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The effect of non-uniform poroelastic reservoir geometry on the propagation of a buoyant gravity current ADAM BUTLER, ALEX COPLEY, JEROME NEUFELD, University of Cambridge — Gravity currents in confined porous media occur in a variety of geological settings, with CO_2 storage one of particular current importance. How the CO_2 current and the porous medium develop over time is sensitive in particular to the pressure in the ambient fluid. This is set by compressibility and poroelastic deformation of the porous medium, and in this manner the current may experience the complex geometry of the domain. Here we model the flow of a gravity current injected into such a poroelastic medium, exploiting the aspect ratio of a typical aquifer in order to vertically average the flow and medium properties across the domain. We derive coupled advection-diffusion equations for the injected and ambient phases and focus on the ambient phase in the limit of large Young's modulus. Using a simple elastic-layer model, we incorporate the response to deformation from the overburden and calculate the diffusion of pore pressure away from the injection point as well as the resulting deformation transmitted to the surface. As a specific case study, we apply our model to an aquifer with converging lid and basement in order to investigate the effect of non-uniform reservoir geometry on propagation.

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