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Fluid-structure interactions in a soft-walled Hele-Shaw cell¹
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University of Oxford — The interaction of viscous and interfacial flows with soft materials has recently attracted substantial interest from a variety of different perspectives. Here, we study these interactions in the context of a model problem: Flow in a deformable Hele-Shaw cell, where one wall is rigid and the other is soft. Combining experiments with mathematical modelling, we consider the coupling of flow and deformation during (a) the initial injection of viscous fluid into the empty cell (the filling problem), (b) the subsequent steady state during continued injection of the same fluid (the steady state), and (c) the relaxation of the cell after injection is stopped (the relaxation problem). We then discuss the implications of these results for hydrodynamic instabilities such as viscous fingering.

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