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Editorial

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Editorial

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A very warm welcome to the first issue in 2023 of the *International Journal of Physical Modelling in Geotechnics* (IJPMG)! Before I start to introduce four interesting and high-quality papers, I would like to express my gratitude to ICE Publishing for the honour and opportunity I was given to work as the Editor in Chief of this journal, and to the team of production, coordination and journal editors and fellow members of the editorial board for their strong support to make the journal operate smoothly. I would particularly thank Professor Conleth D. O'Loughlin of the University of Western Australia (UWA), the immediate past Editor in Chief, for his great efforts and contribution during his role leading the board. It is really impressive that the impact and influence of this journal has been steadily on an upward track under Conleth and his predecessors.

As readers will have noticed, this journal has demonstrated uniqueness in focusing on physical modelling among numerous geotechnical journals. The publication has well reflected active research in this field, featuring innovations in modelling technologies and new developments in diversified and broad research fronts in geotechnical engineering from the perspective of physical modelling. It has showcased how powerful physical modelling could be in addressing traditional geotechnical topics and cutting-edge frontiers. In particular, a large amount of research has shown how closely physical modelling is involved and how useful it is in tackling the most pressing problems the planet is facing: clean energy, sustainability, climate change and so on.

This issue is no exception to showcasing the aforementioned features. It contains four papers from well-known institutions which are very active in physical modelling research: University of California, Davis in the USA, Cambridge University in the UK, UWA in Australia and the University of Pretoria in South Africa. The papers cover various topics: innovative measurement technology, new clarification of boundary effects in dynamic centrifuge tests, ageing problems in pile foundations and a new type of pavement. They either adopt new technology to improve the accuracy and reliability of physical modelling, pursue new mechanisms and trends in major geotechnical processes or cast light on a new horizon of application.

Deformation measurement is a fundamental aspect in model tests and is crucial in fulfilling the purpose of the tests. Enormous efforts have been made to improve the accuracy and accessibility, and new methods have been fast-evolved and developed. What Sinha *et al*. (2023) have proposed is an innovative approach to measure vertical displacement of soil in centrifuge model tests with a combination of laser lines and video cameras. Different from other non-contact approaches such as digital image correlation (DIC) or particle image velocimetry (PIV) methods, it projects laser lines on test projects of interest, and the projection can be captured by high-speed cameras during the test so that laser line images can be converted into displacements according to the theory elaborated in the paper. The technique can produce vertical displacement measurement with accuracy of 0.05–0.1 mm even in high-frequency shaking tests to obverse ground liquefaction, and reliability was proven from the detailed comparison between its results and that of linear potentiometers and three-dimensional (3D) stereophotogrammetry. This landmark paper shows that it is a promising technique and a step forwards in non-contact deformation sensing.

In similar efforts to further improve the validity and reliability of dynamic centrifuge tests, the boundary influence effects of an equivalent shear beam (ESB) container on the model of an onshore wind turbine resting on liquefiable soils subjected to strong ground motion have been carefully investigated by Gaudio *et al*. (2023). In their carefully designed approach, model tests were carried out together with a 3D finite-element (FE) analysis to reproduce the exact test condition using an advanced constitutive model. The soil adopted was Hostun HN31 sand, whose properties have been widely investigated, so that reliable parameters could be obtained. The high quality of data produced in both model tests and FE analysis could be validated with each other and the boundary influence was cross-checked. A large numerical model was then established to eliminate boundary influence; thus, boundary effects were further analysed by comparison between these modelling results. While confidence in the ESB container remains after systematic analysis of boundary effects, disturbance caused by the boundary cannot be neglected for some locations specifically pointed out in the paper.

The topic chosen by Huang *et al*. (2023) related to sustainability of infrastructure. Estimating the ageing effects on shaft friction long after reconsolidation during pile installation is complete is crucial in the case of life extension and re-use of driven piles. Tension tests were carried out in three laboratory chambers filled with reconstituted Onsoy clay retrieved from the Norwegian site, and the results showed that enhancement of shaft friction was reproduced. More importantly, the authors proposed a given time factor $T^*(= c_\text{h}t/R_\text{eq}^2 I_\text{r}^{0.5})$ to draw a good comparison between laboratory tests and field tests. This makes possible the estimation of ageing effects of existing piles on site through simplified laboratory model tests.

The last paper in this issue, authored by Smit and Kearsley (2023), further broadens the topics to an innovative pavement type: ultra-thin continuously reinforced concrete pavement (UTCRCP), which has advantages of reduced concrete slab thickness and is thus environmentally friendly compared with conventional concrete pavement. Centrifuge tests were conducted in this paper to obtain conceptual understanding of the response of UTCRCP to traffic loading, in which a centrifuge pavement tester was developed to simulate bi-directional movement of axle load. Detailed analysis of vertical displacements and settlement bowls under cycles of axle load showed that the design assumptions made for neither rigid nor flexible pavements should be used when designing UTCRCP. It is also suggested that unique design assumptions would be required to model the actual behaviour of UTCRCP, and that the non-brittle, flexible nature of the high strength steel fibre reinforced concrete result in unique deflection bowls and stress distributions in the layers of the concrete pavement.

I sincerely hope you will enjoy reading these papers, a production result which would not exist without the combined support from authors and reviewers. I would like to express my appreciation for your continued support of the journal. Finally, as 2023 will hopefully see us come closer to the end of a once-in-a-century pandemic, I wish that it brings you all good health, more happiness and more achievements.

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