Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Strain localization as a mechanism for dynamic weakening in amorphous solids M. LISA MANNING, JAMES S. LANGER, JEAN M. CARLSON, University of California Santa Barbara — Solids such as foams, colloids, amorphous metals and granular fault gouge are composed of particles in closely-packed, non-crystalline configurations, and small-scale mechanisms for deformation in these materials are less well-understood than those in liquids or crystals. I will discuss a mesoscopic model for these disordered solids, the theory of Shear Transformation Zones (STZs), and show that it captures macroscopic features seen in experiments as well as interesting internal dynamics such as shear banding. An important component of this model is the effective temperature, which describes the statistical distributions of particle configurations and governs plastic deformation. Shear banding occurs due to a "frozen"-time instability in the effective temperature field, and one can determine a condition for shear banding based on the initial conditions alone. I will discuss how the STZ formulation can be used as a continuum model for fault gouge and includes a mechanism by which the system can dynamically weaken.

M. Lisa Manning
University of California Santa Barbara

Date submitted: 27 Nov 2007 Electronic form version 1.4