

Abstract Submitted
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Dissolution patterns from geochemical reactions during Rayleigh-Bénard convection in porous media XIAOJING FU, LUIS CUETO-FELGUEROSO, Massachusetts Institute of Technology, DIOGO BOLSTER, University of Notre Dame, RUBEN JUANES, Massachusetts Institute of Technology — Convective mixing is an essential trapping mechanism during CO₂ sequestration in deep saline aquifers. Upon injection, buoyant CO₂ enters the geologic formation and mixes with the underlying brine, which leads to a local density increase that triggers density-driven flow; meanwhile, the presence of CO₂ disturbs the geochemical equilibrium of brine with respect to the formation, which can lead to dissolution or precipitation of carbonate minerals. Dissolution/precipitation reactions result in changes in porosity, which in turn induce changes in permeability that impact the flow dynamics. Motivated by the process of CO₂ convective mixing in deep saline aquifers, here we study the formation of rock-dissolution patterns that arise from geochemical reactions during Rayleigh-Bénard convection in porous media. We perform high-resolution simulations to analyze the interplay between the density-driven hydrodynamic instability and the formation of high-porosity channels, explain the emergence of a characteristic length scale in the dissolution channels, and quantify the impact of the channelization process on the macroscopic convection rate.

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