

Abstract Submitted  
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**Inertial effects on viscous fingering in the complex plane** ANDONG HE, ANDREW BELMONTE, The W. G. Pritchard Laboratories, Department of Mathematics, Penn State University — We present the nonlinear unsteady Darcy's equation, which includes inertial effects for flows in a porous medium or Hele-Shaw cell, and discuss the conditions under which it reduces to the classical Darcy's law. In the absence of surface tension, we derive a generalized Polubarinova-Galin equation in the complex plane, which includes the inertial effects for a circular interface geometry. The linear stability of the base-flow state is examined by perturbing the corresponding conformal map - we show that inertia always has a tendency to stabilize the interface, regardless of whether a less viscous fluid is displacing a more viscous fluid or vice versa.

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