Jamming and glassy dynamics in driven granular systems: "melting a glass by freezing"

The jamming paradigm aims at providing a unified view for the elastic and rheological properties of materials as different as foams, emulsions, suspensions or granular media. Structurally, these systems can all be viewed as dense assemblies of particles, and the particle volume fraction ϕ plays the role of the coupling constant that tunes the distance to the jamming transition. Apart from the industrial relevance of these materials, there is also a fundamental theoretical interest in the (athermal) jamming transition: as a new paradigm for structural arrest its relation to the (thermal) glass transition, the characterization of common and distinguishing features, remain to be elucidated.

In this contribution we present simulation results for a driven granular system in its glassy phase at high volume fraction. We show evidence of a remelting transition into a fluid phase, which occurs by \emph{reducing} the amplitude of the driving. This transition is accompanied by superdiffusion, cooperative particle motion and a negative differential diffusivity. We will highlight the special role played by frictional interactions, which help particles to escape their glassy cages. Such an effect is in striking contrast to what friction is expected to do: make particles stick to reduce their mobility.