Post-Injection Migration of CO$_2$ in Saline Aquifers subject to Groundwater Flow, Aquifer Slope, and Capillary Trapping CHRISTO-PHER MACMINN, MICHAEL SZULCZEWSKI, RUBEN JUANES, Massachusetts Institute of Technology — We study a sharp-interface mathematical model for the post-injection migration of a plume of CO$_2$ in a deep saline aquifer under the influence of natural groundwater flow, aquifer slope, gravity override, and capillary trapping. The model leads to a nonlinear advection-diffusion equation, where the diffusive term describes the upward spreading of the CO$_2$ against the caprock. We find that the advective terms dominate the flow dynamics even for moderate gravity override, and we solve the model analytically in the hyperbolic limit. We use this solution to estimate the capacity of various target formations in the United States.

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