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Laboratory and Numerical Modelling of Exchange Flows

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In this paper the hydrodynamics of exchange flows is investigated with focusing on the role of non-hydrostatic effects, friction and entrainment in the long straits. The simulation of the exchange flows in a long and narrow straits with a sill and with contraction for the configuration of experiments of Maderich (1998, 2000) were performed with three-dimensional, non-hydrostatic, numerical model of free surface stratified flows (Kanarska Y., Maderich V, 2003). The model is a non-hydrostatic extension of the free-surface primitive equation POM model. Calculations and analysis based on a three-layer decomposition with an intermediate layer of variable density showed the importance of entrainment and friction for hydrodynamics of the long straits. As a result the composite Froude number is significantly lower in comparison to predictions of two-layer hydraulic theory according to the concept of the maximal exchange.

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