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Critical scaling with strain rate in overdamped sheared disordered solids[1] JOEL CLEMMER, Johns Hopkins University, KENNETH SALERNO, Sandia National Laboratories, MARK ROBBINS, Johns Hopkins University — In the limit of quasistatic shear, disordered solids demonstrate non-equilibrium critical behavior including power-law distributions of avalanches [2]. Using molecular dynamics simulations of 2D and 3D overdamped binary LJ glasses, we explore the critical behavior in the limit of finite strain rate. We use finite-size scaling to find the critical exponents characterizing shear stress, kinetic energy, and measures of temporal and spatial correlations. The shear stress of the system rises as a power β of the strain rate. Larger system size extends this power law to lower rates. This behavior is governed by a power law drop of the dynamic correlation length with increasing shear stress defined by the exponent ν. This finite-size effect also impacts the scaling of the RMS kinetic energy with strain rate as avalanches begin nucleating simultaneously leading to continuous deformation of the solid. As system size increases, avalanches begin overlapping at lower rates. The correlation function of non-affine displacement exhibits novel anisotropic power law scaling with the magnitude of the wave vector. Its strain rate dependence is used to determine the scaling of the dynamic correlation length.

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[2] K. M. Salerno and M. O. Robbins, Phys. Rev. E **77, 062206 (2013)**

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