Editorial

Guillermo A. Narsilio PhD, MSc(Math), MSc(CE), CEng
ARC Future Fellow & Associate Professor, Department of Infrastructure
Engineering, The University of Melbourne, Parkville, Australia
(narsilio@unimelb.edu.au)

Once you think that the discipline is mature and professionals in the field know everything there is to know, you are struck by a gamut of novel ideas, new techniques and innovative applications in environmental geotechnics such as the ones included in this issue.

The articles included here cover a range of topics and have been made available Ahead of Print in *Environmental Geotechnics* months ago. We remind the readership to check the Virtual Library to access other fresh content and the latest developments in the field.

There is a saying that “a picture is worth a thousand words”, but a ‘picture’ also contains plenty of useful data waiting to be extracted and used. There now exists several advanced imaging techniques that enable such extraction of meaningful qualitative and quantitative information. Figure 1 is an example of images of the same sample acquired using different tools and techniques, from which data on grain and pore size distributions (Fernlund *et al.*, 2007), pore connectivity, hydraulic and thermal conductivity (e.g., Narsilio *et al.*, 2009, 2010) and even particle breakage mechanisms (Afshar *et al.*, 2017) can be extracted and analysed. The paper by Cherian and Arnepalli (2018) critically analyses the latest developments and feasibility of digital imaging tools and techniques, including x-ray computed tomography (XCT), scanning and transmission electron microscopy (SEM and TEM), light microscopy and digital single-lens reflex (DSLR) cameras, for the micro-morphological characterisation of geomaterials and geosynthetics.

DSLR and XCT imaging techniques were indeed used to investigate the hydraulic performance of geosynthetic clay liners (GCLs)

panels impregnated with bentonite when wrinkles form in seams (Joshi *et al.*, 2018). Further strategies to overcome defective seals, even if wrinkles form, are also recommended in this study.

GCLs are often used in an attempt to reduce the volume of clayey material that is needed to form low permeability barriers. Natural saturated clayey materials are prompted to consolidate, particularly when subjected to additional stresses. However, even though tailing materials are formed by particles of similar size to that of silts and clays, their consolidation characteristics may differ from that of natural soils. To redress this issue, a new compressibility equation can be introduced into numerical modelling to improve predictability of settlement, void ratio and effective stress evolution of tailing materials (Ahmed *et al.*, 2018).

From the above dissipation of excess pore water pressure in clays and in tailings, under saturated conditions, we move to the distribution of pore water pressure in unsaturated materials when the land use changes from grassland to irrigated tree plantations. The effects of changes in soil suction profiles and root systems on slope stability are analysed and thus the agricultural effects of air-soil exchange are (empirically) examined (Bosco *et al.*, 2018).

The last article in this issue deals with thermal energy exchange rather than mass. Energy geotechnics (Arulrajah *et al.*, 2015) and the use of geostructures as heat exchangers (Barla and Perino, 2015) are emerging topics in *Environmental Geotechnics* whose importance has been highlighted repeated times, including special issues in the journal (Barla and Di Donna, 2016; Narsilio *et al.*,

Figure 1. Example of images of the same sample acquired using different techniques (a) XCT, (b) SEM and (c) DSLR. Image used in Cherian C and Arnepalli D (2018), the first article in this issue

2017). In this issue, Hytiris *et al.* (2018) demonstrates the feasibility of a novel heat recovery system applied from tunnel waste water, exemplifying the study on parts of the Glasgow Subway system. The innovative application can potentially address two important issues at once: *i*) to minimise water ingress and pollution into the underground system and *ii*) to optimise ground source heat pump systems for space heating and cooling and provision of domestic hot water.

Geoenvironmental techniques and novel engineering applications continue to develop rapidly, as clearly demonstrated by the papers in this issue, which captures just a snapshot of the diversity and importance of environmental geotechnics within engineering.

REFERENCES

- Afshar T, Disfani M, Narsilio GA and Arulrajah A (2017) Impact of particle shape on breakage of recycled construction and demolition aggregates. *Powder Technology* **308**(February): 1–12, <https://doi.org/10.1016/j.powtec.2016.11.043>.
- Ahmed SI, Siddiqua S and Renner S (2018) Development of a model to predict consolidation of tailings. *Environmental Geotechnics* **5**(5): 271–284, <https://doi.org/10.1680/jenge.15.00013>.
- Arulrajah A, Narsilio G, Kodikara J and Orense R (2015) Key issues in environmental geotechnics: Australia–New Zealand. *Environmental Geotechnics* **2**(6): 326–330, <https://doi.org/10.1680/envgeo.14.00005>.
- Barla M and Di Donna A (2016) Guest Editors of “Themed issue on energy geostructures – 8 articles”. *Environmental Geotechnics* **3**(4), August 2016, pp. 188–290.
- Barla M and Perino A (2015) Energy from geo-structures: a topic of growing interest. *Environmental Geotechnics* **2**(1): 3–7, <https://doi.org/10.1680/envgeo.13.00106>.
- Bosco C, Simeoni L and Dalpiaz M (2018) Agricultural effects on air–soil exchange and slope instability. *Environmental Geotechnics* **5**(5): 285–299, <https://doi.org/10.1680/jenge.15.00057>.
- Cherian C and Arnepalli D (2018) Material characterisation by digital image analysis: a review. *Environmental Geotechnics* **5**(5): 249–262, <https://doi.org/10.1680/jenge.16.00010>.
- Fernlund J, Zimmerman R and Kragic D (2007) Influence of volume/mass on grain-size curves and conversion of image-analysis size to sieve size. *Engineering Geology* **90**(3–4): 124–137, <https://doi.org/10.1016/j.enggeo.2006.12.007>.
- Hytiris N, Ninikas K, Emmanuel R, Aaen B and Younger PL (2018) A heat energy recovery system from tunnel waste water. *Environmental Geotechnics* **5**(5): 300–308, <https://doi.org/10.1680/jenge.15.00087>.
- Joshi P, Rowe RK and Brachman R (2018) GCLs with factory-applied bentonite below geomembrane wrinkle. *Environmental Geotechnics* **5**(5): 263–270, <https://doi.org/10.1680/jenge.16.00027>.
- Narsilio GA, Buzzi O, Fityus S, Yun TS and Smith DW (2009) Upscaling of Navier–Stokes equations in porous media: theoretical, numerical and experimental approach. *Computers and Geotechnics* **36**(7): 1200–1206, <https://doi.org/10.1016/j.compgeo.2009.05.006>.
- Narsilio GA, Kress J and Yun TS (2010) Characterisation of conduction phenomena in soils at the particle-scale: finite element analyses in conjunction with synthetic 3D imaging. *Computers and Geotechnics* **37**(7–8): 828–836, <https://doi.org/10.1016/j.compgeo.2010.07.002>.
- Narsilio G, Sanchez M, Alvarellos J and Guimaraes L (2017) Guest Editors of “Themed issue on the XV Pan-American Conference on Soil Mechanics and Geotechnical Engineering – 8 articles. *Environmental Geotechnics* **4**(2), April 2017, pp. 67–156.