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Laboratory Earthquakes: Granular Friction and Scaling ROBERT ECKE, DREW GELLER, SERGIY GERASHCHENKO, SCOTT BACKHAUS, Los Alamos National Laboratory — Geological processes drive shear motion between tectonic plates over 10-100 km. The rupture gap, of order meters, contains granular matter - fault gouge - produced by the grinding motion of the plates over millennia. The complex behavior of natural earthquakes and the difficulty in making *in situ* measurements, has led to laboratory experiments that allow more control. We describe a laboratory experiment to model the physics of earthquakes that involves the interaction of continuum and granular behavior around a fault. Two photo-elastic plates confine about 3000 bi-disperse rods in a gap with a length-to-width ratio 50. The plates are held rigidly along their outer edges with one held fixed while the other is driven at constant speed at strain rates of 10^{-5}/s. We measure strains from the motions of small spheres on the plate surface, stresses from plate photo-elastic response, and granular motion using particle tracking. We determine the dependence of the friction and the moment distribution of the system on the normal force. The moment distribution scales with a power law close to -1.5. There is an increasing probability for large events with a non-random recurrence time at higher normal force.

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