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Cyclic Simple Shear in a Two-Dimensional Granular System¹ JIE REN, JOSHUA DIJKSMAN, ROBERT BEHRINGER, Duke University — We study the irreversibility transition observed by Pine et al (2005) in a 2D dry granular system, for which our novel experimental apparatus can create quasi-static, quasiuniform simple shear. We use bi-disperse, photo-elastic disks and expose them to a large number of small amplitude shear cycles. We track the particles dynamics over time and evaluate their translational and rotational motion, as well as the inter-particle forces. We have found that both translational and rotational diffusivity increase rapidly when the system's particle density exceeds a certain threshold. This is an indication of the existence of an irreversibility transition. Interestingly, we have found this density threshold to be dependent on the amplitude of cyclic shear, but always smaller than the density for the isotropic jamming transition. To further understand this irreversibility transition, we analyze the system's structural and force evolution.

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