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Editorial to the Special Issue on "Deformation Characteristics of Geomaterials: Honorary & Special Lectures"

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Editorial

This Special Issue contains the Honorary and Keynote Lectures on Deformation Characteristics of Geomaterials, originally delivered at the 8th International Symposium on Deformation Characteristics of Geomaterials held in Porto, Portugal, from the 3rd to the 6th of September 2023 (IS-Porto 2023).

The Symposium aimed to disseminate ideas and recent research regarding the complex stress-strain behaviour of geomaterials, comprising laboratory methods from very small to large strains; anisotropy and localization; time-dependent response of soils; characteristics of natural, treated and unsaturated geomaterials; applications in field methods; evaluation of field performance in geotechnical structures; and physical and numerical modelling in geomechanics. The Symposium was a 3-day event organized by the Faculty of Engineering of the University of Porto, under the auspices of TC101, the Technical Committee on Laboratory Stress Strain Strength Testing of Geomaterials of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE). This symposium was endorsed by the Portuguese Geotechnical Society (SPG), the Faculty of Engineering of the University of Porto (FEUP), with the support of the Research Institute of R&D in Structures and Construction (CONSTRUCT) of the Portuguese Foundation for Science and Technology (FCT). Continuing the legacy established by previous symposia, from Sapporo in 1994 to Glasgow in 2019, IS-Porto 2023 convened over 240 researchers and practitioners representing 37 countries. The symposium facilitated the exchange of knowledge and experiences, stimulating discussions on advancements in testing methodologies as well as constitutive and numerical modelling of geomaterials.

This Special Issue brings together eight articles that discuss, highlight, and demonstrate cutting-edge research and advancements on the mechanics of geomaterials from very small strains to beyond failure. Each contribution offers valuable insights into the characterization, modelling, and analysis of geomaterials, spanning a wide range of scales and methodologies, towards advancing our understanding on earthworks and soil-structure interaction and improving geotechnical engineering practices.

The 7th Bishop Lecture, by Matthew Coop, discusses how the mechanics of coarse-grained geomaterials, at the meso- and micro-scales, reveal the intricate behaviour of soil particles, where localized interactions govern macroscopic responses. Romero examines the study of soils across various scales, from micro-experiments to large-scale mock-ups, providing critical insights into the deformation mechanisms and stress-strain behaviour of geomaterials under diverse conditions. Cotecchia et al. present a two-parts research on micro-to-macro investigations of natural and reconstituted clays, which are essential for informing the constitutive modelling, enabling more accurate predictions of their mechanical behaviour. Similarly, Liu et al. explain how the in-situ and laboratory characterization of stiff and dense geomaterials were applied to the design and analysis of driven piles, ensuring effective load transfer and long-term stability. The study of stress, strain, and force transfer in granular materials, from the intragranular to bulk scale, by Hall, is pivotal for understanding the multi-scale interactions that dictate the overall behaviour of geomaterials, thereby enhancing our capacity to predict soil performance in diverse geotechnical scenarios.

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*Guest Editors

Emerging technologies and advanced non-invasive techniques are revolutionizing near-surface site characterization, as demonstrated by Abbas et al., offering new ways to investigate subsurface conditions without disturbing the soil. Beyond Earth, Delage et al. discuss how the exploration of Martian soil at the InSight landing site provides a unique opportunity to apply terrestrial soil mechanics in an extraterrestrial context, expanding the frontiers of planetary geotechnics.

These topics were carefully selected to be thought-provoking, with the aim of broadening the scope of the main focus of TC101, the deformation characteristics of geomaterials, and fostering in-depth discussion and collaboration. By addressing diverse aspects of geomaterial behaviour and innovative methodologies for its characterisation, this collection seeks to inspire new perspectives and stimulate networking among researchers and practitioners.

The editors of this special issue would like to gratefully acknowledge the dedication and effort of all the keynote speakers, and the collaboration of the Soils & Rocks Editorial Team in the successful production of this special issue.