

## **Solid Earth Physics Seminar, Harvard University**

**Tuesday 11 August at 1:15 pm  
4th Floor, Hoffman Lab, 20 Oxford Street**

### ***Friction is Fracture (sort of)***

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#### **Abstract:**

Friction, the dynamics of how two rough frictional interfaces detach and slide is a fundamental question that is of immense importance in fields ranging from material science to geophysics. Although studied for hundreds of years, the fundamental physics of frictional motion still contain some interesting surprises. In particular, how friction couples to fracture is critical to our fundamental understanding of both frictional motion and related processes, such as earthquake dynamics.

Here, we take a close experimental look at the short-time dynamics of frictional interfaces as frictional sliding unfolds. We will first review recent results that demonstrate that rupture fronts (laboratory "earthquakes") that mediate the transition to frictional motion along a spatially extended dry interface are well-described by the classic singular solutions that were developed to describe shear fracture. We will then show that this fracture mechanics formalism can be used to successfully (1) predict lab-earthquake arrest along interfaces subjected to spatially varying stresses, and (2) describe the dynamics of lubricated interfaces - with some surprising results.

As time permits, we will also touch on "S-waves"; experimental observations of highly focused, high amplitude radiation that propagates ahead of high speed ruptures along the frictional interface. These waves contain both significant energy and information on the amount of elastic energy released by the incoming rupture.