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Jammed by shear: a new perspective of the jamming transition in frictional granular materials[1] DAPENG BI, BULBUL CHAKRABORTY, Brandeis University — In the jamming diagram (*Nature* **396** 21 (1998)) for athermal systems jamming is induced only through compression, and jammed states exist above a packing fraction ϕ_J. Recent experiments in frictional disks clearly show shear induced jamming (D. Bi et al, *Nature* doi:10.1038/nature10667 (2011)). A minimum shear stress, τ_0, is needed to create robust, shear-jammed (SJ) states with a strong force network percolating along both the compressive and dilational directions. This percolation transition is controlled by the fraction of force-bearing grains, a parameter not previously discussed in the context of jamming. The minimum anisotropy of SJ states vanishes as $\phi \to \phi_J$ from below in a manner reminiscent of an order-disorder transition. To shed light on the origin of shear jamming we have constructed a lattice gas model of force-bearing grains with nematic interactions between the force tiles (objects that reflect force balance on each grain). We will show that there are clear signatures of nematic ordering in SJ states, and present analysis of the nature of the shear-induced jamming transitions as a function of ϕ. We will also present numerical simulation results of sheared frictional particles.

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