Abstract Submitted
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Intrusive gravity currents in linearly stratified ambients[1] AMIN KHODKAR, Postdoctoral Research Associate at Rice University, KHAOULA EL ALLAM, Master's student at Graduate School of Engineering of ENSEIRB-MATMECA, ECKART MEIBURG, Distinguished Professor at University of California, Santa Barbara — We extend the vorticity-based modeling approach for stratified flows to intrusions advancing into linear stratifications. Consistent with previous experimental and numerical observations, the vorticity model confirms the formation of equilibrium intrusions when the intrusion density equals the mean density of the ambient fluid, and non-equilibrium intrusions with upstream propagating internal gravity waves when this condition does not hold. We show that the two limits of bottom- and top-propagating gravity currents are non-smooth, so that the current model degenerates under these conditions. Predictions by the model agree closely with two-dimensional DNS simulations and earlier experimental results, specifically with regard to the propagation speed of near-equilibrium intrusions. In addition, the present vorticity model is able to capture the dynamics of internal gravity waves. Since the vorticity approach does not require any empirical energy-related assumptions, the energetics of the flow can be assessed *a posteriori*.

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