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Geometry and elasticity for detachment fronts in friction
ALESSANDRO TALONI, ANDREA BENASSI, STEFANO ZAPPERI, CNR-IENI istituto per l'energetica e le interfasi — Mesoscale friction bridges nanoscale contact mechanics to the macroscopic Amontons laws and is relevant for several mechanical problems including seismology. Recent experiments on polymeric blocks show that the onset of friction occurs by nucleation of detachment fronts and that frictional properties vary along the sample surface. The earthquake-like dynamics found at the millimeter scale is in contrast with the usual assumption of uniform detachment without a coherent pattern in the front formation. Simulating the quasi-equilibrium dynamics of an elastic sample sliding on a rough surface under a shear force, we show that the dynamics of detachment fronts depends on the sample geometry. In particular, we study the effect of the sample aspect ratio by computing the elastic Green function for a finite three-dimensional slider. Our model allows to study the onset of friction in different geometries, from the thin slabs used in the aforementioned experiments to more general samples shapes.

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