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Tuning Parameters and Scaling For Avalanches On A Slowly-Driven Conical Bead Pile with Cohesion[1] SUSAN LEHMAN, D. T. JACOBS, PAROMA PALCHOUDHURI, AVI VAJPEYI, JUSTINE WALKER, College of Wooster, KARIN DAHMEN, MICHAEL LEBLANC, University of Illinois at Urbana-Champaign, JONATHAN UHL, Retired — Slip avalanches on a slowly driven pile are investigated experimentally using a 3D conical pile built from uniform 3 mm steel beads. Beads are added to the pile by dropping them onto the apex one at a time; avalanches are measured through changes in pile mass. We investigate the dynamic response of the pile by recording avalanches from the pile over the course of tens of thousands of bead drops. The statistical properties of the avalanches, including probability of particular avalanche sizes and the time between avalanches of given size, are well-characterized by universal power laws and scaling functions. By adding a uniform magnetic field, we may systematically vary the cohesion between the beads and tune the critical behavior of the system. As the cohesion increases we observe an increase in both size and number for very large avalanches and decreases in the mid-size avalanches, causing a deviation from the power law. A full study of the effect of cohesion on the size and time distributions is in process, combining the experimental results with predictions from an analytical mean-field model [Dahmen, Nat Phys 7, 554 (2011)].

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