα στην Ελλάδα θα αυξηθούν κατά 15-20 ημέρες ετησίως, οι βροχοπτώσεις θα μειωθούν από 10% έως 25%, οι ημέρες υψηλού κινδύνου πυρκαγιάς θα αυξηθούν από 15% έως και 70%, τα ακραία καιρικά φαινόμενα θα είναι πολύ πιο συχνά και οι προβλέψεις ανόδου της στάθμης της θάλασσας θα κυμαίνονται από 0,2 έως και 2 μέτρα μέχρι το 2100.

Πηγή: ΑΠΕ

(ΤΑ ΝΕΑ / in.gr, 7 Ιουνίου 2023, <https://www.in.gr/2023/06/07/b-science/perivallon-b-science/oi-pente-perioxes-stin-ellada-pou-kindynevous-katavythisi-sos-apo-tous-eidikous>)



Climate change causes a mountain peak frozen for thousands of years to collapse

Aimee Gabay

Fluchthorn in the Silvretta Alps is now around 60 feet (19 m) shorter than it was before — and more mountains are expected to follow suit as temperatures thaw the permafrost holding them together.



Part of Fluchthorn's peak collapsed on June 11 after a sustained warm period. (Image credit: Sean Gallup/Getty Images)

Part of a Swiss mountain's summit has collapsed, sending more than 3.5 million cubic feet (100,000 cubic meters) of rock crashing into the valley below. The incident was likely a result of thawing permafrost — and scientists have warned

similar events are to be expected as climate change causes ancient frozen ground to degrade.

The incident occurred on June 11 after an extensive period of high temperatures in the country. Videos reveal the sudden collapse of Fluchthorn's summit, an almost 11,155-foot (3,400 meters) mountain in the Silvretta Alps, on the border of Switzerland and Austria.



<https://www.youtube.com/watch?v=rr6Kr-oGHoA>

"Half of the summit was torn away by the demolition," mountain rescuer Riccardo Mizio told Austrian newspaper [Kronen Zeitung \(translated\)](#), adding the summit cross — a Christian cross marking the peak of a mountain — was missing. No one was injured by the rockfall.

The main peak of Fluchthorn lost approximately 330 feet (100 m). It fell in the western area of the peak, in the Futschöl Valley. The middle peak, which stands at 11,145 feet (3,397 m) is now the highest point of the Fluchthorn — meaning the mountain is now around 60 feet (19 m) shorter than it was before.

Fluchthorn sits among the Mischabel massif, the highest group of mountains in Switzerland. The cluster of 11 peaks all sit above 13,123 feet (4,000 m), including the tallest — the Dom — which is 14,911 feet (4,545 m) tall.

Most mountain peaks above 8,202 feet (2,500 m) in the Alps are covered by permafrost, or permanently frozen ground, which runs deep into cracks in the solid rock, helping to glue them together. Without it, mountainsides can become unstable, leading to landslides and rockfalls.



Landscape image showing the deluge from the landslide triggered by Fluchthorn's collapsed peak. (Image credit: Sean Gallup/Getty Images)

Permafrost is strongly affected by climate change, as warm temperatures can cause ice in the cracks to unfreeze. Although this is not unusual in the summertime, when the layer above the permafrost tends to thaw for a short duration, more frequent heatwaves in the Alps are taking their toll, resulting in a gradual deepening of the summer thaw.

As the ground warms, permafrost thaw is expected to destabilize more rocks across the Alps, leading to more frequent landslides and rockfalls. "The bigger the size of the event, and in this case it was big, the deeper the thaw must have been," said Jan-Christoph Otto, a geologist at the University of Salzburg.

"This mountain peak has been frozen for probably thousands of years," Otto told Live Science. Due to a delay in climate change reaching deeper layers of rock, "the mountain peak failure at Fluchthorn is most likely the result of extreme temperatures last summer or fall," he added.

In the Alps, atmospheric temperatures have risen significantly over the past few decades. According to the Swiss Meteorological Service, temperatures in the Alps are warming at around 0.5 degrees Fahrenheit (0.3 degrees Celsius) per decade — around twice as fast as the global average.

Based on long-term data collected from sensors in the rock-face, research shows that every 10 years the average temperature inside the rock has increased by 1.8 F (1 C).

While it's impossible to predict which peak or slope may fall next in the Alps, experts warn that similar rockfall events are to be expected in a warming world. Otto said there are hundreds of mountains in the Alps where permafrost is present. "Considering the ongoing temperature increase in the Alps, more events are probable," he said.

(LIVESCENCE, 26.06.2023, <https://www.livescience.com/planet-earth/climate-change/climate-change-causes-a-mountain-peak-frozen-for-thousands-of-years-to-collapse>)



Part of the Thames Tideway Tunnel turned into "Loo Gardens"



The Loo Gardens (credits: Tideway)

London's Thames Tideway Tunnel, also known as London's Super Sewer, has been transformed into a colorful garden,

50 meters under the city.

This initiative is part of the “Loo Gardens” installation, which was created to symbolize the healthier future of the river Thames, according to the developers.

Loo Gardens aims at creating an underground oasis for a brief period of time, using rented artificial plants and repurposed waste material, which were found along the Thames, due to the challenges of darkness and watering.

As far as the original project is concerned, the Thames Tideway Tunnel is a 25-kilometer super sewer which is currently being constructed under the city of London, at a cost of £4.5 billion, and is scheduled to be operational in 2025.

The project aims to prevent some millions of tons of raw sewage, or about 95% of today’s spills, from entering the Thames through the Victorian sewer system, which is in place today.

Finally, Loo Gardens will be open for three weeks, before the tunnel is closed prior to being tested before coming into operation, while some lucky Londoners will have the chance to visit the installations through a competition in Time Out magazine.

Sources: www.tideway.london, www.bbc.com, www.geo.tv, www.thenews.com.pk

(Geoengineer.org, Jun, 30, 2023, <https://www.geoengineer.org/news/part-of-the-thames-tideway-tunnel-turned-into-loo-gardens>)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΛΟΙΠΑ

Metro Tunnel trials recycled glass in concrete

Melbourne's Metro Tunnel Project is working with the University of Melbourne and industry partners to trial the use of crushed glass in structural concrete at the new State Library Station.

The trial has demonstrated that 25% of virgin sand used in concrete mix can be replaced with recycled crushed glass, reducing reliance on virgin sand and diverting waste glass from landfill.

The crushed glass concrete mix was used in the construction of temporary suspended concrete slabs, producing a concrete mix of equal strength and quality to traditional concrete.



It is the first time a recycled glass concrete mix has been used in a structural application on a major infrastructure project. It has previously been limited to footpaths and local roads.

Cross Yarra Partnership, which is completing the tunnels and stations contract, says it is considering further trials at the University of Melbourne – with the potential to increase virgin sand replacement from 25% to 80% crushed glass. The consortium comprises Lendlease Engineering, John Holland Bouygues Construction and Capella Capital.

CYP sustainability lead Mick Lo Monaco said the consortium hoped that by providing a field trial site for the research it could pave the way for full-scale commercialisation of recycled glass in structural concrete.

The research is part of the project's sustainability commitment. According to a video on the project website, by using recycled industrial by-products instead of cement, the project has reduced its cement use by more than 50%.

The Metro Tunnel is the first step towards a metro-style rail network for Melbourne. It includes twin 9km tunnels from the west of the city to the south-east and five underground stations. The four TBMs completed tunnelling in May 2021.

(TUNNELS & TUNNELLING, 14 June 2023, <https://www.tunnelsonline.info/news/metro-tunnel-trials-recycled-glass-in-concrete-10940194/>)

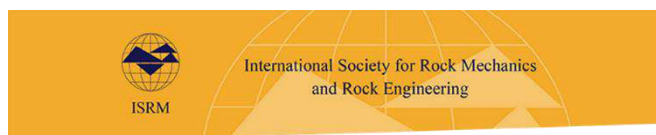
ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ



www.issmge.org/publications/issmge-bulletin/vol-17-issue-3-june-2023

Κυκλοφόρησε το Τεύχος 3 του Τόμου 17 του ISSMGE Bulletin Ιουνίου 2023 με τα ακόλουθα περιεχόμενα:

- **Conference report**
 - The 3rd Betancourt Conference, St. Petersburg, Russia
 - The 8th International Conference on Unsaturated Soils, Milos, Greece
 - The 16th International Conference on Geotechnical Engineering, Lahore, Pakistan
- **ISSMGE Foundation report**
- **Event Diary**
- **Corporate Associates**
- **Foundation Donors**



<https://isrm.net/newsletter/show/240>

Κυκλοφόρησε το Τεύχος Αρ. 62 του ISRM Newsletter – Ιουνίου 2023 με τα ακόλουθα περιεχόμενα:

- [Message from the President](#)
- [15th International ISRM Congress, Salzburg, Austria](#)
- [42nd ISRM Online Lecture by Prof. Antonio Bobet](#)
- [ISRM International Symposium 2024 and ARMS13, 22-27 September 2024, New Delhi, India](#)
- [Eurock2024, Alicante, Spain, 15-19 July 2024 - abstracts submission deadline extended](#)
- [Election of the ISRM Regional Vice Presidents 2023/2027](#)
- [Proceedings of the 2022 Latin American Rock Mechanics Symposium now available](#)
- [Webinars for Latin America](#)
- [4th European Rock Mechanics Debate](#)
- [Online Course of Slope Engineering by Professor Wu Shunchuan](#)

- [NGS 2023 - the 10th Nordic Grouting Symposium: Stockholm, Sweden, 12-13 September 2023](#)
- [1st Chilean Congress on Rock Mechanics, Santiago, Chile, 22-24 November 2023](#)
- [1st SLRMES Conference on Rock Mechanics for Infrastructure and Geo-Resources Development, Colombo, Sri Lanka, 2-7 December 2023](#)
- [ISRM Rocha Medal 2025 nominations](#)
- [ISRM Sponsored Conferences](#)



IGS NEWSLETTER – June 2023

Κυκλοφόρησε το IGS Newsletter της International Geosynthetic Society με τα ακόλουθα περιεχόμενα:

Helping the world understand the appropriate value and use of geosynthetics

www.geosyntheticssociety.org/newsletters

- IGS Strategy Goal Series – Why Does The IGS Need To Be Influential? [READ MORE](#)
- IGS Delegation Strengthens Ties In China [READ MORE](#)
- Watch New Geosynthetics Testing Video [READ MORE](#)
- Cleaning Up Communities With HDPE [READ MORE](#)
- Register Now For Limiting Geomembrane Strain Webinar [READ MORE](#)
- IGS Greece Hosts Soil Reinforcement Seminar [READ MORE](#)
- Young Engineers Gain Insight At Italy Geotechnical Conference [READ MORE](#)
- 10 Questions With... Dustin Taylor [READ MORE](#)
- Calendar of Events



www.icevirtuallibrary.com/toc/jgein/30/3

Κυκλοφόρησε το Τεύχος 3 του Τόμου 30 (Ιουνίου 2023) του Geosynthetic International της International Geosynthetic Society με τα ακόλουθα περιεχόμενα:

[Performance of GCLs after long-term wet-dry cycles under a defect in GMB in a landfill](#), R. K. Rowe, S. Hamdan, 30(3), pp. 225–246

[Slope displacement and soil pressure of soilbag-retaining wall influenced by arrangement](#), Y.-Q. Wang, Y.-L. Li, K. Liu, X. Li, F. Yang, 30(3), pp. 247–258

[Mechanical properties of PVC geomembrane based on non-contact measurement](#), X. L. Zhang, Y. Y. Wu, Z. Y. Ma, C. J. Yin, 30(3), pp. 259–273

[Analytical solution for soil flushing using PVD system with rectangular pattern](#), X. Zhou, H.-Y. Wang, D.-S. Ling, W. Liu, H. Ke, 30(3), pp. 274–284

[Dynamic behaviour of pipe protected by rubber-soil mixtures](#), E. Zhou, L. Cui, X. Zuo, L. Wang, 30(3), pp. 285–295

[Reliability analysis for internal seismic stability of geosynthetic-reinforced soil walls](#), H. Alhaji Chehade, X. Guo, D. Dias, M. Sadek, O. Jenck, F. Hage Chehade, 30(3), pp. 296–314

[Geogrid-soil interaction: experimental analysis of factors influencing load transfer](#), J. Derksen, R. Fuentes, M. Ziegler, 30(3), pp. 315–336

[\(C&D\) waste – Effect of type of fill and compaction](#), Apoorva Agarwal, G.V. Ramana, Manoj Datta, Narendra Kumar Soni, Rajiv Satyakam, Pages 405–417

[A quasi-2D exploration of optimum design settings for geotextile-reinforced sand in assistance with PIV analysis of failure mechanism](#), Bayram Ates, Erol Sadoglu, Pages 418–436

[Multi-scale understanding of sand-geosynthetic interface shear response through Micro-CT and shear band analysis](#), Rizwan Khan, Gali Madhavi Latha, Pages 437–453



www.sciencedirect.com/journal/geotextiles-and-geomembranes/vol/51/issue/3

Κυκλοφόρησε το Τεύχος 3 του Τόμου 51 (Ιουνίου 2022) του Geotextiles and Geomembranes της International Geosynthetics Society με τα ακόλουθα περιεχόμενα:

[Editorial Board](#)

[Quantitative assessment of the shoreline protection performance of geotextile sandbags at an *in-situ* coastal experimental station](#), Yongqing Li, Zai-Jin You, Ye Ma, Bing Ren, Pages 371–380

[Assessing the importance of drainage layers over geomembrane liners within engineered cover systems: Seven years of field monitoring at three mine waste rock piles](#), Deanna Hersey, Christopher Power, Pages 381–389

[DIC assessment of foundation soil response for different reinforcement between base and soft subgrade layer – Physical modeling](#), Mladen Kapor, Adis Skejić, Senad Medić, Anis Balić, Pages 390–404

[Pullout behaviour of polymeric strips embedded in mixed recycled aggregate \(MRA\) from construction & demolition](#)

ΕΚΤΕΛΕΣΤΙΚΗ ΕΠΙΤΡΟΠΗ ΕΕΕΕΓΜ (2019 – 2023)

Πρόεδρος	:	Μιχάλης ΜΠΑΡΔΑΝΗΣ, Δρ. Πολιτικός Μηχανικός, ΕΔΑΦΟΣ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ Α.Ε. mbardanis@edafos.gr , lab@edafos.gr
Α΄ Αντιπρόεδρος	:	Χρήστος ΤΣΑΤΣΑΝΙΦΟΣ, Δρ. Πολιτικός Μηχανικός, ΠΑΝΓΑΙΑ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ Ε.Π.Ε. editor@hssmge.gr , ctsatsanifos@pangaea.gr
Β΄ Αντιπρόεδρος	:	Μιχάλης ΠΑΧΑΚΗΣ, Πολιτικός Μηχανικός mpax46@otenet.gr
Γενικός Γραμματέας:		Γιώργος ΜΠΕΛΟΚΑΣ, Δρ. Πολιτικός Μηχανικός, Επίκουρος Καθηγητής ΤΕΙ Αθήνας gbelokas@teiath.gr , gbelokas@gmail.com
Ταμίας	:	Γιώργος ΝΤΟΥΛΗΣ, Πολιτικός Μηχανικός, ΕΔΑΦΟΜΗΧΑΝΙΚΗ Α.Ε.- ΓΕΩΤΕΧΝΙΚΕΣ ΜΕΛΕΤΕΣ Α.Ε. gdoulis@edafomichaniki.gr
Έφορος	:	Γεώργιος ΓΚΑΖΕΤΑΣ, Δρ. Πολιτικός Μηχανικός, Ομότιμος Καθηγητής Ε.Μ.Π. gazetas@central.ntua.gr , gazetas50@gmail.com
Μέλη	:	Ανδρέας ΑΝΑΓΝΩΣΤΟΠΟΥΛΟΣ, Δρ. Πολιτικός Μηχανικός, Ομότιμος Καθηγητής ΕΜΠ aanagn@central.ntua.gr Παναγιώτης ΒΕΤΤΑΣ, Πολιτικός Μηχανικός, ΟΜΙΛΟΣ ΤΕΧΝΙΚΩΝ ΜΕΛΕΤΩΝ Α.Ε. otmate@otenet.gr Μαρίνα ΠΑΝΤΑΖΙΔΟΥ, Δρ. Πολιτικός Μηχανικός, Αναπληρώτρια Καθηγήτρια Ε.Μ.Π. mpanta@central.ntua.gr
Αναπληρωματικά Μέλη	:	Χρήστος ΣΤΡΑΤΑΚΟΣ, Πολιτικός Μηχανικός, ΝΑΜΑ Α.Ε. stratakos@namalab.gr Βάλια ΞΕΝΑΚΗ, Δρ. Πολιτικός Μηχανικός, ΕΔΑΦΟΜΗΧΑΝΙΚΗ Α.Ε. vxenaki@edafomichaniki.gr
Εκδότης	:	Χρήστος ΤΣΑΤΣΑΝΙΦΟΣ, Δρ. Πολιτικός Μηχανικός, ΠΑΝΓΑΙΑ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ Ε.Π.Ε. editor@hssmge.gr , ctsatsanifos@pangaea.gr

ΕΕΕΕΓΜ

Τομέας Γεωτεχνικής
ΣΧΟΛΗ ΠΟΛΙΤΙΚΩΝ ΜΗΧΑΝΙΚΩΝ
ΕΘΝΙΚΟΥ ΜΕΤΣΟΒΙΟΥ ΠΟΛΥΤΕΧΝΕΙΟΥ
Πολυτεχνειούπολη Ζωγράφου
15780 ΖΩΓΡΑΦΟΥ

Τηλ. 210.7723434
Τοτ. 210.7723428
Ηλ-Δι. secretariat@hssmge.gr ,
geotech@central.ntua.gr
Ιστοσελίδα www.hssmge.org (υπό κατασκευή)

«ΤΑ ΝΕΑ ΤΗΣ ΕΕΕΕΓΜ» Εκδότης: Χρήστος Τσάτσανίφος, τηλ. 210.6929484, τοτ. 210.6928137, ηλ-δι. ctsatsanifos@pangaea.gr,
editor@hssmge.gr, info@pangaea.gr

«ΤΑ ΝΕΑ ΤΗΣ ΕΕΕΕΓΜ» «αναρτώνται» και στην ιστοσελίδα www.hssmge.gr