

CEE 595F – Geotechnical Seminar – ONLINE

Friday, November 6, 2020 | 11:00am Central Time on Zoom



Effects of Thermal Perturbations on the Equilibrium of the Subsurface

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Abstract: The shallow subsurface is subjected to continuous thermal perturbations due to anthropogenic activity or nature, whose influences vary and last from seconds to decades. Complex and coupled phenomena are associated with the previous perturbations, such as heat transfers, mass transfers and deformations. These phenomena critically influence the equilibrium of the underground, controlling the feasibility and performance of geoenery explotations, the stability of land masses, and the interconnected conservation and resilience of built and natural environments. For these reasons among others, understanding the effects of thermal perturbations on the equilibrium of the subsurface is paramount for science and engineering. This lecture presents a fundamental investigation of the effects caused by thermal perturbations on the equilibrium (e.g., thermo-hydro-mechanical) of the subsurface, with a focus on geomaterials. In this context, attention is devoted to the effects of thousands of thermal cycles on the changes in the structure, properties and behavior of coarse-grained soils, which may be associated with the operation of shallow geothermal technologies or the action of daily and seasonal temperature fluctuations on soil slopes. Based on the results of this work, discoveries that can improve the design and performance of geoenery technologies and the mitigation or prevention of natural hazards are analyzed, with an outlook of future scientific and engineering opportunities.

Speaker Bio: Dr. Alessandro Rotta Loria is an Assistant Professor at Northwestern University, USA, where he directs the Mechanics and Energy Laboratory within the Department of Civil and Environmental Engineering. Dr. Rotta Loria received his B.Sc. and M.Sc. degrees in Building Engineering from the Politecnico di Torino, Italy, while his Ph.D. degree in Mechanics from the Swiss Federal Institute of Technology in Lausanne, EPFL, Switzerland. His main research interests are at the interface of Geomechanics, Structural Mechanics and Energy, and are centered on the understanding of the multiphysical behavior of materials and structural systems. Dr. Rotta Loria is the co-author of the book entitled “Analysis and Design of Energy Geostructures” with Professor Lyesse Laloui, as well as of more than 20 research articles published in international scientific journals. He is an Editorial Associate of the international journal Geomechanics for Energy and the Environment, as well as the task force leader of the Academia-Industry Partnership for Innovation on Energy Geotechnics for the Technical Committee 308 of the International Society for Soil Mechanics and Geotechnical Engineering. Dr. Rotta Loria is the recipient of the 2019 Zeno Karl Schindler Foundation Award for the excellence of his scientific activities in field of environmental sustainability. In 2020, he has been recognized the Bright Spark Lecture on Energy Geotechnics from the International Society for Soil Mechanics and Geotechnical Engineering.

Please note that this session will **not** be recorded.