# Phase Separation in Driven Granular Media

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### ABSTRACT

Fluidized granular matter (matter composed of macroscopic particles) exhibit a plethora of fascinating symmetry-breaking instabilities and pattern-formation phenomena. In granular matter, particles collide inelastically, losing energy in each binary collision. Therefore an external driving force is necessary to maintain the particles motion. As a result, granular systems are intrinsically far from equilibrium. Due to inelastic collisions, granular matter has a natural tendency to form clusters. This brings about a possibility of fluid-solid coexistence in driven granular media. In this project, we consider a granular monolayer, vibrated from below. Although this system is three-dimensional, an interesting dynamics occurs only in the horizontal plane, perpendicularly to the direction of vibration. Surprisingly, for a particular regime of parameters a highly nontrivial phenomenon occurs: a solid-like cluster of particles forms in the center of the system, surrounded by particles in the gas-like phase. We theoretically explain this coexistence of dilute and dense phases, employing Navier Stokes granular hydrodynamics.

### REFERENCES

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