Abstract Submitted
for the PSF16 Meeting of
The American Physical Society

Dynamic Phases, Clustering, and Lane Formation for Driven Disk Systems in the Presence of Quenched Disorder YANG YANG, DANIELLE MCDERMOTT, Wabash College, CYNTHIA J. OLSON REICHHARDT, CHARLES REICHHARDT, Theoretical Division, Los Alamos National Laboratory — Granular systems can exhibit fluid-like and solid-like properties in the different environments. Here we examine these flow properties with numerical simulations of granular particles driven over randomly distributed pinning sites in two dimensions. By varying the number of particles and the strength of the driving force, we investigate different effects of the pinning sites on the granular particle system. We show that there is a series of distinct dynamic regimes in our simulation including a clogged or pile-up phase near depinning, a homogeneous disordered flow state, and a dynamically phase separated regime consisting of high density crystalline regions surrounded by a low density of disordered disks, which has been also observed in active matter systems. This dynamical phase separation is one of most interesting features of our granular system since it is not observed in previous studies of driven long-range repulsively interacting particles.

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Date submitted: 15 Sep 2016 Electronic form version 1.4