Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Continuum dislocation dynamics: comparison between models WOOSONG CHOI, YONG CHEN, STEFANOS PAPANIKOLAOU, JAMES SETHNA, Cornell University — Many continuum theories of dislocation dynamics have been proposed to bridge the gap in between discrete microscopic simulations and macroscale phenomenology. As of yet, however, these theories had limited success in explaining or predicting the physics of microstructure formation and evolution. Recently, we have shown that a simple isotropic continuum model dynamically form walls[1] and exhibit complicated microstructure formation and evolution[2] similar to experiments. Most other continuum theories have not seen such structures emerging, and to what extent this theory explains the physics remains to be answered. We explore several variants of the current theories which have different microscopic physics as to how slip systems, cross-slip, statistically stored dislocations, explicit or effective short range interactions, etc. are treated. Comparisons among simulation results of these models will be presented, and we will discuss the relevant mechanisms and their consequences in the dynamics of microstructures.

[1]S. Limkumnerd and J. P. Sethna, Phys. Rev. Lett. **96**, 095503 (2006)
[2]Y. S. Chen, W. Choi, S. Papanikolaou, and J. P. Sethna, Phys. Rev. Lett. **105**, 105501 (2010)

Woosong Choi
Cornell University

Date submitted: 19 Nov 2010 Electronic form version 1.4