APPLICATION OF CENTRIFUGE MODELING IN GEOTECHNICAL ENGINEERING

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ABSTRACT: This seminar addresses the application of centrifuge modeling techniques in solving geotechnical engineering problems. By comparing the behavior of a soil structure with that of a scaled model, made of the same materials (with same physical and mechanical properties) as its prototype, a principle of similitude may be established by the laws of mechanics, as was done by Philip B. Bucky, professor of Columbia University, in his paper, “Use of Models for the Study of Mining Problems” (Technical Publication 425, American Institute of Mining and Metallurgical Engineers, 1931). The principle states that if in the model the force of gravity on each part can be increased in the same proportion as the linear scale is decreased, then the unit stresses at similar points in the model and prototype will be identical, and the displacement or deflection of any point in the model will represent to scale the displacement of the corresponding point in the prototype. The effect of an increase in gravity may be obtained by substituting a centrifugal force to form the gravitational field, i.e., placing the model in a suitable designed centrifugal machine, or centrifuge. In this seminar, a brief introduction of the centrifuge modeling will be given first, and few typical application case studies by using centrifuge on both static and dynamic problems will be presented.

BIO: Dr. Li received his Ph.D. from Osaka City University, Japan in 1996. He worked as a consulting engineer in geotechnical engineering for 12 years in Japan before joining Columbia University in the end of 2007. His major research interests are in field investigation, experimental soil mechanics and centrifuge modeling. He had wide research experiences in both static and dynamic soil-structure interaction problems including mechanical behavior of underground structures, stability of structure foundations and performance of slope protection works. Recently, he is also doing researches on geo-environmental and earthquake engineering such as ground water level change related geo-environmental problems, rainfall induced ground surface erosion, impact of earthquake to the earth structures and risk evaluation and so on.

Dr. Li is a member of Japanese Geotechnical Society, International Society for Soil Mechanics and Geotechnical Engineering, Japan Society of Civil Engineers, and also a voting member of technical committee D18 on Soil and Rock of ASTM. He is also serving as a regular paper reviewer for the Journal of Geotechnical and Geoenvironmental Engineering (ASCE), the Geotechnical Testing Journal (ASTM), Soils and Foundations (JGS) and major international conferences.