Civil Engineering Research Group

Invitation to Seminar

- ## Solute mixing in the hyporheic region

In this work, solute mixing in a porous medium in the presence of turbulent flow conditions is investigated. The setup is representative of mixing processes taking place within the hyporheic zone and considers transport of dissolved chemicals close to the interface between a free fluid system and a porous medium. Turbulence is assumed at the boundary between the free fluid and the porous column in order to simulate the effect of the river flow. The study is based on the use of an appropriate fit-to-purpose Lagrangian mixing model, which enables the prediction of temporal evolution of chemical concentration in the hyporheic zone, as driven by mixing. The theoretical and numerical results are benchmarked against recently published experimental results, quantifying the vertical variation of the effective dispersion coefficient with depth below the sediment-water interface. The available data display an exponential decrease of the dispersion coefficient with depth. The study is keyed at providing a proof-of-concept by assessing the ability of the modelling strategy to reproduce solute breakthrough curves observed at various depths as well as the documented variation of the diffusion coefficient.

Elisa Baioni PhD student, Civil Engineering, University of Warwick and Politecnico di Milano

Elisa obtained the first class BSc and MSc in Civil Engineering from Politecnico delle Marche, Italy. Currently, she is pursuing her double PhD degree between the University of Warwick and Politecnico di Milano (Italy), start 2017, investigating solute diffusion and mixing in the hyporheic zone. She is supervised by Dr Mohad Mousavi Nezhad.

- ## A micromechanical-based constitutive model for fibrous fine-grained composite soils

Composite soils such as municipal solid wastes (MSWs), peats, and reinforced soils are generally composed of multiple phases with different properties. Numerical modelling of these soils, which considers the individual constituents, might be impractical, as it requires great computational efforts. Hence, geotechnical practitioners may prefer to treat a representative material, which accounts for the whole mechanical aspects of the composite soil. In this work, a constitutive model has been developed which treats the fine-grained composite soils in two general phases: matrix (paste) and fibre. In order to consider the composite soil as a single phase homogeneous material, a volumetric homogenization procedure is used based on the micromechanical theories. Based on the hypotheses derived from the experimental observations, the basic model is gradually enhanced in order to account for some important aspects of composite matters including fibres orientation, fibres discontinuity, and slippage-mobilization of fibres within the matrix phase.

Hesamoddin Dejaloud PhD student, Civil Engineering, University of Warwick

Hesamoddin Dejaloud is a PhD candidate at University of Warwick, Start 2019. He completed his first class Master degree of Earthquake Engineering in International Institute of Earthquake Engineering and Seismology in Iran. His PhD is on modelling the responses of natural soils considering their intrinsic behavioural features, and is supervised by Dr Mohammad Rezania.

Wednesday 12 February 2020, 2.00pm-2.50pm

LIB1 Library Building

The seminar is open to all.
For more information, contact Dr Rezania (m.rezania@warwick.ac.uk).