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Stress propagation in isotropic packs with anisotropic boundaries NATHAN KRAPF, THOMAS WITTEN, University of Chicago — Stresses in marginally jammed, anisotropic packs built up from a solid floor propagate along oblique rays toward the floor [1]. This clear anisotropic propagation must result from anisotropic packing and/or anisotropic boundary conditions. Here we numerically isolate the effect of anisotropic boundaries by using an explicitly isotropic periodic pack in a marginally jammed, isostatic state. We then remove the periodicity in one direction and anchor the beads along one edge to a substrate. This preserves the isostatic condition while rendering the boundary anisotropic. However, we find hyperstatic modes along one edge of the pack and hypostatic modes at the other. We show that these extra modes decay rapidly away from the boundaries. Remarkably the hypostatic modes cause the pack to be unstable under any force applied to a single bead. This instability can be remedied by applying a suitable cluster of forces to adjacent beads, allowing a clear measurement of the bulk response. We discuss the resulting stress response.

[1]D. A. Head, A. V. Tkachenko, and T. A. Witten. Eur. Phys. J. E 6, 99-105 (2001))

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