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Universal slip statistics: from nanocrystals to earthquakes?

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A simple mean field model [1] predicts the statistics and dynamics of slips in a broad range of slowly sheared solid materials. In this talk we review the predictions of the model and compare the results to experiments and observations spanning 12 decades in length scale and a wide range of material structures, including slowly compressed nanocrystals, bulk metallic glasses, rocks, slowly sheared granular materials, and earthquakes [2]. Connections to other systems with avalanches, such as neuron avalanches in the brain [3] and stars [4] are also discussed. The study uses tools from the theory of phase transitions, such as the renormalization group. **References**: [1] K. A. Dahmen, Y. Ben-Zion and J. T. Uhl. Phys. Rev. Lett., 102, 175501 (2009). [2] J. T. Uhl, S. Pathak, D. Schorlemmer, X. Liu, R. Swindeman, B. A.W. Brinkman,, M.LeBlanc, G. Tsekenis, N. Friedman, R. Behringer, D. Denisov, P. Schall, X. Gu, W. J. Wright, T. Hufnagel, A. Jennings, J. R. Greer, P.K. Liaw, T. Becker, G. Dresen, and K. A. Dahmen, Scientific Reports 5, 16493 (2015), and references therein. [3] N. Friedman, S. Ito, B.A.W. Brinkman, L. DeVille, K. Dahmen, J. Beggs, and T. Butler, Phys. Rev. Lett. 108, 208102 (2012). [4] M. A. Sheikh, R. L. Weaver, and K. A. Dahmen, Phys. Rev. Lett. 117, 261101 (2016).