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Shear jamming in granular materials¹ JIE ZHANG, Shanghai Jiaotong University — For frictionless particles with purely repulsive interactions, there is a critical packing fraction ϕ_J below which no jammed states exist. Recent experiments have shown that applying shear to a stress-free initial state can generate states which are either fragile or shear jammed depending on the way the force-network is percolated (Bi et al Nature 2011). The nature of the jamming transition however is obscured because the existence of friction between the system and the third dimension. A new apparatus at SJTU has been designed to completely eliminate this friction by letting the particles float on the surface of a shallow water layer, which allows a study of the more detailed nature of the shear-jammed states and the transition from an unjammed state to a shear-jammed state. In this study, we also use high-precision force sensors to monitor the dynamical changes near the jamming transition. We further combine numerical simulations with the experiments to diagnose the nature of this jamming transition and its possible dependence on certain particle properties.

¹The work at SJTU is in collaboration with Ling Zhang and Jie Zheng. The numerical simulations are in collaboration with Maobin Hu at Univ. of Sci. & Tech. of China.

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