

UNIVERSITY OF MACAU
FACULTY OF SCIENCE AND TECHNOLOGY
DEPARTMENT of
CIVIL AND ENVIRONMENTAL ENGINEERING

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**" Strain based slope deformation and stability
analyses - insights from physical and numerical
modeling "**

and

**“DFOS and PIV-based deformation monitoring
of sand foundation model under surcharge
loading ”**

by

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Date: 15/12/2016 (THURSDAY)

Time: 10:00AM – 11:30AM

Venue: E11 – 1035

Abstract

(a) The distributed fiber optic sensing (DFOS) technology enables the measurement of strain distribution in soil slopes, which has gained increasing attention of geotechnical practitioner. In this presentation, the feasibility of strain based slope stability evaluation for slopes under different loading conditions is investigated. The strain measurements of model slopes during surcharge loading and seepage were analyzed. Empirical relationships were established to evaluate the slope stability condition. To verify the above findings, finite element models was built and numerical simulations were conducted. The results show that the strain distribution characteristics are closely related to the propagation of plastic zones and the formation of critical slip surfaces. Compared with conventional displacement-based slope monitoring and stability evaluation method, the strain-based methodology is more efficient and sensitive, which makes full use of the benefits of the DFOS technology.

(b) The DFOS and particle image velocimetry (PIV) techniques are used to investigate the deformation behaviour of plane-strain sand foundation models under surcharge loading. Quasi-distributed fibre Bragg grating (FBG) sensors and fully-distributed Brillouin optical time domain analysis (BOTDA) sensors were embedded in the models to capture the internal deformation, while PIV was used to process digital images taken by a camera placed in the vicinity of the models. The FOS measurements and PIV analyses were combined to reveal the distribution and evolution of deformation of the models under surcharge loading.

Biography

Hong-Hu Zhu is associate professor of engineering geology and geotechnics at Nanjing University, China, and associate director of Suzhou Key Laboratory of Distributed Sensing & Monitoring Technology of Civil Infrastructures. He got the BEng, MSc and PhD degrees from Zhejiang University (2002), Jinan University (2005) and The Hong Kong Polytechnic University (2009), respectively. From 2008 to 2010, he worked as research assistant, research associate, and post-doctoral fellow at The Hong Kong Polytechnic University. He has been a visiting scholar at the Department of Engineering, University of Cambridge, from 2014 to 2015. His areas of expertise include the development and application of smart monitoring systems for geo-structures, field instrumentation and evaluation of slope stability and related geo-hazards, and modelling of time-dependent behaviour of geo-materials. He is the author or co-author of 1 book, 7 patents, and over 100 scientific papers. He serves as the invited reviewer of 22 international journals and the guest editor of 3 journal special issues. He is recipient of

several national awards including Sliver Hammer Prize for Young Scholars in Geoscience and Dezhen Gu Prize for Young Scholars from the China Geology Society.

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