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Large-Deformation Poroelasticity with Friction TYLER LUTZ, LARRY WILEN, JOHN WETTLAUFER, Yale University — Fluid impinging on a soft porous material may cause the material to deform, which alters the behavior of the fluid flow in turn. Flows exhibiting this so-called poroelastic coupling are not generally found in isolation; frictional contacts between the solid phase and any confining boundaries strongly influence the nature of the coupling. For the tractable geometry of uniaxial flow through a cylindrical porous medium, we develop both analytic and numerical models to study the effects of wall friction on the properties of large-deformation poroelastic flows in steady state. The presence of friction leads to a measurable hysteresis in the volume flux, solid deformation, and pore pressure gradient of the flow. Using data from a mechanically-compressed latex foam to parameterize the frictional input to our theoretical models, we present direct quantitative comparisons between model predictions and experimental measurements of volume flux, deformation, and pressure of the foam subject to flow-driven compression.

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