

The Department of Civil and Environmental Engineering at the University of Houston presents...

The CIVE 6111 Graduate Seminar Series

New trends in modeling granular media: applications to geosciences and planetary exploration



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Classroom Business Building (CBB) Room 108

Abstract

Granular materials are the second most manipulated materials on Earth. This tendency increases dramatically when dealing with extraterrestrial applications. While relatively simple individually, collectively, granular materials exhibit complex mechanical behavior and are known for fluctuating between solid- and fluid-like behavior, depending on the situation (e.g., sand dunes vs. avalanches, inactive vs. active fault gouge). In this talk, we will describe the current trends in modeling the complex behavior of granular materials, both experimentally and computationally. Of particular interest will be the measurement of force chains in opaque, three-dimensional geo-materials and the multiscale simulation of complex granular structures under shear. Connections between these new tools and applications in geosciences and planetary exploration will be drawn. Of particular interest will be applications to rheology, grain fracture (e.g., Comminution in fault gouge), and penetration and characterization of Martian regolith in the context of NASA's upcoming InSight mission.



Figure Credit: Courtesy of NASA

Bio

José E. Andrade is the George W. Housner Professor of Civil and Mechanical Engineering and the Cecil and Sally Drinkward Leadership Chair of the Department of Mechanical and Civil Engineering at Caltech. Andrade joined Caltech after four years at Northwestern University as an assistant professor in Theoretical and Applied Mechanics. Andrade got his PhD in 2006 from Stanford University in the area of geomechanics. His research interests lie in the area of computational mechanics with application to problems at the interface of physics and mechanics to develop predictive analytical and numerical models for granular and porous materials (e.g., soils, rocks, foam, bone, etc.), with especial application to energy exploration and space missions by NASA. Prof. Andrade is the recipient of several honors and awards including the 2006 Zienkiewicz Medal in computational mechanics, the 2010 NSF CAREER Award, the 2010 Young Investigator Award from the U.S. AFOSR, the 2011 Arthur Casagrande Career Development Award from ASCE, the 2011 Rocafuerte Medal for Scientific and Technological Advancements from the Republic of Ecuador, the 2017 Thomas Hughes Young Investigator Award from ASME, and the 2018 Huber Research Award from ASCE. Andrade also serves on the Science Team for the NASA's InSight Mission to Mars in 2018. He is on the editorial board for some of the leading journals in the field. Andrade's work is currently funded by NSF, ARO, and NASA.