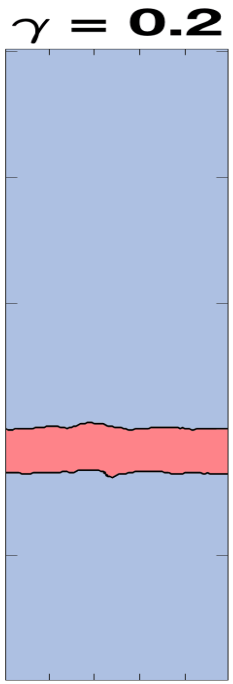
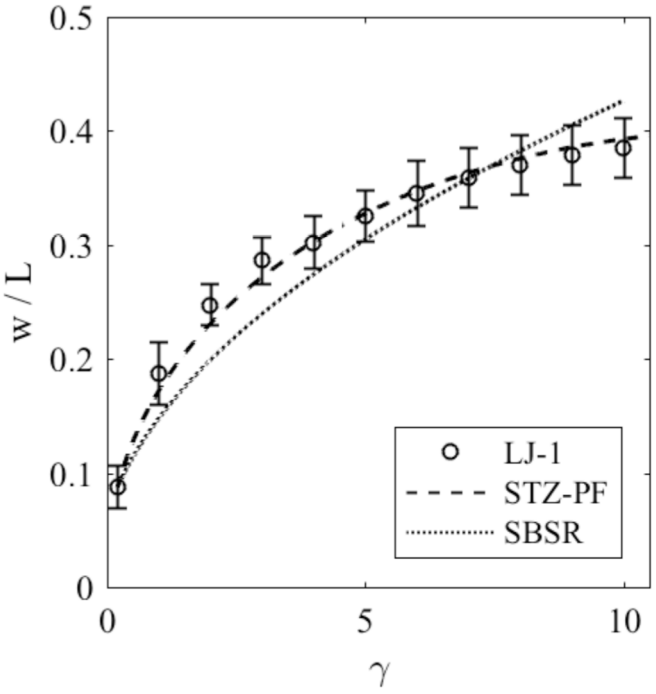
ONE-SLIDE SHAMELESS PLUG: SHEAR BAND BROADENING (ARXIV: 1808.10540)





$$\dot{w} = 2v_0^* = \frac{\pounds V}{2w}\sqrt{1 - \frac{w}{w_\infty}}$$

- Bands in simulated systems (2D BLJ, and 3D CuZr EAM and SW-Si) all show broadening with increasing applied shear.
- While band width appears to grow as applied strain to ½ power at small strains, systematic deviation is seen at large strains.
- Bands appear to saturate at finite width.
- This saturation can be explained to arise from thermal relaxation competing with rejuvenation in an STZ-based continuum model.

OBSERVATIONS/QUESTIONS 1/3

- Both monotonically and cyclically sheared amorphous systems, appear to reach steady states characterized by a unique density, energy and degree of disorder.

1. How do we understand and uniquely characterize these steady states?
2. Can we understand the degree of disorder in terms of more conventional notions of entropy and temperature, or are these equilibrium concepts not useful here?
3. In other words, is an entropy or similar quantity maximized in selecting these states?

OBSERVATIONS/QUESTIONS 2/3

- Cyclic athermal quasi-static (AQS) simulations, despite the lack of any coupling to a thermal bath, result in structural relaxation both at low strain and outside of shear bands, behavior one would typically associate with thermal annealing.

4. How does annealing happen if there are no thermal fluctuations?
5. Does the non-affine elastic field somehow contribute excitations that play the role we would typically attribute to thermal fluctuations? Or is an entirely different mechanism at work?

OBSERVATIONS/QUESTIONS 3/3

- Shear band formation appears to sometimes have elements of a localized instability, but prior studies have proposed that it is a percolation phenomenon. (e.g. Chaudhuri, Horbach).

6. What evidence do we have that shear band formation is a percolation process, as opposed to a localized instability? Could these both be true, albeit at different scales or in different structural regimes?
7. What sets its size and energy scale of this instability?
8. Which material properties are most important to characterize to predict the onset of this instability?