Eos

Rougher Faults May Generate More Earthquake Aftershocks

Lab experiments on pieces of granite reflect natural aftershock dynamics and highlight the role of rock roughness along a fault.

By **Sarah Stanley**
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New lab work suggests that rock roughness affects earthquake aftershock dynamics along faults. Credit: Dextersinister/Wikimedia Commons, CC BY-SA 4.0

Source: ***Geophysical Research Letters***

When an earthquake hits, it is rarely an isolated event. **Foreshocks** precede quakes, and **aftershocks** follow them. To quantify seismic hazards, scientists must disentangle the factors that contribute to these shaking sequences.

In recent years, advancements in laboratory methods have enabled deeper exploration of earthquake dynamics. Now, ***Goebel et al.*** present new lab findings highlighting how the **roughness** of the rocks sliding past each other in a fault zone may influence aftershocks.

The researchers created fractures of varying roughness in several granite cylinders ranging from 40 to 50 millimeters in diameter. Then they applied pressure to the fractured granite to simulate sliding motions along a fault. They measured the resulting seismic disturbances in high resolution in the form of **acoustic emission** wave measurements. The result was a realistic and manipulable simulation of actual earthquakes: Spacing and timing of the main slips, foreshocks, and aftershocks in the granite cylinders resembled those of real-world Southern California earthquakes.

The researchers found that after a major slip along a fracture—analogous to a main earthquake along a fault—the granite cylinders underwent periods of **relaxation** of built-up stress as well as aftershocks. Fractures with greater roughness moved less along the fracture during the main slip event but had more aftershocks; smoother fractures had more slip but fewer aftershocks.

These findings suggest that in nature, fault surface roughness may play a key role in the production of aftershocks following a main earthquake event. (*Geophysical Research Letters*, **https://doi.org/10.1029/2022GL101241**, 2023)

—Sarah Stanley, Science Writer

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