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Shear Modulus Heterogeneities in Disordered Frictionless Particle Packings LEO SILBERT, SIU Carbondale, HIDEYUKI MIZUNO, MATTHIAS SPERL, German Space Agency (DLR) — It is understood that amorphous solids, ranging from thermal glasses to athermal granular packings, exhibit spatially inhomogeneous mechanical properties. Here, we explore the spatial extent of elastic modulus heterogeneities using computer simulations of a model granular material composed of frictionless, monodisperse spheres, through the implementation of an equilibrium fluctuation formalism. This protocol allows us to decompose the elastic moduli into their affine and nonaffine components. We first validate our numerical scheme by examining how the macroscopic values of the bulk and shear moduli vary as we tune the density of the packing towards its state of marginal stability, that lies at a critical solids packing fraction. Paying particular attention to the shear modulus, we find that it is the fluctuations in the shear modulus that control the mechanical stability of the solid. Furthermore, we are able to associate a characteristic length scale with the relative heterogeneities in the local shear modulus that grows on approach to the critical packing density.

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