Abstract Submitted
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Gravity currents down a slope in the acceleration phase[1] YU-LIN HUANG, ALBERT DAI, National Taiwan University — Gravity currents generated from an instantaneous buoyancy source propagating down a slope in the range of $0^\circ \leq \theta < 90^\circ$ have been investigated. Front velocity history shows that, after the heavy fluid is released from rest, the flow goes through the acceleration phase, reaching a maximum front velocity $U_{f,max}$, and followed by the deceleration phase. The existence of a maximum of $U_{f,max}$ is found near $\theta = 40^\circ$, which is supported by the theory. It is identified that the time of acceleration decreases as the slope angle increases, when the slope angle is approximately greater than 10°, and the time of acceleration increases as the slope angle increases for gravity currents on lower slope angles. A fundamental difference in flow patterns, which helps explain the distinct characteristics of gravity currents on high and low slope angles using scaling arguments, is revealed. Energy budgets further show that, as the slope angle increases, the ambient fluid is more easily engaged in the gravitational convection and the potential energy loss is more efficiently converted into the kinetic energy associated with ambient fluid.

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