Abstract Submitted
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Intrusive gravity currents interacting with obstacles in a continuously stratified environment[1] JIAN ZHOU, SUBHAS VENAYAGAMOORTHY, Colorado State Univ — The flow dynamics of intrusive gravity currents past a surface-mounted obstacle was investigated using large eddy simulations. The propagation dynamics of a classical intrusive gravity current in the absence of an obstacle was first simulated to validate the numerical simulations. The numerical results showed good agreement with experimental measurements. An obstacle with a dimensionless height of $\tilde{D} = D/H$ (H the total fluid depth) was then introduced and acted as a controlling factor of the downstream flow pattern. It is found that for short obstacles, the intrusion re-established itself downstream in a form similar to the classical intrusion (in the absence of an obstacle). However, for tall obstacles, the downstream flow was found to be a joint effect of horizontal advection, overshoot-springback phenomenon, and the Kelvin-Helmholtz instability. Three regimes of downstream obstacle-affected propagation speed were identified depending on values of $\tilde{D}$, i.e. a retarding regime ($\tilde{D} \approx 0 \sim 0.3$), an impounding regime ($\tilde{D} \approx 0.3 \sim 0.6$), and a choking regime ($\tilde{D} \approx 0.6 \sim 1.0$).

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