

Abstract Submitted  
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**The effect of viscosity variation on the stability of a buoyantly unstable miscible layer in vertical porous media**<sup>1</sup> SATYAJIT PRAMANIK, TAPAN KUMAR HOTA, MANORANJAN MISHRA, Indian Institute of Technology Ropar, India — We numerically show that in the absence of displacement a buoyantly unstable miscible layer with variable viscosity is less unstable than the constant viscosity layers. With the help of scaling analysis, we proved that the dynamics of variable viscosity layers with stable as well as unstable viscosity contrasts are identical in the absence of displacement. When the heavier fluid displaces the lighter one, the influence of viscosity contrast on the buoyantly unstable miscible layer is analogous to that in neutrally buoyant fluids. These findings of direct numerical simulations (DNS) in the fully nonlinear regime are consistent with the linear stability analysis (LSA). Furthermore, we perform a non-modal stability analysis of the linearized equations, which depicts the qualitative agreement with both LSA and DNS. In addition, the response of the linearized operator to external excitation has been studied through pseudospectra. The present findings are of great importance to understand the hydrodynamic mechanisms involved in geologic carbon sequestration.

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