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Circulation-based modeling of gravity currents propagating into ambients with arbitrary shear and density stratification MOHAMAD NASR-AZADANI, ECKART MEIBURG, University of California, Santa Barbara — We develop a vorticity-based approach for modeling quasisteady gravity currents propagating into arbitrary density and velocity stratification. The model enforces the conservation of mass, horizontal and vertical momentum, and in contrast to previous approaches it does not rely on empirical, energy-based closure assumptions. Instead, the effective energy loss of the flow can be calculated *a posteriori*. The present model results in the formulation of a second order, nonlinear ODE that can be solved in a straightforward fashion to determine the gravity current velocity, along with the downstream ambient velocity and density profiles. Comparisons between model predictions and DNS simulations show excellent agreement. They furthermore indicate that for high Reynolds numbers the gravity current height adjusts itself so as to maximize the loss of energy.

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