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Localized Disturbance in a 2D Cohesive Granular Packing[1] JENNIFER RIESER, University of Pennsylvania, MATHILDE LAPLAGNE, University of Pennsylvania and Ecole Polytechnique, DOUGLAS DURIAN, University of Pennsylvania — How the local structural configuration influences large-scale deformation in disordered materials is not known. Inspired by nano-indentation experiments, we characterize the response of disordered granular packing to a localized disturbance by driving a triangular wedge into the packing. The extent of the disturbance is explored by performing experiments with several wedge angles. The two-dimensionality of the system allows for direct observation of all particle dynamics during the indentation. The grains can be cohesive, with an attraction governed by tunable capillary forces that are induced through an interstitial fluid. Topological quantities derived from a radical Voronoi diagram as well as the resulting triangulation are used to characterize local structure within the packing. Dynamics are characterized by local deformations to the triangulation as well as the local non-affine motion. For all wedge angles, a boundary develops between moving and static grains. This size and shape of this boundary depend on the indenter angle, and in all cases, the size of the boundary increases with time. During the deformation, non-affine grain motion occurs both throughout the moving region as well as along the boundary, while holes tend to develop primarily along this boundary.

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