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Mixed mode buoyancy-driven instability in a Hele-Shaw cell J. CARBALLIDO-LANDEIRA, P.M.J. TREVELYAN, C. ALMARCHA, A. DE WIT, NLPC, Universite Libre de Bruxelles, Brussels, Belgium — Buoyancy-driven instabilities of a horizontal interface between two different miscible solutions contained in a Hele-Shaw cell are studied both theoretically and experimentally. Our regime of interest is focused on the case when the fastest diffusing species is located in the upper layer. If the upper solution is denser, a Rayleigh-Taylor (RT) instability develops characterized by a deformation of the interface into fingers. If, on the contrary, the denser solution is on the bottom, a Diffusive Layer Convection (DLC) instability is obtained because of differential diffusion effects. Indeed the fast diffusion downwards of the solute initially contained in the upper zone leads to a depletion and an accumulation zone respectively above and below the contact line where locally convection is triggered. In between these two regimes, a mixed mode dynamics intermediate between the RT and DLC regimes is obtained when the density profiles contain a locally stratifically stable region near the interface surrounded by two stratifically unstable regions. Experiments show that such an instability generates new plume-like structures around the interface.

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