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Scaling of Waves in Heterogeneous Materials[1] TRACY VOGLER, Sandia National Laboratories — The fourth power scaling of strain rate with stress described by Swegle and Grady describes steady waves in many homogeneous materials, but heterogeneous materials can display different scaling relationships. In particular, layered materials exhibit a second power scaling of strain rate with stress, while first power scaling has been observed in granular materials. To better understand these scaling behaviors, numerical simulations of wave propagation in layered and granular materials are performed. The simulations demonstrate that the heterogeneous nature of these materials can cause behavior similar to what has historically been termed viscosity when observed in homogeneous materials. From these simulations, non-dimensional groups that control the scaling of the waves are identified. These groups collapse the available experimental data reasonably well onto a single curve. Finally, a simple model for the first power scaling in granular materials is proposed that illustrates the importance of void space between particles to the wave structure.

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Tracy Vogler
Sandia National Laboratories

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