



INVITED SESSION

Upscaling of Particle Systems

ORGANIZERS

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ABSTRACT

A major challenge in simulating particulate materials is dealing with the multi-scale nature of particle systems: the behaviour of a large-scale process ultimately depends on how individual particles interact with one another. At present, simulation methods struggle to meet this challenge. Particle-scale modelling techniques provide a wealth of useful information, but for relatively small numbers of particles, so cannot be used to simulate large-scale processes in a robust way. Modelling techniques which can be applied at large scale lack the crucial physics originating from interparticle interactions. We therefore need robust upscaling approaches able to transfer information across widely varying length scales.

This session will enable a discussion of the latest advances in upscaling methods and identify gaps in the state-of-the-art. Examples of upscaling methods of interest include, but are not limited to: upscaling from Discrete-element Method (DEM) simulations through coupling with Population balance models (PBM); discrete-to-continuum (D2C) transition for particle-based, multi-scale continuum constitutive models; and lumping groups of physical particles into larger meso-particles in DEM simulations.

The session is aligned with the EU-funded Innovative Training Network “Training in Upscaling particle Systems: Advancing Industry across Length-scales (TUSAIL)”, <https://tusail.eu/>.