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Simulations of lock-exchange density currents over an erodible bed by means of level set method.

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Particle-laden turbidity currents driven by gravity are the main agent of erosion and sedimentation processes on land, lakes, sea, and oceans. Such flows cause the resuspension of particles and can trigger rapid deformations on the bed of the reservoirs, causing important environmental issues such as reservoir sedimentation, pollutant dispersion, among other phenomena. The impact of such natural events arise the need of stronger efforts in the understanding of the basic principles and their simulation. A 3D Numerical model of a lock exchange turbidity current in a flume channel flowing over an erodible bed is under development in order to reproduce the evolution of the current and the density distribution of the particles in the channel, and to investigate the topographical changes of the bed. The unsteady Navier-Stokes solver, LES-COAST, is used to solve the governing equations and represent the particles concentration distribution in the flow considering an Euler-Euler single phase approach for the suspended particles. A level set method for arbitrary evolving surfaces is implemented in order to simulate the evolution of the current and the deformation of the erodible bed. The outcomes of the early trials performed and the steps towards the reduction of the computational cost of the simulations are presented. The expected improvements induced by the use of a wall model along with the LES simulations assuming an equilibrium-stress approach, are also discussed.

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