

“MULTI-SCALE MODELING OF GEOMATERIALS”

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ABSTRACT

Soils are composed of a wide range of materials with different mineralogies, shapes and sizes. One of the main challenges in understanding the bulk-scale behavior is to characterize soil behavior at smaller scales. It is essential to understand how soil grains interact with each other under working load conditions and how grains crush under high loads. These fundamental behavior modes are essential to understand soil performance under typical foundation loads as well as extreme loads such as blast impacts. One of the key concepts towards understanding soil behavior is to characterize grain compressibility and crushing characteristics. Elastic properties as well as peak strength of a sand grain are essential for understanding bulk-scale soil behavior. This presentation focuses on silica and carbonate sands which are unique and different in their own ways as a result of differences in mineralogy and internal structure. Recent research on nanoindentation testing on silica and carbonate sand grains are presented. Emphasis is placed on the significant differences in elastic grain compressibility. Micro-CT scans of sand grains are provided in the context of their internal structure and resulting differences in grain crushing behavior. The differences of bulk-scale behavior of silica and carbonate sands under one-dimensional loading are also presented.

BIOGRAPHY

Dr. Guney Olgun is an Assistant Professor at Missouri University of Science and Technology. He received his BS and MS degrees on Civil Engineering from Bogazici University in Turkey, and his PhD from Virginia Tech. He has research expertise on the seismic performance of improved ground and reinforced soil structures, computational modeling of soil-structure interaction, cyclic vulnerability of fine-grained soils, and thermo-active geotechnical structures. In particular, he has directed several research projects investigating the thermo-mechanical behavior of energy piles. He has also worked as a consultant on a variety of projects in North America, Europe and Middle East, involving earth dams, seismic hazard analysis, ground improvement, deep foundations and landslide stabilization. Dr. Olgun is a member of the Sustainability Committees of the American Society of Civil Engineering (ASCE) and Deep Foundations Institute (DFI). He is the co-chair of the Energy Foundations technical committee at DFI. He is also a member of the Transportation Research Board (TRB) technical committee on Geo-Environmental and Climatic Impacts on Geomaterials AKG30. He is a founding member of the International Society on Soil Mechanics and Geotechnical Engineering (ISSMGE) technical committee (TC308) on Energy Geotechnics.

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