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PROPERTIES OF LONG-RUNNING SUBMERGED TURBIDITY CURRENTS

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Abstract. Turbidity currents (TCs) are sediment-laden flows that travel along sloping surfaces, typically the submarine bottom. They are driven by the density difference between the current and the deep layer of quiescent ambient fluid above them. The interaction of the current with the bottom may result in the generation of sedimentary features on the seafloor called bedforms, and the interaction with the ambient fluid causes sediment-free fluid entrainment into the current. In this work we focus our attention on both phenomena using a combination of highly resolved direct numerical simulations (approx. 113 million grid points) and large eddy simulations (approx. 20 million grid points) of spatially evolving TCs in a long domain, of length equal to 150 times the inlet height. The flow is simulated using the spectral element method, with the open-source computational fluid dynamics solver Nek5000. We assess the effect of bed slope, settling velocity of the sediment (i.e., sediment size) and bottom boundary conditions for both sub and super-critical regimes. For bedform formation, we solve the Exner equation at the bottom and update the mesh coordinates employing the moving mesh capabilities of the code, resulting in a realistic back-coupling with the flow.