57TH RANKINE LECTURE

Wednesday 15th March 2017 at 5.30pm

The Great Hall, Sherfield Building, Imperial College London, Exhibition Road, SW7 2AZ

(Additional seating in the Clore Lecture Theatre, Huxley Building, Imperial College)

Triggering and Motion of Landslides

Professor Eduardo Alonso

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ABSTRACT

The velocity and motion of landslides, once equilibrium is lost, is necessary information for the estimation of the potential damage. The Lecture will describe concepts and modelling techniques addressing this problem. Firstly, the physical phenomena and deformation mechanisms leading to fast sliding velocities will be explored. The mechanism of thermal pressurization of pore water in the sliding surface will be described and applied to simple but common sliding geometries. Criteria to decide if rapid motion is likely to occur in practice will be given.

At the other extreme of landslide mobility, slow creeping motion is often found in natural and man-made environments. Relevant questions are what will be their evolution in time and what is the risk of sudden acceleration? These questions will be addressed for some sliding mechanisms.

It will be shown that generalisation to arbitrary geometries can be achieved by means of a calculation procedure, the Material Point Method, which was formulated for a three-phase granular medium. This computational tool, in the domain of continuum mechanics, also provides an opportunity to examine the transition from static impending failure to subsequent dynamic motion. The material point formulation has been adapted to incorporate thermal water pressurization in shearing surfaces generated by strain localization. The implications of this phenomenon, which enhances landslide mobility, will be discussed.

The final part of the Lecture describes rainfall-induced landslides in partially saturated soils. Unlike other mechanisms of instability, where shearing strains concentrate in shear bands, unsaturated slopes exhibit mixed diffuse-shearing failure modes. The Lecture closes with a critical examination of the advances described and the prospects for improvements in predicting landslide mobility.

Eduardo Alonso has been Professor of Geotechnical Engineering at the Civil Engineering School of UPC since 1986. He is a past Dean of the School and a past Vice-Rector for research at UPC. His main research interests have focused on the stochastic analysis of soil heterogeneity, unsaturated soil mechanics, rockfill mechanics, dam engineering, coupled thermo-hydro-mechanical analysis and some chemo-mechanical interactions. He has maintained a special interest in landslide phenomena, a subject which involves the disciplines of engineering geology, rock mechanics and soil mechanics.

Recently he has contributed to the development of a computational technique, the Material Point Method, capable of addressing the static and dynamic aspects of landslide instability. He has lectured in many countries and he has also acted as a consultant on a variety of geotechnical engineering projects in several countries. He is member of the Royal Academy of Engineering of Spain and he is the current editor of ICE journal Géotechnique. Past honorary lectures include Coulomb, Buchanan, Sowers, Croce, Heim, Kezdi, Rocha and BGA Touring lectures.

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This event will be broadcast online, details for which will be issued to BGA members by email prior to the meeting

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Advance booking for Lecture not required
Tea & Biscuits available: 5.00 – 5.30 pm

DINNER TICKETS SOLD SEPARATELY
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