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Axisymmetric viscous gravity currents flowing over a deep porous medium MELISSA SPANNUTH, JEROME NEUFELD, Geology and Geophysics Dept, Yale University, JOHN S. WETTLAUFER, Geology and Geophysics Dept and Physics Dept, Yale University, M. GRAE WORSTER, DAMTP, University of Cambridge — When a viscous fluid flows over a porous substrate, it not only spreads but also seeps into the underlying medium. Such flows have relevance to the design of shingle beds for use as safety features around storage facilities of dense fluids and to flow through fissures in porous rocks. Whereas previous investigations have been confined to two-dimensional flows of fixed volume, we have investigated currents fed by a constant fluid flux flowing axisymmetrically over a deep porous bed. Our experimental system consisted of glycerin spreading over monodisperse glass spheres of known permeability and the data were analyzed using scaling analyses. We have also solved a mathematical model using the well-known equations for a viscous gravity current spreading due to the slope of its free surface augmented by a simple draining law. Its predictions agree well with our experimental results and quantify, in particular, the maximum distance to which the current spreads as a function of the material and input properties.

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