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# Viscosity-stratified flow in a Hele-Shaw cell

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## Abstract

A hierarchy of mathematical models describing viscosity-stratified flow in a Hele-Shaw cell is constructed. Numerical modelling of jet flow and development of viscous fingers with the influence of inertia and friction is carried out. One-dimensional multi-layer flows are studied. In the framework of three-layer flow scheme the interpretation of the Saffman–Taylor instability is given. Two kinematic-wave models of viscous fingering are proposed. The first one includes friction between the fluid layers. The second model takes into account the formation of the intermediate mixing layer. Comparison with calculations on the basis of two-dimensional equations shows that these models allow one to determine the velocity of propagation and the thickness of the viscous fingers. Some details can be found here: [arxiv.org/abs/1501.00366](http://arxiv.org/abs/1501.00366).

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