Cite this article
Martínez A (2023)
Editorial.
International Journal of Physical Modelling in Geotechnics **23(6)**: 272,
https://doi.org/10.1680/jphmg.2023.23.6.272

Editorial

International Journal of Physical Modelling in Geotechnics

Editorial

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The sixth and final issue of *International Journal of Physical Modelling in Geotechnics* for this year is composed of three papers with the common thread of providing data that can be used to fill in gaps in understanding and to validate numerical models and design equations. Two papers use geotechnical centrifuge testing to model prototype foundation systems subjected to lateral loading, one for subsea pipelines and the second one for structures in areas with seismic hazard. The third paper uses calibration chamber (CC) tests to quantify the possible boundary effects on cone penetration test (CPT) results. In aggregate, these three papers provide valuable insights to our profession and research community.

In the first paper of the issue, Jia *et al*. (2023) present the results of a geotechnical centrifuge investigation on the effect of soil type on the performance of tolerably mobile foundations which are typically used for offshore pipeline infrastructure. Tolerably mobile foundations are designed to slide on the seabed to accommodate the lateral forces resulting from the thermal expansion of pipelines. This study focuses on understanding how the sliding response changes as a function of soil type, applied vertical load and period of consolidation between loading cycles. Four centrifuge tests were performed on lightly over-consolidated calcareous silt, and the results were compared with those of previously performed experiments on kaolin clay. The results show how settlements, composed of shear and consolidation components, increase and how sliding resistance, composed of base friction and berm resistance, develops during sliding cycles and consolidation periods. The mechanisms of resistance mobilisation, generation of shear-induced excess pore pressures, consolidation and berm construction control the behaviour of the foundation. These results can be used to better predict the behaviour of subsea foundations under different loading and consolidation scenarios.

The second paper, by Hayashi *et al*. (2023), studies the non-linear response of a soil–pile system using a scaled reinforced concrete (RC) model pile. Seismic loading and soil liquefaction have led to failure of many piles in the field. However, the mechanisms of damage progression of RC piles during seismic loading, and the resulting structure response, remain unclear. Structural centrifuge tests were performed on piles by failing them under cyclic horizontal loading while a constant axial load was applied. The test results indicate that the model piles successfully reproduce the behaviour of full-scale RC piles in terms of their maximum strength and fracture mode, and when the configuration of the reinforcement is precisely reproduced, the plastic deformation behaviour is also closely reproduced. Additional centrifuge pile load tests with the same applied loading were performed on piles embedded in dry sand. The results indicate that the maximum pile strength can be determined by the smaller value between the flexural failure and shear failure modes. However, the flexural fracture position was inconsistent with Broms' equation, indicating likely shortcomings of this well-established method.

In the last paper of this issue, by Domingos *et al*. (2023), the authors measure the distribution of horizontal stresses on the lateral walls of a CC during all the phases of testing, starting from sample formation and ending in CPT testing. This investigation seeks to fill the gap in the understanding of possible boundary effects in CC tests caused by the lack of measurement of the magnitude and distribution of horizontal stresses. Tactile pressure sensors are used to measure the distribution of horizontal stress during CC experiments where a constant vertical stress was applied to the soil while the horizontal boundary can be considered rigid (i.e., BC3 conditions). Tests were performed on specimens of loose and medium-dense sand. Most notably, the results show increases in the average horizontal stresses as the CPT probe is pushed, with greater increases in the tests on the medium-dense specimen and with greater vertical stresses. These conclusions can be used to validate theories using CC tests with controlled stress conditions.

I hope that you enjoy reading these papers, and learn in the process, as much as I did.

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