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Localised leakage from porous and viscous gravity currents

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— Motivated by the geological sequestration of CO_2 we investigate the effect of localized leakage on the spreading of porous and viscous gravity currents in a variety of both two and three dimensional geometries. Generically, we find that these systems tend towards a steady state in which the input flux is exactly balanced by the leakage flux. Of particular importance is the efficiency of storage defined as the instantaneous fraction of fluid that does not leak. We compare analytic expressions for the asymptotic behavior of the efficiency to full numerical results and laboratory models of both porous and viscous gravity currents. These results bear on the time scales over which CO_2 may be safely stored in saline aquifers.

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