The University of Hong Kong
Faculty of Engineering
Department of Civil Engineering
香港大學工程學院土木工程系

THE HONG KONG INSTITUTION OF ENGINEERS
香港工程師學會
Geotechnical Division
岩土分部

The Thirteenth Lumb Lecture

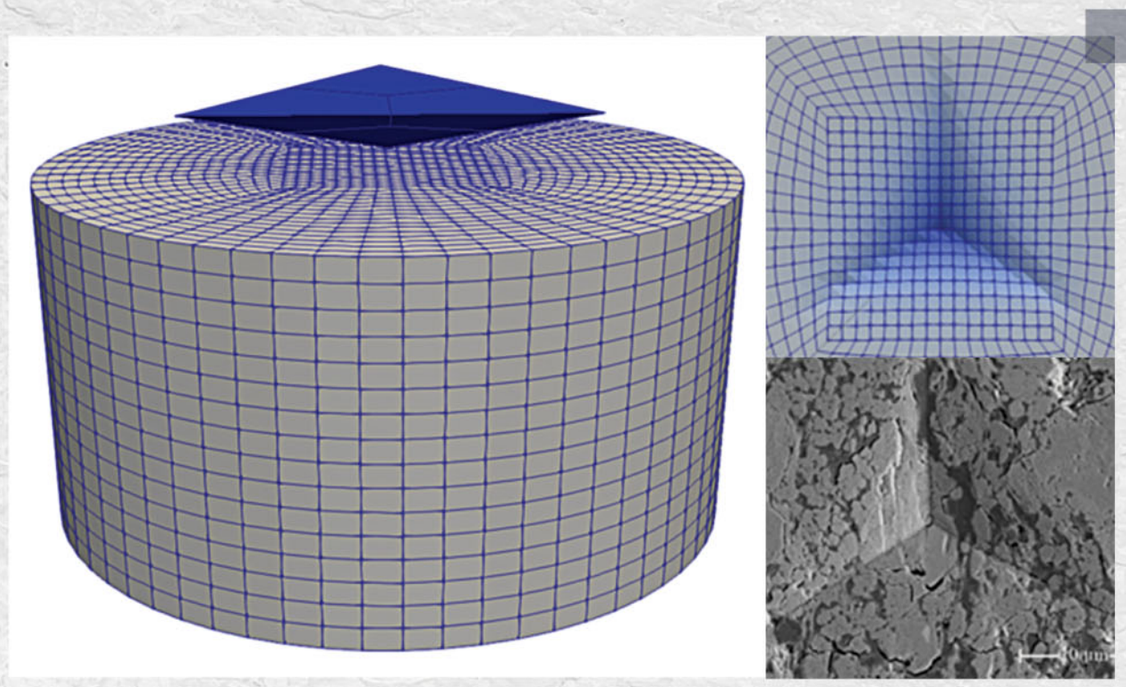
Measurement and modeling of creep deformation in a shale at multiple scales

Presented by
Prof. Ronaldo I. Borja
Stanford University

6:30 p.m.
December 2, 2025 (Tuesday)
Rayson Huang Theatre,
The University of Hong Kong

About the Speaker

Ronaldo I. Borja works in theoretical and computational mechanics with applications to geomechanics, geotechnical engineering, and geosciences. His research includes the development of mathematical and computational frameworks for multiscale and multi-physical processes in geomechanics and geosciences. He is the author of a textbook titled Plasticity Modeling and Computation published by Springer. He serves as editor of two leading journals in his field: Acta Geotechnica published by Springer and the International Journal for Numerical and Analytical Methods in Geomechanics published by Wiley. He is the recipient of the 2016 Maurice A. Biot Medal of the American Society of Civil Engineers, the inaugural recipient of the 2025 Mary F. Wheeler Medal of the US Association for Computational Mechanics, and a winner of the 2025 Yushan Fellow Award from the Ministry of Education in Taiwan.



Abstract

Shale is known to exhibit significant creep across spatiotemporal scales. In this work, we performed indentation and triaxial creep tests on organic-rich Woodford shale and established a correlation between the measured creep responses of this rock at the nanometer and millimeter scales. The link between the two extreme scales is facilitated by an elasto-viscoplastic constitutive model based on critical state theory. Shale is a transversely isotropic material, so we conducted indentation and triaxial creep tests in both bed-normal and bed-parallel directions. Furthermore, nanoindentation tests induce large deformation in the vicinity of the indenter, so we employed a recently developed finite deformation theory based on multiplicative decomposition of the deformation gradient to model finite deformation effects within the framework of the finite element method. The study demonstrates strongly anisotropic creep responses of the rock at both the nanometer and millimeter scales and proposes a methodology for unifying these two creep responses.

Attendance certificates will be available.
For further details, please contact Ms. Jas Lee

FREE ADMISSION – ALL ARE WELCOME

Registration is required

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