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Critical scaling of stresses and correlations with strain rate in overdamped sheared disordered solids[1] JOEL CLEMMER, Johns Hopkins University, KENNETH SALERNO, Sandia National Laboratories, MARK ROBBINS, Johns Hopkins University — Like many nonequilibrium systems, disordered solids exhibit a power-law distribution of avalanches and other critical behavior when driven slowly. We extend molecular dynamics studies of quasistatic shear of 2D and 3D overdamped binary LJ glasses[2] to finite strain rate. Finite-size scaling is used to determine the critical behavior of the shear stress and several measures of temporal and spatial correlations in non-affine displacements. With increasing strain rate, there is a power-law rise in the shear stress with exponent β extending to lower rates in larger systems. This behavior is governed by the rise in the dynamic correlation length with decreasing stress with exponent ν. The correlation function of non-affine displacements exhibits novel anisotropic power law scaling with q, the magnitude of the wave vector. Its strain rate dependence is used to determine the scaling of the dynamic correlation length in various angular directions. In the quasistatic limit, particle diffusion in 2D is proportional to strain with a system-size dependent diffusion constant. Increasing strain rate, the dynamic correlation length drops below the system-size and the diffusion constant begins to fall.

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[2]K. M. Salerno and M. O. Robbins, Phys. Rev. E **88**, 062206 (2013)

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