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Onset and cessation of porous convection in the context of geological carbon sequestration ANJA SLIM, Harvard University, T.S. RAMAKRISHNAN, Schlumberger-Doll Research, Cambridge, MA 02139 — In geological carbon sequestration, CO_2 injected into a saline aquifer is less dense than the resident brine and floats above it. It is slightly soluble in brine and progressively dissolves, making the brine slightly denser than "pure" brine. Motivated by this, we consider conditions for free convection in a porous medium from a one-dimensional, time-dependent, pure-diffusion base state. This problem has been addressed in several previous studies using a variety of approximations. We present a simple but rigorous calculation, showing where in time and wavenumber space a perturbation exists (of infinitesimal or finite amplitude) whose mean square amplitude grows. The critical Rayleigh-Darcy number, Ra, below which instability cannot occur is $Ra = 32.50$. Above $Ra \approx 100$, the earliest possible onset time becomes independent of porous-layer thickness. We discuss implications for realistic reservoir conditions.

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