

Abstract Submitted
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Leakage from inclined porous reservoirs PAWEL ZIMPOCH, JEROME NEUFELD, DOMINIC VELLA, University of Cambridge — We investigate the effect of localized leakage on the injection of buoyant fluids in porous, inclined reservoirs, with application to the geological storage of CO₂. We consider a simplified two-dimensional geometry and find that the resulting gravity current reaches a steady-state shape apart from a nose, which propagates at constant velocity. Crucially, this means that the efficiency of storage (defined as the instantaneous proportion of the injected fluid that does not leak) tends to a finite value at late times. This is in contrast to previous studies of localized leakage in horizontal reservoirs, which found that the efficiency of storage tends to zero at late times. We analyze the steady-state efficiency and relevant time scales for leakage points located upslope and downslope of the injection point using analytical and numerical methods, and compare our findings with the results of model laboratory experiments. Finally, we consider the implications of our results for the geological storage of CO₂ in the presence of sloping cap rocks compromised by the presence of fractures or fissures.

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