Abstract Submitted
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Dislocation dynamics at zero temperature and at finite temperature: analytics and simulations[1] KARIN DAHMEN, GEORGIOS TSEKENIS, Department of Physics, University of Illinois at Urbana Champaign, PAK YUEN CHAN, THOMAS FEHM, JONATHAN DANTZIG, NIGEL GOLDENFELD, JONATHAN UHL — Crystalline materials are known to deform in an intermittent way with avalanches. Power laws govern the statistics of the avalanches. In this work we are studying plasticity as a member of the universality class of depinning phase transition. Results from our Discrete Dislocation Dynamics simulations agree with analytical mean field predictions for distributions of avalanche sizes, durations, power spectra, and avalanche shapes. Results from phase field crystal simulations agree with analytical predictions for the depinning phase transition at finite temperature. Both numerics and analytics indicate that the dynamics of edge dislocations in sheared crystals belong to the mean field universality class of depinning transitions, both at zero temperature and at finite temperature.

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