Ófœrufoss waterfall, Nyðri-Ófœra river (the impassable northern river) into the great fissure Eldgjá, or Canyon of Fire, Iceland

Αρ. 106 – ΣΕΠΤΕΜΒΡΙΟΣ 2017

ΕΛΛΗΝΙΚΗ
ΕΠΙΣΤΗΜΟΝΙΚΗ
ΕΤΑΙΡΕΙΑ
ΕΔΑΦΟΜΗΧΑΝΙΚΗΣ
& ΓΕΩΤΕΧΝΙΚΗΣ
ΜΗΧΑΝΙΚΗΣ

Τα Νέα

106

της Ε Ε Ε Ε Γ Μ

SIMSG ISSMGE

ISRM

Π Ε Ρ Ι Ε Χ Ο Μ Ε Ν Α

Neist Point Lighthouse in Isle of Skye, Scotland

Northern Lights hunt in Iceland - aurora

Stokksnes, Iceland

Sunset at Fansipan peak in Hoang Lien Son range, the highest mountain in Vietnam

ΑΡΘΡΑ

GLOBAL SURVEY ON THE STATE-OF-THE-ART AND THE STATE-OFPRACTICE IN GEOTECHNICAL ENGINEERING

Hugo Acosta-Martinez[1], Pierre Delage[2], Jennifer Nicks[3], Kim Chan[4], Peter Day[5]

[1] AECOM, Australia [2] Ecole Nationale des Ponts et Chaussées, France [3] Federal Highway Administration, USA [4] GHD, Australia [5] Jones & Wagener and University of Stellenbosch, South Africa

ABSTRACT This paper presents the results of a global survey on the State-of-the-Art and State-of-Practice in geotechnical engineering initiated by the ISSMGE Corporate Associates Presidential Group and the Technical Oversight Committee in March 2017. It also summarises the discussions held on the topic during the 19th ICSMGE in Seoul on 20 September 2017.

1 INTRODUCTION

The International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) is the pre-eminent professional body representing the interests and activities of Engineers, Academics and Contractors all over the world that actively participate in geotechnical engineering. As a truly global organisation, the ISSMGE provides a focus for professional leadership to some 90 Member Societies and around 20,000 individual members. Further details on the activities of the ISSMGE can be found at www.issmge.org. One of the objectives of the Corporate Associates Presidential Group (CAPG) of the ISSMGE is facilitating the uptake of geotechnical research in practice thereby narrowing what is referred to as the "research-practice gap". To this end, the CAPG in conjunction with the Technical Oversight Committee (TOC) initiated a worldwide survey on the state-of-practice and the state-of-the-art in geotechnical engineering. The results of this survey were presented at a workshop at the 19th International Conference of the ISSMGE in Seoul on 20 September 2017. The workshop was organised jointly by the CAPG and the TOC, both of which are Board-level committees of the ISSMGE. The purpose of this paper is to present a summary of the survey results and of the discussions held at the Seoul Workshop. The paper then identifies potential follow-up actions required to maintain the momentum of this initiative.

2 THE CAPG, TOC AND TECHNICAL COMMITTEES

2.1 CORPORATE ASSOCIATES PRESIDENTIAL GROUP

In his introduction to the Seoul Workshop, Karel Allaert (Jan de Nul) described the CAPG as an ISSMGE Board-level committee which comprises representatives drawn from the Corporate Associates (CAs) of the ISSMGE. At the time of the Seoul Workshop, there were thirty-one CAs including corporations, consultancies, contractors, equipment and product manufacturers, as well as one university. CA logos, with links to their company web sites, are displayed prominently on the ISSMGE web page and included in each issue of the ISSMGE Bulletin. The CAs list as at September 2017 is presented in Figure 1. The number of CAs peaked at 43 and it is clear that more members are required. It is believed that a stable platform of CAs could be about 60. The key purpose of the CAPG is to assist the ISSMGE in developing actions and activities that will enhance the commercial sector of the geotechnical profession. Among these, identifying and helping to bridge the gap between the State-of-the-Art (SoA) and State-of-Practice (SoP) in geotechnical engineering has been a key activity for CAPG during the last term (2013-2017).

2.2 TECHNICAL COMMITTEES

The mission of Technical Committees (TCs) is to provide a forum for active participation by the individual members of ISSMGE, and to promote the objectives, activities and results of the technical committees throughout the ISSMGE membership. The TCs are a meeting arena for discussing, developing and applying specialist geotechnical knowledge related to the behaviour of geo-materials, geotechnical engineering and engineering for society.

Figure 1: List of Corporate Associates (September 2017)

There are 33 technical committees of the ISSMGE divided into three categories, namely Fundamentals, Applications

and Impact on Society (Delage, 2017). These technical committees are listed in Table 1. Technical committees may be removed or added in the future depending on the interest and activity of the members. For example, a new TC309 is currently being created on Machine Learning and Big Data in Geotechnics.

2.3 TECHNICAL OVERSIGHT COMMITTEE

The Technical Oversight Committee (TOC) is in charge of supervising and coordinating the activities of the TCs of the ISSMGE.

The TOC is managed by a Chair and a Secretary. Its members are the six Vice-Presidents of the Regions. Each Vice-President follows the activities of the TCs from his/her region (http://bit.ly/2D5xfyx).

3 GLOBAL SURVEY

3.1 BACKGROUND

In late 2013, the core group of the CAPG, with the support of the then President of the ISSMGE, Prof. Roger Frank, embarked on a project to work towards improving the understanding of the SoA and SoP in geotechnical engineering. The Chair of the TOC, Pierre Delage joined this working group in late 2014 and was pivotal in engaging in regular communications with all of the TCs. As a result, a mini survey on the SOA and SOP was conducted involving all of the TCs in early 2015, culminating in a discussion session during the European Conference in Edinburgh in September 2015.

Table 1: List of ISSMGE Technical Committees

Fundamentals
• TC101 - Laboratory Stress Strain Strength Testing of Geomaterials • TC102 - Ground Property Characterization from In-Situ Tests • TC103 - Numerical Methods • TC104 - Physical Modelling in Geotechnics • TC105 - Geo-Mechanics from Micro to Macro • TC106 - Unsaturated Soils • TC107 - Laterites and Lateritic Soils
Applications
• TC201 - Geotechnical Aspects of Dykes and Levees and Shore Protection • TC202 - Transportation Geotechnics • TC203 - Earthquake Geotechnical Engineering and Associated Problems • TC204 - Underground Construction in Soft Ground • TC205 - Safety and Serviceability in Geotechnical Design • TC206 - Interactive Geotechnical Design • TC207 - Soil-Structure Interaction and Retaining Walls • TC208 - Slope Stability in Engineering Practice • TC209 - Offshore Geotechnics • TC210 - Dams & Embankments • TC211 - Ground Improvement • TC212 - Deep Foundations • TC213 - Scour and Erosion • TC214 - Foundation Engineering for Difficult Soft Soil Conditions • TC215 - Environmental Geotechnics • TC216 - Frost Geotechnics • TC217 - Land Reclamation • TC218 - Reinforced Fill Structures
Impact on Society
• TC301 - Preservation of Historic Sites • TC302 - Forensic Geotechnical Engineering • TC303 - Coastal and River Disaster Mitigation and Rehabilitation • TC304 - Engineering Practice of Risk Assessment and Management • TC305 - Geotechnical Infrastructure for Megacities and New Capitals • TC306 - Geo-engineering Education • TC307 - Sustainability in Geotechnical Engineering • TC308 - Energy Geotechnics

Encouraged by the success of the mini survey and the discussion session, the CAPG core group and TOC decided to undertake a global survey inviting the TCs to develop the specific survey questions considered as "hot issues" in their field.

SurveyMonkey was selected as the tool for hosting the survey questions. Sam Mackenzie (GHD) kindly offered to implement and administer the survey. The global survey was subsequently launched in March, 2017.

The main aims of the CAPG/TOC global survey were to gain a better understanding of the state-of-practice in the geotechnical profession, to identify areas for improvement and to provide feedback from the profession to the Technical Committees.

The survey was divided into three sections. The first section included general questions regarding the demographics of the survey respondents. This section also allowed the respondent to identify the Technical Committees they were interested in within the ISSMGE. The second section consisted of targeted questions compiled by each of the technical committees. Most of these questions were aimed at ascertaining the extent to which existing knowledge is being applied in practice, and the needs of industry and practicing geotechnical engineers. The final section invited respondents to provide general feedback on ways of narrowing the gap between the SoA and the SoP.

3.2 RESPONDENT DEMOGRAPHICS

The survey drew 1,295 responses from 68 countries. 84% of the respondents were male and 16% were female.

Figure 2 shows the number of responses received from the various participating countries. The majority of responses (56%) came from the European Region followed by 13% from Asia and 12% from Australasia.

Figure 3 shows the sectors of the industry in which the respondents are employed. Clearly the survey has achieved its objective with about 70% of the responses being from practitioners. One response was received from lawyers with none from insurers.

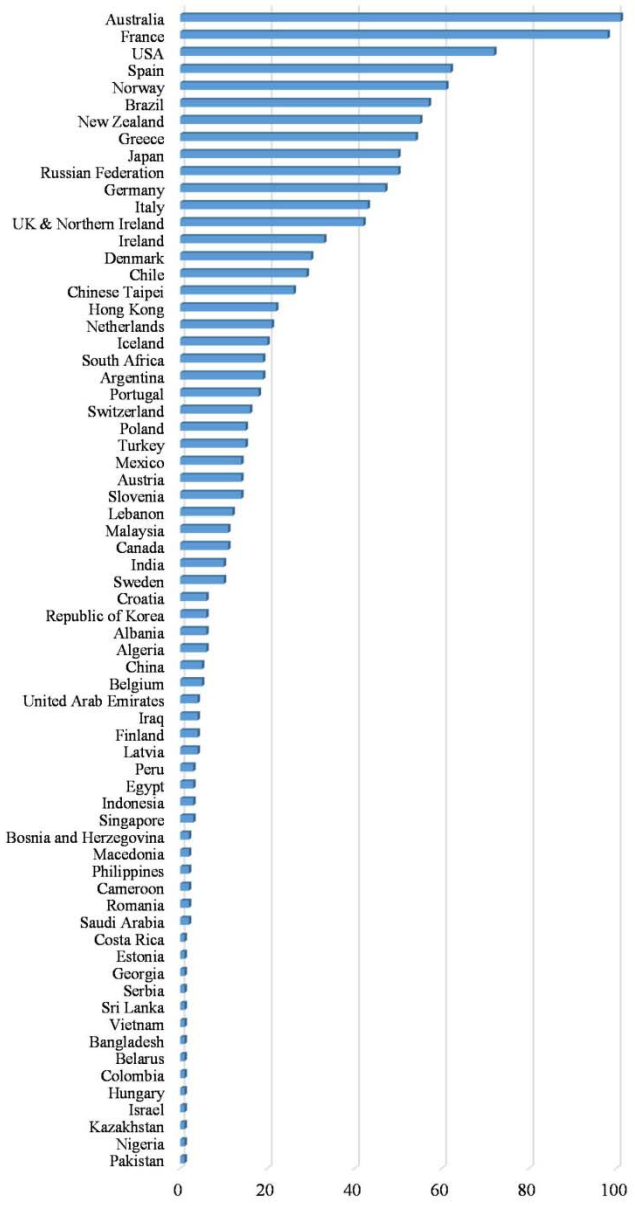


Figure 2: Number of responses by country

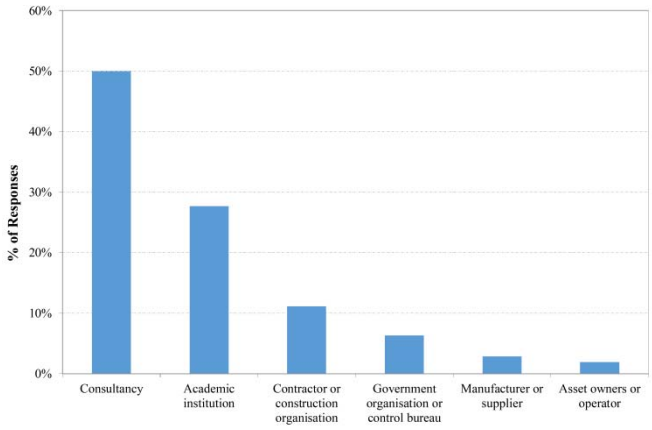


Figure 3: Industry sector of respondents

Figure 4 shows the distribution of respondents' number of years of experience in the industry. Overall, a wide range of

experience was represented, helping to provide different viewpoints.

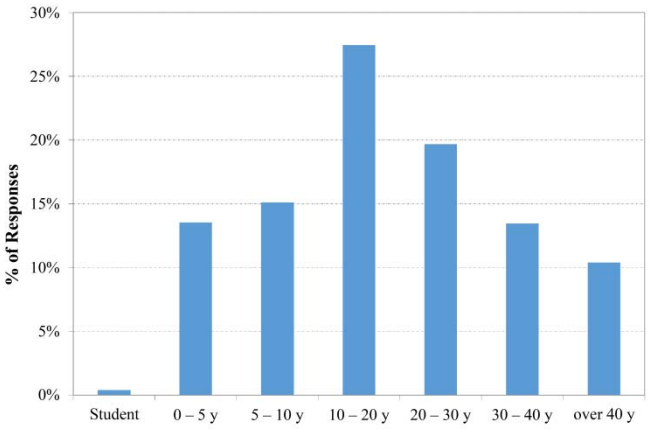


Figure 4: Number of years of experience of respondents

Figure 5 shows the percentage of respondents interested in each technical committee of the ISSMGE. Twenty eight percent of the respondents are members or corresponding members of technical committees. Seventeen percent of the respondents attend TC meetings and 25% attend TC-related conferences.

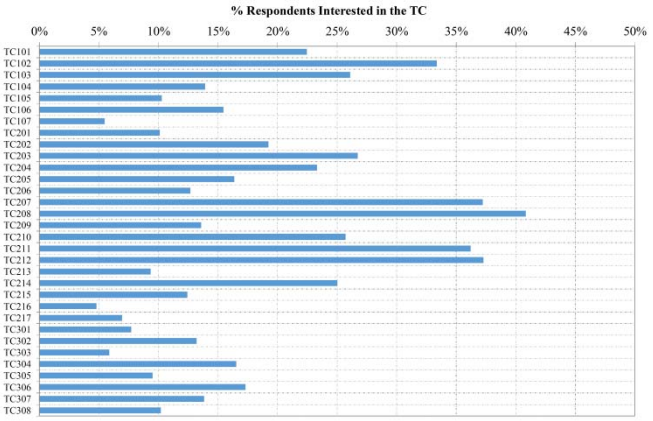


Figure 5: Respondents' interest in various Technical Committees

3.3 RESPONSE TO TC SURVEY QUESTIONS

Twenty nine of the 33 Technical Committees listed in Table 1 provided a total of 232 questions for inclusion in the global survey. Respondents could contribute to the sections of the survey relating to the technical committees of their choice. A complete list of the questions and the responses received is available on the CAPG web site at CAPG/Downloads http://bit.ly/2mkAaIj. Note that, in each case, responses have been numbered sequentially and that the numbers bear no connection to individual respondents. This summary is an adaptation of the analysis of survey results produced by Jennifer Nicks (FHWA, USA). Figures 2 to 5 come from this analysis.

In his capacity of Chair of the Technical Oversight Committee, Pierre Delage presented feedback on the survey to the Seoul Workshop with particular reference to the roles of the technical committees. A copy of the presentation is available on the CAPG web site at http://bit.ly/2mkAaIj. A summary of the salient points is given below.

3.3.1 Role and objectives of Technical Committees

The objectives of the TCs as per ISSMGE guidelines are:

a) To disseminate knowledge and practice within the TC's subject area to the membership of the ISSMGE.

b) To establish guidelines and technical recommendations within the TC's subject area.

c) To assist with the technical programs of international and regional conferences organized by the ISSMGE.

d) To interact with industry and overlapping groups working in areas related to the TC's specialist area.

These objectives are closely aligned with the objectives of the CAPG. Furthermore, all these objectives form a part of the knowledge development and interaction cycle (Day, 2017) as illustrated in Figure 6.

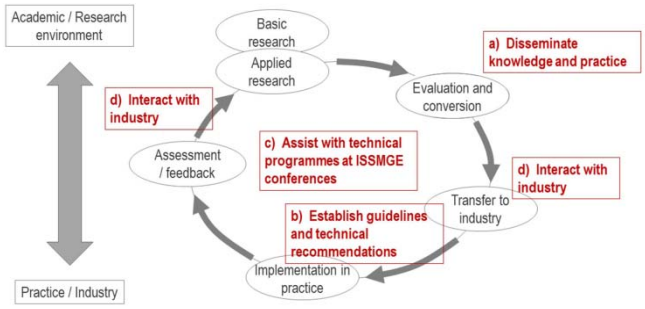


Figure 6: Integration of TC objectives in the knowledge development and implementation cycle

As shown in Table 1, the ISSMGE technical committees are divided into three groups. The Series 100 committees deal with fundamentals such as soil properties and calculation / test methods. The Series 200 committees deal with application of knowledge in practice. The Series 300 committees deal with impact on society. These three groups of committees, although positioned differently as shown in Figure 7, each play a role in the knowledge development and implementation cycle.

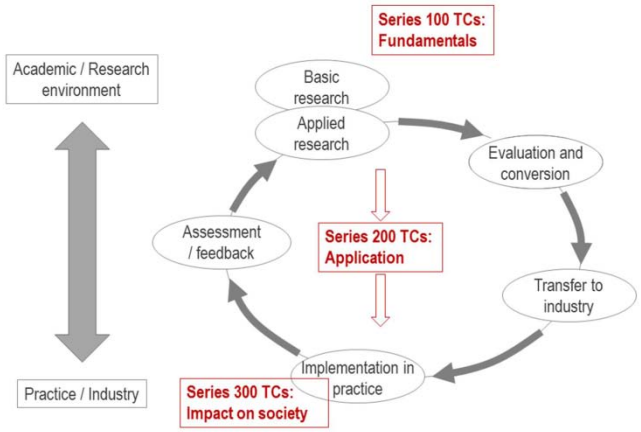


Figure 7: Role and positioning of the three groups of technical committees in the knowledge development and implementation cycle

Pierre Delage stressed that the vast majority of technical committees, particularly the Series 200 TCs, comprised a good balance of academics and practitioners, with approximately half of the participants from industry. The majority of the TCs hold regular activities aimed at transferring knowledge into practice, i.e. reducing the gap between the SoA and the SoP.

3.3.2 General feedback from global survey

Pierre Delage noted that the survey was an ambitious and difficult project and thanked all involved including the organisers, technical committees and respondents. A lot of

effort and thought by the TCs went into preparing the survey questions and analysing the results.

The survey produced many interesting contributions, thoughts and feedback, providing new insights into the professional practice and technical committee activities. It is clear that academics, practitioners and contractors often think in different ways and may have divergent interests.

While the survey was a success, some of the TCs expressed frustration in that there was no information in the feedback they received on the origin of the responses and disappointment at the limited number of responses received. The timing of the survey may also not have been ideal for certain member societies with respect to the timing of their own activities.

Certain TCs expressed an interest in getting more responses to the questions asked, possibly by way of a follow-up survey. However, the results of the current survey should be evaluated first.

It is clear that the gap between the State-of-the-Art and the State-of-Practice requires careful consideration by the TCs and should receive further consideration in the planning of future TC meetings and activities.

3.3.3 State-of-the-Art and State-of-Practice

The State-of-the-Art (SoA) is the theoretical basis of the subject matter and is generally provided by the relevant technical committee, particularly TCs dealing with fundamentals (Series 100). This then needs to be incorporated into the State-of-Practice (SoP) in conjunction with the practical TCs (Series 200). The SoP represents a synthesis and analysis of practical experiences at any particular time in the light of the SoA. The SoP may be national, regional or international in application. Among the difficulties faced are that existing regulations may not be consistent with the current SoA and the time it takes for advances in the SoA/SoP to be incorporated into codes and standards. Often, no SoP documentation exists, and practice is based on personal experience of successes and failures.

In many instances, the SoA in the subject area of the TCs is contained in papers published at speciality conferences (e.g. the series of in-situ site characterisation conferences hosted by TC102). Certain TCs, such as TC215 (Environmental Geotechnics), TC301 (Historical Sites) and TC304 (Risk Assessment) disseminate this information in dedicated journals, books or working group reports.

The SoP in the subject area of many TCs is encapsulated in national, regional or international design codes and guidelines. These include EN, ASTM, ASCE, AASHTO, API, DNV, FHWA, CIRIA and other codes or documents. TCs that fall into this category include TCs 201, 203, 205, 209, 211, 213 216, and 218.

In the survey, respondents expressed the need for further guidelines (TCs 202, 208, 209, 211 and 304) while others requested better inclusion of the SoA in existing codes (TC212).

3.3.4 General feedback

The final section of the survey dealt with general feedback of respondents on ways of narrowing the gap between the SoA and the SoP. This general feedback was presented at the Seoul Workshop by Kim Chan (GHD) who summarised the main opinions as follows:

- Compulsory professional accreditation is seen as a key step in narrowing the gap between the SoA and the SoP.
- TCs should interact more with industry and the public sector so that the TCs are exposed to more real needs.
- Data interoperability and the establishment of pre-competitive data federations (such as those used in Australia and Canada to federate groundwater data) could assist in closing the gap. The application of the SoA requires the SoP practitioners to have access to such data.
- Academia should sometimes focus more on "practical questions" in their research. Research in geotechnical engineering must seek an application in practise.
- Coming up with a set of guidelines for each sub-discipline within Geotechnical Engineering and making these available to the ISSMGE community will go a long way to bridging the gap between SoP and SoA.
- Increase the number of symposia focusing on the case studies in geotechnical engineering to assist researchers in understanding the real behaviour of structures in order to model them in a better way.
- The gap between SoA and SoP can be bridged with continued professional education and involving practicing engineers in specific geotechnical committees.
- In the steering / drafting committees of regulations such as Eurocodes, a better balance between academics and practicing engineers should be sought.
- Often, SoA and SoP are both used for solving practical problems, SoA for more demanding problems vs SoP for more common problems.

4 SEOUL WORKSHOP PANEL DISCUSSION

4.1 DISCUSSION TOPIC

In the spirit of the Seoul conference theme *"Unearth the Future, Connect Beyond"*, two questions were formulated for the panel discussion:

a) Q1: How should we 'unearth' this material for the future to serve the geotechnical community?

b) Q2: How should we 'connect' this work to the 20th ICSMGE in Sydney in 2021?

Members of the audience were invited to come forward, join a circle of their colleagues and express their views. One such group is shown in Photo 1.

Photo 1: Panel discussion session in full swing

4.2 PANEL DISCUSSION CONTRIBUTIONS

A summary prepared by Hugo Acosta-Martinez (AECOM) of the main comments and discussions is given below.

Peter Day, University of Stellenbosch / Jones & Wagener Consultants, South Africa

- The application of new technology is often limited by the availability of the data required to apply the technology.
- Universities should consider asking industry which topics they wish to have researched.
- Universities should involve members from industry in both teaching and research activities.
- Discussion documents, such as the TC205/304 (2017) report made available at the conference, are valuable as they contain practical guidance and have been compiled by both practitioners and academics.

- We need to improve the quality and sufficiency of site investigation data by clearer specification of minimum requirements.

Kenichi Soga, UC Berkeley, USA

- Work with companies, invite them, have open discussions about how to work together.
- Organise sessions with companies.
- Foster company-university interaction.
- Bring infrastructure owners, contractors and clients to ICSMGE-Sydney-2021.

Jay Ameratunga, Golder, Australia

- Contractors and owners are the missing link. Work with them to further development of profession.

Marcelo Sanchez, Texas A&M University (USA) and Chair of TC308 (Energy Geotechnics)

- There were no surprises in the survey outcome.
- Ask ourselves where we want to be in four years.
- The diagnostics are there in survey
- Define milestones and objectives for Sydney-2021.

Peter Van Impe, Jan de Nul (Belgium)

- Transfer of knowledge is an issue.
- Specific knowledge is not always easy to find.
- Academia is controlled by the need to publish as this is often linked to research funding and career advancement. This has a perverse effect on the profession.
- It is impossible to follow up on everything that is being published.
- The need to publish to survive in academia is killing applied research.

Graham Scholey, Golder Associates (Australia)

- There is an opportunity to synthesise and address these concerns in ICSMGE-Sydney-2021.
- Identify the key people to address the conference.
- How to balance the number of papers with the quality of conference is an issue that needs careful consideration.
- An important question for the CAPG to answer is "What is in it for me as a Corporate Associate?".
- Corporate Associates need to receive tangible benefits.
- Important to increase number of CAs.

K.K. "Muralee" Muraleetharan, University of Oklahoma, USA

- Repeat the survey among chosen respondents.
- Analyse regional differences.
- Consider carefully the issue of sampling.
- Need 'far thinking' clients to support improvement.

Jennifer Nicks, Department of Transportation's FHWA (USA) and Chair of ISSMGE's Young Member Presidential Group

- Researchers are not rewarded for doing better.
- There are risks associated with trying something new.

Walter Paniagua, Chair of TC214 Soft Soils, Mexico

- Organise special sessions for commercial services / products.
- Contractors to be encouraged to present case histories in association with consultants.
- Research-to-practice papers should be encouraged at conferences.
- Acknowledgement that bridging the gap and managing expectations of commercially-oriented members are not easy tasks.

Soheil Nazarian, University of Texas at El Paso, USA

- Mutually exclusive expectations from academic and practitioners.
- Dissemination of research findings may not be permitted. Universities are funded by government.
- Invite the right people to write specifications and guidelines. Where no specifications exist for the application of new techniques, these techniques will not be used by designers for fear of litigation.
- Do not invite managers; they will not transfer knowledge; bring in young active engineers instead.

Ana Heitor, University of Wollongong, Australia

- Referred to experience at the University of Wollongong which has deep involvement with contractors and development of practical solutions to specific problems.
- Bridge the gap between SoA and SoP with education and training.
- Access to journals and databases is expensive.
- Suggest creating a platform for review of papers from the last few years on specific topics.
- Look further than Sydney-2021.

Ken Ho, Government of Hong Kong

- Reference to SoA could be ambiguous; for a given topic different answers from different universities are possible
- Add an assessment process before transferring knowledge. The GEO Office (Hong Kong) attempts to fulfil the role of assessing research findings and transferring relevant findings into practice by producing practical guidelines.
- Proposal to consider a Technical Review Board and consultation at local and international level.
- There is not always consensus among researchers on the value of new knowledge.
- Bring the right stakeholders to the table.
- 'Technovation forums' are suggested.
- Calibration of methods with real data and actual performance is important.
- New knowledge needs to be interpreted, e.g. by translating into design charts or computer programmes. The research institutions themselves need to take the process this step further.

Anand Puppala, University of Texas (Arlington), USA

- Work on big data.
- Industry funding is difficult.

4.3 DISCUSSION CLOSURE AND THANKS

Valerie Bernhardt (Terrasol) closed the discussion session and thanked all the participants. In her closing remarks, she mentioned:

- The survey serves as a point of reference for next steps.
- The survey makes people aware of the real issues.
- The communication problem is from both sides. Everyone needs to make an effort; it is not a one-sided problem.
- Interact with other Board level committees.
- Survey for academic/consultant members.
- Open access is an important initiative to be maintained and expanded.

5 NEXT STEPS

In concluding the joint TOC and CAPG workshop session, Sukumar Pathmanandavel (Aurecon, Chair of CAPG) set out what he sees as the next steps in the process.

The CAPG and TOC, with help from TCs, plan to disseminate these findings among the profession. (This paper helps fulfil this intention.)

Specialised sessions are planned for the five ISSMGE mid-term regional conferences in 2019 to discuss, debate, and promote issues relating to geotechnical engineering that have, or are perceived to have, a significant impact on the commercial sector of the ISSMGE. CAPG will interact with the local organising committees to develop topics and invited participants relevant to the needs of each region.

The possibility of a further survey before the 20th ICSMGE in Sydney in 2021 has been raised. Inclusion of a request for topics that industry would like researched has also been mentioned. This will be considered by the CAPG/TOC.

Suggestions on this work can be submitted to Sukumar Pathmanandavel (S.Pathmanandavel@aurecongroup.com) and Peter Day (day@jaws.co.za).

6 ACKNOWLEDGEMENTS

The following representatives of the Corporate Associates were actively involved in the development and launch of the global survey:

- Sukumar Pathmanandavel (CAPG Chair), Aurecon
- Chaido Doulala-Rigby (Yuli), Tensar
- Kim Chan and Sam Mackenzie, GHD
- Karel Allaert, Jan de Nul
- Gabriele Zapf, formerly with Siemens
- Mandy Korf, Deltares
- Ian Hosking, AECOM
- Valérie Bernhardt, Terrasol/ Setec group.

Special thanks are due to:

- Roger Frank, ISSMGE Immediate Past President, for his leadership and his interest and involvement in all CAPG's activities
- Pierre Delage, Chair of the TOC, for invaluable assistance both in the development of the global survey, and for being the focal point for communication with the TCs
- Sam Mackenzie of GHD for his excellent work of developing and deploying the survey tool
- Jennifer Nicks, Chair of the Young Member Presidential Group for support in reducing complexity of the survey data for use by the technical committees
- all the ISSMGE Technical Committees for participating, framing of survey questions and analysis of results
- and, finally, to the ISSMGE members who participated in the survey.

7 REFERENCES

Day, P.W. (2017). Terzaghi Oration: Challenges and shortcomings in geotechnical engineering practice in the context of a developing country. In *Proc. 19th Int. Conf. on SMGE*, Seoul, pp 11-34.

Delage P. (2017). Report of the Technical Oversight Committee on the term 2013 – 2017. In *Proc. 19th Int. Conf. on SMGE*, Seoul, Korea

TC205/TC304 (2017). Joint TC205/TC304 Working Group on 'Discussion of statistical/reliability methods for Eurocodes, Final Report'. Available at: http://bit.ly/2EA65Mr.

ΝΕΑ ΑΠΟ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ

International Society for Soil Mechanics and Geotechnical Engineering

Το Corporate Associates Presidential Group [CAPG - στο οποίο συμμετείχε το μέλος της ΕΕΕΕΓΜ Yuli (Chaido) Doula-la-Rigby] λειτούργησε τα τελευταία δύο χρόνια υπό την καθοδήγηση του Roger Frank. Διεξήγαγαν έρευνα σχετικά με την State of the Art (SoA) και την State of Practise (SoP) στην Γεωτεχνική Μηχανική. Τα αποτελέσματα της έρευνας παρουσιάζονται στο πρώτο άρθρο της έκδοσης αυτής.

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

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

5th International Course on Geotechnical and Structural Monitoring, 22 - 25 May 2018, in Rome www.geotechnicalmonitoring.com

EUROCK 2018 Geomechanics and Geodynamics of Rock Masses, 22-26 May 2018, Saint Petersburg, Russia, www.eurock2018.com/en

4th GeoShanghai International Conference, May 27-30, 2018, Shanghai, China, http://geo-shanghai.org

micro to MACRO - Mathematical Modelling in Soil Mechanics, May 29-June 1, 2018, Reggio Calabria, Italy, www.microtomacro2018.unirc.it

GeoReinforcement Workshop, 4 - 5 June 2018, Munich, Germany, https://igs.wufoo.com/forms/q10dk31u19dx00v/

International Conference on Deep Foundations and Ground Improvement - Urbanization and Infrastructure Development: Future Challenges, June 5-8, 2018, Rome, Italy, www.dfi.org/dfieventlp.asp?13310

GeoBarrier Workshop, 6 - 7 June 2018, Munich, Germany, https://igs.wufoo.com/forms/q10dk31u19dx00v/

XVI Danube-European Conference on Geotechnical Engineering: Geotechnical Hazards and Risks: Experiences and Practices, 7 - 9 June 2018, Skopje, Former Republic of Yugoslav www.decge2018.mk

16th European Conference on Earthquake Engineering (16thECEE), 18-21 June 2018, Thessaloniki, Greece, www.16ecee.org

CPT'18 4th International Symposium on Cone Penetration Testing, 21-22 June 2018, Delft, Netherlands, www.cpt18.org

PATA DAYS 2018 - 9th International INQUA Meeting on Paleoseismology, Active Tectonics and Archeoseismology, 24-29 June 2018, Chalkidiki, Greece, www.patadays2018.org

NUMGE 2018 9th European Conference on Numerical Methods in Geotechnical Engineering, 25-27 June 2018, Porto, Portugal, www.numge2018.pt

RockDyn-3 - 3rd International Conference on Rock Dynamics and Applications, 25-29 June 2018, Trondheim, Norway, www.rocdyn.org

ICOLD 2018 26th Congress – 86th Annual Meeting, 1 - 7 July 2018, Vienna, Austria, www.icoldaustria2018.com

9th International Conference on Physical Modelling in Geotechnics (ICPMG 2018), 17-20 July 2018, London, UK, www.icpmg2018.london

ICSSTT 2018 - 20th International Conference on Soil Stabilization Techniques and Technologies, July 19 - 20, 2018, Toronto, Canada, https://waset.org/conference/2018/07/toronto/ICSSTT

GeoChine 2018 - 5th GeoChina International Conference Civil Infrastructures Confronting Severe Weathers and Climate Changes: From Failure to Sustainability, July 23-25, , HangZhou, China, http://geochina2018.geoconf.org

UNSAT2018 The 7th International Conference on Unsaturated Soils, 3 - 5 August 2018, Hong Kong, China, www.unsat2018.org

China- Europe Conference on Geotechnical Engineering, 13-16 August 2018, Vienna, Austria, https://china-euro-geo.com

CRETE 2018 6th International Conference on Industrial & Hazardous Waste Management, 4-7 September 2018, Chania, Crete, Greece, www.hwm-conferences.tuc.gr

EUCEET 2018 - 4th International Conference on Civil Engineering Education: Challenges for the Third Millennium, 5-8 September 2018, Barcelona, Spain, http://congress.cimne.com/EUCEET2018/frontal/default.asp

SAHC 2018 11th International Conference on Structural Analysis of Historical Constructions "An interdisciplinary approach", 11-13 September 2018, Cusco, Perú http://sahc2018.com

26th European Young Geotechnical Engineers Conference, 11 - 14 September 2018, Reinischkogel, Austria, www.tugraz.at/en/institutes/ibg/events/eygec

11th International Conference on Geosynthetics (11ICG), 16 - 20 Sep 2018, Seoul, South Korea, www.11icg-seoul.org

CHALK 2018 Engineering in Chalk 2018, 17-18 September 2018, London, U.K., www.chalk2018.org

International Symposium on Energy Geotechnics SEG - 2018, 25-28 September 2018, Lausanne, Switzerland https://seg2018.epfl.ch

HYDRO 2018 - Progress through Partnerships, 15-17 October 2018, Gdansk, Poland, www.hydropower-dams.com/hydro-2018.php?c_id=88

GEC - Global Engineering Congress Turning Knowledge into Action, 22 - 26 October, London, United Kingdom, www.ice.org.uk/events/global-engineering-congress

ARMS10 - 10th Asian Rock Mechanics Symposium, ISRM Regional Symposium, 29 October - 3 November 2018, Singapore, www.arms10.org

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

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

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

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

14th international Conference "Underground Construction", 3 to 5 June 2019, Prague, Czech Republic, www.ucprague.com

2019 Rock Dynamics Summit in Okinawa
7-11 May 2019, Okinawa, Japan

Contact Person: Prof. Aydan Omer, aydan@tec.u-ryukyu.ac.jp

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

ISDCG 2019
7th International Symposium on Deformation Characteristics of Geomaterials
26 - 28 June 2019, Glasgow, Scotland, UK,

The Technical Committee 101 of the ISSMEG is pleased to announce the organisation of the 7th International Symposium on Deformation Characteristics of Geomaterials (ISDCG) in 2019, in Glasgow, UK. The symposium is co-organised by the University of Strathclyde in Glasgow, the University of Bristol, and the Imperial College in London.

Building on the success of the previous Symposia organised in Sapporo (Japan) Japan in 1994, Torino (Italy) in 1999, Lyon (France) in 2003, Atlanta (US) in 2008, Seoul (Korea) in 2011 and Buenos Aires (Argentina) in 2015, the 7th ISDCG will equally follow both its traditions and active promotion of new technical elements to maintain it as one of the most popular and vibrant events within the geotechnical community. The technical core themes will focus on: (i) advanced laboratory geotechnical testing; (ii) application of advanced laboratory testing in research, site characterisation, and ground modelling; (iii) application of advanced testing to practical geotechnical engineering. In addition to these traditional topics, sub-themes will include cutting-edge techniques and approaches, for example experimental micro-mechanics, non-invasive monitoring systems, nano and micro-sensors, new sensing technologies. A key goal is to engage with the full spectrum of geotechnical specialists, from early career engineers and researchers through to world leading experts.

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

For additional information, please contact the secretariat of the congress, Ms. Lara Leite

CMN2019, Universidade do Minho, Departamento de Engenharia Civil, 4800-058 Guimarães - Portugal
Email: cmn2019@civil.uminho.pt
Telephone: +351 253 510 748
Fax: +351 253 510 217

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

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

XVII African Regional Conference on Soil Mechanics and Geotechnical Engineering
07-10 October 2019, Cape Town, South Africa

Organiser: SAICE

Contact person: Dr Denis Kalumba

Email: denis.kalumba@uct.ac.za

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

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

YSRM2019 - the 5th ISRM Young Scholars' Symposium on Rock Mechanics and REIF2019 - International Symposium on Rock Engineering for Innovative Future
1-4 December 2019, Okinawa, Japan

Contact Person: Prof. Norikazu Shimizu, jsrm-office@rocknet-japan.org

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

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

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

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

ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

Large slow-moving landslide captured on video, Tibet

A dramatic earthflow, slow-moving landslide, occurred in Qinghai province's Dimye village, Tibet on September 7, 2017 and was captured on video.

Geophysicist and disaster researcher Mika McKinnon said the flow might be associated with the melting permafrost, following a tip from Tibet that said the event happened in a permafrost region and is comparable to local glacier flow.

Dr. Dave Petley of the Landslide Blog said the video does not show any obviously frozen soil or ice blocks. "To me, this is quite reminiscent of the landslides that we see in peat in the uplands of Europe."

"The soils involved in the Dimye village landslide are extremely dark in color, which suggests that they are rich in organic matter. In a recent open access paper, Yang et al. (2017) describe peat areas in the Qinghai-Tibetan area, noting that there is significant environmental degradation occurring in these places, causing rapid peat loss," Petley said, adding that it is not possible to say whether this is indeed a peat landslide, or something similar in an organic soil, or a permafrost slide.

"Unfortunately, I doubt that more information will become available in the near future. But it is a great video."

(September 14, 2017, https://watchers.news/2017/09/14/earthflow-video-tibet/?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+adorraeli%2FtsEq+%28The+Watchers+-+watching+the+world+evolve+and+transform%29)

The Coming Wave of Biogeotechnical Engineering

Biogeotechnical engineering is adding enzymes, microbes, and much more to the engineer's toolbox

Geosynthetics have achieved some remarkable levels of performance in infrastructure. They play a big role, but they are only a small part of a project. Other materials, such as soils, aggregates, and concrete make up the rest of infrastructure. Increasingly, we find geosynthetics being used in conjunction with other engineered solutions that can play a big role too while being ostensibly only a small part of a project. The emerging field of biogeotechnical engineering is producing solutions that can have a tremendous and beneficial impact.

We interviewed Kimberly Martin, a researcher at the **Center for Bio-mediated and Bio-inspired Geotechnics**, about ways in which biogeotechnical engineering shows promise, with consideration to how geosynthetic materials may be used alongside these solutions in the future. The CBBG, based at Arizona State University and directed by Dr. Ed Kavazanjian—whose name is well known in the geosynthetics field—is a National Science Foundation Engineering Research Center.

(Listen to "The Coming Wave of Biogeotechnical Engineering" on Spreaker)

Biogeotechnical Engineering

"Biomediation is when you use nature to do a process for you," says Martin. "Bio-inspired is when you take a process from nature and modify it so you don't have to have a living creature do the process for you. It's sometimes easier to implement."

One of the areas Martin has been investigating is with Enzyme-Induced Carbonate Precipitation.

"You can chemically induce calcium carbonate precipitation in a soil, but when you do that it happens too quickly; so, you get clogging and you can't further inject your solution and get more precipitation. By having the enzyme or the microbe, it slows the process down because the inputs you put in can't directly be used until the enzyme or the microbe goes through a process–making it available for precipitation."

This research is being studied for the use of geotechnical columns.

Other areas in which biogeotechnical engineering is being studied include liquefaction mitigation, soil stabilization beneath existing infrastructure (e.g., railways, tunnels), and other places in which access or the ability to disturb soils is complicated.

The CBBG divides is core areas into four Research Thrusts:

- Thrust 1: Hazard Mitigation
- Thrust 2: Environmental Protection and Restoration
- Thrust 3: Infrastructure Construction
- Thrust 4: Cross-Cutting Projects

The list of topics at the CBBG are unique: soil mechanics in ant tunneling, Enzyme Induced Carbonate Precipitation soil nails, looking at natural foundations (e.g., root networks) and how geotechnical engineering might draw inspiration for new designs, and much more.

(Chris Kelsey / geosynthetica.net, September 28, 2017, http://www.geosynthetica.net/podcast-biogeotechnical-engineering-martin-cbbg)

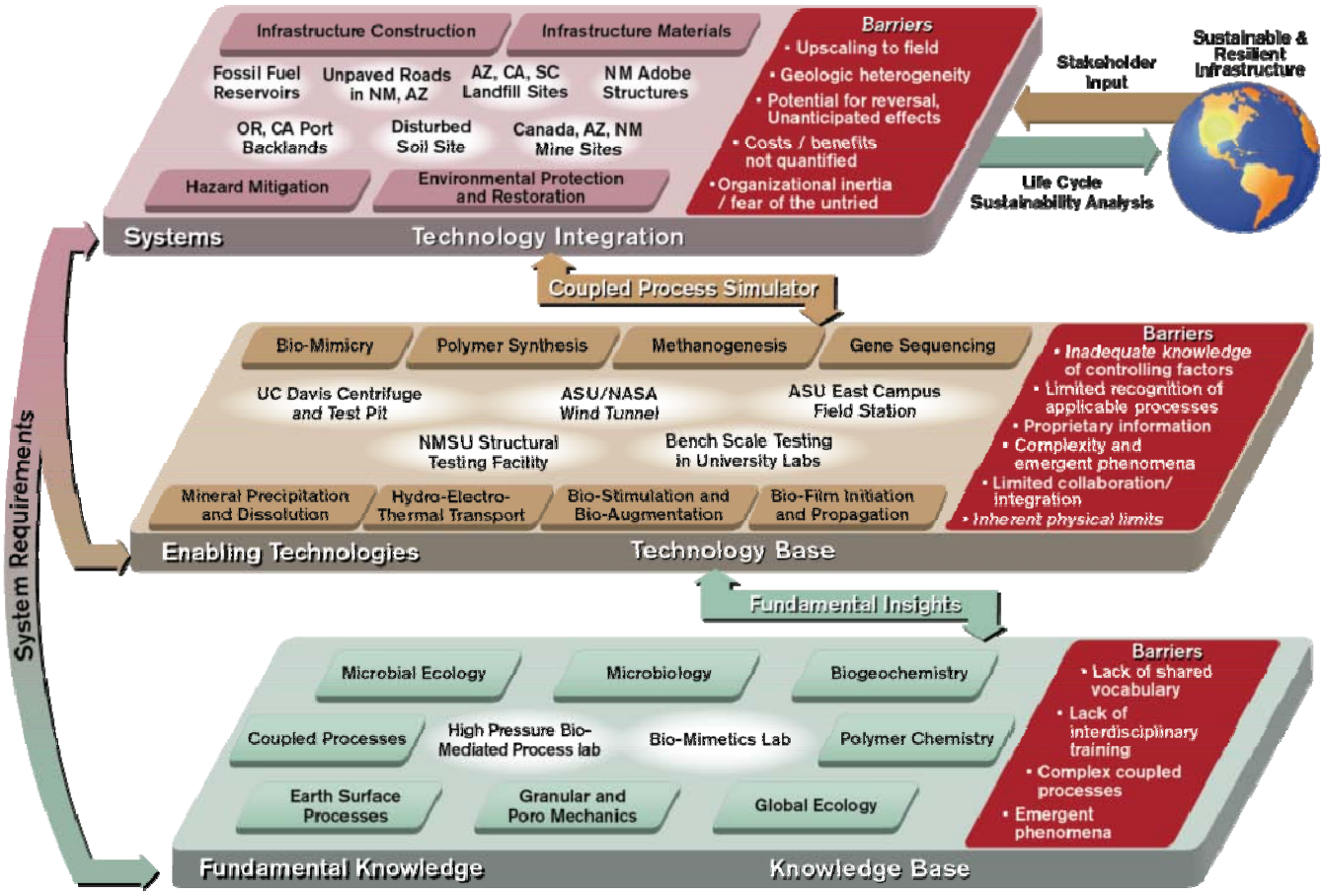
Center for Bio-mediated and Bio-inspired Geotechnics (https://cbbg.engineering.asu.edu)

Learning from nature to develop more sustainable, safer, and more resilient civil infrastructure systems

Through 3.8 billion years of trial and error (sometimes referred to as evolution), nature has developed many elegant, efficient, and sustainable biologically based solutions to some of the challenges that vex geotechnical infrastructure systems today. Examples include and excavation processes that are 1,000 times more energy efficient than man-made tunneling machines, carbonate-cemented sand that is exceptionally resistant to erosion and earthquakes, and self-sensing and self-healing tree root structures that are 10 times more efficient than any mechanical soil reinforcing system developed by humans.

The Center for Bio-mediated and Bio-inspired Geotechnics (CBBG) seeks to understand and harness the scientific processes and principles of natural phenomena such as those cited above to develop more sustainable, safer, less intrusive, more resilient civil infrastructure systems. The Center's approach embodies a transformational shift from traditional energy-intensive, mechanical methods for engineering the ground to a sustainable, nature-compatible biogeotechnical approach that employs innovative bio-mediated and bio-inspired technologies to meet the demands of modern society.

In the CBBG, Arizona State University (ASU), Georgia Institute of Technology (GaTech), New Mexico State University (NMSU), and the University of California, Davis (UCD) have joined to develop a new generation of geotechnical processes and solutions inspired by nature to transform the design, construction, operation, and maintenance of resilient and sustainable systems for civil infrastructure. The CBBG will realize this vision by combining fundamental scientific research with application-based engineering advances, facilitated by enabling technology and systems integration test beds. CBBG research, development, and implementation will be informed by input from our industry partners to develop sustainable and cost-effective processes and products that can be readily commercialized and deployed in civil infrastructure systems. These partnerships poise the Center to address the pressing need for sustainable infrastructure development to maintain the quality of living in the U.S. and meet the needs of the world's growing industrialized population.

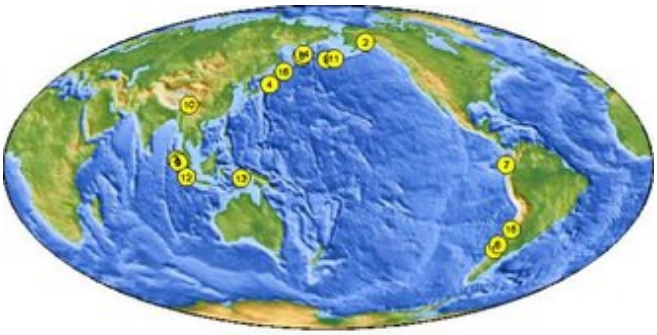


The CBBG strives to catalyze this transformational shift in engineering practice for geotechnical aspects of infrastructure systems by filling critical gaps in research, education, and workforce development. Many of the problems and opportunities in this emerging field of biogeotechnical engineering are inherently interdisciplinary. The CBBG partners together provide the critical mass needed to integrate the necessary disciplines, bridge knowledge gaps, accelerate technology development, and educate a new generation of engineers, collectively transforming biogeotechnical engineering from a specialty research niche into established practice.

The CBBG integrates research and education programs in biogeotechnical engineering at four Universities into a unified team that addresses the broad spectrum of bio-mediated and bio-inspired geotechnics. The synergy generated by merging these four academic programs into a multi-disciplinary team within a Center that is informed by a robust and diverse Industrial Affiliates program and facilitated by a stable source of long-term funding is accelerating the development and deployment of innovative and transformative biogeotechnical methods in engineering practice.

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΣΕΙΣΜΟΙ

The 10 Biggest Earthquakes in History



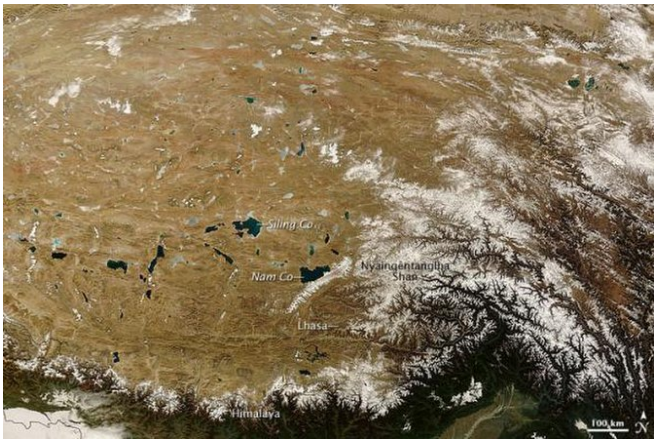
USGS National Earthquake Information Center

Intro

As massive and deadly as Japan's recent magnitude 9.0 earthquake was, it's not the world's biggest recorded quake.

It is Japan's largest quake, but dating back to 1900, four other earthquakes of magnitude 9.0 or greater have ruptured across the globe, according to data from the U.S. Geological Survey (USGS). We countdown the top 10 biggest recorded earthquakes in the world.

Assam-Tibet, 1950 - Magnitude 8.6

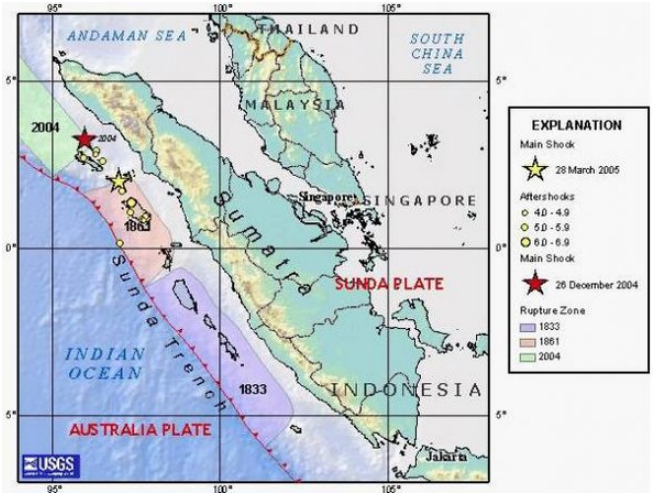


At least 1,500 people were killed across eastern Tibet and Assam, India, when this temblor shook the region. Ground cracks, large landslides and sand volcanoes hit in the area. The quake was felt in the Sichuan and Yunnan Provinces of China, and as far away as Calcutta, India.

The quake caused large landslides that blocked rivers. When the rivers finally burst through the walls of debris, waves inundated several villages and killed hundreds of people.

This quake is commonly called the Assam-Tibet earthquake or the Assam earthquake, even though the epicenter was in Tibet. The quake struck at the intersection of the most vigorous collision of continental plates on the planet, where the Indian continental plate smashes into the Eurasian plate and dives beneath it. The slow-motion crash helped create the massive Himalayas.

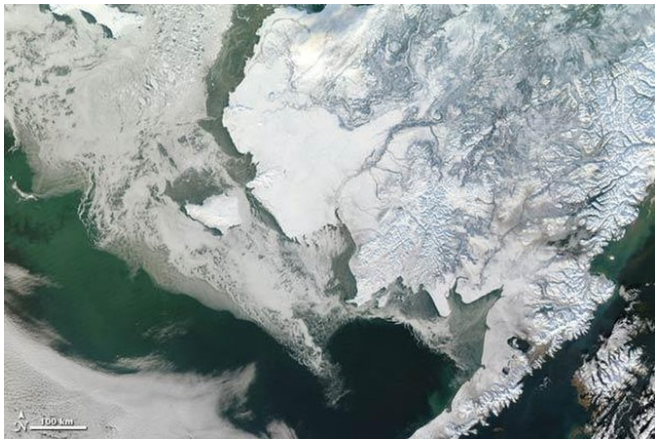
Northern Sumatra, Indonesia, 2005 - Magnitude 8.6



More than 1,000 people were killed, with hundreds more injured, mostly in Nias, in northern Sumatra, Indonesia. The quake hit just months after an even bigger earthquake destroyed the region (see entry #3).

The quake ruptured below the surface of the Indian Ocean, where the Indo-Australian Plate is pushing under the Eurasian plate at the Sunda trench, similar to the 2004 quake.

Rat Islands, Alaska, 1965 - Magnitude 8.7



Alaska had been a state for only 7 years when this huge earthquake triggered a tsunami of over 30 feet (10 meters). Despite its size, the quake caused little damage due to its remote location at the tip of the Aleutian Islands.

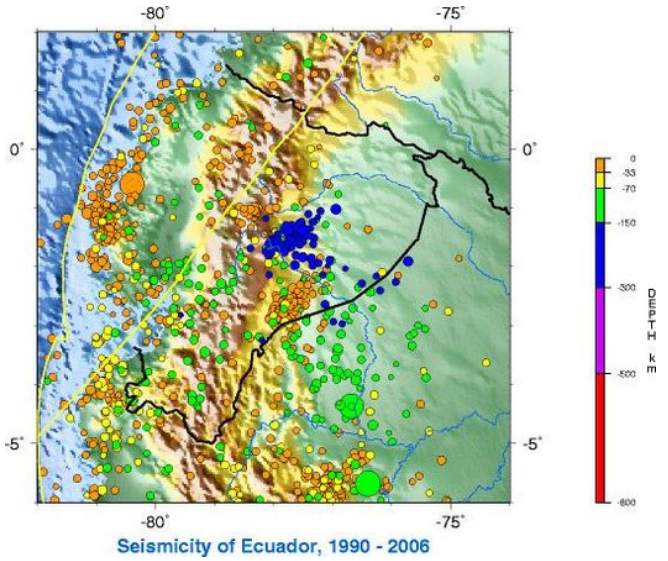
The tsunami was reported in Hawaii and spread as far away as Japan.

The temblor was the result of the Pacific Plate diving beneath the North American Plate at the Alaska-Aleutian megathrust, which has been the location of many megathrust earthquakes.

The quake cracked wood buildings and split an asphalt runway. Hairline cracks also formed in the runways at the U.S. Coast Guard Loran Station.

Off the Coast of Ecuador, 1906 - Magnitude 8.8

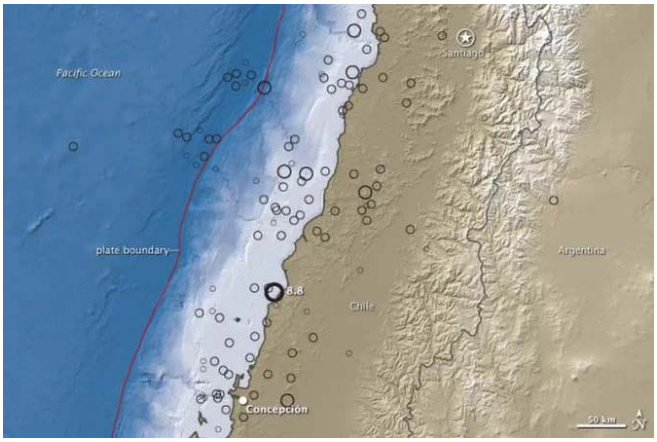
A catastrophic magnitude 8.8 earthquake ruptured off the coast of Ecuador and Colombia and generated a strong tsunami that killed 500 to 1,500 people. The tsunami spread along the coast of Central America, and even stretched to San Francisco and Japan.



Seismicity of Ecuador, 1990 - 2006

The earthquake occurred along the boundary between the Nazca Plate and the South American Plate. It hit more than 100 years ago, so reports are spotty, but according the USGS, witnesses reported a huge rush of water in Honolulu Bay. All the steam and sailboats in the bay were turned around, and then a sudden flood tide roared inland.

Offshore Maule, Chile, 2010 - Magnitude 8.8



Just last year, at least 500 people were killed and 800,000 were displaced by the earthquake and tsunami that hit central Chile. More than 1.8 million people were affected and the total economic loss was estimated at $30 billion USD. Central Chile is still feeling aftershocks to this day.

The earthquake took place along the boundary between the Nazca and South American tectonic plates.

The quake hit just over a month after the disastrous magnitude 7.0 quake in Port-Au-Prince, Haiti, which killed more than 200,000 people.

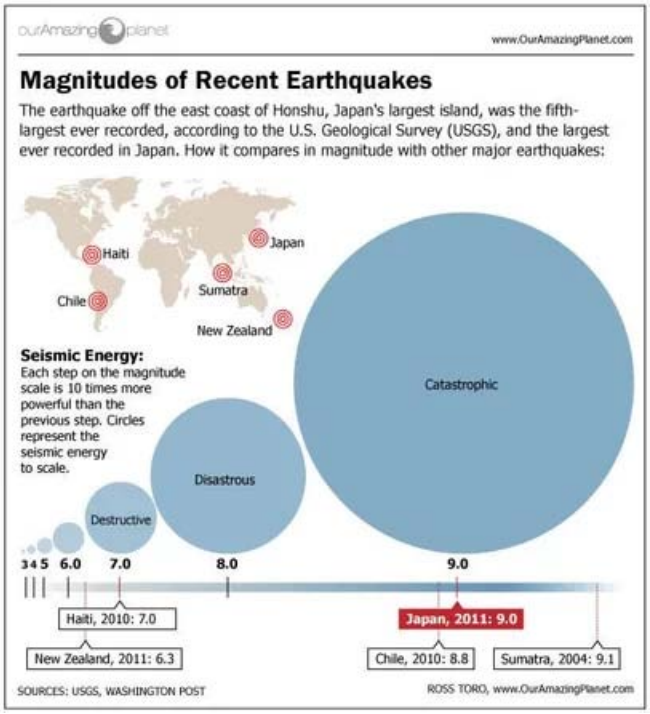
Kamchatka Peninsula, Russia, 1952 - Magnitude 9.0

The world's first recorded magnitude 9.0 earthquake struck off the east coast of Kamchatka in 1952. The quake generated a 43-foot tsunami (13 m) locally. The tsunami rocked Crescent City, Calif., which was also hit hard by the recent Japan earthquake.

No lives were lost, but in Hawaii, property damage was estimated at up to $1 million USD. The waves tossed boats onto the beach, caused houses to collide, destroyed piers, scoured beaches and moved road pavement.

Kamchatka has a rumbling past and many active volcanoes. It was also hit by an 8.5 magnitude quake in 1923.

Near the East Coast of Honshu, Japan, 2011 - Magnitude 9.0



On March 11, a magnitude 9.0 quake triggered a tsunami that killed an estimated 29,000 people and damaged some nuclear reactors. This earthquake is the largest ever recorded in Japan.

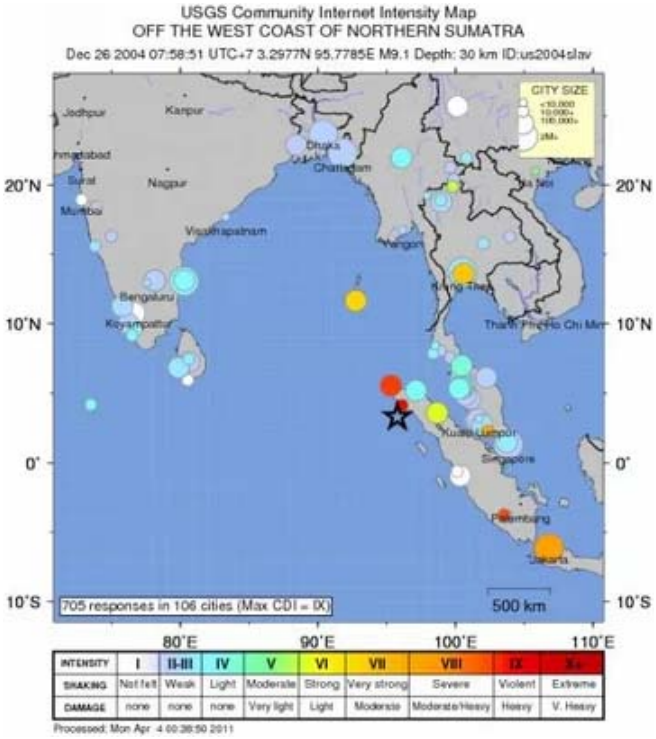
Aftershocks continue to rock the island of Honshu. The aftershocks include more than 50 of magnitude 6.0 or greater, and three above magnitude 7.0.

The quake was caused by thrust faulting near the Japan Trench, the boundary between the Pacific and North America tectonic plates. Thrust faulting happens when one tectonic plate dives under another. In this case, the Pacific plate is diving under the North America plate.

Off the West Coast of Northern Sumatra, 2004 - Magnitude 9.1

This quake was the third largest earthquake in the world, and the largest since the 1964 earthquake in Prince William Sound, Alaska (see entry #2). In total, 227,898 people were killed or missing and presumed dead and about 1.7 million people were displaced by the earthquake and subse-

quent tsunami in 14 countries in Southeast Asia and East Africa.



The tsunami caused more casualties than any other in recorded history, although some estimates say the death toll from the 2010 Haiti earthquake was larger. The tsunami was recorded nearly world-wide on tide gauges in the Indian, Pacific and Atlantic Oceans.

This quake struck one day after Christmas along the interface of the India and Burma tectonic plates (huge, moving slabs of the Earth's crust) and was caused by the release of stresses that develop as the India plate dives beneath the Burma plate.

Prince William Sound, Alaska, 1964 - Magnitude 9.2

This great earthquake and ensuing tsunami took 128 lives and caused about $311 million USD in property loss. The earthquake damage was heavy in many towns, including Anchorage, which was about 75 miles (120 kilometers) northwest of the epicenter. The quake ruptured along a fault between the North American and Pacific plates. The shaking lasted about 3 minutes.

Landslides in Anchorage caused heavy damage. Huge slides occurred in the downtown business section and water mains and gas, sewer, telephone and electrical systems were disrupted throughout the area.

Chile, 1960 - Magnitude 9.5

Approximately 1,655 people were killed during the largest earthquake ever recorded. Thousands more were injured, and millions were left homeless. Southern Chile suffered $550 million USD in damage.

The quake triggered a tsunami that killed 61 people in Hawaii, 138 in Japan and 32 in the Philippines.

The earthquake ruptured where the Nazca Plate dives underneath the South American Plate, on the Peru-Chile Trench.

(Live Science Staff, April 12, 2011, https://www.livescience.com/30320-worlds-biggest-earthquakes-110412.html)

Ένα «πάρκο» απειλεί να μας αφανίσει (αλλά ευτυχώς η NASA έχει μία λύση)

Κάτω από τα θερμά λουτρά και τους πίδακες ατμών του εθνικού Πάρκου Γελοοουστόουν στις ΗΠΑ, «κοιμάται» ένα υπερηφαίστειο που απειλεί να αφανίσει την ανθρωπότητα, αναγκάζοντας το Συμβούλιο Πλανητικής Άμυνας της NASA να σκεφτεί με ορίζοντα αιώνων και χιλιετιών.

Κάτω από τα θερμά λουτρά και τους πίδακες ατμών του εθνικού Πάρκου Γελοοουστόουν στις ΗΠΑ, «κοιμάται» ένα υπερηφαίστειο που απειλεί να αφανίσει την ανθρωπότητα.

Οι ίδιοι μηχανισμοί που διαμορφώνουν την εξωτερική ιδιομορφία του τοπίου, προσελκύοντας εκατομμύρια επισκέπτες κάθε χρόνο, μπορούν μελλοντικά να καταστρέψουν τον ανθρώπινο πολιτισμό, εξηγούν οι γεωλόγοι.

Οι επιστήμονες που έχουν εντοπίσει 20 υπερηφαίστεια σε όλον των πλανήτη, προειδοποιούν πως **κάθε 100.000 χρόνια κάποιο από αυτά εκρήγνυται**, απειλώντας τη ζωή στη Γη.

«Φοβόμασταν τον Ουρανό ξεχνώντας τη Γη»

Ο ηλεκτρολόγος μηχανικός και ερευνητής της NASA σε θέματα ρομποτικής, Μπράιαν Γουίλκοξ, απασχολείται πλέον στο εργαστήριο αεριώθησης της Υπηρεσίας (JPL) αλλά στο παρελθόν έχει διατελέσει **μέλος του Συμβουλίου Πλανητικής Άμυνας** που εστιάζει σε σενάρια πρόσκρουσης αστεροειδών ή κομητών στον πλανήτη μας.

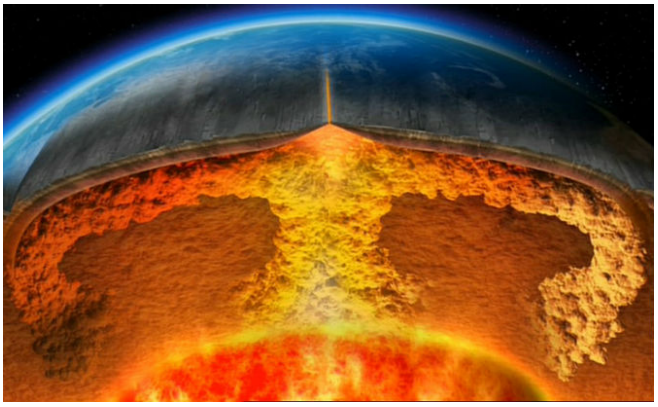
Όπως όμως εξηγεί ο Γουίλκοξ «κάποια στιγμή έγινε αντιληπτό» πως **η έκρηξη ενός υπερηφαιστείου είναι πολύ πιο άμεση απειλή από οποιοδήποτε «διαστημικό τρακάρισμα»**.

Υπερηφαίστειο θεωρείται κάθε ηφαίστειο που μπορεί να εκτινάξει **περισσότερα από 1.000 κυβικά χιλιόμετρα** ηφαιστειακού υλικού (η 8η και ανώτατη βαθμίδα της κλίμακας εκρηκτικότητας), με καταστροφικές συνέπειες για το κλίμα και την τροφική αλυσίδα.

Το Γελοουστόουν ίσως «ξυπνήσει» σύντομα

Το Γελοουστόουν εκρήγνυται κάθε 600.000 χρόνια και αυτό που ανησυχεί ολοένα και περισσότερους επιστήμονες, είναι ότι η τελευταία φορά που έδωσε μία ισχυρή έκρηξη, ήταν **ακριβώς πριν από 600.000 χρόνια**.

Τα υπερηφαίστεια δημιουργούνται όταν το μάγμα της Γης, ανεβαίνει μέχρι τον φλοιό της χωρίς να τον διαπερνά. Η πίεση σε αυτούς τους τεράστιους θόλους λάβας αυξάνεται με την πάροδο των αιώνων, μέχρι που ο φλοιός της γης υποχωρεί από την πίεση, απελευθερώνοντας στην ατμόσφαιρα πετρώματα, αέρια και **πυρωμένο μάγμα**.



Θόλος μάγματος κάτω από λεπτό φλοίο

Μία απρόσμενη υπερ-έκρηξη ενδεχομένως να αφανίσει τους χιλιάδες ή εκατομμύρια κατοίκους πάνω από την περιοχή του λεπτού φλοιού, αλλά αυτός δεν είναι «καν» ο μεγαλύτερος κίνδυνος.

Η πείνα μετά την Καταστροφή

Αντίθετα, η μεγαλύτερη απειλή είναι η διαταραχή της τροφικής αλυσίδας από τη ραγδαία μείωση της ηλιοφάνειας σε παγκόσμια κλίμακα, αφού η έκρηξη θα έχει ως αποτέλεσμα έναν **παρατεταμένο «ηφαιστειακό χειμώνα»** με σχεδόν βέβαιη συνέπεια τον λιμό.

Μελέτη που είχαν εκπονήσει τα Ηνωμένα Έθνη ήδη από το 2012, προέβλεπε ότι σε μία τέτοια περίπτωση τα παγκόσμια αποθέματα τροφίμων θα κρατούσαν για 74 ημέρες το πολύ.

Μία πολύ αργή αλλά και πολύ αποτελεσματική προσέγγιση

Όταν οι επιστήμονες της NASA ασχολήθηκαν «επί χάρτου» με το υπερηφαίστειο κάτω από το Εθνικό Πάρκο, σκέφθηκαν μία «απλή» λύση για να ρίξουν, σε βάθος αιώνων, τη πίεση κάτω από τον θόλο μάγματος, εκμηδενίζοντας τον κίνδυνο της καταστροφής.

Η αναξιοποίητη πηγή ενέργειας

Πρακτικά το Γελοουστόουν είναι μία τεράστια αναξιοποίητη «γεννήτρια». Το 60% με 70% αυτής της ενέργειας εκλύεται στην ατμόσφαιρα μέσω του νερού και των πιδάκων του, αλλά το υπόλοιπο συσσωρεύεται στον θάλαμο μάγματος, αυξάνοντας την πίεση στην «εύθραυστη» κορυφή του.

Όταν η πίεση θα ξεπεράσει ένα συγκεκριμένο όριο, ο θάλαμος θα σπάσει και το πάρκο θα εκραγεί. «Δεν είναι ερώτημα του αν, αλλά του πότε θα εκραγεί», εξηγεί ο Γουίλκοξ. Αν όμως υπήρχε τρόπος να εκτονωθεί αυτή η ενέργεια, η έκρηξη δεν θα συνέβαινε ποτέ.

Ένα «απλό» σχέδιο μερικών αιώνων

Μία λύση θα ήταν η κατασκευή ενός τεράστιου φράγματος νερού πάνω από το Γελοουστόουν, αλλά ο Γουίλκοξ παραδέχεται πως η προσέγγιση αυτή θα σπαταλούσε τεράστιες ποσότητες «πολύτιμου νερού» που μετά την «χλιαρή θέρμανση τους» στη λεκάνη του φράγματος, δεν θα μπορούσε εύκολα να αξιοποιηθεί.

Υπάρχει όμως και μία άλλη υδάτινη λύση που σύμφωνα με τις εκτιμήσεις της NASA **θα στοίχιζε μεν 3,46 δισεκατομμύρια δολάρια**, αλλά θα απέδιδε τα πολλαπλάσια, από την πρώτη κιόλας φάση: η κατασκευή ενός θερμοηλεκτρικού σταθμού που θα αποδίδει όσο έξι συμβατικοί σταθμοί.

Στέλνοντας με πίεση νερό μέσα στον θάλαμο μάγματος από μικρές τρύπες, το αποτέλεσμα θα ήταν η επιστροφή **μεικτών αερίων θερμοκρασίας 350 βαθμών Κελσίου** που θα μπορούσαν να συλλεχθούν μέρος της θερμότητάς τους να μετατραπεί σε ηλεκτρική ενέργεια.

«Στο Γελοοουστόουν έχουμε **διαρροές θερμότητας 6 γκιγκαβάτ**» εξηγεί ο Γουίλκοξ. Σκάβοντας σταδιακά σε βάθος 10 χιλιομέτρων και στέλνοντας νερό που θα επέστρεφε με επιπλέον αποθηκευμένη ενέργεια, θα αρκούσε για να εκτονωθεί ο κίνδυνος.

Οπωσδήποτε το εγχείρημα θα αποτελέσει πρόκληση για τις εταιρείες κατασκευής γεωθερμικών έργων, αλλά το κίνητρο του κέρδους θα μπορούσε να τις «πείσει» να σκάψουν βαθύτερα και σε πιο εχθρικό περιβάλλον από ότι το συνηθίζουν και προτιμούν.

Ο σταθμός θα μπορούσε να τροφοδοτεί με φτηνή ηλεκτρική ενέργεια τις γύρω περιοχές **κυριολεκτικά για χιλιάδες χρόνια**, εξηγεί ο Γουίλκοξ, σε ανταγωνιστικές τιμές. «Και φυσικά ως «μπόνους», δεν θα καταστραφεί η ανθρωπότητα».

Το παράδοξο είναι πως η προτεινόμενη μέθοδος ενέχει και τον κίνδυνο που προσπαθεί να αποτρέψει: «Σκάβοντας σε έναν θάλαμο μάγματος, **εξασθενίζουμε τη στατικότητά του** στις εσωτερικές πιέσεις. Αυτό θα μπορούσε να οδηγήσει στην απευκταία έκρηξη ή σε απελευθέρωση επικίνδυνων και βλαβερών αερίων που σε αντίθετη περίπτωση δεν θα απελευθερώνονταν.

Για τον λόγο αυτό οι επιστήμονες προτείνουν τα τρυπάνια να ανοίξουν οπές **στις παρυφές του ηφαιστείου** και όχι τη στεγανή κορυφή του όπου συγκεντρώνεται η μεγαλύτερη πίεση.

Το σχέδιο εκτός από τιτάνιο είναι και «πρωτοφανώς χρονοβόρο» αφού η NASA προτείνει το αργό σκάψιμο, με ρυθμό ενός μέτρου τον χρόνο. Αυτό σημαίνει πως το σχέδιο, αν ποτέ εφαρμοστεί, θα διαρκέσει για χιλιετίες και αυτοί που το συνέλαβαν δεν θα δουν ποτέ την ολοκλήρωσή του.

Όμως **ο μακρόπνοος σχεδιασμός είναι η μόνη δυνατή προσέγγιση** για την αντιμετώπιση μιας τόσο μεγάλης απειλή με τα ενεργειακά οφέλη να είναι απτά, από το πρώτο κιόλας έτος λειτουργίας του σταθμού (σε βάθος μόλις ενός μέτρου).

Η NASA σκέφτεται πως παρόμοια προσέγγιση θα μπορούσε να ακολουθηθεί και στα υπόλοιπα γνωστά υπερηφαίστεια (π.χ στην Ιαπωνία, τη Νέα Ζηλανδία και το Μεξικό).

Ελάχιστες αλλαγές σε βάθος αιώνων

Η λογική των «απειροελάχιστων αλλαγών κάθε χρόνο» που σε βάθος δεκαετιών, αιώνων ή χιλιετιών οδηγεί σε σωτήριες λύσεις για την ανθρωπότητα διαπνέει όλα τα σενάρια πρόσκρουσης αστεροειδών/κομητών.

Όπως υπενθυμίζει ο Γουίλκοξ, αν ποτέ στο μέλλον εντοπίσουμε έναν αστεροειδή που κατευθύνεται προς την Γη, αρκεί να στείλουμε ένα διαστημόπλοιο με ισχυρούς πυραύλους στην επιφάνειά του, **που θα τον σπρώχνουν «ανεπαίσθητα»** για πολλά χρόνια, αλλάζοντας τελικά την κατεύθυνσή του.

Αυτή η μικρή αλλά σταθερή ώθηση θα κάνει τον διαστημικό βράχο τελικά να αστοχήσει, αφήνοντας «ανενόχλητο» τον πλανήτη μας στην τροχιά του και γλιτώνοντας την ανθρωπότητα από βέβαιη καταστροφή.

Όπως όμως τονίζει ο ερευνητής της NASA, η προετοιμασία για το Γελοουστόουν πρέπει να αρχίσει άμεσα, γιατί το ξυπνητήρι των 600.000 ετών δεν θα αργήσει να χτυπήσει».

(Πάνος Σάκκας / ΣΚΑΙ.gr, 06/09/2017,
http://www.skai.gr/news/environment/article/354742)

Υπερηφαίστεια

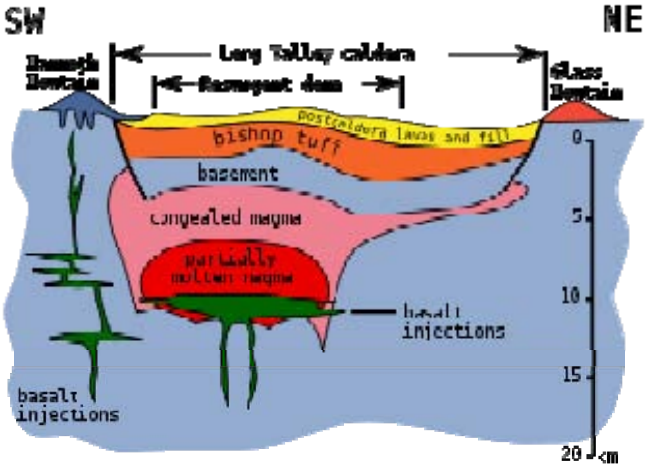
Υπερηφαίστειο ονομάζεται ένα ηφαίστειο ικανό να παράξει έκρηξη με ποσότητα ηφαιστειακού υλικού μεγαλύτερη από 1.000 κυβικά χιλιόμετρα (240 κυβικά μίλια), δηλαδή στην μέγιστη βαθμίδα 8 του Δείκτη Ηφαιστειακής Εκρηκτικότητας.[1] Το μέγεθος αυτό είναι χιλιάδες φορές μεγαλύτερο από το αντίστοιχο στις περισσότερες κατεγεγραμμένες ηφαιστειακές εκρήξεις. Υπερηφαίστεια μπορούν να δημιουργηθούν όταν μάγμα μέσα στη Γη ανεβαίνει από μια θερμή κηλίδα μέχρι το φλοιό αλλά δεν μπορεί να τον διαπεράσει. Η πίεση δημιουργεί μια μεγάλη και συνεχώς αυξανόμενη ποσότητα μάγματος έως ότου ο φλοιός είναι ανίκανος να συγκρατήσει την πίεση. Μπορεί επίσης να δημιουργηθούν σε ενώσεις συγκλινουσών τεκτονικών πλακών (π.χ. Toba) και σε περιοχές του φλοιού όπου βρίσκονται θερμές κηλίδες (π.χ. Yellowstone).

Map of known supervolcanoes around the world:

Δείκτης Ηφαιστειακής Εκρηκτικότητας (VEI) 8 (*)
Δείκτης Ηφαιστειακής Εκρηκτικότητας (VEI) 7 (*)

Το Discovery Channel έχει επισημάνει έξι γνωστά υπερηφαίστεια:[2]

- Καλντέρα Γελλοουστόουν (Η.Π.Α)
- Λονγκ Βάλεϊ (Η.Π.Α)
- Καλντέρα Valles (Η.Π.Α)
- Λίμνη Τόμπα (Βόρεια Σουμάτρα, Ινδονησία)
- Ηφαίστειο Τάουπο (Βόρειο Νησί (Νέα Ζηλανδία))
- Καλντέρα Άιρα (Νομαρχιακό Διαμέρισμα Καγκοσίμα, Κιούσου, Ιαπωνία)



Η δομή της καλντέρας του Long Valley

Υπάρχουν σχετικά λίγα υπερηφαίστεια της τεταρτογενούς περιόδου, ωστόσο η έκρηξη ενός τέτοιου ηφαιστείου συνήθως καλύπτει πολύ μεγάλες περιοχές με λάβα και ηφαιστειακή στάχτη και προκαλεί μακρυπρόθεσμες μεταβολές στον καιρό (όπως η πρόκληση μιας εποχής παγετώνων μικρής διάρκειας) ικανές να απειλήσουν με εξαφάνιση διάφορα είδη ζωής.

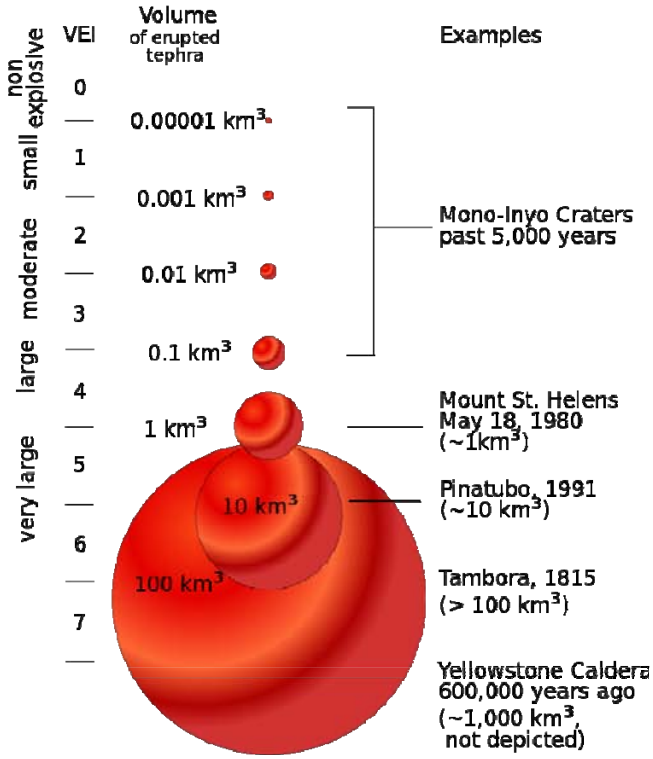
Σημειώσεις παραπομπές

1. What is a supervolcano? στο Yellowstone Volcano Observatory.

2. O'Hanlon, Larry. «Supervolcano: Yellowstone's Super Sisters». Discovery Channel. Ανακτήθηκε στις 30 September 2009.

(*) Δείκτης Ηφαιστειακής Εκρηκτικότητας

Ο **Δείκτης Ηφαιστειακής Εκρηκτικότητας**, ή απλούστερα **Κλίμακα Ηφαιστειακής Εκρηκτικότητας**, με διεθνές αρκτικόλεξο **VEI**(= **V**olcanic **E**xplosivity **I**ndex) είναι η καθιερωμένη σήμερα διεθνώς κλίμακα μέτρησης της ηφαιστειακής ενέργειας που εκλύεται κατά την έκρηξη ενός ηφαιστείου. Πρόκειται για οκτάβαθμη λογαριθμική κλίμακα επί της οποίας βασικό κριτήριο έχει ληφθεί η κατ᾽ όγκον ποσότητα των ηφαιστειακών αναβλημάτων σε κυβικά χλμ. που εκτινάσσονται κατά περίπτωση στον αέρα.



Παράσταση του VEI κατ᾽ όγκο αναβλημάτων

Η κλίμακα αυτή επινοήθηκε από τους ηφαιστειολόγους ερευνητές Κρις Νιούχολ του Geological Survey των ΗΠΑ (Αμερικανός) και Στιβ Σελφ του Πανεπιστημίου Χαβάης (Άγγλος) το 1982.

Παρότι τα ηφαίστεια είναι παρατηρήσιμα από τους μυθικούς χρόνους, διατηρώντας μέχρι σήμερα την πρώτη θέση του ανθρώπινου δέους σε γεωλογικό φαινόμενο, εν τούτοις η κατάταξη αυτών αναλογικά με την καταστροφή που μπορεί να προκαλέσουν είναι ιδιαίτερα δύσκολη, τόσο κατά μέγεθος, όσο και κατά συχνότητα δράσης εκάστου. Τούτο συμβαίνει κυρίως από το γεγονός ότι άμεσα παρατηρήσιμα είναι μόνο τα εξωτερικά φαινόμενα που συνοδεύουν τις διεγέρσεις και οι συνέπειες αυτών και όχι τόσο ο μηχανισμός δημιουργίας τους.
Ένα από τα βασικότερα στοιχεία των συνεπειών μιας ηφαιστειακής δραστηριότητας είναι η επακόλουθη απόθεση των ηφαιστειακών αναβλημάτων, ιδιαίτερα ηφαιστειακής τέφρας και λάβας στην επιφάνεια του γεωφλοιού, τα οποία και είναι μετρήσιμα τόσο κατ᾽ έκταση, όσο και κατά ποσότητα, αλλά και ακόμα κατά γεωλογικό χρόνο απόθεσης.

Έτσι με βασικό κριτήριο τον όγκο των αναβλημάτων, και λαμβάνοντας υπόψη το ύψος της ηφαιστειακής στήλης, την ταξινόμηση των ηφαιστείων κ.ά δευτερογενή περιγραφικά και στατιστικά στοιχεία οι παραπάνω ηφαιστειολόγοι επινόησαν την κλίμακα VEI, με οκτώ λογαριθμικές βαθμίδες (δηλαδή δεκαπλάσιας διαφοράς η μία από την άλλη) από **0** μέχρι **8** και που χαρακτηρίζονται περιγραφικά σύμφωνα με τον παρακάτω πίνακα. Το μέγιστο της κλίμακας είναι το 8 και αντιστοιχεί σε όγκο αναβλημάτων μεγαλύτερο των 1.000 κ.χλμ. Παράλληλα, από τα δευτερεύοντα κριτήρια οι ηφαιστειακές εκρήξεις κατηγοριοποιούνται κατά βαθμίδες της κλίμακας καθώς και κατ᾽ άλλα μεγέθη όπως χρονική διάρκεια,

διείσδυση σε ατμοσφαιρικά στρώματα και συχνότητα επανάληψης.

VEI	Όγκος υλικών m^3	Εκρηκτικότητα	Ύψος στήλης υλικών m	Συχνότητα
0	< 10.000	Μη εκρηκτική	< 100	Διαρκής
1	> 10.000	Ελάχιστα εκρηκτική	100–1.000	Ημερήσια
2	> 1.000.000	Μικρή	1–5 km	1 κάθε εβδομάδα
3	> 10.000.000	Μέτρια	3–15 km	1 κάθε λίγους μήνες
4	> 0.1 km^3	Μεγάλη	10–25 km	≥ 1 κάθε 1 έτος
5	> 1 km^3	Εξαιρετικά μεγάλη	20–35 km	≥ 1 κάθε 10 έτη
6	> 10 km^3	Κολοσσιαία	> 30 km	≥ 1 κάθε 100 έτη
7	> 100 km^3	Υπερκολοσσιαία	> 40 km	≥ 1 κάθε 1.000 έτη
8	> 1.000 km^3	Συντελειακή (υπερηφαίστειο)	> 50 km	≥ 1 κάθε 10.000 έτη

Σημειώσεις

- Η κλίμακα VEI καλύπτει όλους τους τύπους των επισωρευσιγενών ηφαιστείων, ενώ τα εκχυματικά ηφαίστεια κατατάσσονται στη μηδενική βαθμίδα.
- Με δείκτη 7 έχουν χαρακτηριστεί εκρήξεις τεσσάρων ηφαιστείων, ενώ με 8 καμία στους ιστορικούς χρόνους.

(Από τη Βικιπαίδεια, την ελεύθερη εγκυκλοπαίδεια, ανάκτηση 07.09.2017)

Οι αρχαίοι Έλληνες έχτιζαν σκοπίμως στις περιοχές των σεισμικών ρηγμάτων

Τα σεισμικά ρήγματα είναι πιθανό ότι έπαιξαν ρόλο-κλειδί στη διαμόρφωση του πολιτισμού των αρχαίων Ελλήνων, υποστηρίζει ένας Βρετανός γεωεπιστήμονας. Όπως πιστεύει, οι πρόγονοί μας πιθανώς έχτιζαν ναούς, ιερά και άλλα κτίρια μεγάλης γι' αυτούς σημασίας σκοπίμως σε περιοχές που προηγουμένως είχαν πληγεί από σεισμούς.

Ο καθηγητής γεωεπιστήμονας Ίαν Στιούαρτ, διευθυντής του Ινστιτούτου Βιώσιμης Γης του Πανεπιστημίου του Πλίμουθ, ο οποίος έκανε τη σχετική δημοσίευση στο γεωλογικό περιοδικό "Proceedings of the Geologists' Association", έχει στο παρελθόν παρουσιάσει διάφορα ντοκιμαντέρ του BBC σχετικά με την πολιτισμική επιρροή των σεισμών.

Στη νέα μελέτη του υποστηρίζει ότι τα σεισμικά ρήγματα στην περιοχή του Αιγαίου έπαιξαν καθοριστικό ρόλο στο να αποκτήσουν συγκεκριμένες περιοχές ιερή σημασία και να ανεγερθούν σε αυτές σημαντικοί ναοί και πόλεις.

Στο παρελθόν, ορισμένοι επιστήμονες είχαν υποστηρίξει ότι οι Δελφοί είχαν αποκτήσει την ξεχωριστή θέση τους στην αρχαία ελληνική κοινωνία σε μεγάλο βαθμό χάρη σε μια ιερή πηγή και σε αέρια που εκλύονταν από ένα σεισμικό ρήγμα. Ένας σεισμός κατέστρεψε το ιερό των Δελφών το 373 π.Χ., αλλά ο ναός κτίσθηκε ξανά στο ίδιο σημείο, όπως επισημαίνει ο βρετανός ερευνητής.

Ο Στιούαρτ θεωρεί όμως ότι οι Δελφοί δεν αποτελούσαν εξαίρεση και ότι άλλες τοποθεσίες όπως οι Μυκήνες, η Έφεσος, η Κνίδος και η Ιεράπολις είχαν επίσης αποκτήσει ξεχωριστό «στάτους» εξαιτίας της παρουσίας γειτονικών ρηγμάτων.

Όπως δήλωσε «πάντα θεωρούσα ότι ήταν κάτι περισσότερο από σύμπτωση το γεγονός πως πολλές σημαντικές τοποθεσίες στον κόσμο του Αιγαίου βρίσκονται ακριβώς πάνω από ρήγματα που προκλήθηκαν λόγω σεισμικής δραστηριότητας. Οι αρχαίοι Έλληνες απέδιδαν μεγάλη αξία στις θερμοπηγές που δημιουργούνται από σεισμούς, ίσως, όμως η κατασκευή ναών και πόλεων κοντά σε αυτά τα μέρη να ήταν πιο συστηματική από ό,τι είχε προηγουμένως θεωρηθεί».

Η μελέτη καταγράφει αντιστοιχίες μεταξύ ενεργών ρηγμάτων και αρχαίων ελληνικών πόλεων τόσο στην Ελλάδα όσο και στην αντίπερα όχθη του Αιγαίου, στη σημερινή δυτική Τουρκία. Σε μερικές μάλιστα περιπτώσεις, ορισμένα ρήγματα φαίνονται να περνούν κυριολεκτικά μέσα από την 'καρδιά' μερικών ιερών κτισμάτων.

«Δεν υποστηρίζω ότι κάθε ιερή τοποθεσία στην αρχαία Ελλάδα κτίσθηκε πάνω σε ένα ρήγμα. Όμως μολονότι σήμερα η σχέση μας με τους σεισμούς είναι πλήρως αρνητική, πάντα ξέραμε ότι σε βάθος χρόνου οι σεισμοί δίνουν περισσότερα από όσα παίρνουν. Οι αρχαίοι Έλληνες ήσαν απίστευτα έξυπνοι άνθρωποι και πιστεύω πως θα είχαν αναγνωρίσει αυτή τη σημασία των σεισμών και θα ήθελαν οι πολίτες τους να επωφεληθούν από αυτούς» ανέφερε ο Στιούαρτ.

(in.gr / ΑΠΕ-ΜΠΕ, 14 Σεπ. 2017, http://news.in.gr/culture/article/?aid=1500161905)

Tectonic plates 'weaker than previously thought', say scientists

Experiments carried out at Oxford University have revealed that tectonic plates are weaker than previously thought. The finding explains an ambiguity in lab work that led scientists to believe these rocks were much stronger than they appeared to be in the natural world. This new knowledge will help us understand how tectonic plates can break to form new boundaries.

Study co-author Lars Hansen, Associate Professor of Rock and Mineral Physics in Oxford University's Department of Earth Sciences, said: 'The strength of tectonic plates has been a major target of research for the past four decades. For plate tectonics to work, plates must be able to break to form new plate boundaries. Significant effort has gone into measuring the strength of the key olivine-rich rocks that make up plates using laboratory experiments.

'Unfortunately, those estimates of rock strength have been significantly greater than the apparent strength of plates as observed on Earth. Thus, there is a fundamental lack of understanding of how plates can actually break to form new boundaries. Furthermore, the estimates of rock strength from laboratory experiments exhibit considerable variability, reducing confidence in using experiments to estimate rock properties.'

The new research, published in the journal Science Advances, uses a technique known as 'nanoindentation' to resolve this discrepancy and explain how the rocks that make up tectonic plates can be weak enough to break and form new plate boundaries.

Dr Hansen said: 'We have demonstrated that this variability among previous estimates of strength is a result of a special length-scale within the rocks – that is, the strength depends on the volume of material being tested. To determine this we used nanoindentation experiments in which a microscopic diamond stylus is pressed into the surface of an olivine crystal. These experiments reveal that the strength of the crystal depends on the size of the indentation.

'This concept translates to large rock samples, for which the measured strength increases as the size of the constituent crystals decreases. Because most previous experiments have used synthetic rocks with crystal sizes much smaller than typically found in nature, they have drastically overestimated the strength of tectonic plates. Our results therefore both explain the wide range of previous estimates of rock strength and provide confirmation that the strength of the rocks that make up tectonic plates is low enough to form new plate boundaries.'

The study was an international collaboration involving scientists from Stanford University, the University of Pennsylvania, Oxford University and the University of Delaware.

Dr Hansen added: 'This result has implications beyond forming tectonic plate boundaries. Better predictions of the strength of rocks under these conditions will help inform us on many dynamic processes in plates. For instance, we now know that the evolution of stresses on earthquake-generating faults likely depends on the size of the individual crystals that make up the rocks involved. In addition, flexing of plates under the weight of volcanoes or large ice sheets, a process intimately linked to sea level on Earth, will also ultimately depend on crystal size.'

For further information, please contact Stuart Gillespie in the Oxford University press office at stuart.gillespie@admin.ox.ac.uk.

Dr Lars Hansen: lars.hansen@earth.ox.ac.uk

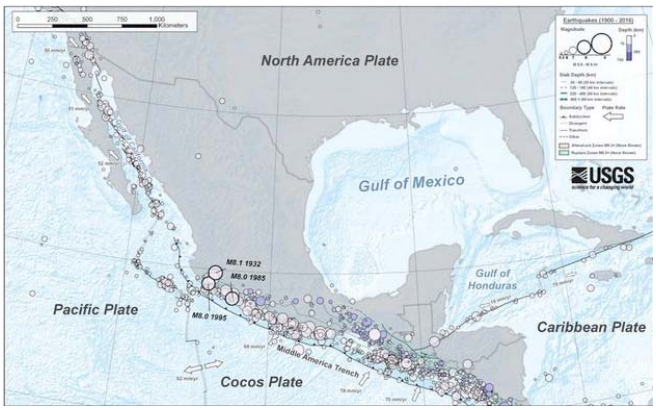
(University of Oxford / News, 14 September 2017, http://www.ox.ac.uk/news/2017-09-14-tectonic-plates-%E2%80%98weaker-previously-thought%E2%80%99-say-scientists-0#)

Were Mexico's Recent Earthquakes Related?

In the 20th century, Mexico was hit by hundreds of earthquakes, including about 20 magnitude-6.5 or higher quakes that struck around Mexico City.

Over the past two weeks, Mexico has experienced a lot of shaking.

On Sept. 8, a magnitude-8.1 earthquake struck 54 miles (87 kilometers) southwest of Pijijiapan, which sits just above the Mexico-Guatemala border. Eleven days later, a magnitude-7.1 quake struck 3 miles (5 km) east of Raboso, near Mexico City. And today (Sept. 21), another quake — a magnitude 4.8 — hit just outside Pijijiapan.



While Mexico's position along major tectonic fault lines makes it a hotbed of seismic activity, the frequency of these powerful earthquakes begs the question: Are these quakes happening more often?

Not likely, said Gavin Hayes, a research geophysicist at the U.S. Geological Survey's National Earthquake Information Center.

"Mexico is very prone to earthquakes," he said, "so earthquakes of this size in Mexico are not unusual. Getting two in a row of this size so close together is unusual but not unexpected."

In the grand, slow-moving world of tectonic plates, Mexico is situated at an unfortunate location: It rests at the southern edge of the North American Plate, putting it right at the point where it meets the Pacific Plate, the Cocos Plate and the Caribbean Plate.

The quakes occur because all of these plates are moving in different directions, and as they collide or rub against each

other, this movement can unleash destructive forces. While these tectonic events usually occur along coastlines, like near Pijijiapan, the Cocos Plate has a unique conformation that explains why so many earthquakes are hitting Mexico City, which lies farther inland, according to the U.S. Geological Survey(USGS).

Mexico has been hit by several moderate earthquakes in the past week, but the one that struck Mexico City was several orders of magnitude stronger.

While the North American landmass is slowly moving west, the Cocos Plate is traveling northeast. As they push against each other, the Cocos Plate, which carries the seafloor and is denser than plates carrying land, is forced underneath, into the Earth's mantle, according to the USGS.

But Hayes said that although most of these above-below collisions, called subduction zones, involve one point of descent, the Cocos Plate sinks a bit and then flattens out for a long expanse before it begins to sink again. Because the location at which it sinks is spread out, the resulting earthquakes often occur farther inland than they would at a typical subduction zone.

"I think this perhaps facilitated the shaking we saw two days ago," Hayes said.

Some large earthquakes can trigger large aftershocks, but that's almost certainly not what happened here, according to Hayes. For one, the two epicenters are too far away from each other to be causally related. Even though both earthquakes occurred on the same subduction slab that goes beneath Central America, they were caused by different fault lines, he said.

As such, it was more of a coincidence than anything else that both fault lines were "ready to go," Hayes said.

But because there are so many fault lines along the subduction zone that runs down the coast of Mexico, Hayes thinks it's reasonable to assume that there will be more large earthquakes in the region in the future, but not any more than one might normally expect.

"It's still a significant hazard," he said.

(Dan Robitzski / LIVESCIENCE Staff Writer, September 21, 2017, https://www.livescience.com/60489-were-strong-mexico-earthquakes-related.html)

Πρόσφατοι Σεισμοί στο Μεξικό

«Σύμφωνα με την Αμερικανική Γεωλογική Υπηρεσία (USGS) ο σεισμός Μ = 8.1 της 7ης Σεπτεμβρίου που έπληξε το Μεξικό, προερχόταν από μια γνωστή σεισμογενή ζώνη στα όρια δυο μεγάλων λιθοσφαιρών πλακών. Είχε βάθος 69 χιλιομέτρων (σύμφωνα με το Ευρωπαϊκό-Μεσογειακό Σεισμολογικό Κέντρο – EMSC- 61 km). Ο σεισμός αυτός έγινε περίπου 80 km ανοικτά στη θαλάσσια περιοχή του Ειρηνικού και ακλούθησε προειδοποίηση για τσουνάμι για το Μεξικό, τη Γουατεμάλα, τον Παναμά, το Ελ Σαλβαδόρ, την Κόστα Ρίκα, τη Νικαράγουα, την Ονδούρα και τον Ισημερινό, το οποίο συνέβη στις 6 π.μ. ώρα Ειρηνικού. Τα μεγαλύτερα κύματα που καταγράφηκαν ήταν 2,3 πόδια (~0,65 m).

Ο ισχυρότατος αυτός σεισμός συνέβη στην Κεντρική Αμερική, όπου η τεκτονική Πλάκα Cocos υποβυθίζεται κάτω από τη βορειοαμερικανική πλάκα με ρυθμό περίπου 80 mm / έτος. Λόγω του μεγέθους του, έγινε ιδιαίτερα αισθητός τόσο μακριά όσο η Πόλη του Μεξικού, με τα γνωστά γεωλογικά-εδαφοτεχνικά προβλήματα της, και η πόλη της Γουατεμάλας. Με βάση τους χάρτες (Shake Map), της USGS περισσότεροι από 40 εκατομμύρια άνθρωποι αισθάνθηκαν αυτόν τον σεισμό σε ποικίλους βαθμούς έντασης. Το σύστημα USGS PAGER (σενάρια καταστροφών) προβλέπει ότι οι θάνατοι θα είναι μεταξύ 1.000 και 10.000. Το σύστημα USGS PAGER προβλέπει επίσης ότι οι οικονομικές απώλειες πιθανόν θα ανέλθουν σε περισσότερα από 1 δισ. Δολάρια. Ο σεισμός αυτός είναι ο ισχυρότερος που συνέβη στην περιοχή από την εποχή της ισπανικής κατάκτησης (1600).

Παρά το γεγονός ότι ο σεισμός συνέβη κοντά στην τάφρο (Trench) της Κεντρικής Αμερικής, γεωλογικά ένα περιβάλλον τεκτονικής συμπίεσης, ο μηχανισμός γένεσης του (USGS) αντίθετα δείχνει ότι ο σεισμός αυτός οφειλόταν **παραδόξως** σε εφελκυσμό (επέκταση κίνησης καταβυθιζόμενου τμήματος λιθόσφαιρας). Πάντα η Φύση μας εκπλήσσει (*Φύσις κρύπτεσθαι φιλεί*). Με βάση το βάθος του σεισμού υποθέτουμε ότι η διάρρηξη συνέβη σε τμήμα της λιθόσφαιρας με διαφορετική συμπεριφορά, πράγμα που σημαίνει ότι η εκτατική κατάσταση μπορεί να οφείλεται σε μεταβαλλόμενη γωνία βύθισης στην υποβυθιζόμενη πλάκα. Νέα δεδομένα θα επιβεβαιώσουν ή θα διαφοροποιήσουν αυτήν την ερμηνεία.

Σύμφωνα με το μοντέλο υπολογισμού αναμενόμενων σεισμών της USGS (Global Earthquake Activity Rate (GEAR (*) mode) στην περιοχή έξω από την ακτή του Μεξικού, το πιθανό αναμενόμενο μέγεθος υπολογιζόταν σε Μ 7,25 (Εκτίμηση Σεισμικής Επικινδυνότητας, SHA). Και η περίπτωση αυτή υπογραμμίζει τον απρόβλεπτο χαρακτήρα των σεισμών και ότι σε σεισμογενείς περιοχές με μεγάλους σεισμούς, οι κάτοικοι πρέπει να γνωρίζουν τους επιπρόσθετους κινδύνους και ο σχεδιασμός αντισεισμικής προστασίας να είναι διαφορετικός από το συνηθισμένο. Δυστυχώς, στις περισσότερες περιπτώσεις η χειρότερη εκδοχή (worst case scenario) είτε δεν γίνεται κατανοητή ή αγνοείται ή δεν λαμβάνεται σοβαρά υπόψη. Και όμως συμβαίνει !.

Ο νέος ισχυρός σεισμός Μ=7.1 της 19ης Σεπτεμβρίου 2017 (Puebla, Mexico), με σχεδόν 300 νεκρούς και πολλές καταρρεύσεις κτηρίων στη πόλη του Μεξικού, ως συνέχεια και προέκταση του πρώτου, συνέβη απεναντίας σε ζώνη σχετικά χαμηλής σεισμικότητας, όπου το μέγιστο αναμενόμενο μέγεθος είχε εκτιμηθεί σε Μ=6.5-6.75. Δηλαδή πάλι η φύση υπερέβη τις επιστημονικές εκτιμήσεις με σοβαρότερες συνέπειες. Ο μηχανισμός γένεσης είναι εφελκυστικός, δηλαδή φυσιολογικός για την περιοχή. Τώρα γίνεται προσπάθεια να διερευνηθεί σε πιο βαθμό ο πρώτος ισχυρότατος σεισμός (Μ8.1) διέγειρε το δεύτερο (Μ7.1). Απετέλεσε επίσης έκπληξη ότι σε τόσο σύντομο χρονικό διάστημα, στη ίδια χώρα και σε σχετικά κοντινή απόσταση συνέβη δεύτερος ισχυρός σεισμός με καταστροφικές συνέπειες, που μεγεθύνει υπέρμετρα τα προβλήματα αντιμετώπισης (αδυναμία κινητοποίησης κρατικού μηχανισμού, αυξημένο οικονομικό κόστος, επίδραση στην οικονομία της χώρας κ.α.). Ο σεισμός Μ=6.1 της 23ης Σεπτεμβρίου (Matias Romero-Oaxaca) σύμφωνα με τα μοντέλα μεταφοράς τάσης (stress transfer) σαφώς βρίσκεται στην επικίνδυνη ζώνη αύξησης της τάσης εξ αιτίας της προηγούμενης δόνησης Μ7.1, από την οποία διεγέρθηκε.

Τέλος, αξίζει να σημειωθεί η σχετικά νέα προσπάθεια, που δοκιμάστηκε με επιτυχία στην πόλη του Μεξικού, το νέο σύστημα συναγερμού προειδοποίησης των επερχόμενων S καταστροφικών σεισμικών κυμάτων, το οποίο στηρίζεται στη διαφορά άφιξης των P (πρώτα) και S (δεύτερα) σεισμικά κύματα, λόγω της διαφοράς ταχυτήτων τους. 60'' (δευτερόλεπτα) πριν ήχησαν οι σειρήνες στο σεισμό της 7ης Σεπτεμβρίου και 12'' πριν από το σεισμό της 19ης /9/2017 με συνεχή προειδοποιητική ήχηση 37''.

(*) «This model uses global strain rates and the last 40 years of seismicity to forecast the likely earthquake magnitude in your lifetime anywhere on earth. Based on this model, tonight's M=8.1 earthquake can be considered sur-

prising as the expected magnitude to occur in your lifetime in this area is M=7.25»

(Πηγή Templor/USGS)

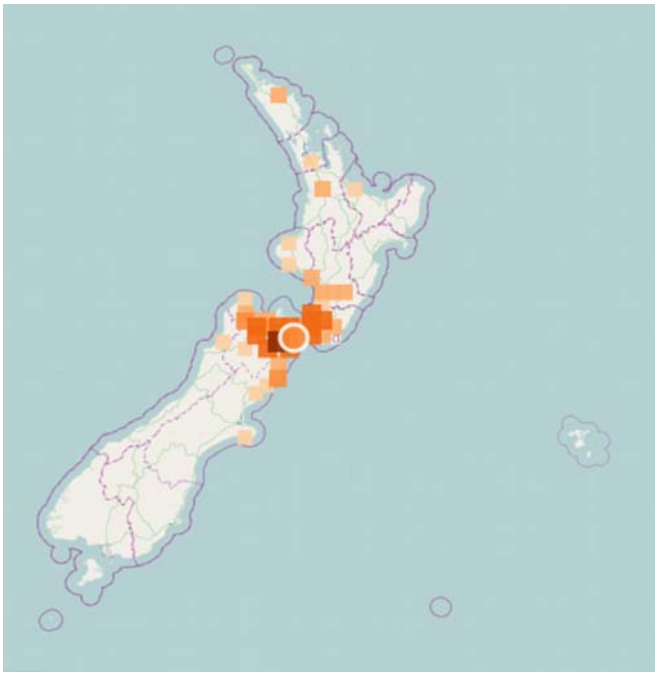
Σ. Β. Παυλίδης
Καθηγητής Γεωλογίας Α.Π.Θ.
Πρόεδρος ΔΣ Αριστοτελείου Μουσείου Φυσικής Ιστορίας Θεσσαλονίκης
Πρόεδρος ΔΣ Ελληνικής Γεωλογικής Εταιρίας

Παγκόσμια ανησυχία: Ξυπνάει το «δαχτυλίδι της φωτιάς»

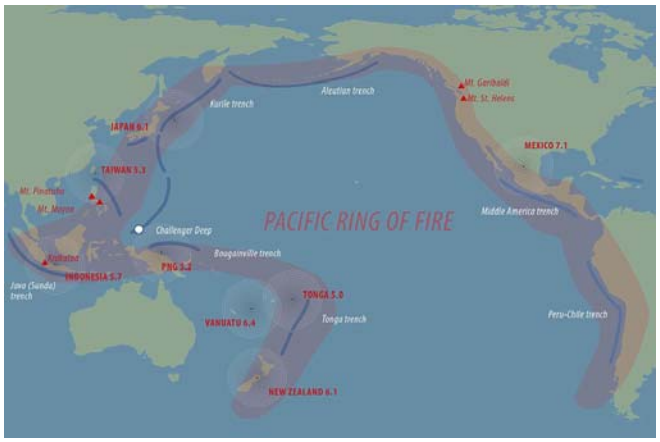
Έντονη ανησυχία προκαλεί στη διεθνή επιστημονική κοινότητα μια σειρά μεγάλων σεισμών, που σημειώθηκαν σε διάστημα μικρότερο μιας μέρας, τα τελευταία 24ωρα και ενδέχεται να προκλήθηκαν από σεισμικά κύματα που ταξιδεύουν κατά μήκος ρηγμάτων στο λεγόμενο «Δαχτυλίδι της Φωτιάς».

Την Τετάρτη ένας σεισμός 6,1 Ρίχτερ έπληξε τη Νέα Ζηλανδία κι ακολούθησαν άλλοι ανοικτά των ακτών της Ιαπωνίας (6,1), του αρχιπελάγους Βανουάτου (6,4) και της Ινδονησίας (5,7) νωρίς το πρωί της Πέμπτης.

Σύμφωνα με το GeoNet ο σεισμός στη Νέα Ζηλανδία έγινε ιδιαίτερα αισθητός στο Ουέλινγκτον και τα Στενά του Κουκ



Όλοι τους σημειώθηκαν στο «Δακτυλίδι της Φωτιάς», μια ζώνη σε σχήμα πέταλου, μήκους 40.000 χλμ., στον Ειρηνικό Ωκεανό, που εκτείνεται από τη Νέα Ζηλανδία μέχρι τη Χιλή, την Ινδονησία, την Ιαπωνία και την Καλιφόρνια και όπου σημειώνεται το 90% των σεισμών.



Μολονότι οι δυτικές ακτές του Μεξικό περιλαμβάνονται στο «Δακτυλίδι της Φωτιάς» ειδικοί εκτιμούν ότι ο φονικός σεισμός, που προκάλεσε το θάνατο εκατοντάδων ανθρώπων, δεν σχετίζεται με τις άλλες δονήσεις.

Σεισμολόγοι παραδέχονται ότι είναι «ασυνήθιστο φαινόμενο» να συμβούν την ίδια μέρα τόσοι σεισμοί, μαζί με άλλες ασθενέστερες δονήσεις κοντά στις νήσους Τόνγκα (5,0), την Ταϊβάν (5,3) και την Παπούα Νέα Γουϊνέα (5,2).

«Είναι ασυνήθιστο, δεν υπάρχει αμφιβολία, υπήρξε μεγάλη [σεισμική] δραστηριότητα», είπε ο Γκάρι Γκίμπσον του Πανεπιστημίου της Μελβούρνης. «Αυτές οι ασυνήθιστες σεισμικές ακολουθίες συμβαίνουν σχετικά συχνά, φαίνεται ότι δεν είναι τυχαίες, αλλά δεν ξέρουμε τα αίτια.»

Ο Φιλ Κάμινς του Geoscience Australia υποστηρίζει ότι μπορεί να ευθύνονται σεισμικά κύματα που ταξιδεύουν κατά μήκος ρηγμάτων. Τονίζει ότι τα κύματα αυτά μπορεί να υπερπηδήξουν κοντινά ρήγματα και να συνεχίσουν να κινούνται προκαλώντας αναταράξεις σε απομακρυσμένα ρήγματα, που ήταν ήδη έτοιμα να ενεργοποιηθούν.

Ένας σεισμός 6,1 Ρίχτερ χτύπησε την Τετάρτη ανοικτά των ανατολικών ακτών της Ιαπωνίας

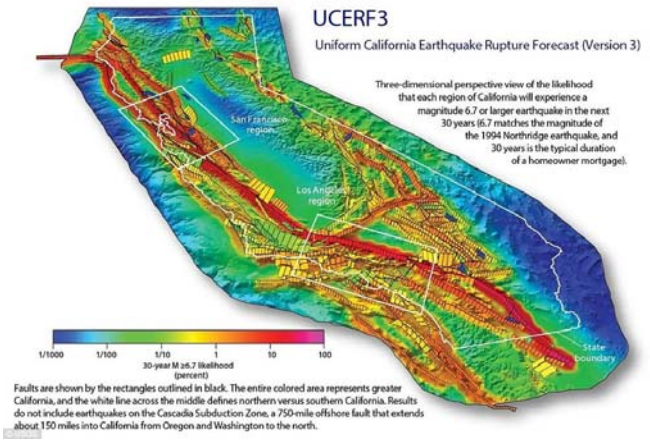
Ο καθηγητής Κάμινς τόνισε ότι τα σεισμικά κύματα δεν μπορούν να προκαλέσουν από μόνα τους σεισμούς, αλλά μπορούν να επιταχύνουν κάποιους που επρόκειτο να εκδηλωθούν σε σύντομο διάστημα.

«Οι σεισμοί αυτοί είναι σχεδόν βέβαιο ότι θα συνέβαιναν πολύ σύντομα», είπε.

Και τόνισε ότι δεν αποκλείει την πιθανότητα ο ίδιος μηχανισμός να προκαλέσει έναν άλλο σημαντικό σεισμό τις ερχόμενες ώρες ή 24ωρα.

Έπεται η Καλιφόρνια;

Αυτό, όμως δεν σημαίνει απαραίτητα ότι θα επηρεαστούν η Καλιφόρνια ή άλλες περιοχές των δυτικών ακτών της Αμερικής.



Σύμφωνα με τον δρα Κρίστοφερ Πλούχαρ, καθηγητή Γεωλογίας στο Φρέσνο, οι λιθοσφαιρικές πλάκες σ' αυτή τη σεισμογενή περιοχή κινούνται συνεχώς με ετήσιο ρυθμό 1-10 εκατοστών. Αν και αυτό μπορεί να προκαλέσει σεισμούς, συχνά περνούν απαρατήρητοι.

«Συμβαίνει όλη την ώρα και δεν υπάρχουν ζημιές, γι' αυτό και δεν δίνουμε σημασία. Σεισμοί συμβαίνουν. Πρέπει να τους περιμένουμε».

Οι σεισμολόγοι προειδοποιούν από καιρό για ένα μεγάλο χτύπημα του Εγκέλαδου στην Καλιφόρνια

Σύμφωνα με τον Πλούχαρ υπάρχουν 60% πιθανότητες να γίνει ένας μεγάλος σεισμός στην Καλιφόρνια μέσα στα επόμενα 30 χρόνια, πιθανότατα κατά μήκος του ρήγματος Χέιγουορντ.

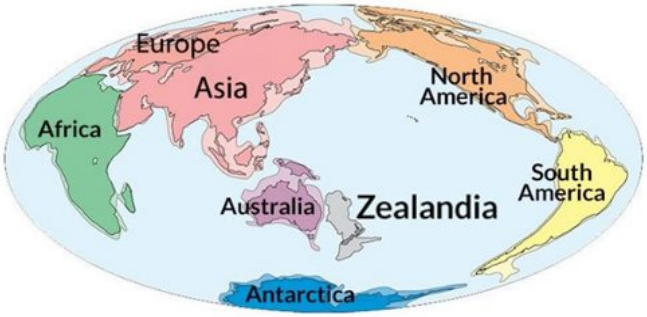
Αν και οι ειδικοί προειδοποιούν από καιρό ότι είναι αναπόφευκτος ένας μεγάλος σεισμός στην Καλιφόρνια, η τεκτονική δραστηριότητα στην αμερικανική αυτή Πολιτεία είναι διαφορετική από εκείνες στις ακτές του Μεξικό και άλλων περιοχών στο «Δακτυλίδι της Φωτιάς», λέει ο σεισμολόγος Ζαν Πωλ Αμπουέρο.

Οι πλάκες που συγκροτούν τα διάφορα τμήματα του «Δακτυλιδιού της Φωτιάς» τρίβονται κάθετα μεταξύ τους, ενώ η Καλιφόρνια βρίσκεται ανάμεσα σε δύο πλάκες που συγκρούονται οριζόντια.

(22 Σεπτεμβρίου 2017)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΓΕΩΛΟΓΙΑ

Η βυθισμένη Ζηλανδία
Η χαμένη ήπειρος της Γης ήταν... γέφυρα



Στις αρχές του 2017 ομάδα έντεκα ερευνητών υποστήριξε ότι η μελέτη στοιχείων και ευρημάτων 20 ετών στην περιοχή του νοτιοδυτικού Ειρηνικού Ωκεανού οδηγούν στο συμπέρασμα ότι η Νέα Ζηλανδία, η Νέα Καληδονία και κάποιες νησιωτικές περιοχές κοντά στην Αυστραλία αποτελούν τα ψηλότερα βουνά μία τεράστιας και ενιαίας πλάκας ηπειρωτικού φλοιού που είναι ξεχωριστός από εκείνον της Αυστραλίας.

Με απλά λόγια οι ερευνητές έκαναν λόγο μια άγνωστη βυθισμένη σήμερα ήπειρο της Γης. Οι επιστήμονες της έδωσαν το όνομα «Ζηλανδία» (Zealandia).

Σύμφωνα με τους ερευνητές, η συνολική έκταση αυτής της περιοχής είναι περίπου 5 εκατομμύρια τετραγωνικά χιλιόμετρα και βρίσκεται κατά 94% κάτω από την επιφάνεια της θάλασσας. Βέβαια δεν υπάρχει κάποια επιστημονική επιτροπή που θα αποφασίσει εάν η «Ζηλανδία» είναι πράγματι μία νέα ήπειρος.

Παρόλα αυτά οι ερευνητές που έκαναν την ανακάλυψη ανέφεραν ότι η ήπειρος αυτή μπορεί να είναι τόσο βυθισμένη αλλά εξακολουθεί να είναι ενιαία και αυτό την καθιστά ένα χρήσιμο και τολμηρό εργαλείο για την εξερεύνηση της συνοχής και της διάλυσης του ηπειρωτικού φλοιού.

Αμέσως μετά την ανακοίνωση ξεκίνησε μια νέα ερευνητική αποστολή μελέτης της περιοχής όπου πραγματοποιήθηκαν ανάμεσα στα άλλα γεωτρήσεις. Τα αποτελέσματα αυτών των ερευνών παρουσιάστηκαν πριν από λίγα 24ωρα.

Το πιο εντυπωσιακό εύρημα των νέων ερευνών είναι ότι η Zelandia λειτουργούσε σαν ένα είδος διηπειρωτικής γέφυρας προσφέροντας δίοδο στα ζώα και τα φυτά να διασχίζουν ηπείρους πριν από περίπου 80 εκατομμύρια έτη.

(in.gr, 29 Σεπ. 2017, http://news.in.gr/science-technology/article/?aid=1500164568)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΠΕΡΙΒΑΛΛΟΝ

Το νερό που εξατμίζεται:
Μία νέα ανανεώσιμη πηγή ενέργειας
Εφικτή και καλύτερη από την αιολική

Επιστήμονες στις ΗΠΑ ανακοίνωσαν ότι, έπειτα από σχετική μελέτη, κατέληξαν στο συμπέρασμα πως στις ήδη αξιοποιούμενες ανανεώσιμες πηγές ενέργειας μπορεί να προστεθεί μία ακόμη: το νερό που εξατμίζεται.

Περίπου η μισή ηλιακή ενέργεια απορροφάται από την επιφάνεια της Γης και, μεταξύ άλλων, προκαλεί την εξάτμιση του νερού. Η ενέργεια που δημιουργείται από την εξάτμιση, είναι δυνατό στη συνέχεια να αξιοποιηθεί.

Αν μια μηχανή με τα κατάλληλα υλικά τοποθετηθεί πάνω από ένα σημείο, όπου γίνεται εξάτμιση του νερού, π.χ. σε μία λίμνη, τότε είναι δυνατό να λειτουργήσει ως γεννήτρια και να παραχθεί ηλεκτρισμός. Μάλιστα, σύμφωνα με τις εκτιμήσεις των ερευνητών, η ηλεκτρική ενέργεια που είναι δυνατό να παραχθεί από τη φυσική εξάτμιση του νερού, μπορεί να φθάσει τα δέκα βατ ανά τετραγωνικό μέτρο, δηλαδή τριπλάσια σε σχέση με την αιολική ενέργεια.

Οι ερευνητές του Πανεπιστημίου Κολούμπια της Νέας Υόρκης, με επικεφαλής τους τουρκικής καταγωγής Οζγκούρ Σαχίν και Αχμέντ-Χαμντί Τσαβούσογλου, που έκαναν τη σχετική δημοσίευση στο περιοδικό "Nature Communications", ανέπτυξαν ένα μοντέλο, που περιγράφει πώς είναι εφικτό να γίνει κάτι τέτοιο.

Οι επιστήμονες εκτιμούν ότι η εξάτμιση των υδάτων από τις λίμνες και άλλους ταμιευτήρες νερού με έκταση 0,1 τετραγωνικού χιλιομέτρου στις ΗΠΑ, μπορεί να παράγει έως 325 γιγαβάτ ηλεκτρικής ενέργειας, καλύπτοντας περίπου το 70% του ενεργειακού δυναμικού της χώρας.

Η μελέτη εκτιμά ότι οι ενεργειακές δυνατότητες της εξάτμισης του νερού είναι τουλάχιστον συγκρίσιμες με τις αντίστοιχες της ηλιακής και της αιολικής ενέργειας. Μάλιστα, αντίθετα με τις δυο τελευταίες, η εξάτμιση του νερού επηρεάζεται λιγότερο από τις συνεχώς μεταβαλλόμενες καιρικές συνθήκες.

Επιπλέον, ο ηλεκτρισμός από την εξάτμιση μπορεί να παράγεται μέρα-νύχτα. Όσο πιο ηλιόλουστη και με ξηρό κλίμα είναι μια χώρα (όπως η Ελλάδα), ιδίως λόγω της κλιματικής αλλαγής, με αποτέλεσμα η εξάτμιση των επιφανειακών υδάτων να είναι πιο έντονη, τόσο πιο αξιοποιήσιμη θα είναι η νέα ανανεώσιμη πηγή ενέργειας.

Επίσης, εκτιμάται ότι χάρη σε μελλοντικές τεχνολογικές καινοτομίες, θα είναι δυνατό να περιορισθούν σχεδόν στο μισό οι απώλειες από την εξάτμιση του νερού, συνεπώς τέτοια ενεργειακά συστήματα μπορούν να εγκατασταθούν και σε περιοχές που υποφέρουν από λειψυδρία.

Το επόμενο βήμα θα είναι η περαιτέρω βελτίωση των υλικών και των συσκευών που μπορούν να παράγουν ενέργεια από την εξάτμιση. Με τις κατάλληλες βελτιώσεις, αναμένεται να αυξηθεί η ενεργειακή αποδοτικότητά τους σταδιακά, έτσι ώστε τέτοιες μηχανές να μπορούν να ανταγωνισθούν τις ανεμογεννήτριες και τα φωτοβολταϊκά στο μέλλον.

(in.gr, 27 Σεπ. 2017, http://news.in.gr/science-technology/article/?aid=1500164135)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΛΟΙΠΑ

Engineering the world's grandest architectural projects

UK firm Newtecnic is using engineering know-how to turn architectural dreams into reality

Tucked away in the heart of Cambridge's city centre sits the R&D department of one of the UK's most interesting engineering firms.

Founded in 2003, Newtecnic is behind some of the world's grandest civil projects, from the Heydar Aliyev Cultural Centre in Baku, Azerbaijan, to the Grand Theatre of Rabat in Morocco. Working alongside clients including Zaha Hadid Architects, it is helping to shape the public spaces of undeveloped regions across the globe.

"We provide the engineering design for ambitious, large-scale projects, which are usually high-profile projects," Andrew Watts, Newtecnic's CEO, told *The Engineer*.

According to Watts, Newtecnic's role is to understand the architectural vision but also be sympathetic to what engineers and contractors can feasibly achieve. With a combination of cutting-edge design tools, building techniques and materials, the company is challenging the boundaries of modern construction.

"The work is all done from first principles," Watts explained. "In other words, we design structures and buildings as if we've never done them before."

The Heydar Aliyev Cultural Centre in Baku, Azerbaijan, designed by Zaha Hadid

As well as Morocco and Azerbaijan, Newtecnic has worked extensively in the Middle East, where large-scale public projects are sprouting in a desert bloom of steel and glass.

However, despite working for clients in some of the world's wealthiest states, the realities of financial constraint still apply.

"Nobody throws money and just says 'Build your dream,'" said Watts.

"They tend to be quite commercial rates of construction so, in order to make that work, we have to do a lot of research into reducing the quantity of material and the weight of the structures.

"When you reduce weight, you start to enter the world of mechanical engineering… it becomes much more like designing an aircraft, for instance, than a traditional, heavy building."

Newtecnic has an industrial partnership with the University of Cambridge's Department of Engineering, where Watts has maintained links as an alumnus. The company's R&D team uses advanced 3D BIM (building information modelling) systems to digitally explore a project, then creates physical mock-ups in its structures lab. This rapid prototyping and wind tunnel testing is unusual for the civil sector, according to Watts.

"What may be fairly standard in transportation-led engineering fields we're now introducing into building design," he said.

It's not just the design phase where Newtecnic is innovating. The company employs a range of composite materials, including UHPC (ultra high-performance concrete), GRC (glassfibre-reinforced concrete) and FRP (fibre-reinforced plastic).

"Why would you use those materials?" Watts posited. "Because you can mould them. You can make them into things you've never made before. You don't need to extrude or squash to make them all the same. You can make them in a way that is very specific to the project."

Yet to serve their dues

Engineers know how traditional concrete and plastics react over time, but these relatively new materials have yet to serve their dues. To counteract that novelty, Newtecnic puts them through accelerated ageing to see how they change over a lifetime.

The company's building philosophy is also designed to reduce the high proportion of waste material that construction often leaves behind. According to Watts, this can be as much as 50 per cent on some projects.

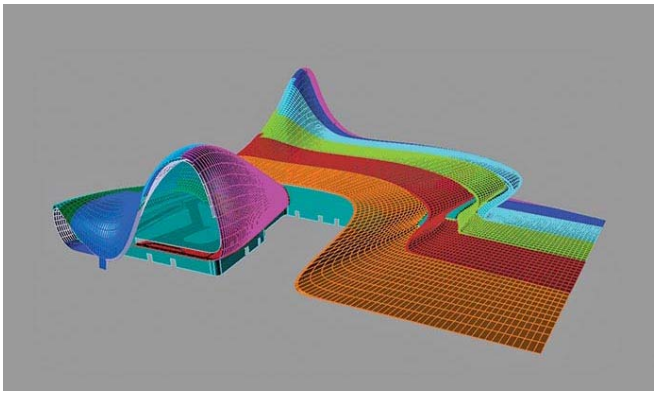
And the savings are not limited to quantities of concrete and steel. Transporting materials is one of the biggest energy inputs for a building's construction; cutting the amount of material needed can reduce journeys to and from the build.

As for the finished products, it seems that less can indeed be more. Newtecnic's buildings are among the most groundbreaking designs seen anywhere and have seeped into the public consciousness in ways that buildings rarely do. The Zaha Hadid-designed cultural centre in Baku is perhaps the most prominent example, its delicate sweeping curves standing in contrast to the stark Soviet blocks that surround it. In a recent Google Doodle that celebrated the late architect, it was the Baku building that a smiling Hadid stood before.

Another major collaboration between Newtecnic and Zaha Hadid Architects is now nearing completion. The King Abdullah Financial District (KAFD) Metro Station will be the jewel in the crown of Riyadh's new mass transport network, due to open in 2019. Its futuristic design should make an apt centrepiece for such an ambitious project but, according to Watts, buildings like this are possible only as a direct result of the R&D carried out by Newtecnic in the UK.

"We often have to work on these [materials] a year or two before they're needed," he explained. "So we have to invest in things that may end up not being used on the project but, we hope, will maybe get used on something else.

"We work much more like a tech company, which would consider it very normal to invest large amounts of its profit into research."



Newtecnic's BIM approach takes cues from aerospace and automotive design

Much of the company's landmark work has taken place in emerging economies, where public space is plentiful. As they seek to make their mark on the 21st century, many of these nations are pumping money into major civil projects.

"Russia, the Middle East and China: they've acquired a lot of wealth in a short space of time and they're building the future, building their future cities," said Watts.

"They think the urban community should extend to cultural projects that you can virtually inhabit, as it were. Art galleries, theatres, the transport system: all these are felt to be part of the fabric of the cities that they're creating. They're not just add-ons."

Many of the locations call for innovative approaches to temperature management. Whereas some buildings are fitted with HVAC systems to simply deal with temperature load at given times of the year, Newtecnic takes a different approach. During the design phase it carries out CFD (computational fluid dynamics) studies to better understand the natural airflow within the structures and how various building elements interact. It then develops algorithms to explore how those conditions can be optimised.

"It's very much a high-tech version of what I learned as an undergraduate, in learning how to create an environmental strategy for a building," said Watts.

"What needs heating? What needs cooling? What needs lots of air changes? What needs very few air changes? And how can you tie them all up together so that they work as one big mechanism?"

Form dictated by function

Here, form is often dictated by function, with not only internal spaces tweaked to reduce the HVAC load but buildings' facades shaped to serve their occupants. Reminiscent of Formula One engineer Adrian Newey's automotive designs, the results are generally striking, with the algorithms calling for unconventional features to manipulate the airflow in just the right manner.

"They end up, sort of, not exactly generating themselves but the form is strongly influenced by performance, and often ends up looking quite nice," Watts said. "It resonates with the architects when they can see they're getting an original expression through a technical process rather than through a visually driven process, or something they've seen somewhere else."

As for the future, Watts regards the open expanses of Australia as a major new frontier. Newtecnic is working on a large housing development in northern Queensland, as well as two towers in the southern part of the state, and another project in Sydney.

"We've had a couple of years where everything seemed to be gravitating into Saudi Arabia. Then it was China. Now it seems to be Australia," he said.

"The mood in Australia at the moment seems very progressive, the way the built environment is being developed."

(Andrew Wade / The Engineer, 14th September 2017, https://www.theengineer.co.uk/engineering-grandest-architectural/?cmpid=tenews_3956297&adg=25D5594B-61A5-4477-9BBF-F97F87829407)

ΝΕΕΣ ΕΚΔΟΣΕΙΣ ΣΤΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΠΙΣΤΗΜΕΣ

Crossrail Project: Infrastructure Design and Construction - Volume 1

Edited by Mike Black, Christian Dodge and Ursula Lawrence

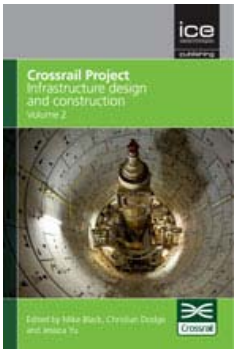
The construction of the Crossrail project began at North Dock in Canary Wharf in May 2009. Five years on, it is the biggest railway construction project in Europe and is one of the largest single infrastructure investments undertaken in the UK. It consists of 21 km of new twin-bore tunnels under central London and 10 new world-class stations constructed under the largest city in the European Union.

Crossrail Project: Infrastructure Design and Construction (Volume 1) contains a collection of 36 papers submitted to Crossrail's Technical Papers Competition between 2012 and 2013. Contributions have come from consultants, contractors, suppliers and third-party stakeholders involved in design and construction across the Crossrail project. The papers cover a multitude of disciplines including Ground Engineering, Sprayed Concrete Lining, Tunnel Boring Machine Tunnelling, Engineering Geology, Geotechnical Monitoring and Mitigation, Architectural Design, Operations and Logistics.

As part of Crossrail's legacy, it is incumbent upon the organisation to share its experiences and best practices with the rest of the industry and to showcase the skills of the personnel involved and the successful delivery of each phase of works. This first volume is the culmination of that experience.

Crossrail Project: Infrastructure Design and Construction provides a valuable source of reference for current practices in design and construction of large-scale underground projects.

(ICE Publishing, 03/11/2014)



Crossrail Project: Infrastructure Design and Construction - Volume 2

Mike Black, Christian Dodge and Jessica Yu (eds.)

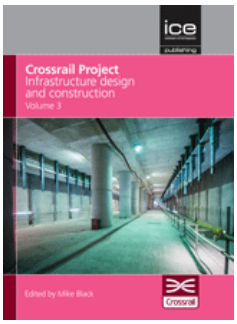
The construction of the Crossrail project began at North Dock in Canary Wharf in May 2009. Six years on, it is the biggest railway construction project in Europe and is one of the largest single infrastructure investments undertaken in the UK. It consists of 21 km of new twin-bore tunnels under central London and 10 new world-class stations constructed under the largest city in the European Union.

Crossrail Project: Infrastructure Design and Construction (Volume 2) contains a collection of papers submitted to Crossrail's Technical Papers Competition in 2014. Contributions have come from consultants, contractors, suppliers and third-party stakeholders involved in design and construction across the Crossrail project. The papers cover a multitude of disciplines including Ground Engineering, Sprayed Concrete Lining, Tunnel Boring Machine Tunnelling, Engineering Geology, Geotechnical Monitoring and Mitigation, Architectural Design, Operations and Logistics.

As part of Crossrail's legacy, it is incumbent upon the organisation to share its experiences and best practices with the rest of the industry and to showcase the skills of the personnel involved and the successful delivery of each phase of works. This second volume is the culmination of that experience.

Crossrail Project: Infrastructure Design and Construction provides a valuable source of reference for current practices in design and construction of large-scale underground projects.

(ICE Publishing, 07/09/2015)



Crossrail Project: Infrastructure Design and Construction - Volume 3

Edited by Mike Black

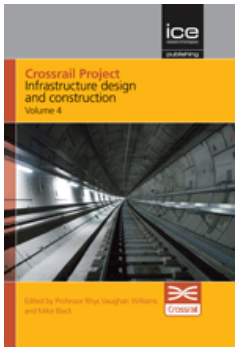
The construction of the Crossrail project began at North Dock in Canary Wharf in May 2009. Seven years on, it is the biggest railway construction project in Europe and is one of the largest single infrastructure investments undertaken in the UK. It consists of 21 km of new twin-bore tunnels under central London and 10 new world-class stations constructed under the largest city in the European Union.

Crossrail Project: Infrastructure Design and Construction (Volume 3) contains a collection of 34 papers submitted to Crossrail's Technical Papers Competition between 2014 and 2015. Contributions have come from consultants, contractors, suppliers and third-party stakeholders involved in design and construction across the Crossrail project. The papers cover a multitude of disciplines including Ground Engineering, Sprayed Concrete Lining, Tunnel Boring Machine Tunnelling, Engineering Geology, Geotechnical Monitoring and Mitigation, Architectural Design, Operations and Logistics.

As part of Crossrail's legacy, it is incumbent upon the organisation to share its experiences and best practices with the rest of the industry and to showcase the skills of the personnel involved and the successful delivery of each phase of works. This third volume is the culmination of that experience.

Crossrail Project: Infrastructure Design and Construction provides a valuable source of reference for current practices in design and construction of large-scale underground projects.

(ICE Publishing, 31/8/2016)



Crossrail Project: Infrastructure Design and Construction - Volume 4

Crossrail, Rhys Vaughan Williams and Mike Black

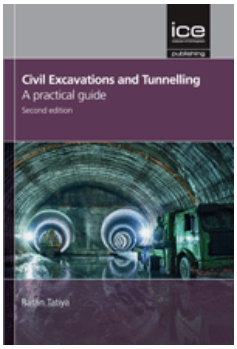
The construction of the Crossrail project began at North Dock in Canary Wharf in May 2009. With the railway due to open in 2018, it is one of the largest single infrastructure investments undertaken in the UK to date. It consists of 21 kilometres of new twin-bore tunnels and 10 new world-class stations in central London connecting to upgraded lines providing new services to the east and west of the UK capital.

Crossrail Project: Infrastructure Design and Construction - Volume 4 contains a collection of 23 papers submitted to Crossrail's Technical Papers Competition. Contributions have come from consultants, contractors, suppliers and third-party stakeholders all of whom have been involved in the Crossrail project. The papers cover a variety of disciplines including health and safety, insulation materials, material corrosion, ground engineering and many more.

As part of the legacy of the Crossrail project, it is important for the organisation to share its experiences and best practices with the rest of the industry and to showcase the skills of the personnel involved and the successful delivery of each phase of works. This fourth volume continues Crossrail's dissemination of that experience.

Crossrail Project: Infrastructure Design and Construction – Volume 4 provides a valuable source of reference for current practices in design and construction of large-scale underground projects.

(ICE Publishing, 12/09/2017)



Civil Excavations and Tunnelling - A Practical Guide, Second Edition

Ratan Tatiya

Civil Excavations and Tunnelling is a comprehensive guide to civil excavations at surface and subsurface levels, with or without the aid of explosives. It features descriptions of the latest methods, techniques, equipment, trends and practices, as well as guidance on safety and the environment.

Civil Excavations and Tunnelling, Second edition:

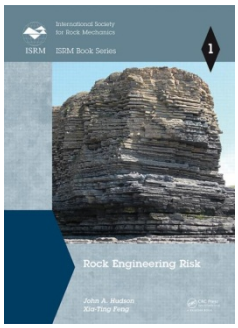
- serves as a single point of extraction of multiple data for earthworks
- comprises numerous case studies to illustrate the challenges posed by different types of soil, as well as the pros and cons of different sets of equipment
- details the recent innovations in tunnel boring machines (TBMs), including crossover, variable density and multi-mode TBMs
- includes key points and learning questions that allow readers to test their knowledge
- highlights best practices, sustainability in operations, loss-prevention strategies, and occupational health, safety and environment issues

Excavation is a multi-disciplined activity involving civil, construction and mining professionals, earth scientists and geologists. This book will appeal to practitioners, researchers and students in these disciplines.

Contents

1. Introduction and site investigations
2. Ground and rock fragmentation – drilling and blasting
3. Earth movers, excavators and open-cut excavations
4. Tunnelling by conventional methods
5. Mechanized tunnelling
6. Shield tunnelling in soft ground
7. Special methods
8. Microtunnelling
9. Raising, sinking and large subsurface excavations
10. Hazards, safety, environment (HSE) & Loss prevention

(ICE Publishing, 27/07/2017)



Rock Engineering Risk

John A. Hudson, Xia-Ting Feng

This book provides a new, necessary and valuable approach to the consideration of risk in underground engineering projects constructed within rock masses. There are Chapters on uncertainty and risk, rock engineering systems, rock fractures and rock stress, the design of a repository for radioactive waste, plus two major case examples relating to the headrace tunnels and caverns for a hydroelectric project. These Chapters highlight in detail the authors' new rock engineering risk approach, especially how monitoring during construction can significantly reduce the construction risks. The book is particularly timely given the current increasing emphasis on geo-engineering safety, accountability and sustainability—which requires stricter attention to risk and greater reliability than ever before.

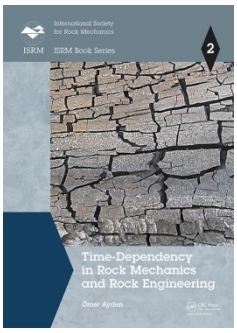
Written by two eminent authors, the two most recent past-Presidents of the International Society for Rock Mechanics (ISRM), this modern and well-illustrated guide on Rock Engineering Risk complements the authors' previous 2011 book on Rock Engineering Design, also published by Taylor & Francis. The book will benefit engineers, contractors, clients, researchers, lecturers and advanced students who are concerned with rock engineering projects in civil, mining, geological and construction engineering worldwide.

Features

- Clearly explains basic material so that readers from different backgrounds will be able to understand the content
- Emphasizes the linking of uncertainty and risk analysis concepts to practical rock engineering projects
- Features illustrative examples of risks in major rock engineering projects and how these were minimised
- Uses risk analysis protocols to enable the reader to assess the risks involved in any rock engineering project

- Disseminates knowledge generated by the 4-year work of the ISRM Design Methodology Commission

(CRC Press, May 5, 2015)



Time-Dependency in Rock Mechanics and Rock Engineering

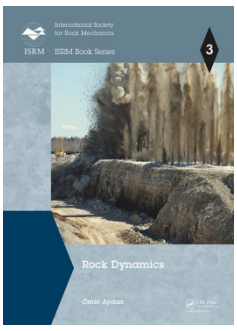
Ömer Aydan

This book is concerned with time-dependency in rock mechanics and rock engineering, whose spectrum is very wide. While the term "time-dependency" involves time-dependent behavior/rate-dependent behavior of rocks in a conventional sense, this books attempts to cover the spectrum as much as possible including coupled processes of thermal, hydrological and diffusions in rocks. It presents theoretical formulations, experiments, numerical formulation and examples of applications. Of paramount concern is the long-term response and stability of rock engineering structures, including for instance man-made and natural slopes and underground facilities such as tunnels and powerhouses.

Features

- Discusses time-dependence of rocks and its evaluations
- Deals with degradation of rocks in the long-term and its modeling
- Examines coupling of heat transport, seepage and diffusion
- Offers experimental procedures and practical examples
- Contains numerical techniques and their applications

(CRC Press, December 12)



Rock Dynamics

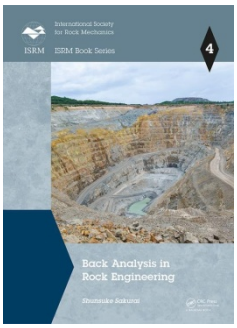
Omer Aydan

Rock dynamics has become one of the most important topics in the field of rock mechanics and rock engineering. The spectrum of rock dynamics is very wide and it includes the failure of rocks, rock masses and rock engineering structures such as rockbursting, spalling, popping, collapse, toppling, sliding, blasting, non-destructive testing, geophysical explorations, science and engineering of rocks and impacts. The book specifically covers fundamentals of rock dynamics, constitutive models, numerical analysis techniques, dynamic testing procedures, the multi-parameter responses and motions of rocks during fracturing or slippage in laboratory experiments, earthquakes and their strong motion characteristics and their effect on various rock structures such as foundations, underground structures, slopes, dynamic simulation of loading and excavation, blasting and its positive utilization in rock engineering, the phenomenon of rockburst in rock excavations, non-destructive testing of rockbolts and rock anchors and impacts by meteors or projectiles. The main goal of this book is to present a unified and complete treatise on Rock Dynamics and to represent a milestone in advancing the knowledge in this field and in leading to new techniques for experiments, analytical and numerical modelling as well as monitoring of dynamics of rocks and rock engineering structures.

Features

- Covers the understudied topic of dynamics issues in geo-mechanics and geo-engineering
- Describes both fundamentals and state-of-the-art advances in the field
- Highlights specialized, experimental techniques
- Of interest to engineers as wel as geo-scientists

(CRC Press, May 23, 2017)



Back Analysis in Rock Engineering

Shunsuke Sakurai

This book provides practicing engineers working in the field of design, construction and monitoring of rock structures such as tunnels and slopes with technical information on how to design, how to excavate and how to monitor the structures during their construction. Based on the long-term engineering experiences of the author, field measurements together with back analyses are presented as the most powerful tools in rock engineering practice. One of the purposes of field measurements is to assess the stability of the rock structures during their construction. However, field measurement results are only numbers unless they are quantitatively interpreted, a process in which back analyses play an important role.

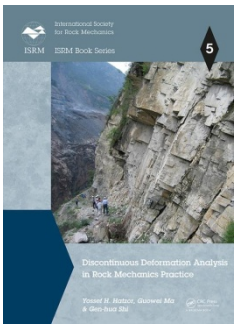
The author has developed both the concepts of "critical strain" and of the "anisotropic parameter" of rocks, which can make it possible not only to assess the stability of the structures during their construction, but also to verify the validity of design parameters by the back analysis of field measurement results during the constructions. Based on the back analysis results, the design parameters used at a design stage could be modified if necessary. This procedure is called an "Observational method", a concept that is entirely different from that of other structures such as bridges and buildings. It is noted that in general, technical books written for practicing engineers mainly focus on empirical approaches which are based on engineers' experiences. In this book, however, no empirical approaches will be described, instead, all the approaches are based on simple rock mechanics theory. This book is the first to describe an observational method in rock engineering practice, which implies that the potential readers of this book must be practicing engineers working on rock engineering projects.

Features

- Contains observational methods for making a bridge between theory and practice
- Provides practicing engineers support by the theory of rock mechanics, not by engineering judgments

- Back analyses allow for quantitative assessment of field measurement data obtained at construction sites
- Factor of safety of slope and tunnels can be back-analyzed during construction on a real-time basis
- The catastrophic failure of structures can be predicted during their construction by back analysis of field measurement results

(CRC Press, August 17, 2017)



Discontinuous Deformation Analysis in Rock Mechanics Practice

Yossef H. Hatzor, Guowei Ma, Gen-hua Shi

The numerical, discrete element, Discontinuous Deformation Analysis (DDA) method was developed by Dr. Gen-hua Shi while he was working at the University of California, Berkeley, under the supervision of Prof. Richard E. Goodman in the late 1980s. Two-dimensional DDA was published in 1993 and three-dimensional DDA in 2001. Since its publication DDA has been verified, validated and applied in numerous studies worldwide and is now considered a powerful and robust method to address both static and dynamic engineering problems in discontinuous rock masses.

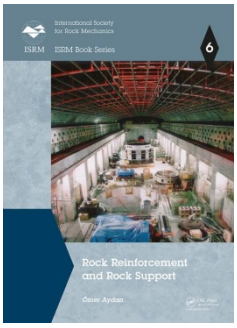
In this book Yossef H. Hatzor and Guowei Ma, co-chairs of the International Society for Rock Mechanics (ISRM) Commission on DDA, join Dr. Shi in authoring a monograph that presents the state of the art in DDA research. A comprehensive discussion of DDA development since its publication is provided in Chapter 1, followed by concise reviews of 2D and 3D DDA in chapters 2 and 3. Procedures to select geological and numerical input parameters for DDA are discussed in Chapter 4, and DDA validation and verification is presented in Chapter 5. Applications of DDA in underground and rock slope engineering projects are discussed in chapters 6 and 7. In Chapter 8 the novel contact theory recently developed by Dr. Shi is published in its complete form, for the first time.

This book is published within the framework of the ISRM Book Series and is the contribution of the ISRM DDA Commission to the international rock mechanics community.

Features

- Covers the basic theory with some new modifications
- Provides benchmark tests for validation and verification
- Demonstrates how the method can be used in practice
- Has a strong link to the necessary geological input so that it may be applied realistically.
- Provides a set of guidelines as to how to correctly assess the numerical control parameters so that it may be applied accurately

(CRC Press, July 27, 2017)



Rock Reinforcement and Rock Support

Ömer Aydan

The stability of underground and surface geotechnical structures during and after excavation is of great concern as any kind of instability may result in damage to the environment as well as time-consuming high cost repair work. The forms of instability, their mechanisms and the conditions associated with them must be understood so that correct stabilisation of the structure through rock reinforcement and/or rock support can be undertaken.

Rock Reinforcement and Rock Support elucidates the reinforcement functions of rock bolts/rock anchors and support systems consisting of shotcrete, steel ribs and concrete liners and evaluates their reinforcement and supporting effects both qualitatively and quantitatively. It draws on the research activities and practices carried out by the author for more than three decades and has culminated in a most extensive up-to-date and a complete treatise on rock reinforcement and rock support.

Features

- Explains fundamentals of why rock support and reinforcement is necessary and how to address it
- Provides coverage of dynamic issues and non-destructive testing for soundness evaluations
- Addresses most recent issues in the field of rock support and rock reinforcement such as dynamic loading conditions, non-destructive testing
- Contains experimental procedures and practical examples
- Features numerical and analytical techniques and their applications

(CRC Press, January 8, 2018)

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ

www.geoengineer.org

Κυκλοφόρησε το Τεύχος #148 του **Newsletter** του **Geoengineer.org** (Σεπτεμβρίου 2017) με πολλές χρήσιμες πληροφορίες για όλα τα θέματα της γεωμηχανικής. Υπενθυμίζεται ότι το Newsletter εκδίδεται από τον συνάδελφο και μέλος της ΕΕΕΕΓΜ Δημήτρη Ζέκκο (secretariat@geoengineer.org).

Ενδεικτικά αναφέρονται:

- Residents evacuate after mudslide hits Swiss-Italian border village (video)
- Devastating landslide hits Sierra Leone's capital: Death toll rises to 500
- Can satellites be used as an early warning system for landslides?
- Earthquake on Italian holiday island leaves at least two people dead and 39 injured
- Joint Technical Committee on Education - JTC3

http://campaign.r20.constantcontact.com/render?m=1101304736672&ca=1a161b50-5de4-43e1-becd-460b3086c95c

ISRM International Society for Rock Mechanics NEWSLETTER

No. 39 - September 2017
www.isrm.net/adm/newsletter/ver_html.php?id_newsletter=143&ver=1

Κυκλοφόρησε το Τεύχος #39 του **Newsletter** της **International Society for Rock Mechanics** (Σεπτεμβρίου 2017) με τα παρακάτω περιεχόμενα:

- Welcome to AfriRock 2017 in Cape Town
- 19th ISRM online lecture by Prof. Xia-Ting Feng
- The 2018 ISRM International Symposium ARMS10, 29 Oct. 3 November
- European Rock Mechanics Symposium Eurock 2018, Saint-Petersburg, Russia, 22-26 May
- New titles launched in the ISRM book series
- 3rd Nordic Rock Mechanics Symposium NRMS 2017, Helsinki, Finland, 11-12 October
- Shaoxing International Forum on Rock Mechanics and Engineering Geology (SXFRG), Shaoxing, China, 28-29 October 2017 Invitation to TuniRock2018, Hammamet, Tunisia, 29-31 March
- Invitation to RocDyn-3, 25-29 June 2018, Trodheim, Norway
- ISRM Sponsored meetings
- ISRM Rocha Medal 2019 nominations to be received by 31 December 2017
- Report on the Jubilee Conference of the French ISRM Group
- Macedonian Association for Geotechnics organized a lecture on three topics in Rock Mechanics
- Seminar on "Advance Techniques for Assessment of Slope Stability", Hanoi, Vietnam

ΕΚΤΕΛΕΣΤΙΚΗ ΕΠΙΤΡΟΠΗ ΕΕΕΕΓΜ (2015 – 2018)

Πρόεδρος	:	Γεώργιος ΓΚΑΖΕΤΑΣ, Δρ. Πολιτικός Μηχανικός, Καθηγητής Ε.Μ.Π. president@hssmge.gr, gazetas@ath.forthnet.gr
Α' Αντιπρόεδρος	:	Παναγιώτης ΒΕΤΤΑΣ, Πολιτικός Μηχανικός, ΟΜΙΛΟΣ ΤΕΧΝΙΚΩΝ ΜΕΛΕΤΩΝ Α.Ε. otmate@otenet.gr
Β' Αντιπρόεδρος	:	Μιχάλης ΠΑΧΑΚΗΣ, Πολιτικός Μηχανικός mpax46@otenet.gr
Γενικός Γραμματέας	:	Μιχάλης ΜΠΑΡΔΑΝΗΣ, Πολιτικός Μηχανικός, ΕΔΑΦΟΣ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ Α.Ε. mbardanis@edafos.gr, lab@edafos.gr
Ταμίας	:	Γιώργος ΝΤΟΥΛΗΣ, Πολιτικός Μηχανικός, ΕΔΑΦΟΜΗΧΑΝΙΚΗ Α.Ε.- ΓΕΩΤΕΧΝΙΚΕΣ ΜΕΛΕΤΕΣ Α.Ε. gdoulis@edafomichaniki.gr
Έφορος	:	Γιώργος ΜΠΕΛΟΚΑΣ, Δρ. Πολιτικός Μηχανικός, Επίκουρος Καθηγητής ΤΕΙ Αθήνας gbelokas@teiath.gr, gbelokas@gmail.com
Μέλη	:	Ανδρέας ΑΝΑΓΝΩΣΤΟΠΟΥΛΟΣ, Δρ. Πολιτικός Μηχανικός, Ομότιμος Καθηγητής ΕΜΠ aanagn@central.ntua.grn
		Βάλια ΞΕΝΑΚΗ, Δρ. Πολιτικός Μηχανικός, ΕΔΑΦΟΜΗΧΑΝΙΚΗ Α.Ε. vxenaki@edafomichaniki.gr
		Μαρίνα ΠΑΝΤΑΖΙΔΟΥ, Δρ. Πολιτικός Μηχανικός, Αναπληρώτρια Καθηγήτρια Ε.Μ.Π. mpanta@central.ntua.gr
Αναπληρωματικό Μέλος	:	Κωνσταντίνος ΙΩΑΝΝΙΔΗΣ, Πολιτικός Μηχανικός, ΕΔΑΦΟΜΗΧΑΝΙΚΗ Α.Ε. kioannidis@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 Τσατσανίφος, 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