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Non-modal disturbances growth of miscible viscous fingering in porous media[1] TAPAN KUMAR HOTA, MANORANJAN MISHRA, Indian Institute of Technology Ropar, India — The transient amplification of disturbances in a pressure driven rectilinear flow of two miscible fluids with varying viscosity in porous media are examined. The system has been studied by coupling the continuity and Darcy equations with a convection-diffusion equation for the evolution of solute concentration. Since the base state is time dependent, the common techniques used in the literatures for studying the linear stability are either quasi-steady state approach or initial value approach with random initial disturbance or both. To overcome difficulties in these approaches, the non-modal analysis (NMA) has been employed to study the amplification of disturbances. The Runge-Kutta method has been used to solve the matrix differential equation obtained by NMA from the linearized equations. The optimum amplification and structures of the disturbances are found by singular value decomposition. Initial disturbances that lead to the optimum amplifications are found to be localized within the diffusive layers, unlike the random disturbances used in the initial value technique. It has also been observed that the optimum growth obtained by NMA decays at early time due to the diffusion before it starts amplifying, unlike the results of modal analysis.

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