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Fluid-driven fracture of elastic reservoirs followed by viscous backflow CHING-YAO LAI, ZHONG ZHENG, EMILIE DRESSAIRE, HOWARD STONE, Department of Mechanical and Aerospace Engineering, Princeton University — We developed a laboratory scale experiment to study the physical mechanisms of fluid driven fracture and viscous backflow from elastic reservoirs. When pressurized fluid was injected into a gelatin reservoir, which is elastic but brittle, the fracture grows along an almost continuous plane and forms a fluid-filled disc-like shape. Once the injected fluid is exposed to the atmospheric pressure, the elastic relaxation of the reservoir drives the fluid flows backwards towards the original source. We study the back flow process, e.g. volume recovered as a function of time, as a function of experimental parameters such as injection volume, reservoir elasticity, and fluid viscosity. Scaling arguments are provided to explain the experimental results, which provide insights into the underlying physics of hydraulic fracturing.

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