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Granular dynamics under shear with deformable boundaries DREW GELLER, SCOTT BACKHAUS, ROBERT ECKE, Los Alamos National Laboratory — Granular materials under shear develop complex patterns of stress as the result of granular positional rearrangements under an applied load. We consider the simple planar shear of a quasi two-dimensional granular material consisting of bi-dispersed nylon cylinders confined between deformable boundaries. The aspect ratio of the gap width to total system length is 50, and the ratio of particle diameter to gap width is about 10. This system, designed to model a long earthquake fault with long range elastic coupling through the plates, is an interesting model system for understanding effective granular friction because it essentially self tunes to the jamming condition owing to the hardness of the grains relative to that of the boundary material, a ratio of more than 1000 in elastic moduli. We measure the differential strain displacements of the plates, the inhomogeneous stress distribution in the plates, the positions and angular orientations of the individual grains, and the shear force, all as functions of the applied normal stress. There is significant stick-slip motion in this system that we quantify through our quantitative measurements of both the boundary and the grain motion, resulting in a good characterization of this sheared 2D hard sphere system.

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