Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Interactions between a confined poroelastic reservoir and a buoyant gravity current ADAM BUTLER, ALEX COPLEY, JEROME NEUFELD, University of Cambridge — Many geological processes, of which CO_2 sequestration is an important example, involve the flow of gravity currents through porous media. The long-term behaviour of such buoyant currents strongly depends on the properties of the containing reservoir as well as the interaction between the current and the pressure field of the surrounding fluid. This allows the injected current to experience the full geometry of the reservoir when only the pressure field has reached the boundaries. The reservoir is also affected by the current: the increased pore pressure following injection leads to deformation of the porous medium that, while generally small, may produce ground-level deformation that can be measured remotely to reveal large-scale details of the reservoir's properties. We model the two-phase flow of a buoyant gravity current injected into a fluid-filled poroelastic medium, utilising the large aspect ratio of the domain to vertically average the flow and reservoir properties. With a simple elastic-layer model for the overburden we are able to incorporate the pressure and surface deformation signals in response to the deformation of the reservoir. We apply this model to the In Salah Project to determine reservoir properties and forecast the long-term behaviour post injection.

Adam Butler
University of Cambridge

Date submitted: 02 Aug 2020 Electronic form version 1.4