

**Lister, John R.; Kerr, Ross C.**

**The propagation of two-dimensional and axisymmetric viscous gravity currents at a fluid interface.** (English) Zbl 0673.76110

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Summary: Viscous gravity currents resulting from the introduction of fluid between an upper layer of fluid of lesser density and a lower layer of greater density are analysed. The nonlinear equations governing the spread and shape of the intrusion are formulated for the cases of intrusion at low Reynolds number between deep ambient layers and of flow over a shallow layer of viscous fluid with a rigid lower boundary. Similarity solutions of these equations are obtained in both two-dimensional and axisymmetric geometries, under the assumption that the volume of intruding fluid increases with time like  $t^\alpha$ . The theoretical predictions are shown to be in reasonable agreement with experimental observations of the spreading of glucose syrups and of viscous hydrocarbons between fluid layers of differing densities. Scaling arguments are used to derive many new results for the rates of spread of intrusions in a wide variety of further situations. A compendium of spreading relations, including some previously isolated results, is derived within a coherent framework and tabulated.

**MSC:**

[76T99](#) Multiphase and multicomponent flows  
[76D33](#) Waves for incompressible viscous fluids  
[76M99](#) Basic methods in fluid mechanics

Cited in 14 Documents

**Keywords:**

Viscous gravity currents; Similarity solutions; spreading of glucose syrups; viscous hydrocarbons

**Full Text:** [DOI](#)

**References:**

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