

Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Hydrodynamic Stability in Hele-Shaw and Porous Media Flows

PRABIR DARIPA, Texas A&M University — We will discuss some stability problems of two-phase flows in Hele-Shaw cell and porous media and provide some stability results based on Darcy's law and saturation model. Effects of surface tension in Hele-Shaw flows and capillarity in porous media flows on slowdown of instabilities will be quantified within linear theory. Results on hydrodynamic instability in immiscible porous media flows in the presence of capillarity will be provided. We will present analysis and provide arguments that show that slowdown of instabilities due to capillarity is usually very rapid which makes the flow almost, but not entirely, stable. The profiles of the stable and unstable waves in the far-field will be characterized using a novel but very simple approach. Open problems in this direction will be discussed. Time permitting, we will briefly outline the proof of nonlinear instability for single phase flows in a Hele-Shaw cell with viscosity gradient in the direction of flow.

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Date submitted: 05 Aug 2008

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