Nonlinear elastic stress response in granular materials[1] BRIAN TIGHE, Universiteit Leiden, JOSHUA SOCOLAR, Duke University — We study the response of two-dimensional granular materials to a local boundary force, for which classical elasticity predicts identical stress states in the cases of isotropic and hexagonally anisotropic materials. We probe the differences in these two cases by including corrections from the full nonlinear elasticity theory. Additionally, we model the effect of discrete microstructure by taking the magnitude of multipole stress response terms, which are induced in the nonlinear system, as material parameters. By so incorporating both anisotropy and microstructure, reasonable fits are obtained for experimental stress response profiles in hexagonal packings of photoelastic grains, while either correction alone is insufficient.

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