Special Session:

Underground Structures in Liquefiable Ground

Organisers

Prof. Yong Yuan; Tongji University, China (yuany@tongji.edu.cn)

Full professor at Tongji University and the group leader on seismic resilience of underground facilities in the State Key Laboratory of Disaster Reduction in Civil Engineering, China. He also noted for the researches on the theory and practice on the technologies of printcrete and maintenance.

Prof. Roberto Cudmani; TU Munich, Germany (roberto.cudmani@tum.de)

Full Professor and Director of the Chair and Testing Institute of Soil Mechanics and Foundation Engineering, Rock Mechanics and Tunneling at the Technical University of Munich (TUM). Prof. Cudmani's research centers on constitutive modelling and numerical simulation of soils and on creep-induced material degradation. He has also made notable contributions to the dynamic response of soils under seismic loading, soil-structure interaction, and liquefaction analysis, both experimentally and numerically, and has published more than 100 high-level papers and monographs. Prof. Cudmani's research group is equipped with advanced geotechnical and underground engineering laboratory facilities and has strong capabilities in numerical analysis.

Prof. Alessandro Flora; University of Naples Federico II, Italy (flora@unina.it)

Full Professor of Geotechnical Engineering at the University of Naples Federico II, with adjunct appointment at IIT Madras since 2023. He chairs the ISSMGE TC301 (Historic Site Preservation) and represents Italy on ISSMGE TC211 (Ground Improvement). Additionally, he is a member of the executive committee of the International Society of Lifeline and Earthquake Engineering (ISLEE) and serves on the editorial board of the Italian Geotechnical Journal. His research focuses on ground improvement, liquefaction risk mitigation, seismic isolation of structures, and preservation of historic sites. He has authored 3 books and over 150 research publications, receiving Best Thomas Telford Journals paper on Ground Improvement (2020, 2022) and the prestigious 2022 ISSMGE Kerisel Lecture.

Session Description

Liquefaction of soils can result in extensive damage to structures and infrastructures on the ground due to lack of bearing capacity or ground flow. The recent earthquake in Turkey (February 2023) has shown once more how critical these effects can be. The triggering of soil liquefaction has been studied for decays, but mostly focused on surface buildings or foundations. Underground structures such as tunnels or metro stations, as key infrastructures, may cross liquefiable ground inevitably but have been given less attention in the past. Things have started to change, and efforts have been put in the recent past on experiments aimed to have information on the behavior of underground structures in liquefiable soils, mostly through centrifuge tests. However, there is still the need for research and critical interpretation of the testing results, with necessary contributions from computational soil dynamics, geotechnical and structural mechanics, and the mechanics of soil-structure interaction.

This special session aims to put together researchers working on the topic from and experimental, theoretical or computational point of view. Experts and researchers from all over the world are invited to present their results in this pioneering field. Element volume tests, centrifuge tests, and 1-g shaking-table tests should be presented and discussed, considering the effect of soil density, soil system response, loading path, and saturation conditions. The presentation of back analyses of the experimental results is also encouraged, especially with reference to different types of underground structures.