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DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
土木及環境工程學系

AMERICAN SOCIETY OF CIVIL ENGINEERS HONG KONG SECTION DISTINGUISHED LECTURE

FACTOR OF SAFETY IN A PARTIALLY SATURATED SLOPE INFERRED FROM HYDRO-MECHANICAL CONTINUUM MODELING

By Prof. Ronaldo I. Borja
Department of Civil and Environmental Engineering
Stanford University

Date:14 June 2016 (Tuesday)
Time: 18:00 - 19:00
Venue: Y302, The Hong Kong Polytechnic University

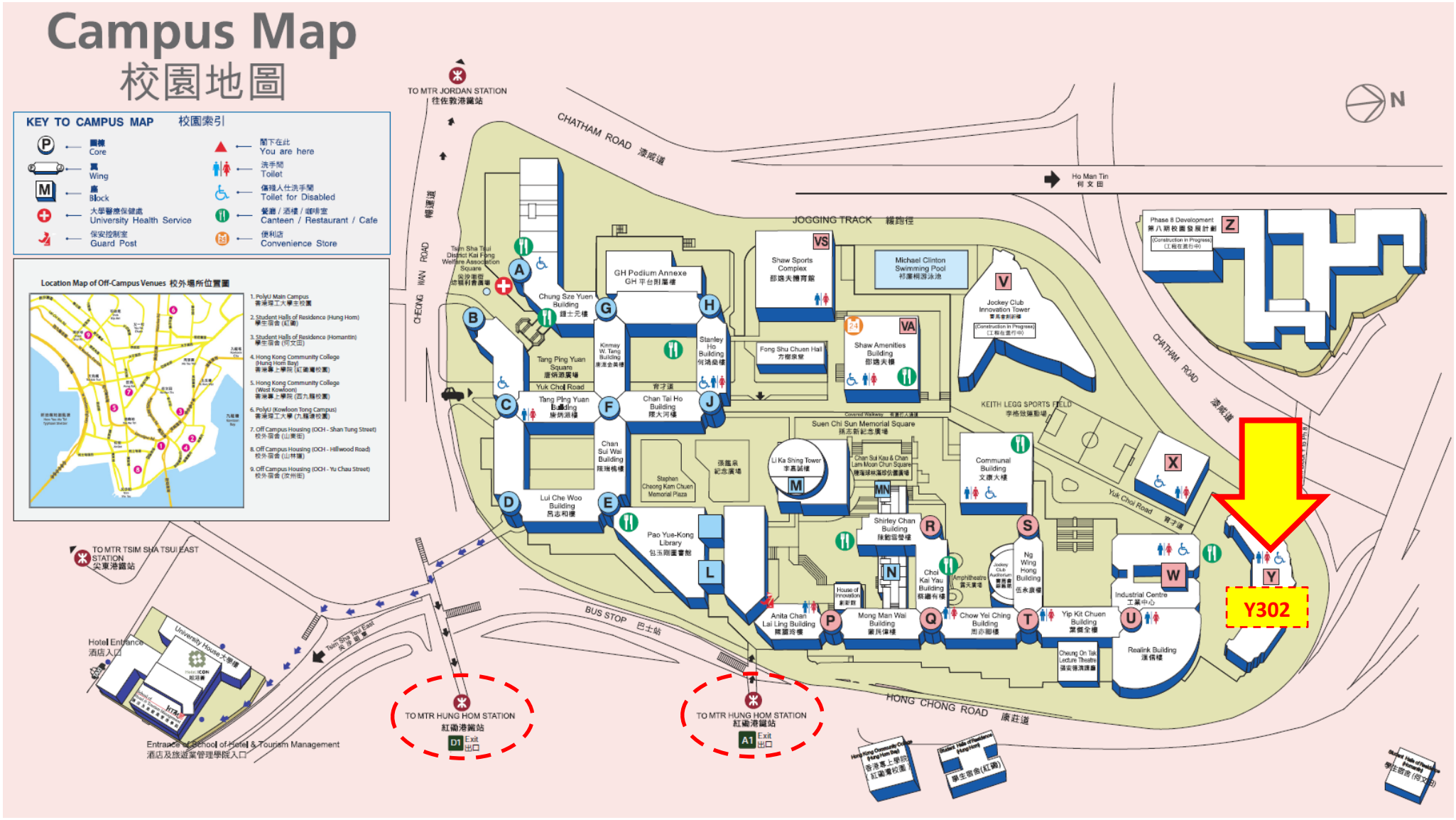
Abstract

Rainfall weakens an earth slope and triggers mass movement. Relevant triggering mechanisms are complex and include reduction of capillary pressure due to increased saturation and frictional drag on the sediment induced by fluid flow. Physics-based continuum models utilizing modern computational tools are useful for understanding the mechanisms of deformation in partially saturated slopes; however, they do not provide a scalar indicator called 'factor of safety' that measures the potential of a given slope for mass movement. In the present work we employ sequential calculations consisting of a physics-based finite element modeling that couples solid deformation with fluid flow to quantify the stress and deformation fields in a steep hillside slope subjected to rainfall infiltration. This is then followed by a limit equilibrium calculation based on the method of slices that evaluates the desired factor of safety. The field condition investigated is similar to the steep experimental catchment CB1 near Coos Bay, Oregon, which failed as a large debris flow from heavy rainfall. This study is important in understanding mechanisms of rainfall-induced failure on shallow slopes such as those that occur routinely in Hong Kong and other parts of the world.

Biography

Prof. Borja works in theoretical and computational solid mechanics, geomechanics, and geosciences. At Stanford University, he teaches an undergraduate course in geotechnical engineering, a graduate course in mechanics and finite element method, and two doctoral level courses in computational plasticity and computational poromechanics. His research includes the development of multi-scale discontinuity framework for crack and fracture propagation utilizing the strong discontinuity and extended finite element methods; solution techniques for multi-physical processes such as coupled solid deformation-fluid diffusion in saturated and unsaturated porous media; stabilized finite element methods for solid/fluid interaction and nonlinear contact mechanics; and nanometer-scale characterization of the inelastic deformation and fracture properties of shales. He is the author of a textbook entitled *Plasticity Modeling and Computation* published by Springer. He serves as editor of two leading journals in his field, the *International Journal for Numerical and Analytical Methods in Geomechanics* published by Wiley, and *ActaGeotechnica* published by Springer. Prof. Borja is the recipient of the 2016 ASCE Maurice A. Biot Medal.

This seminar is free of charge. Online registration http://goo.gl/HGKwPH
For more information, please contact Dr. Songye Zhu: 3400 3964, Email: ceszhu@polyu.edu.hk.
The attendance certificate will be provided upon request.



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