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Force Correlations in 2D Granular Materials[1] TRUSH MAJMUDAR, Duke University, ROBERT BEHRINGER, Duke University — We present experimental measurements on force correlations in a 2D granular system consisting of bi-disperse photo-elastic disks. A biaxial test apparatus is used and three different types of loading conditions are implemented: isotropic compression, uniaxial compression and pure shear. For each case, incremental deformations are applied and the system is imaged at each increment. We then calculate forces at each particle contact using an inverse algorithm and photoelasticity. From these forces, we calculate autocorrleation functions of the force magnitude for these images. We observe for uniaxial compression and most strongly for pure shear, that there is an approximately power-law decay along the dominant direction of the force chains, and short-range correlations in the transverse direction. Distributions of the vector contact forces show relatively little difference among the various preparation methods for the tangential forces, although the distributions of normal forces show some differences. We conclude that the force-force correlation function is the best statistical tool to differentiate among these states.

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