CIVIL RESEARCH GROUP SEMINAR

Friday 11 March 2016, 12.00 pm
Room LIB1

A micromechanical investigation of the incremental behavior of crushable granular soils

Dr Matteo O. Ciantia

Department of Civil and Environmental Engineering, Imperial College of London, UK

ABSTRACT

The mechanical behavior of crushable granular materials is characterized by strong non-linearity and irreversibility. When defining a constitutive model, experimental data on the nature of the incremental response of the material is desirable. However obtaining the necessary stress-strain measurements is non-trivial and it can be difficult to reproduce a set of identical samples to use for a stress probing campaign and so numerical tests using the discrete element method (DEM) can be very useful. In this work, the incremental behavior of crushable granular soils is investigated using DEM by simulating three dimensional stress probing experiments on a random assembly of spheres. The incremental behavior of the numerical models is studied by performing a series of axisymmetric and deviatoric stress probes. Particle breakage is permitted and the initial high stress condition is such that crushing will occur along some of the loading directions. The results obtained show that particle crushing induces a change in the direction of the plastic flow and that this direction is independent of the loading path. The incremental behavior is also investigated from a micromechanical perspective. In particular the micro investigations highlight how macroscopic plastic strains induced by the particle breakage are related to changes in the mechanical coordination number and internal force redistributions.

ABOUT THE SPEAKER

Dr. Matteo O. Ciantia is a Junior Research Fellow in the Geotechnics Section of the Department of Civil and Environmental Engineering at Imperial College since October 2015. He completed his PhD at the Politecnico di Milano in Spring 2013. From Feb 2013 until Sept 2015 he was a Post-doctoral Fellow at the Universitat Politècnica de Catalunya (UPC), Barcelona. His background is in laboratory testing, strain hardening plasticity framed constitutive modeling and the finite element method (FEM). Currently the main focus of his research is to apply the discrete element method (DEM) to boundary value problems relevant to civil engineering by using high performance computing. He has co-authored a dozen of papers in international Journal. His biographical details are available at http://www.imperial.ac.uk/people/m.ciantia.

This seminar is open to all and refreshments are provided. For more information, contact Dr Stefano Utili by email at s.utili@warwick.ac.uk

THE UNIVERSITY OF WARWICK
SCHOOL OF ENGINEERING