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Direct Numerical Simulations of the onset of density-driven convection in anisotropic porous media SAIKIRAN RAPAKA[1], SHIYI CHEN, Dept of Mechanical Engineering, Johns Hopkins University, Baltimore MD 21218, RAJESH PAWAR, PHILIP STAUFFER, EES-6, Los Alamos National Laboratory, Los Alamos NM, DONGXIAO ZHANG, Mewbourne School of Petroleum and Geological Engineering, University of Oklahoma, Norman OK — Among the many options available to mitigate carbon dioxide emissions in the short-term, geologic sequestration is being considered as one of the most promising ones. Carbon dioxide is injected into the earth in a supercritical phase where it's density is lower than that of the surrounding water. When carbon dioxide dissolves into the medium, the system has a gravitational instability leading to "finger"-like convection patterns. Previous investigators have studied this problem in the framework of linear and global stability analyses. We present an improved linear stability analysis followed by detailed direct numerical simulations, using a pseudospectral method. We present results for the dependence of the critical time and critical wavenumber on the permeability anisotropy ratio. We also present an improved definition of the critical time which is more characteristic of the time scales observed for the onset of convection.

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