Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Elasticity-Driven Backflow of Fluid-Driven Cracks[1] CHING-YAO LAI, Princeton University, EMILIE DRESSAIRE, New York University, GUY RAMON, Israel Institute of Technology, HERBERT HUPPERT, HOWARD A. STONE, Princeton University — Fluid-driven cracks are generated by the injection of pressurized fluid into an elastic medium. Once the injection pressure is released, the crack closes up due to elasticity and the fluid in the crack drains out of the crack through an outlet, which we refer to as backflow. We experimentally study the effects of crack size, elasticity of the matrix, and fluid viscosity on the backflow dynamics. During backflow, the volume of liquid remaining in the crack as a function of time exhibits a transition from a fast decay at early times to a power law behavior at late times. Our results at late times can be explained by scaling arguments balancing elastic and viscous stresses in the crack. This work may relate to the environmental issue of flowback in hydraulic fracturing.

[1]This work is supported by National Science Foundation via grant CBET-1509347 and partially supported by Andlinger Center for Energy and the Environment at Princeton University.

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Date submitted: 03 Oct 2016 Electronic form version 1.4