Inhomogeneous cooling state of a strongly confined granular gas at low density

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The inhomogeneous cooling state describing the hydrodynamic behaviour of a freely evolving granular gas strongly confined between to parallel plates is studied, using a Boltzmann kinetic equation derived recently [1]. By extending the idea of the homogenous cooling state, we propose a scaling distribution in which all the time dependence occurs through the granular temperature of the system, while there is a dependence on the distance to the confining walls both through the density and the temperature.

It is obtained that the velocity distribution is not isotropic, and has different temperature parameters associated to the motion perpendicular and parallel to the confining plates, although their cooling rates are the same. The cooling rate and the temperature are calculated by means of a Gaussian approximation. The theoretical predictions are compared with molecular dynamics simulation results and a good agreement is found.

[1] J. J. Brey, P. Maynar, and M. I. García de Soria, Kinetic equation and nonequilibrium entropy for a quasi-two-dimensional gas, Phys. Rev. E **94**, 040103(R) (2016).