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The Influence of Order and Disorder on Buckling 2D granular layers ANDREW B. CROLL, BEKELE GURMESSA, Department of Physics, North Dakota State University, ANTOINETTE TORDISILLAS, DAVID CAREY, JINGYU SHI, Department of Mathematics and Statistics, University of Melbourne
— The buckling of thin films has recently received considerable attention in both the materials and the continuum elasticity communities. To the former, elastic instabilities form a platform for the mechanical measurement of material properties under increasing degrees of confinement. To the latter, instabilities represent a testing ground for advanced elastic theory. Buckling is also of considerable importance in the evolution of granular systems, which often show deformations that resemble those of continua. Previously, we documented several differences between continuum theory and discrete elasticity in a discrete model of a thin film experimentally constructed from a well ordered (hexagonally packed) layer of colloid scale particles. Here we consider how the structure of the 2D layer influences the buckling process. In particular, we examine the details of how a complex, disordered (glassy) 2D layer resting on soft foundations responds to in-plane compressive stress. We show how the fundamental buckling lengthscale remains identical to that of ordered layers, despite considerable heterogeneity in the motion of the particles.

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