Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

From the local Coulomb rule to a global failure criterion for packings of frictional particles SILKE HENKES, CAROLINA BRITO, Lorentz Institute, Leiden University, OLIVIER DAUCHOT, GIT, SPEC, CEA Saclay, MARTIN VAN HECKE, Kamerlingh Onnes Laboratory, Leiden University, WIM VAN SAARLOOS, Lorentz Institute, Leiden University — Frictional contacts at the Coulomb threshold are unstable to tangential perturbations and thus contribute to failure at the microscopic level. How can they be linked to global failure? Here, we use a simulated bed of frictional disks under the action of gravity undergoing a slow tilt. Based on contact information, we develop a novel criterion to separate the quiet state from the avalanching state. During the quiet state, we find both spatial and temporal correlations between failure and the clusters of particles with fully mobilized contacts. These clusters are strongly fluctuating, and eventually approach system spanning size near the avalanche. We find that the clusters cross the line of marginal stability at the start of the avalanche, while the global system does not. We conclude that to initiate failure, it is only necessary for a correlated subset of the packing to violate the generalized isostaticity stability criterion.

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Date submitted: 19 Nov 2009 Electronic form version 1.4