Computational Investigations of Turbidity Currents in Complex Topographies

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We consider turbidity currents interacting with complex seafloor topographies, such as mini-basins, ridges, and curved or meandering channels. Both two- and three-dimensional Navier-Stokes simulations are employed in order to investigate the dynamics of the currents, along with their erosional and depositional behavior for a range of flow parameters and topographical shapes.

For mini-basin topographies, we observe that coherent vortical structures generated by topographical effects can result in the formation of strong local variations in the sediment deposit. Reflections of the current, as well as the formation of internal bores, are seen to be influential as well. Results from a parametrical study are discussed, based on two- and three dimensional simulations of depositing currents, in order to quantify the effects of the geometrical parameters and grain-size on the sediment deposit fields.

For continuous inflow turbidity currents propagating through bends and meandering channels, the amount of over-spill is investigated as a function of the governing geometrical and flow parameters. Particular emphasis is placed on the influence of the secondary flow induced by the channel curvature.