MAR09-2008-007030

Abstract for an Invited Paper
for the MAR09 Meeting of
the American Physical Society

Measuring the configurational temperature of granular media

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Twenty years ago Edwards and Oakeshott suggested developing a statistical mechanics of static granular media based on the idea that the logarithm of the number of mechanically stable states of a specific sample constitutes the relevant entropy [1]. From this entropy then, a configurational temperature, named compactivity, could be derived. However, in the absence of an appropriate thermometer to measure compactivity, the question if it is indeed a relevant state variable remained untested. Only recently it was shown that the steady state volume fluctuations of a periodically driven sample can be used to measure the compactivity of a granular sample including its dependence on volume fraction and surface friction of the particles [2]. This opens up the possibility of studying questions like the existence of a zeroth law of granular thermodynamics or the relationship between compactivity and other forms of granular temperature.

[1] Edwards and Oakeshott, Physica A **157**, 1080 (1989).
[2] M. Schröter, D. Goldman, and H. L. Swinney Phys. Rev. E **71**, 030301(R) (2005)