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Testing the equal-probability assumption of jammed particle packings GUO-JIE GAO, JERZY BLAWZDZIEWICZ, COREY O'HERN, Yale University — The Edwards' entropy formalism provides a statistical mechanical framework for describing dense granular systems. In addition, experiments on vibrated granular columns and numerical simulations of quasi-static shear flow of dense granular systems have provided evidence that the Edwards' theory may accurately describe certain aspects of these systems. However, a fundamental assumption of the Edwards' description—that all mechanically stable (MS) granular packings at a given packing fraction are equally likely—has not been explicitly tested in dense granular systems. We investigate this assumption by generating all mechanically stable hard disk packings in small systems using a protocol in which we successively compress or decompress the system followed by energy minimization. We then apply quasi-static shear flow at fixed pressure to these MS packings to study the frequency with which MS packings occur during the shear flow. We find that the MS packings do not occur with equal probability during the shear flow, in fact, there is a significant reduction in the number of accessible MS packings at large shear strain. Thus, the Edwards' entropy formalism should be re-examined in light of our findings.

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