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**Viscous gravity currents on a plane with leaks** JOHN LISTER, JEROME NEUFELD, DOMINIC VELLA, HERBERT HUPPERT, University of Cambridge — Axisymmetric similarity solutions for viscous gravity currents spreading on a uniform plane are well-known. The addition of regions of leakage destroys both the symmetry and the self-similarity by introduction of preferred directions and length scales. We examine the effect of such leaks on the asymptotic long-time behaviour of viscous and porous gravity currents in a variety of geometries, showing how novel self-similar structures can emerge in the far-field, fed by quasi-steady near-field solutions that are nonlinear analogues of problems in electrostatics. Matching the two allows predictions of the asymptotic rate of spread and increase in volume of the current. The problems are motivated by the proposed geological sequestration of $CO_2$ and bear on the time scales over which $CO_2$ may be stored in saline aquifers that have an imperfect seal in the cap rock.

John Lister
University of Cambridge

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