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Use of a magnetic field to modify and detect avalanche behavior on a conical bead pile NATHAN JOHNSON, SUSAN LEHMAN, Department of Physics, College of Wooster, Wooster, OH — A conical bead pile subject to slow driving and an external magnetic field is used to test the effects of drop height and cohesion on avalanche statistics. Magnetically susceptible beads were dropped onto a pile from different heights and into different strengths of magnetic field. Avalanches were recorded by the change in mass as beads fall off the pile. For beads dropped from a low drop height with no cohesion, the avalanche size distribution follows a power law. As cohesion increases, we observe an increase in the probability of very large avalanches and decreases in the mid-size avalanches. The resulting bump in the avalanche distribution moves to larger avalanche size as the cohesion in the system is increased, matching the prediction by an analytic theory from a mean-field model of slip avalanches. The model also makes predictions for avalanche duration, which is not measurable with our current system. Since the steel beads are magnetized while in the applied magnetic field, their motion during an avalanche creates a change in magnetic flux. To detect this motion, we have placed a large-diameter pick-up coil around the pile. Results of the testing and calibration of this coil to measure avalanche duration are presented.

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