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Experimental imaging of focused fluid flow through a viscous porous rock-analogue.

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Seismic chimneys have been observed in sediments overlying reservoirs containing different fluids, such as water, hydrocarbons, or CO₂. Furthermore, such chimneys have been linked to pockmarks and gas seepages on the seafloor. Visco-plastic models show how these chimneys can form by focused fluid flow through viscous, porous materials. However, the mechanisms that cause fluid flow to focus along such relatively narrow pathways with transiently elevated permeability have not been investigated thoroughly in experiments.

We present analogue experiments carried out in a transparent Hele-Shaw cell, in which a fluid is injected into an aggregate of viscous grains, leading to transient focused fluid flow. Fluid flow is imaged using a digital camera, and our observations are compared to models describing chimney formation.