

Abstract Submitted
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PIV measurement of solute diffusion natural convection in a Hele-Shaw cell DANA EHYAEI, MATTHEW BALDUS, KEN KIGER, University of Maryland — Dissolution trapping of CO₂ is regarded as a critical mechanism for sequestration of carbon in deep saline aquifers. Currently, however, there is significant variability in the literature concerning the critical time required for onset of the convective fingering instabilities that are responsible for accelerating the dissolution of CO₂ into the brine. In the current work, we focus on making a direct measure of the velocity field during the onset, growth and saturation of the convection in a Hele-Shaw cell analog of the porous media problem. The working fluids consisted of aqueous mixtures of methanol and ethylene glycol (MEG), which when dissolved into water, results in a negatively buoyant solution similar to CO₂ in brine. The velocity field was measured using PIV, and procedures were developed to circumvent traditional implementation difficulties within thin-gap flows through careful particle selection and manipulation prior to starting the experiment. The results of these measurements provide the unsteady evolution of the flow from onset to late-time mixing, as revealed by the velocity and vorticity field during the finger growth and saturation. Features of the flow and the rate of mixing will be discussed.

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