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Scaling of vertical mixing in two-species buoyancy-driven instabilities ANNE DE WIT, SHYAM S. GOPALAKRISHNAN, BERNARD KNAEPEN, Universite libre de Bruxelles — A miscible horizontal interface separating two solutions of different solutes can deform into convective finger-like structures due to buoyancy-driven instabilities like the classical Rayleigh-Taylor instability or the double-diffusive instabilities, triggered by differential diffusion of the solutes in the solutions. We analyse numerically for porous media flows the scaling of the fingers vertical speed, defined as the slope of the temporal evolution of the mixing length of the fingers. In the parameter space of the problem, spanned by the buoyancy ratio R, and the ratio δ of diffusion coefficients of the two species, the vertical speed is found to scale linearly with the adverse density difference that drives the convective mixing in these flows. The adverse density difference is the density jump across the spatial domain where the density gradient of the diffusive base-state is negative along the direction of gravity. It can be computed analytically from the diffusive base-state density profile and can be significantly different from the initial density difference when differential diffusion of the solutes are at play. Our results evidence the possibility of controlling the nonlinear evolution of mixing of buoyancy-driven instabilities in two-species stratifications

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