

THREE DIMENSIONAL HIGH-RESOLUTION SIMULATION OF CONVECTIVE MIXING

Xiaojing Fu, MIT, 315-261-0037, rubyfu@mit.edu

1. Xiaojing Fu, Massachusetts Institute of Technology
2. Luis Cueto-Felgueroso, Massachusetts Institute of Technology
3. Ruben Juanes, Massachusetts Institute of Technology

Dissolution by convective mixing is an essential trapping mechanism during CO₂ sequestration in deep saline aquifers. Injected CO₂ dissolution into the underlying brine leads to a local density increase initially. The resulting CO₂-brine mixture is denser than the two initial fluids, leading to a Rayleigh –Benard type instability, which greatly accelerates the dissolution process. While two-dimensional analyses on this phenomenon have elucidated various aspects of the dominant flow mechanisms and mixing scales, full three-dimensional studies are scarce. We present high-resolution, 3D simulations of convective dissolution, and discuss the validity of quantitative results derived from lower-dimensional models.