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Poroelastic packing and gravity currents DUNCAN HEWITT, University of British Columbia, University of Cambridge, JAPINDER NIJJER, University of Toronto, University of Cambridge, JEROME NEUFELD, University of Cambridge — The flow of fluid through a poroelastic medium leads to deformation of the medium. We study flow in deformable media in two different contexts, in both cases undertaking laboratory experiments using small deformable hydrogel spheres. First, we present experimental results of vertical planar flow through a deformable medium driven by an imposed pressure difference. Even this simple system exhibits a complex coupling of flow and deformation. The flow-induced compaction of the medium is non-uniform with depth, and the mass flux measured in a series of experiments for different applied pressure exhibits hysteresis. We compare experimental measurements with the predictions of a simple theoretical model. Second, we consider the gravity-driven flow of fluid injected into a poroelastic medium, where flow-induced deformation leads to uplift of the surface of the medium. In the context of geological CO_2 sequestration, uplift of the surface has been observed above CO_2 injection sites. We develop a shallow-layer theory which describes both the flow of the injected current and the associated uplift of the surface of the medium. We also compare measurements from laboratory experiments of injection into a poroelastic medium with predictions from the theoretical model.

Duncan Hewitt
University of British Columbia, University of Cambridge

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