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Avalanche Distributions and the Effect of Inertia in Strained Amorphous Solids[1] K. MICHAEL SALERNO, MARK O. ROBBINS, Johns Hopkins University, CRAIG MALONEY, Carnegie Mellon University — We present results from two and three-dimensional simulations of a disordered, binary Lennard-Jones solid under quasi-static, steady-state shear. The solid responds to the applied shear strain with bursts of particle movement and plasticity. The energy E of these avalanches spans a wide range and follows a power-law distribution $N(E) \propto E^{-\tau}$ with three distinct exponents, depending on the importance of inertia. In the limit of overdamped dynamics, or no inertia, we find $\tau \approx 0.8$, consistent with previous energy minimization simulations. As inertia becomes more important, the system approaches an unstable critical point where $\tau = 1$. In the underdamped limit, where inertia plays a large role, the distribution of avalanches follows a power-law with exponent $\tau = 1.4$ with an excess of system-spanning events. The three regimes have distinct finite-size-scaling exponents. The fact that consistent exponents are found in two and three dimensions indicates that both may be in the mean-field limit. Spatial correlations in avalanches under different damping regimes will be contrasted.

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