Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Simple model for plastic deformation and slip avalanches in bulk metallic glasses[1] KARIN DAHMEN, JAMES ANTONAGLIA, University of Illinois at Urbana Champaign, JUNWEI QIAO, Taiyuan University of Technology, Taiyuan, Peoples Republic of China, XIE XIE, PETER LIAW, The University of Tennessee, Knoxville, JONATHAN UHL, University of Illinois — Ductile bulk metallic glasses are known to deform under shear in an intermittent way with slip-avalanches detected as acoustic emission and serrations in the stress-strain curves. In many such materials, power laws govern the statistics of these avalanches. A basic micromechanical model for deformation of solids with only one tuning parameter is introduced. The model predicts the observed stress-strain curves, acoustic emissions, related power spectra, and power-law statistics of slip avalanches, including the dependence of the cutoff on experimental parameters with a continuous phase transition from brittle to ductile behavior. Material independent ("universal") predictions for the power-law exponents and scaling functions are extracted using the mean-field theory and renormalization group tools. The results agree with recent experimental observations on deformed bulk metallic glasses.

[1]JA and KD gratefully acknowledge NSF grants DMR-1005209 and DMS-1069224, XX, JQ, and PKL gratefully acknowledge NSF grants DMR-0231320, CMMI-0900271, CMMI-1100080, and DMR-0909037 .

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Date submitted: 03 Nov 2012 Electronic form version 1.4