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Viscous backflows from elastic reservoirs ZHONG ZHENG, SJTU, EMILIE DRESSAIRE, ALBAN SAURET, UCSB — The dynamics of fluid removal from an elastic reservoir is related to the practice of waste water migration following hydraulic fracturing, surface morphology control during geotechnical engineering and skin fluid collection for medical use. We report a series of reduced-order modelling studies and scaling results for the viscous backflow process from elastic reservoirs, including that from a hydraulic fracture and from beneath a stretched membrane or a bending plate. The backflow is generated once the exit of the elastic cavities is exposed to the atmosphere, or a fluid bath with a lower pressure. A couple of first-order ODEs are derived to describe the time evolution of the length and height of the fracture/cavity. The rate of fluid removal can also be estimated accordingly. The flow dynamics is found to depend on three nonlinear competing terms that correspond to the process of fluid propagation within a fracture or an elastic cavity, the viscous flow in the exiting channel, and the induced flow from the low pressure at the exit.

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