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Spatial Distribution of Forces within Granular Materials[1] JOHN WAMBAUGH, National Center for Computational Toxicology, US EPA, ROBERT BEHRINGER, Department of Physics and Center for Nonlinear and Complex Systems — Granular materials display surprisingly inhomogeneous distributions of forces. Some chains of inter-grain contacts carry forces much greater than the mean while other contacts with adjacent particles carry almost no force at all, resulting in the phenomenon of force chains. Recently, a theoretical framework for understanding the spatial distribution of these networks of force chains was proposed by analogy to bond percolation theory [Ostojic, S., Somfai, E. and Nienhuis, B. Nature **439**, 828830 (2006)]. In this experimental work, we test these predictions on static, isotropic force networks in two-dimensions using photo-elastic techniques. We observe the distribution of clusters of grains connected by contacts with forces in excess of a threshold of the mean force. We find that these distributions can be scaled to a function that is independent of overall isotropic pressure. We then use a numerical model to predict similar scale-independence for anisotropic pressures. We believe our results provide evidence for a mechanism for comparing the spatial fluctuations on the laboratory-scale with other systems.

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