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Large Eddy Simulation of Particle Clouds Using Open-Source CFD

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Abstract : Open-source CFD has become increasingly popular and promising. The recent progress in multiphase flow enables new CFD applications, which provides an economic and flexible research tool for complex flow problems. Our numerical study using four-way coupling Euler-Lagrangian Large-Eddy Simulations to resolve particle cloud dynamics with OpenFOAM and CFDEM will be introduced: The fractioned Navier-Stokes equations are numerically solved for fluid phase motion, solid phase motion is addressed by Lagrangian tracking for every single particle, and total momentum is conserved by fluid-solid inter-phase coupling. The grid convergence test was performed, which proves the current resolution of the mesh is appropriate. Then, we validated the code by comparing numerical results with experiments in terms of particle cloud settlement and growth. A good comparison was obtained showing reliability of the present numerical schemes. The time and height at phase separations were defined and analyzed for a variety of initial release conditions. Empirical formulas were drawn to fit the results.

Keywords : four-way coupling, dredging, land reclamation, multiphase flows, oil spill
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