Variable Density and Viscosity Displacements in Horizontal Hele-Shaw Cells: Linear Stability Analysis LAURENT TALON, UCSB, Universites P. et M. Curie, NISHEET GOYAL, ECKART MEIBURG, UCSB — We investigate the linear stability of a variable density and viscosity, miscible displacement in a horizontal Hele-Shaw cell. The two-dimensional base state is evaluated by means of nonlinear Stokes simulations. We observe the formation of a quasisteady tip, whose vertical equilibrium position is determined by a balance of viscous and gravitational forces. The tip propagates more rapidly as the effects of gravity increase. The linear stability of this base state is studied with regard to spanwise perturbations. We observe a gravity-modulated viscous fingering mode at the displacement front, and a Rayleigh-Taylor mode along the unstably stratified horizontal interface. Their dependence on the viscosity ratio, the gravity parameter and the Peclet number is discussed.

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