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Double diffusive effects between two miscible fluid flows in a channel MANORANJAN MISHRA, Indian Institute of Technology Ropar, India, ANNE DE WIT, Université Libre de Bruxelles, Brussels, Belgium, KIRTI CHANDRA SAHU, Indian Institute of technology Hyderabad, India — The pressure-driven displacement flow of a less viscous fluid by a more viscous one in a horizontal channel is a stable configuration in the context of single component flows. However, we have shown by numerical simulations based on finite volume approach that the double-diffusive (DD) effects can destabilize this stably stratified system. Such effects can appear if the fluid consists of a solvent containing two solutes both influencing the viscosity of the solution and diffusing at different rates. The continuity and Navier-Stokes equations coupled to two convective-diffusion equations for the evolution of the concentration of the solutes are solved. The viscosity is assumed to depend on the concentration of both solutes, while density contrast is neglected. The results demonstrate the development of various new instability patterns in the presence of DD effects at the miscible "interface" separating the fluids. It is found that the intensity of the instability increases with increasing the diffusivity ratio of the solutes. This in turn increases the fluid mixing and accelerates the displacement of the fluid originally filled inside the channel.

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