Two-way coupling between a Finite-Volume Solver with pressure-dependent rheology and a Lagrangian Particle Simulation for debris flow modelling– Coupled Problems 2017

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ABSTRACT

The open-source, OpenFOAM-based finite-volume debris flow model *debrisInterMixing*[1] treats gravel as a Coulomb-viscoplastic fluid, accounting for pressure-dependent rheology but neglecting grain-to-grain collisions and the coupling between the coarser gravel grains and the interstitial fluid. An extension of that solver is presented that accounts for the grain collisions with a Lagrangian Particle Simulation, which introduces granular flow behavior to the finite volume simulation of the continuous phases. The two-way coupling exchanges momentum between the phase-averaged flow in a finite volume cell and all individual particles contained in that cell using drag models. The coupling is implemented in analogy to the OpenFOAM solver DPMfoam, with a semi-implicit treatment of the drag with an implicit part included in the momentum equation and an explicit part in the pressure equation of the so-called PISO-loop, resulting in a stable coupling.

REFERENCES

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