Abstract for an Invited Paper
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Computational Investigations of Gravity and Turbidity Currents[1]

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We will present an overview of high-resolution, Navier-Stokes based simulations of gravity and turbidity currents. The turbidity currents we consider are driven by particles that have negligible inertia and are much smaller than the smallest length scales of the buoyancy-induced fluid motion. For their mathematical description an Eulerian approach is employed, with a transport equation for the particle-number density. The governing equations are integrated numerically with high-order, compact finite difference techniques for rectangular geometries, and with second order finite difference methods for complex geometries. Arbitrary seafloor topographies are implemented via an immersed boundary method. We will discuss differences between two- and three-dimensional turbidity current dynamics in the lock-exchange configuration, and we will introduce some effects due to complex topography. Results will be shown regarding non-Boussinesq effects, and the unsteady interaction of a gravity current with a submarine structure, such as a pipeline. Furthermore, we will briefly discuss the linear stability problem of channel and sediment wave formation by turbidity currents.

[1]In collaboration with M. Nasr, University of California, Santa Barbara.