Coupled CFD-MPM simulation of soil-fluid interaction in geotechnics

Quoc-Anh Tran*, Gustav Grimstad* and Seyed Ali Ghoreishian Amiri*

* Department of Civil and Environmental Engineering,
Norwegian University of Science and Technology (NTNU), Trondheim, Norway

Email: quoc.a.tran@ntnu.no

ABSTRACT

Material Point Method (MPM) canbe used to simulate large deformations in geotechnicssuch as debris flows or landslides[1]. However, simulating the submarine debris flows using MPM is quite challenging as it involvescomplex interactionsbetween debris flow (soil) and seawater (fluid)such as turbulence or hydroplaning mechanisms.This paper presents a coupled Computational Fluid Dynamics and MPM (CFD-MPM)approach[2] to simulate the behaviour of soil-fluid interaction for applications in geotechnical engineering. MPM is employed to model the porous media system, while the CFD is usedto simulate the fluid flow by solving the Navier–Stokes equations. The soil-fluid interaction is considered by drag forces and buoyancy forcesin the multi-phase governing equations. We implemented the formulations in the Uintah computational framework. Numerical simulations are performed and compared with the experiment to highlight the capability of the coupled CFD-MPM model.

REFERENCES

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