Editorial

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I am very pleased and honoured to welcome our readers to the first issue of 2018 of *Geotechnical Engineering*. While we wait for the new Chairperson of our Editorial Advisory Panel to officially take charge, I take the opportunity to thank the outgoing honorary Editor, Trevor Orr, for all his hard work and guidance during the past three years, in which the journal has maintained its distinctively practical and applied nature, publishing a selection of high-quality contributions from both academic and industrial authors.

This issue contains seven technical articles, covering a wide range of timely geotechnical engineering topics of practical relevance, from innovative laboratory studies to well-documented case histories and field tests where traditional analysis methods are critically reviewed and assessed. Our journal's international vocation is confirmed in this issue by the wide variety of authors' nationalities (spanning almost all continents) and of geographical locations of interest, as the illustrated case studies range from Brazil to the Jordan desert. I am, therefore, quite confident that you will find this issue interesting.

The first two papers are chiefly experimental, proposing detailed analyses of the effect of different couplings on the mechanical behaviour of soil. Carmona *et al.* (2018) focus on an innovative soil improvement technique for granular materials based on artificially induced calcite precipitation, by mixing the soil with urea, calcium chloride and the urease enzyme. Given the complex (bio-)chemo-mechanical coupled effects brought about by this technique, laboratory experimentation is a fundamental step to understand the effectiveness of the method for practical purposes. Building up on existing studies, the authors consider a new preparation technique where samples are compacted with an energy corresponding to the Proctor test, and evaluate the effect of a wide range of parameters on the process of bio-stabilisation, such as enzyme concentration, curing time and pH. Both strength and stiffness of the stabilised soil were shown to increase with the content of calcium carbonate, demonstrating the effectiveness of this technique. The topic of bio-stabilisation was previously addressed in this journal by Van der Ruyt and van der Zon (2009), with

focus on sandy near-shore areas. In the second paper of this issue, Steiner *et al.* (2018) experimentally investigate the influence of repeated (up to 20) freeze–thaw cycles and different freezing rates on the shear strength of illite clay, determined via unconsolidated undrained triaxial tests. Soil strength is shown to decrease with the first cycle, to then exhibit temporary recovery with subsequent cycles and finally decrease again, approaching an equilibrium value. Such behaviour is associated with changes in the soil structure due to the observed formation of ice lenses of different shapes, also depending on the rate of freezing. This work is particularly timely given the growing popularity of energy geo-structures, especially in the UK and northern Europe. On the topic of energy geotechnics, this journal published a themed issue last year, containing detailed studies about different types of thermo-active structures such as foundation piles (Gawecka *et al.*, 2017; Wang *et al.*, 2017) and diaphragm walls (Di Donna *et al.*, 2017).

The work of Simpson (2018) is directly oriented to geotechnical practice, critically examining two different approaches to calculate long-term heave pressures in fine-grained soils beneath basement slabs. By means of simple but very instructive examples, the author shows that, on the one hand, finite-element modelling provides a correct analysis; although it may be difficult in common practice to determine all needed parameters. On the other hand, a simpler method currently used in the industry, based on elasticity calculations, is shown to provide wrong results. The author points out the need for field monitoring of long-term heave pressures, which could enable the development of an improved empirical approach to design.

Both papers by Wu *et al.* (2018) and Tarawneh *et al.* (2018) present field tests on non-standard ground conditions, assessing the reliability of existing settlement evaluation methods. The former paper describes a full-scale test of geogrid-reinforced and pile-supported railway embankments founded on completely decomposed granite soil, which is commonly found in southern China. Emphasis is placed on load-transfer

mechanisms accounting for soil-arching effects. Results show that the existing methods generally lead to a conservative design; however, comparison between different approaches is recommended to optimise the design. Another case study of instrumented geogrid-reinforced and pile-supported embankment was presented in this journal by Almeida *et al.* (2007); however, in that case the foundation soil consisted of highly compressible organic clay. Tarawneh *et al.* (2018) propose a review of different traditional methods to predict settlements, by elaborating upon data collected by means of shallow foundation load tests on desert sand in Oman. The authors observe that while Menard's method appears reliable, most other methods tend to over-predict settlements.

The last two articles discuss geotechnical engineering case histories in different parts of the world, providing particularly useful guidance to practitioners. In the paper by de Souza Campelo *et al.* (2018), a detailed description is given of a gravity retaining structure project based on gabion walls built in Brazil, in which excessive horizontal displacement occurred during construction. The authors describe how the problem was tackled, evaluating a number of alternatives and finally opting for a wall cross-section increase. This choice was corroborated by carefully installed georeferenced monitoring of displacements. Roohnavaz *et al.* (2018) focus on managing ground risk and infrastructure resilience in remote areas. Referring to the case study of an oil and gas exploration facility project in the eastern Jordan desert, the authors emphasise the importance of understanding the geological history of the site in order to adequately manage the associated ground risks. This is crucial in remote parts of the world characterised by a scarcity of ground engineering and environmental data, especially given the time pressures that are typical of fixed-time concessions. In such contexts, early planned engineering geological studies play a more important role than usual, as they allow more efficient establishment of the ground model and geohazards compared to carrying out intrusive ground investigation campaigns. The authors also discuss how the excavability and suitability of site-won material for reuse were assessed, considering the environmental sustainability, integrity and resilience of the project.

On behalf of the Editorial Panel, I hope that you will enjoy reading this issue and that it will stimulate further discussion.

REFERENCES

- Almeida MSS, Ehrlich M, Spotti AP and Marques MES (2007) Embankment supported on piles with biaxial geogrids. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **160**(4): 185–192, <https://doi.org/10.1680/geng.2007.160.4.185>.
- Carmona JPSF, Venda Oliveira PJ, Lemos LJJ and Pedro AMG (2018) Improvement of a sandy soil by enzymatic calcium carbonate precipitation. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **171**(1): 3–15, <https://doi.org/10.1680/jgeen.16.00138>.
- de Souza Campelo N, Santoro Filho MJG, de Paiva Valdares OC, da Costa Paes MD and Figueiredo Aragao A (2018) Georeferenced monitoring of displacements of gabion walls. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **171**(1): 64–77, <https://doi.org/10.1680/jgeen.16.00198>.
- Di Donna A, Cecinato F, Loveridge F and Barla M (2017) Energy performance of diaphragm walls used as heat exchangers. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **170**(3): 232–245, <https://doi.org/10.1680/jgeen.16.00092>.
- Gawecka KA, Taborda DMG, Potts DM *et al.* (2017) Numerical modelling of thermo-active piles in London Clay. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **170**(3): 201–219, <https://doi.org/10.1680/jgeen.16.00096>.
- Simpson B (2018) Effective heave pressures beneath restrained basement slabs. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **171**(1): 28–36, <https://doi.org/10.1680/jgeen.16.00066>.
- Steiner A, Vardon PJ and Broere W (2018) The influence of freeze–thaw cycles on the shear strength of illite clay. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **171**(1): 16–27, <https://doi.org/10.1680/jgeen.16.00101>.
- Roohnavaz C, McInnes K and Thomas JH (2018) Managing ground risks and infrastructure resilience in remote areas. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **171**(1): 78–92, <https://doi.org/10.1680/jgeen.16.00172>.
- Tarawneh B, Nusairat J and Hakam Y (2018) Load testing and settlement of shallow foundation on desert sands. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **171**(1): 52–63, <https://doi.org/10.1680/jgeen.16.00109>.
- Van der Ruyt M and van der Zon W (2009) Biological in situ reinforcement of sand in near-shore areas. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **162**(1): 81–83, <https://doi.org/10.1680/geng.2009.162.1.81>.
- Wang CL, Liu HL, Kong GQ and Ng CWW (2017) Different types of energy piles with heating-cooling cycles. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **170**(3): 220–231, <https://doi.org/10.1680/jgeen.16.00061>.
- Wu L, Jiang G, Xianfeng L, Xiao H and Sheng D (2018) Performance of geogrid-reinforced pile-supported embankments over decomposed granite soil. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **171**(1): 37–51, <https://doi.org/10.1680/jgeen.17.00009>.