Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Rare events in granular media: a volcanic-like explosion EVGENIY KHAIN, Oakland University, LEONARD SANDER, University of Michigan — Granular matter is ubiquitous in nature and exhibits a variety of nontrivial phenomena. Within the same system, different regions of granular media can be at a solid or a gas phase. Here we focus on a granular Leidenfrost effect: a solid-like cluster is levitating above the "hot" granular gas [1]. This state was observed experimentally, when granular matter was vertically vibrated in a two-dimensional container [2]. This solid-gas coexistence can be described by using granular hydrodynamics, taking into account the viscosity divergence in the solid cluster. The approach is similar to the one employed in investigating solid-fluid coexistence in dense shear granular flows [3]. We performed extensive molecular dynamics simulations of a simple model of inelastic hard spheres driven by a "thermal" bottom wall. Simulations showed that for low wall temperatures, the levitating cluster is stable, while for high wall temperatures, it breaks down, and a hot gas bursts out resembling a volcanic explosion. We found a hysteresis: for a wide range of bottom wall temperatures, both the clustering state and the volcanic state are stable. However, even if the system is at the (stable) clustering state, a volcanic explosion is possible: it is a rare event driven by large fluctuations. We propose a special simulation technique that allows investigating such rare events. [1]. B. Meerson, T. Pöschel, and Y. Bromberg, Phys. Rev. Lett. 91, 024301 (2003). [2]. P. Eshuis, K. van der Weele, D. van der Meer, and D. Lohse, Phys. Rev. Lett. 95, 258001 (2005). [3]. E. Khain, Phys. Rev. E 75, 051310 (2007); E. Khain, EPL 87, 14001 (2009).

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Date submitted: 30 Jul 2015 Electronic form version 1.4