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Gravity currents propagating along channels in porous media[1]
MADELEINE GOLDING, HERBERT HUPPERT, University of Cambridge, INSTITUTE OF THEORETICAL GEOPHYSICS, DEPARTMENT OF APPLIED MATHEMATICS AND THEORETICAL PHYSICS TEAM — The effect of impermeable channel boundaries on gravity currents propagating in a porous medium is investigated. The problem admits similarity solutions for currents of a variety of rates of input flux and channel shapes. Experiments were conducted in V-shaped and semicircular channels and the results are generally found to be in good agreement with theoretical predictions. One motivation for the study of gravity currents in a porous medium is the process of carbon dioxide (CO_2) sequestration, whereby supercritical CO_2 is pumped deep underground into rock saturated with denser salt water. The CO_2 rises as a buoyant plume until it reaches an impermeable boundary, at which point it spreads laterally as a gravity current. Our knowledge of geological structure deep underground is limited. Therefore the theory developed in this study aims to help understand to what extent the presence of more complex boundaries, namely channel boundaries, would affect predictions for the propagation of gravity currents in porous media.

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