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Influence of fluid dispersion on transient behaviors of miscible viscous fingering TAPAN KUMAR HOTA, MANORANJAN MISHRA, Indian Institute of Technology Ropar — We study the influence of fluid dispersion on miscible viscous fingering (VF) in the framework of non-modal stability theory. Miscible VF has traditionally been investigated by quasi-steady approximation (QSSA), followed by normal mode analysis. However, the results of QSSA poorly predicting the transient behavior and often stability analysis are obscured by the unsteady base flow. The system has been studied by coupling the continuity and Darcy equations with a convection-diffusion equation for the evolution of solute concentration. To measure the fluid dispersion the convective characteristic scales are used. The long time behavior of the response to external excitations and the initial conditions are studied by examining the structure of pseudospectra and the optimal growth function, respectively. Particular attentions are paid to the transient behavior rather than the long time behavior of eigenmodes predicted by modal analysis. The results show that there can be substantial transient growth of perturbations when the fluid disperses at a very slow rate.

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