

# ISSMGE Bulletin

Volume 13, Issue 1 February 2019

### International Society for Soil Mechanics and Geotechnical Engineering

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www.issmge.org

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## Conference reports

## The 2<sup>nd</sup> JTC1 Workshop on Triggering and Propagation of Rapid Flow-like Landslides, Hong Kong

The Second JTC1 Workshop 2018 on Triggering and Propagation of Rapid Flow-like Landslides was jointly organised by Joint Technical Committee on Natural Slopes and Landslides (JTC1) of the Federation of International Geo-engineering Societies (FedIGS), which is an alliance of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE), the International Society for Rock Mechanics and Rock Engineering (ISRM), the International Association for Engineering Geology (IAEG) and the International Geosynthetics Society (IGS), together with the Hong Kong University of Science and Technology (HKUST), the Hong Kong Geotechnical Society (HKGS), and the Geotechnical Division of the Hong Kong Institution of Engineers (HKIE). The workshop was held from 3 to 5 December 2018 in Hong Kong at the HKUST Jockey Club Institute for Advanced Study (IAS). More than 120 delegates from over 20 countries participated at the workshop and benefited from the exchange of knowledge and experience.

Opening remarks were delivered by Prof. Charles W. W. Ng (President of ISSMGE) Prof. Norikazu Shimizu (Vice-President of ISRM), Prof. Luciano Picarelli (Chairman of JTC1) and Prof. Ken Ho (Chairman of Organising Committee). Afterwards, Prof. Ken Ho delivered certificates of appreciation to the sponsors of the event and formally commenced the workshop.

The 2<sup>nd</sup> JTC1 Workshop on Triggering and Propagation of Rapid Flow-like Landslides, Hong Kong (Con't)



Figure 1. Opening remarks: (a) Prof. Charles W. W. Ng; (b) Prof. Norikazu Shimizu; (c) Prof. Luciano Picarelli and (d) Prof. Ken Ho



Figure 2. Presentation of certificates of appreciation to sponsors
(Sponsors included: VSL Intrafor Hong Kong, Fugro (Hong Kong) Limited, Geotech Engineering
Limited, Mannings (Asia) Consultants Limited, Tai Kam Construction Engineering Company
Limited, Dix Construction & Transportation Limited, Dywidag-Systems International Far East
Limited, Gammon Construction Limited, Bachy Soletanche Group Limited, China GeoEngineering Corporation, ARUP, MTR Corporation)

The 2<sup>nd</sup> JTC1 Workshop on Triggering and Propagation of Rapid Flow-like Landslides, Hong Kong (Con't)

Five themes were selected for the parallel plenary sessions, including landslide analysis and numerical methods; landslide mechanisms, experiments and monitoring; landslide propagation and mitigation; numerical analysis and landslide risk mitigation and experiments; case studies and monitoring.



Figure 3. Hungr Oration delivered by Prof. Scott McDougall



Figure 4. Hutchinson Lecture delivered by Dr Nùria Pinyol

All the presented papers have been compiled and published in electronic proceedings including the Hungr Oration, the Hutchinson Lecture, four Keynote Addresses and eight theme Lectures. Prof. Scott McDougall delivered the Hungr Oration in remembrance of late Prof. Oldrich Hungr, entitled, "A practical approach to landslide science: The legacy of Professor Oldrich Hungr". Dr Nùria Pinyol delivered the 2<sup>nd</sup> Hutchinson Lecture entitled "Physics of Landslides". In addition, the keynote addresses were given by:

- Prof. Alexander Puzrin from ETH Zurich, Switzerland [Effects of sedimentation and shearing on the triggering of flow-like submarine landslides]
- Prof. Manuel Pastor from Universidad Politécnica de Madrid, Spain [Modelling of propagation of fast landslides]
- Mr. John Whittall from BGC Engineering, Canada [Mines: a landslide laboratory]
- Prof. Ken Ho from Geotechnical Engineering Office of Hong Kong SAR Government [Advances in debris flow risk mitigation practice in Hong Kong]









Figure 5. Keynote addresses: (a) Prof. Alexander Puzrin; (b) Prof. Manuel Pastor; (c) Mr. John Whittall; (d) Prof. Ken Ho

The 2<sup>nd</sup> JTC1 Workshop on Triggering and Propagation of Rapid Flow-like Landslides, Hong Kong (Con't)

The theme lectures were delivered by young, emerging talents as follows:

- Dr Jean-Sébastien L'heureux
- Dr Ching Hung
- Dr Clarence Edward Choi
- Prof. Sabatino Cuomo
- Dr Anja Dufresne
- Dr Vidya Bhushan Maji
- Dr Shintaro Nohara
- Dr Dominique Turmel

Parallel plenary sessions were organised on Day 1 and Day 3 of the workshop and all the sessions went smoothly thanks to the excellent work by the moderators, which included Dr Suzanne Lacasse, Prof. Chan-Young Yune, Prof. Dave Chan, Prof. Dave Petley, Prof. Serge Leroueil, Dr Brian McArdell and Dr Farrokh Nadim. Additionally, fruitful discussions were initiated by the moderators in each session.



Figure 6. Group photo of workshop attendees

# The 2<sup>nd</sup> JTC1 Workshop on Triggering and Propagation of Rapid Flow-like Landslides, Hong Kong (Con't)

Day 2 of the Workshop started with a benchmarking exercise on landslide runout analysis. The session featured an overview by the review sub-committee, comprising Prof. Manuel Pastor, Dr Julian Kwan, Prof. Scott McDougall and Prof. Kenichi Soga, followed by presentations from participants of the exercise and lastly a fruitful panel discussion. The afternoon session of Day 2 included technical visits to HKUST centrifuge facility, debris-resisting barriers at Yu Tung Road and the Headquarters of the Geotechnical Engineering Office (GEO).

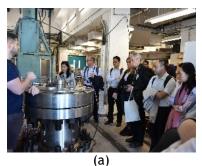






Figure 7. Technical visits: (a) HKUST centrifuge facility; (b) Yu Tung Road barriers; (c) GEO

Breaks during the Workshop and gala dinner provided ample opportunities for the participants to discuss and network.



Figure 8. Coffee break



Figure 9. Gala dinner

Prof. Ken Ho and Prof. Luciano Picarelli delivered closing remarks for the workshop on Day 3. They both stressed the high standards of the presentations delivered at the Workshop. Prof. Ken Ho highlighted Hong Kong's key role in enhancing flow-like landslide hazard mitigation practice and also emphasised the need for further research on prediction tools especially with the threat posed by a changing climate.





Figure 10. Closing remarks: (a) Prof. Ken Ho; (b) Prof. Luciano Picarelli

The 2<sup>nd</sup> JTC1 Workshop on Triggering and Propagation of Rapid Flow-like Landslides, Hong Kong (Con't)

For further details of the Workshop, visit the website: http://www.hkges.org/JTC1\_2nd/index.html

The papers presented at the Workshop can be accessed here:



http://www.hkges.org/JTC1\_2nd/paper.html

## The 10<sup>th</sup> Chilean Conference of Geotechnical Engineering, Valparaíso, Chile

The 10<sup>th</sup> Conference of Geotechnical Engineering, under the auspices of the Chilean Geotechnical Society, has successfully taken place on December 3<sup>rd</sup>-5<sup>th</sup> 2018 at Valparaíso, in the main campus of the Federico Santa María Technical University and organised by the Pontifical Catholic University of Valparaiso. This conference was sponsored by 18 private companies including consulting groups, geotechnical software, geotechnical equipment supplier and civil engineering firms.

This conference is a milestone for the Chilean Geotechnical Society (SOCHIGE) who commemorate 50 years of existence since a group of visionaries formed the Chilean Society of Soil Mechanics and Foundations Engineering, later renamed SOCHIGE.

With more than 260 attendants, the conference covered a wide range of topics include geotechnical site characterization, seismic site response, soil Improvement, foundation engineering, tunnels and underground excavations, numerical and physical modelling in geotechnics, environmental geotechnics and mining geotechnics.

The conference was organised with four parallels sessions with the oral presentation of 81 technical articles. Also present at this event were four international keynotes who presented on a variety of related topics to the Chilean geotechnical community. At the opening ceremony, Prof. Ellen Rathje from The University of Texas at Austin presented the topic: *Insights into Site Response Analysis from Downhole Array Data*. Prof. Efraín Ovando from the National Autonomous University of Mexico also presented the topic: *The earthquakes of September 19<sup>th</sup> 1985 and 2017 and their effect in Mexico City*. Prof. Andy Fourie from the University of Western Australia discussed the consolidation, compressibility and strength behaviour of geotechnical materials at very low effective stress. Mr John Lupo, senior director or geotechnics at Newmont Mining Corporation, closed the conference with the topic: *What can we learn from long-term monitoring of open pit slopes*.



Figure 1. Profs Andy Fourie, Ellen Rathje and Efraín Ovando

In addition, and under the celebration of the 50 years of SOCHIGE, a series of plenary sessions were organised with technical actors of the country including ICOLD Chile, the Chilean Rock Mechanics Society, the International Society of Geosynthetics, and the Ministry of Public Works.

## The 10<sup>th</sup> Chilean Conference of Geotechnical Engineering, Valparaíso, Chile (Con't)

For the golden anniversary of SOCHIGE, a special session was held to discuss the past, present and future of the geotechnical engineering in Chile. Luis Valenzuela, Claudio Foncea, Pedro Ortigosa, Michel Van Sint Jan, and Ramón Verdugo shared their thoughts about the topic in a round table. We believe as the organising committee that for the nearly 90 students who attended the conference, this technical session represents an excellent opportunity for their professional development as geotechnical engineers.

Special plenary sessions were also held where CODELCO, the Ministry of Public Works, Metro Santiago and the Committee of Tunnels and Underground Spaces of Chile presented the challenges in the upcoming years with the construction of new metro lines deep into the Santiago gravel, the Chacao channel bridge, tunnelling in high-stress rock and macro particles in the mining industry.

The use of numerical modelling in geotechnics was discussed in a panel session. The speakers were Alfredo Arenas from Golder Associates, Ramón Verdugo from CGMI and Esteban Saez from the Pontifical Catholic University of Chile who presented their impressions, experiences and challenges when comparing numerical results against physical modelling and laboratory results.

A cocktail reception was held at on Monday, December 3<sup>rd</sup> at the Canon Square of the Federico Santa María Technical University with a lovely view of the Valparaiso bay. A dinner for the active members of SOCHIGE was held on Tuesday, December 4<sup>th</sup> at the Marina del Rey Hotel; downtown Viña del Mar was the assistants share a moment of friendly discussion.

The 11th Chilean conference of Geotechnical Engineering will take place at the University of Talca in 2020.



Figure 2. Daniela Pollak, president of Sochige; John Lupo, Newmont Mining; Matías Silva, president of the organising committee

The 10th Chilean Conference of Geotechnical Engineering, Valparaíso, Chile (Con't)





Figure 4. SOCHIGE board

# XXIX Italian National Conference on Geosynthetics Engineering, Bologna, Italy

The XXIX Italian National Conference on Geosynthetics Engineering was held on 18<sup>th</sup> October 2018 in Bologna, giving excellent results in terms of both number of registered attendees and quality of presented papers. This time, the conference theme was addressed to the presentation of the "A.G.I. recommendations for the use of geosynthetics in soil reinforcement: design of walls and steep slopes". The conference was organised by the Italian Geotechnical Association (AGI) and by the Italian Chapter of the International Geosynthetics Society (AGI-IGS), in partnership with BolognaFiere, under the auspices of the National Engineers Council (CNI), the Association of Bologna's Engineers and the University of Bologna.

The Italian Geotechnical Association (AGI) support the preparation of different geotechnical guidelines to lead the engineers towards a correct design of the geotechnical works according to the National Codes. One of the guidelines that will be published in the next months is the "A.G.I. recommendation for the use of geosynthetics in soil reinforcement: design of walls and steep slopes". For this reason, the last conference theme was addressed to the presentation of them.

The conference took place in the context of the SAIE Exhibition (the international reference point for the world of construction in Italy) and it was divided in two different sessions.

The morning session was coordinated by Daniele Cazzuffi (AGI-IGS President) and, through a series of invited lectures, it was concerned on the basics regarding the geosynthetic-reinforced soil structures, the characterisation of the design parameters and the methodologies of analysis both in static and seismic fields. The first lecture was presented by Nicola Moraci (Mediterranea University of Reggio Calabria, Italy) and the lecture focused on the "Basics and working principles of the design with geosynthetic", taking into account the practices currently used worldwide and the recent developments achieved with regard to construction technologies.

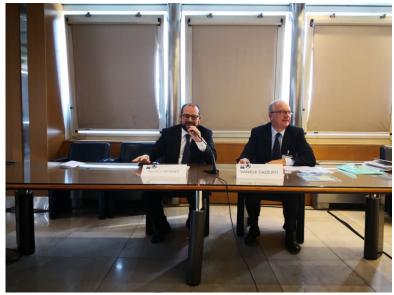


Figure 1. AGI President Nicola Moraci and AGI-IGS President Daniele Cazzuffi during the conference

The second lecture was presented by Giuseppe Cardile (Mediterranea University of Reggio Calabria, Italy) and the lecture focused on the "Materials used for earth reinforced wall construction: characterization for a correct design", in which all the requirements for the evaluation of the design parameters were debated. The third lecture presented by Marilene Pisano (Mediterranea University of Reggio Calabria, Italy) was entitled "Italian design code and current international standards and recommendations". The last lecture of the morning session was presented by Giovanni Biondi (University of Messina) and Paolo Carrubba (University of Padua) on the "Static and seismic analysis methods".

XXIX Italian National Conference on Geosynthetics Engineering, Bologna, Italy (Con't)



Figure 2. Speakers at the XXIX Italian National Conference on Geosynthetics - Bologna 18th Oct 2018

The afternoon session started with the presentation of the AGI-IGS Award for the best thesis on Geosynthetics Engineering discussed in the last two years in an Italian University. The winner was Stefano Anzani (Politecnico Milano) with a Master's Degree thesis on the "Study and development of an innovative adhesive anchored external waterstop for the waterproofing of joints in concrete face rockfill dams".



Figure 3. AGI President Nicola Moraci and AGI-IGS President Daniele Cazzuffi delivering 2018 AGI-IGS Award to Stefano Anzani

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## Conference reports

## XXIX Italian National Conference on Geosynthetics Engineering, Bologna, Italy (Con't)

Nicola Moraci (AGI President) coordinated the afternoon session, in which the invited lectures illustrated the numerical design approaches and examine comprehensively the practical aspects such as realisation, testing and monitoring, passing through a design example that will show the correct application of the new national technical code (NTC2018). Specifically, Claudio di Prisco (Politecnico Milano) presented a lecture on the "Numerical design approaches", Piergiorgio Recalcati (Tenax SpA) and Pietro Rimoldi (Officine Maccaferri SpA) presented a "NTC2018 design practical case and the differences with the previous code", while Maurizio Schiavo (Sogen srl) gave a lecture on "Realization, testing and monitoring of earth-reinforced structures".

At the end of each session, a fruitful and interesting discussion on the different topics took place. The next XXX Italian National Conference on Geosynthetics Engineering will be held in 2020.

Daniele Cazzuffi, AGI-IGS President and IGS Past President Giuseppe Cardile, AGI-IGS Secretary Marilene Pisano, Mediterranea University of Reggio Calabria

### The International Workshop on Granular Matter, Budapest, Hungary

Following an initiative taken by Dr. Emoke Imre of Óbuda University, Budapest, Hungary, an International Workshop on Granular Matter was jointly organised by Óbuda University, Budapest, Hungary, The Hungarian Academy of Sciences (HAS), BME Morpho-dynamics Research Group, Hungary and the School of Engineering and The Built Environment, Napier University, Edinburgh, UK, on 12<sup>th</sup> June 2018. The workshop was supported by a diverse group of scientists, including the 6<sup>th</sup> Section of Engineering Sciences and the Institute for Soil Sciences and Agricultural Chemistry, HAS, Eötvös Loránd Physics Society, Thermodynamics Group, Scientific Soc. of Silicate Industry, the International Society of Soil Mechanics & Geotechnical Engineering (ISSMGE) and the Department of Engineering Geology and Geotechnics, BME, Hungary. The theme of the workshop is on the topics, grading entropy, constitutive modelling including unsaturated soils, discrete element methods (DEM).

The workshop aims to provide an opportunity for the research groups and DEM schools from UK, Spain, Hungary etc. (i) to work together on the planned Theme Issue publications mostly related to grading entropy and constitutive equations of the *Granular Matter Section* of the 14- Joint European Thermodynamics Conference (2017, Budapest, Hungary); and (ii) to discuss some relating topics for the coming ISC6 conference to be held in 2020 in Budapest, Hungary. There were 38 participants coming from five main universities and research institutes in Hungary. The invited speakers were from (i) the Department of Civil and Environmental Engineering, Geotechnical Division, UPC, Barcelona in Spain, (ii) Universities of Swansea and Edinburgh in UK, and (iii) Department of Mechanical Engineering, University of Bratislava, Slovakia.

A brief program of the workshop is given below.

#### Part 1. Unsaturated soil modelling in terms of the grading curve

#### Part 2. Modern constitutive laws

- A nonlinear continuum theory of finite deformations of elastoplastic media
- Large strain plasticity for soils using the Particle Finite Element Method
- · Effect of crushing on critical states of soils
- A non-equilibrium foundation of thermodynamics
- Nonlinear Theories and Dry Friction)

#### Part 3. Grain shape and DEM

- Linking true sphericity and particle rotation to calibrate DEM contact models
- Tracking critical points on evolving curves and surface
- Frustrated packing in a granular system under geometrical confinement
- Breakage properties and DEM modelling of Ballast material
- Analysis of particle movement of open mixing screws
- Calibration algorithm for discrete element models
- Multiple shear bands in granular materials

#### Part 4. Grading Entropy and DEM.

- New aspects of the grading curve characterization
- Mean or fractal gradings, natural soils, internal stability, strong force chains and probability
- Preliminary study on the relationship between various physical properties and the grading entropy parameters
- Breakage grading entropy path A rock classification alternative

# The International Workshop on Granular Matter, Budapest, Hungary (Con't)

Plenary lecturers and presentation topics are:

- M. Arroyo: Effect of crushing on critical state of soils: a DEM-based study
- Barreto, D. McDougall, J. and Imre, E. Volumetric consequences of mass loss in soils A micro-mechanical perspective
- Écsi, L. and Ván, P: A nonlinear continuum theory of finite deformations of elastoplastic media
- Lőrincz, J., Imre, E., Trang, P. Q., Fityus, S., Casini, F., Guida, G., Gálos, M., Kárpáti L., Szendefy, J., and Barreto, D.. Mixture composition change and grading entropy A rock classification alternative?
- Monforte, L., Arroyo, M., Carbonell, J. M., and Gens, A. Large strain plasticity for soils using the Particle Finite Element Method.
- Pande, G. N. Pore size distribution & microstructure of saturation key elements for rational description of mechanical behaviour of unsaturated soils.

#### In the topic of grading entropy and DEM, the main findings were:

- The grading entropy is the sum of mathematically precise and statistical entropy, called entropy coordinates. The first coordinate is a mean log diameter (similar to d<sub>m</sub>) and is related to internal structure and internal stability of soil. The second coordinate is an effective fraction number, similar to the coefficient of uniformity c<sub>u</sub>. Introducing the space of all possible grading curves with a fixed diameter range, the conditional maximum of the second coordinate for each, fixed mean log diameter value uniquely defines a single, mean grading curve with finite fractal distribution, a small part of these may characterize the natural soil.
- The internal stability rule defined in terms of the entropy coordinates is successfully proved by all case studies and is connected to the internal structure by DEM studies and by micro CT imaging. However, the probability of being stable is decreasing to practically zero with increasing fraction number N while the soils in nature are generally internally stable due to degradation.
- The degradation is a spontaneous process. Its entropy path shows a linkage with the entropy principle the grain size distribution becomes fractal. The stability state of the internal structure suddenly increases at the appearance of smaller grains sizes.

Further research is planned on (i) grading curve and model parameter relations; (ii) internal stability and internal structure relations, (iii) the statistical entropy of pore size distribution and DEM micro-variable distributions, using these through the entropy principle to define "final states" and unsaturated soil models.

#### In the topic of constitutive modelling of unsaturated soils, the main findings were:

- New models were proposed to utilize novel constitutive laws (including large strain rates, particle crushing, dynamic effects) to describe the penetration process.
- A new friction constitutive law was suggested including static and sliding friction being thermodynamically consistent.
- A physically sound model was suggested for unsaturated soils based on the grading curves and pore size geometry with less parameter number than the well-known models.

Further research is planned on the suggested models which are planned to be presented in ISC6.

Emoke Imre

#### Hot news

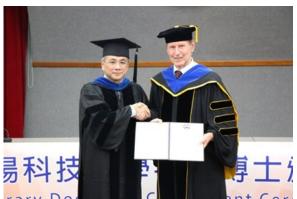
### From Vienna to Taipei - Prof. Heinz Brandl visits at Chinese Taipei Geotechnical Society

Prof. Heinz Brandl was invited by Chinese Taipei Geotechnical Society (CTGS) to visit Taiwan on October 21-26, 2018. ISSMGE Bulletin editorial member, Prof. Der-Wen Chang (Tamkang University, TKU) was hosting the receptions. With the warmest welcome by CTGS members, Prof. Brandl delivered two MOST lectures on Energy Foundation at National Taiwan University and National Chung Hsing University, respectively. Enormous welcomes on Prof. Brandl's 1st visit in Taiwan were honored by TKU with the first Chair Lecture under the name of her Founder. Engineering faculty and students were crowded at the international conference center to listen to the two-hour chair lectures on Cyclic Preloading of In-Situ Piles and Box-Shaped Deep Foundations. When delivering his speech in the prestigious series of Dr. Clement Chang and Carrie Chang lecture, Prof. Brandl felt a great interest of the audience and the idealism of students. According to him, it was very touching, when the students encircled him afterwards for nearly half an hour with special questions, asking for advices and taking photos together with them. Prof. Brandl returned his courtesy to TKU library with the renowned textbook "Erdbaumechanik auf bodenphysikalischer Grundlage" by Karl Terzaghi, first published in 1925. During his trip to Taichung City, he was honored by Chaoyang University of Technology with the honorable doctorate. The visit has established the friendships between Brandl and CTGS colleagues. Further cooperation between Österreichisches Nationalkomitee der ISSMGE and CTGS would be expected in the future.





Figure 1. Visiting photos taken at Tamkang University



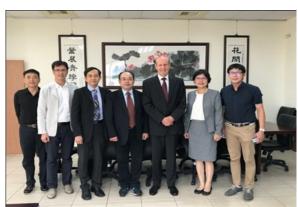


Figure 2. Visiting photos taken at Chaoyang University of Technology

## Hot news (Con't)

From Vienna to Taipei - Prof. Heinz Brandl visits at Chinese Taipei Geotechnical Society (Con't)

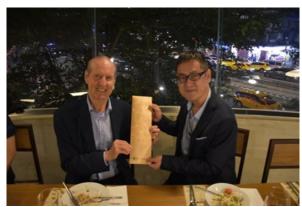




Figure 3. Receptions by CTGS President Prof. KJ Shao and CTGS colleagues





Figure 4. Lecturing photos taken at National Taiwan University

## **ISSMGE Foundation Report**

The conference started with a welcome speech delivered by Prof. N. J. Mattei, and Prof. Khalid El-Zahaby with GlennW. Hewus and Prof. Charles W. W. Ng who explained the objectives of the conference. After the welcoming delegates and participant, the keynote lecture started with R. A. Kemper and G. W. Hewus. The inaugural day spent with the inspiring lectures in the area of pile foundation, earthquake engineering and rock mechanics. It was enlightening and inspiring in the presence of well-known distinguished. After that, for three days, six keynote lectures were delivered in pre-lunch session and post-lunch session parallel oral sessions conducted on the different themes. The parallel session focused on the sustainability issues in geotechnical engineering and civil infrastructures, soil and rock mechanics, ground engineering, geosynthetics engineering, sustainable pavement engineering, expansive and problematic soils, deep foundation, shallow foundation, ground improvement, soil structure interaction, structures and bridge engineering, numerical methods in geotechnical engineering, soil testing and slope stability.

I attended sustainable issues in geotechnical engineering, expansive and problematic soils, sustainable pavement engineering, ground improvement, soil testing and slope stability sessions. The lecture by Prof. Buddhima Indraratna on "Application of Geo-inclusion for sustainable rail infrastructure under Increased axle loads and higher speeds" illustrate detail modelling experiments in the laboratory with successful practical application on felid. Prof. William Powrie explains the importance of fibre reinforcement in rail applications. Prof. Helmunt F. Schweiger's explain about numerical models for the study of geotechnical problems. Prof. Anand J. Puppala talked about the ettringite generation when sulfate soil is going to stabilized with lime and cement and the remedial measures for the problems. Prof. J.P. Giroud explained the canal lining with the help of geomembranes with and without concrete lining. In parallel sessions the topics presented by the different presenter from the different countries were interesting. In the area of stabilisation of expansive soils and sustainable pavement engineering, the researcher presented different solutions with laboratory experimental and their practical use. Microstructural change in soil by using chemical stabilisation got my interest and going to help me in my research work for stabilisation of expansive soils with Corex Slag. The discussion during my presentation in the session of was useful with the participants and as well as with chairpersons Prof. Aminaton Marto and Prof. Suzan Saad. The whole conference was a useful, informative and inspiring experience for me. I am grateful to ISSMGE foundation to give me the financial assistance to attain this prestigious conference.



Figure 1. A glimpse of presentation by a keynote speaker



Figure 2. During my presentation in the conference

Radha J. Gonawala S V National Institute of Technology, Surat, Gujarat, India

## **Event Diary**

#### ISSMGE EVENTS

Please refer to the specific conference website for full details and latest information.

#### 2019

13th Australia New Zealand Conference On Geomechanics 2019

Date: 01-04-2019 - 03-04-2019

Location: Perth Convention and Exhibition Centre, Australia

Language: English

Organiser: Australian Geomechanics Society

Contact person: Conference Managers Arinex Pty Ltd

Address: 3/110 Mounts Bay Road

Phone: +61 8 9486 2000 Fax: +61 8 9486 2000

Website: <a href="http://geomechanics2019.com.au/">http://geomechanics2019.com.au/</a> Email: <a href="mailto:anzgeomechanics2019@arinex.com.au/">anzgeomechanics2019@arinex.com.au/</a>

Geotechnical Challenges In Karst

Location: Hotel Plaža Omiš, Omiš, Croatia

Date: 11-04-2019 - 13-04-2019 Language: Croatian/English

Organiser: Croatian Geotechnical Society

Contact person: Igor Sokolić Address: Nikole Pavića 11 Phone: +385 (0)91 301 2437

Email: igor.sokolic@geotehnicki-studio.hr; omis2019.hgd@grad.hr

Website: http://www.hgd-cgs.hr

Prague Geotechnical Days 2019

Location: Czech Academy of Science, Czech Republic, Prague

Date: 13-05-2019 - 14-05-2019

Language: English

Organiser: Czech and Slovak Society for Soil Mechanics and Geotechnical Engineering, SG Geotechnika,

Charles University - Faculty of Science

Contact person: David Mašín

Address: Charles University, Faculty of Science, Albertov 6

Phone: +420602384793

Email: david.masin@natur.cuni.cz

Website: http://www.issmge.cz/index.htm

Email: jana.frankovska@stuba.sk, david.masin@natur.cuni.cz, Zdenek.Sekyra@geotechnika.cz

#### 4th International Conference "Transportation Soil Engineering in Cold Regions"

Location: St .Petersburg, Russia, Date: 20-05-2019 - 23-05-2019

Language: English

Organiser: Emperor Alexander I Petersburg State Transport University

Contact person: Anastasiia Konon

Address: 9, Moskovsky av, Phone: +7 (921) 795-58-57 Email: geotech@pgups.ru

Website: http://conf-geotech.wixsite.com/transoilcold2019

14th International Conference on Under-Ground Construction Prague 2019

Location: Clarion Congress Hotel Prague, Czech Republic

Date: 03-06-2019 - 05-06-2019

Languages: English & Czech (simultaneous translation provided)

Organiser: Czech Tunnelling Association, ITA-AITES

Contact person: Dr. Markéta Prušková

Address: Dělnická 12 Phone: +420 702 062 610

Email: pruskova@ita-aites.cz; ps2019@guarant.cz

Website: https://www.ucprague.com/

7 ICEGE 2019 - International Conference on Earthquake Geotechnical Engineering

Date: 17-06-2019 - 20-06-2019

Location: Rome, Italy Language: English

Organizer: TC203 and AGI (Italian Geotechnical Society)

Contact person: Susanna Antonielli

Address: AGI - Viale dell' Università 11, 00185, Roma, Italy

Phone: +39 06 4465569 Fax: +39 06 44361035

E-mail: agi@associazionegeotecnica.it

IS-Glasgow 2019 - 7th International Symposium on Deformation Characteristics of Geomaterials

Location: Technology and Innovation Centre (TIC) of the University of Strathclyde, United Kingdom,

Glasgow

Date: 26-06-2019 - 29-06-2019

Language: English Organiser: TC101

Contact person: Katharine Houston, University of Strathclyde

Email: <a href="mailto:geomaterials-symposium2019@strath.ac.uk">geomaterials-symposium2019@strath.ac.uk</a>
Website: <a href="mailto:https://www.is-glasgow2019.org.uk">https://www.is-glasgow2019.org.uk</a>

ISDCG 2019 - 7th International Symposium on Deformation Characteristics of Geomaterials

Date: 26-06-019 - 28-06-2019

Location: Technology and Innovation Centre (TIC) of the University of Strathclyde, Scotland, UK,

Language: English Organizer: TC101 Website: in construction

7<sup>th</sup> Asia-Pacific Conference on Unsaturated Soils

Date: 23-08-2019 - 25-08-2019

Location: Nagoya Congress Center, Nagoya, Japan

Language: English

Organiser: Prof. Feng ZHANG - The Japanese Geotechnical Society. Supported by: TC106 Unsaturated Soils

of ISSMGE

Contact person: Dr. Hiromasa Iwai (Technical Secretary)

Phone: (+81) 052-735-7525 Fax: (+81) 052-735-7525

Email: ap-unsat2019@jiban.or.jp; iwai.hiromasa@nitech.ac.jp

Website: https://www.jiban.or.jp/e/activities/events/20190823-25-seventh-asia-pacific-conference-on-

unsaturated-soils/

ECSMGE 2019 - XVII European Conference on Soil Mechanics and Geotechnical Engineering

Date: 01-09-2019 - 06-09-2019

Location: Harpa Conference Centre Reykjavik, Iceland

Language: English

Organizer: The Icelandic Geotechnical Society Contact person: Haraldur Sigursteinsson

Address: Vegagerdin, Borgartún 7, IS-109, Reykjavik, Iceland

Phone: +354 522 1236 E-mail: has@road.is

Website: http://www.ecsmge-2019.com

3rd International Conference "Challenges in Geotechnical Engineering" CGE-2019

Date: 10-09-2019 - 13-09-2019

Location: University of Zielona Gora (Poland),

Language: English

Organiser: University of Zielona Gora (Poland) and Kyiv National University of Construction and

Architecture (Ukraine)

Contact person: Co-Chairmen of the Organising Committee: Volodymyr Sakharov, Waldemar Szajna

Address: 1, Prof. Zygmunta Szafrana str

Fax: +48 (68) 328 47 23 Email: info@cgeconf.com

Website: <a href="http://www.cgeconf.com">http://www.cgeconf.com</a>

1st Mediterranean Young Geotechnical Engineers Conference

Location: Kefaluka Resort Hotel, Bodrum, Mugla, Turkey

Dates: 23-09-2019 - 24-09-2019

Language: English

Organiser: Turkish Society for ISSMGE - ZMGM

Contact person: Altug Saygili

Address: Mugla Sitki Kocman University, Engineering Faculty, Department of Civil Engineering, Kotelki,

Mugla, Turkey

Phone: +90 252 211 1942 Fax: +90 252 211 1912

Email: <a href="mailto:secretariat@mygec2019.org">secretariat@mygec2019.org</a>
Website: <a href="mailto:http://mygec2019.org">http://mygec2019.org</a>

27th European Young Geotechnical Engineers Conference

Location: Kefaluka Resort Hotel, Bodrum, Mugla, Turkey

Dates: 26-09-2019 - 27-09-2019

Language: English

Organiser: Turkish Society for ISSMGE - ZMGM

Contact person: Altug Saygili

Address: Mugla Sitki Kocman University, Engineering Faculty, Department of Civil Engineering, Kotekli,

Mugla, Turkey

Phone: +90 252 211 1942 Fax: +90 252 211 1912

#### 3rd International Conference on Information Technology in Geo-Engineering (3RD ICITG2019)

Date: 29-09-2019 - 02-10-2019

Location: Cultural Centre of Vila Flor, Guimarães, Portugal

Language: English

Organiser: University of Minho and Portuguese Geotechnical Society under the auspices of JTC2 of FedIGS)

Contact person: 3<sup>rd</sup> ICITG Secretariat

Address: University of Minho/ School of Engineering/ Civil Engineering Department, Campus de Azurem

Phone: (+ 351) 253 510 750 Fax: (+ 351) 253 510 217

Email: 3rd-icitg2019@civil.uminho.pt

Website: http://www.3rd-icitg2019.civil.uminho.pt/

#### XVII African Regional Conference on Soil Mechanics and Geotechnical Engineering

Date: 07-10-2019 - 10-10-2019

Location: Cape Town Convention Centre, South Africa

Language: English Organiser: SAICE

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

#### XVI Asian Regional Conference on Soil Mechanics and Geotechnical Engineering

Date: 21-10-2019 - 25-10-2019 Location: Taipei, China

Contact person: 16<sup>th</sup> ARC Secretariat Phone: 886-2-27988329 ext.35

Fax: 886-2-27986225 (fax) Email: secretariat@16arc.org Website: http://www.16arc.org

#### XVI Panamerican Conference on Soil Mechanics and Geotechnical Engineering

Date: 18-11-2019 - 22-11-2019

Location: Cancun, Quintana Roo, Mexico

Organizer: SMIG

Phone: +(52) 1 55 5677-3730, +(52) 1 55 5679 3676 E-mail: <a href="mailto:support@panamerican2019mexico.com">support@panamerican2019mexico.com</a> Website: <a href="http://panamerican2019mexico.com">http://panamerican2019mexico.com</a>

#### The 4<sup>th</sup> International Conference on Geotechnics for Sustainable Infrastructure Development

Location: National Convention Center (NCC), Hanoi, Vietnam,

Date: 28-11-2019 - 29-11-2019

Language: English

Organiser: Vietnamese Society for Soil Mechanics and Geotechnical Engineering (VSSMGE), FECON

Corporation, Thuyloi University (TLU), and Kokusai Kogyo Co., Ltd (KKC, Japan)

Contact person: NGUYEN Tien Dung

Address: FECON, 15th Floor, CEO Tower, HH2-1 Lot, Me Tri Ha Urban Area, Pham Hung Street, Me Tri

Ward, Nam Tu Liem District Phone: +84 903 440 978

Email: <a href="mailto:secretariat@geotechn.vn">secretariat@geotechn.vn</a> Website: <a href="mailto:https://geotechn.vn/">https://geotechn.vn/</a>

#### 9th Asian Young Geotechnical Engineers Conference

Location: University of Engineering & Technology (UET) Lahore, Pakistan

Date: 05-12-2019 - 07-12-2019

Language: English

Organiser: Pakistan Geotechnical Engineering Society (PGES)

Contact person: Dr. Muhammad Irfan

Address: 54810 G.T. Road Phone: +92 306 66 666 010 Email: 9AYGEC@uet.edu.pk;

Website: http://15icge-9aygec.uet.edu.pk/

## 15<sup>th</sup> International Conference on Geotechnical Engineering, and 9<sup>th</sup> Asian Young Geotechnical Engineers Conference

Location: Lahore, Pakistan, Date: 05-12-2019 - 07-12-2019

Language: English

Organiser: Pakistan Geotechnical Engineering Society (PGES)

Contact person: Dr. Muhammad Irfan (for 15ICGE); Dr. Jahanzaib Israr (for 9AYGEC)

Address: Civil Engineering Department, UET Lahore, Pakistan

Phone: +92 306 66 666 010; +92 334 413 2808 Email: <u>15icge@uet.edu.pk</u>, <u>9aygec@uet.edu.pk</u>

#### 2020

#### 14th Baltic Sea Geotechnical Conference 2020

Date: 25-05-2020 - 27-05-2020

Location: Clarion Hotel Helsinki, Finland

Language: English

Organiser: Finnish Geotechnical Society Contact person: Leena Korkiala-Tanttu Email: <a href="mailto:leena.korkiala-tanttu@aalto.fi">leena.korkiala-tanttu@aalto.fi</a>

Website: http://www.ril.fi/en/events/bsgc-2020.html

Email: ville.raassakka@ril.fi

#### 18th NGM Nordic Geotechnical Meeting

Date: 25-05-2020 - 27-05-2020 Location: Helsinki, Finland Contact person: Ville Raassakka Email: ville.raassakka@ril.fi

Website: http://www.ril.fi/en/events/ngm-2020.html

International Conference on Geotechnical Engineering Education

Location: Greece, Athens Date: 24-06-2020 - 25-06-2020

Language: English Organiser: TC306

Contact person: Marina Pantazidou Email: <u>gee2020athens@gmail.com</u> Website: https://www.gee2020.org

4th European Conference on Unsaturated Soils - Unsaturated Horizons

Location: Instituto Superior Técnico, Lisbon, Portugal,

Address: Av Rovisco Pais, 1 Date: 24-06-2020 - 26-06-2020

Language: English

Organiser: IST, TUDelft and UPC

Contact person: <a href="mailto:info@EUNSAT2020.tecnico.ulisboa.pt">info@EUNSAT2020.tecnico.ulisboa.pt</a> Website: <a href="http://www.EUNSAT2020.tecnico.ulisboa.pt">http://www.EUNSAT2020.tecnico.ulisboa.pt</a>

TC204: Geotechnical Aspects of Underground Construction In Soft Ground - TC204 Cambridge 2020

Date: 29-06-2020 - 01-07-2020

Location: University of Cambridge, United Kingdom

Language: English

Organiser: University of Cambridge Contact person: Dr Mohammed Elshafie

Address: Laing O'Rourke Centre, Department of Engineering, Cambridge University

Phone: +44(0) 1223 332780 Email: me254@cam.ac.uk

6th International Conference on Geotechnical and Geophysical Site Characterization

Date: 07-09-2020 - 11-09-2020

Location: Budapest Congress Center, Hungary , Budapest

Language: English

Organizer: Hungarian Geotechnical Society

Contact person: Tamas Huszak Address: Muegyetem rkp. 3. Phone: 0036303239406 Email: huszak@mail.bme.hu

Website: <a href="http://www.isc6-budapest.com">http://www.isc6-budapest.com</a>

Email: info@isc6-budapest.com

3<sup>rd</sup> International Symposium on Coupled Phenomena in Environmental Geotechnics

Location: Kyoto University, Japan Date: 29-10-2020 - 30-10-2020

Language: English

Organiser: TC215 (Environmental Geotechnics), Japanese Geotechnical Society (JGS), and Kyoto University

Contact person: Takeshi Katsumi Address: Yoshida-honmachi Phone: +81-75-753-9205 Fax: +81-75-753-5116

Email: katsumi.takeshi.6v@kyoto-u.ac.jp

Website: https://cpeg2020.org

Email: cpeg2020@geotech.gee.kyoto-u.ac.jp

#### NON-ISSMGE SPONSORED EVENTS

#### 2019

Intensive Short-Course on "Energy Geostructures: Analysis and Design" - 2nd Edition

Location: Lausanne, Switzerland, Date: 06-03-2019 - 08-03-2019

Language: English

Organizer: Swiss Federal Institute of Technology in Lausanne (EPFL)

Contact person: Formation Continue UNIL-EPFL Address: EPFL Innovation Park Bâtiment E

Email: formcont@unil.ch

Website: http://www.formation-continue-unil-epfl.ch/en/formation/energy-geostructures-analysis-design/

Email: alessandro.rottaloria@epfl.ch

#### International Conference on Advances in Structural and Geotechnical Engineering 2019

Location: Hurghada, Egypt Date: 25-03-2019 - 28-03-2019

Language: English

Organiser: Structural Engineering Department - Tanta University - Egypt

Contact person: Prof. Marawan Shahien

Address: Faculty of Engineering, Tanta University

Phone: +201005117064

Email: marawan.shahin@f-eng.tanta.edu.eg; icasge@unv.tanta.edu.eg

Website: <a href="http://www.icasge.com/">http://www.icasge.com/</a>

#### 2<sup>nd</sup> International Intelligent Construction Technologies Group Conference

Date: 23-04-2019 - 25-04-2019

Location: Beijing Hotel, Beijing, China Language: English and Mandarin

Organiser: International Intelligent Construction Technologies Group (IICTG)

Contact person: George Chang (President of IICTG)

Address: 6111 Balcones drive

Phone: 5124516233

Email: <a href="mailto:gkchang@TheTranstecGroup.com">gkchang@TheTranstecGroup.com</a>

Website: http://www.iictg.org/2019-conference/

#### Western Geotechnical Centrifuge Opening & Symposium 2019

Dates: 02-05-2019 - 03-05-2019

Location: Western University, London, Canada

Language: English

Contact person: Cynthia Quintus

Address: Geotechnical Research Centre, Spencer Engineering Building

Phone: +1-519-661-3344 Fax: +1-519-661-3942

Email: <a href="mailto:cquintus@uwo.ca">cquintus@uwo.ca</a>; tnewson@eng.uwo.ca</a>
Website: <a href="mailto:https://www.eng.uwo.ca/wgc/">https://www.eng.uwo.ca/wgc/</a>

6th International Course on Geotechnical and Structural Monitoring

Dates: 27-05-2019 - 31-05-2019

Location: Casa dell'Aviatore, Rome, Italy

Language: English

Contact person: NHAZCA Srl Address: Via V. Bachelet, 12

Email: info@geotechnicalmonitoring.com

Website: <a href="https://www.geotechnicalmonitoring.eu/">https://www.geotechnicalmonitoring.eu/</a>

2<sup>nd</sup> International Conference on Natural Hazards and Infrastructure

Location: Minoa Palace Resort, Chania, Greece, Chania

Date: 23-06-2019 - 26-06-2019

Language: English

Organiser: The Innovation Center on Natural Hazards and Infrastructure

Contact person: Dr. Rallis Kourkoulis

Address: Efesou 15 Phone: +30 210 6721798 Email: secretary@iconhic.com Website: https://iconhic.com/2019/

EUROCLAY, Paris 2019: Geotechnical characterisation of clayey geomaterials from micro to

macroscale: the role of microstructure and anisotropy

Location: Pierre & Marie Curie University, Sorbonne Universités, Paris, France

Date: 01-07-2019 - 05-07-2019

Language: English

Organiser: French Clay Group (GFA), part of the European Clay Groups Association (ECGA)

Contact person: Prof. Philippe Cosenza Email: <a href="mailto:philippe.cosenza@univ-poitiers.fr">philippe.cosenza@univ-poitiers.fr</a>

Website: <a href="https://euroclay2019.sciencesconf.org">https://euroclay2019.sciencesconf.org</a>

Email: euroclay2019@sciencesconf.org

ISRM - 14th International Congress of Rock Mechanics

Location: Bourbon Cataratas Convention & Spa Resort, Foz do Iguassu, Brazi

Date: 13-09-2019 - 18-09-2019

Language: English

Organiser: ABMS, SAIG, SPG

Contact person: Sergio A. B. da Fontoura

Email: fontoura@puc-rio.br

Website: <a href="http://www.isrm2019.com">http://www.isrm2019.com</a>

12th Asian Regional Congress of IAEG

Location: Booyoung Jeju Hotel & Resort, South Korea, Seogwipo-si

Date: 21-09-2019 - 27-09-2019

Language: English

Organiser: The Korean Society of Engineering Geology and Korea national group of International

Association of Engineering Geology and the Environment (IAEG

Contact person: Jen. Ryu

Address: 4F Officia BD, 92 Saemunan-ro

Phone: +82--3276-2206

Email: secretariat@iaegarc12.org

Website: <a href="http://www.iaegarc12.org/main/main.html">http://www.iaegarc12.org/main/main.html</a>

#### Canadian Geotechnical Society's Annual Conference

Location: St. John's Convention Centre in St. John's, Newfoundland and Labrador, Canada,

Date: 29-09-2019 - 02-10-2019

Organiser: Canadian Geotechnical Society

Contact person: Lisa McJunkin

Email: admin@cgs.ca

Website: <a href="http://www.geostjohns2019.ca">http://www.geostjohns2019.ca</a>
Email: sponsors@geostjohns2019.ca

#### DFI 44th Annual Conference on Deep Foundations

Dates: 15-10-2019 - 18-10-2019

Location: Hilton Chicago, United States Organizer: Deep Foundations Institute Contact person: Theresa Engler Address: 326 Lafayette Avenue

Phone: 19734234030 Fax: 19734234031 Email: tengler@dfi.org Website: http://www.dfi.org

Email: staff@dfi.org

#### ReSyLAB & GEO-EXPO 2019 - Sarajevo, Bosnia and Herzegovina

Location: Sarajevo, Bosnia and Herzegovina

Date: 23-10-2019 - 25-10-2019

Languages: Bosnian, Croatian, Serbian and English

Organiser: Geotechnical Society of Bosnia and Herzegovina

**Contact Information** 

Contact person: Sabrina Salkovic

Address: Univerzitetska 2, Tuzla 75000 Bosna i Hercegovina

Phone: + 387 61 451 701

Email: <u>geotehnika@geotehnika.ba</u>
Website: <u>http://www.geotehnika.ba/</u>

#### 2020

#### DFI Deep Mixing 2020

Dates: 15-06-2020 - 17-06-2020 Location: TBD, Gdansk, Poland Organizer: Deep Foundations Institute Contact person: Theresa Engler

Address: 326 Lafayette Avenue, Hawthorne, NJ 07506, USA

Phone: 19734234030 Fax: 19734234031 Email: tengler@dfi.org Website: http://www.dfi.org

Email: staff@dfi.org

## 16<sup>th</sup> International Conference of the International Association for Computer Methods and Advances in Geomechanics - IACMAG

Location: Politecnico di Torino Conference Centre, Italy,

Date: 29-06-2020 - 03-07-2020 English

Organiser: Politecnico di Torino Contact person: Symposium srl Address: via Gozzano 14 Phone: +390119211467

Email: info@symposium.it; marco.barla@polito.it

#### DFI 45th Annual Conference on Deep Foundations

Dates: 13-10-2020 - 16-10-2020

Location: Gaylord National Resort & Convention Center, Oxon Hill, MD, USA

Organizer: Deep Foundations Institute Contact person: Theresa Engler

Address: 326 Lafayette Avenue, Hawthorne, NJ 07506, USA

Phone: 19734234030 Fax: 19734234031 Email: tengler@dfi.org Website: http://www.dfi.org

Email: staff@dfi.org

### Fifth World Landslide Forum

Dates: 02-11-2020 - 06-11-2020

Location: Kyoto International Conference Center, Kyoto, Japan

Organizer: International Consortium on Landslides

Contact person: Ryosuke Uzuoka

Address: Gokasho Phone: +81-774-38-4090

Email: uzuoka.ryosuke.6z@kyoto-u.ac.jp

Website: <a href="http://wlf5.iplhq.org/">http://wlf5.iplhq.org/</a> Email: <a href="mailto:secretariat@iclhq.org">secretariat@iclhq.org</a>

FOR FURTHER DETAILS, PLEASE REFER TO THE WEBSITE OF THE SPECIFIC CONFERENCE

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NAUE GmbH Co KG Gewerbestrasse 2 32339 Espelkamp-Fiestel GERMANY



Norwegian Geotechnical Institute P.O. Box 3930 Ullevaal Stadion N-0806 OSLO NORWAY



Pagani Geotechnical Equipment Localita Campogrande 26 29010 Calendasco (PC) Italy www.pagani-geotechnical.com



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SRK Consulting Oceanic Plaza, 22<sup>nd</sup> Floor, 1066 West Hastings Street, Vancouver, BC, Canada V6E 3X2



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### **Foundation Donors**

The Foundation of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) was created to provide financial help to geo-engineers throughout the world who wish to further their geo-engineering knowledge and enhance their practice through various activities which they could not otherwise afford. These activities include attending conferences, participating in continuing education events, purchasing geotechnical reference books and manuals.

- Diamond: \$50,000 and above
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http://www.issmge.org/

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**b.** Geo-Institute of ASCE <a href="http://content.geoinstitute.org/">http://content.geoinstitute.org/</a>



c. Japanese Geotechnical Society <a href="http://www.jiban.or.jp/">http://www.jiban.or.jp/</a>

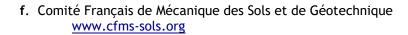


d. The Chinese Institution of Soil Mechanics and Geotechnical Engineering - CCES www.geochina-cces.cn/en



e. Korean Geotechnical Society www.kgshome.or.kr







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d. CalGeo - The California Geotechnical Engineering Association

www.calgeo.org



e. Prof. Ikuo Towhata <u>towhata.ikuo.ikuo@gmail.com</u> <u>http://geotle.t.u-tokyo.ac.jp/</u>



f. Chinese Taipei Geotechnical Society

www.tgs.org.tw

g. Prof. Zuyu Chen http://www.iwhr.com/zswwenglish/index.htm



h. East China Architectural Design and Research Institute *ECADI*<a href="http://www.ecadi.com/en/">http://www.ecadi.com/en/</a>

- TC 211 of ISSMGE for Ground Improvement www.bbri.be/go/tc211
- j. Prof. Askar Zhussupbekov www.enu.kz/en, www.kgs-astana.kz



- k. TC302 of ISSMGE for Forensic Geotechnical Engineering http://www.issmge.org/en/technical-committees/impact-on-society/163-forensic-geotechnical-engineering
- I. Prof. Yoshinori lwasaki <u>yoshi-iw@geor.or.jpwww.geor.or.jp</u>
- m. Mr. Clyde N. Baker, Jr.
- n. Prof. Hideki Ohta



o. Prof. Eun Chul Shin <a href="www.incheo@incheon.ac.kr.n.ac.krecshin">www.incheo@incheon.ac.kr.n.ac.krecshin</a>



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