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Strain localization in disordered materials and implications for constitutive laws for sliding interfaces MARY LISA MANNING, JAMES S. LANGER, JEAN M. CARLSON, University of California Santa Barbara — We investigate localization in a model for disordered materials such as granular particles or plastically deforming asperities that are sheared between sliding interfaces. We model the dynamics of configurations of particles that are more susceptible to deformation under shear stress using Shear Transformation Zone (STZ) theory. STZ theory has recently been modified to include effective disorder temperature dynamics, which provides a mechanism for strain softening and shear localization because as the material is strained it becomes more disordered and a more disordered material is more susceptible to deformation. The STZ effective temperature model is investigated in a simple shear geometry by numerically integrating the equations of motion and analyzing their generalized stability. We find that a material with a spatially homogeneous initial effective temperature distribution (corresponding to a slowly quenched sample) supports homogeneous flow, but one with a finite spatial perturbation in the disorder (corresponding to a rapidly quenched sample) develops a shear band, which leads to a dramatic reduction in the yield stress and a modified constitutive law for the interface.

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