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Modified thermal theory for gravity currents on sloping boundaries ALBERT DAI, Tamkang University — In this study we generalize the thermal theory adopted in Beghin, Hopfinger, and Britter (J. Fluid Mech. Vol. 107, 1981, p. 407) in order to account for both entrainment and detrainment effects occurring in the motion of gravity currents. We observe that although the model of Beghin et al. (1981) qualitatively captures the acceleration and deceleration phases of gravity current motion, their pure entrainment model consistently underpredicts the gravity current velocity and the distance before the maximum velocity is reached. Their model, therefore, could easily overestimate the arrival time of a gravity current generated by an instantaneous buoyancy release. We find that the effect of detrainment is to increase the predicted velocity of gravity current and extend the predicted distance before the maximum velocity is reached. The effect of detrainment is not immediately obvious, but it explains the differences between the experimental data and the model of Beghin et al. (1981). The idea presented here will lead to more investigations of gravity currents on sloping boundaries.

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