HYDRODYNAMICS MODES IN SHALLOW GRANULAR FLUIDS

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The dynamics of a granular medium subject to a bulk energy injection mechanism method is studied. Making simple generic assumptions on the injection method the hydrodynamics equations are written. The fluctuations around the stationary state are analyzed and described in terms of the dynamic structure factor as it provides information of the fields that couple to the density uctuations but also of the transport coefcients and some equilibrium properties like compressibility or specic heats. Two regimes are distinguished. A disipative one in which the heat mode is suppressed and a quasielastic regime in which the heat mode is visible. The two regimes and the crossover between the two regimes are fully characterized.
A particular geometry that has gained interest in the study of granular media is the quasi two-dimensional one (Q2D). Here the box is large in the horizontal directions, while the vertical one is smaller than two particles' diameters. The box is vertically vibrated. Under appropiated conditions the system is fluidized and can remain homogenous. Varying the vibration amplitude and frecuency the system develops a phase transition with a solid-like region coexisting with the fluid. To model the Q2D system we propose an effective two dimensional hard disk model in which disipative collisions are characterized by a constant restitution coefficient and a collisional energy input mechanism is introduced to model the input of energy by vibration. The effective 2D collisional model is simulated using the event driven algorithm for systems of different restitution coefficients and global density. An stationary granular temperature is reached that depends on the injection and disipation mechanism. The intermediate scattering function $F(k,t)$ and the dynamic structure factor $S(k,w)$ are obtained and compared with the theoretical predictions for the model. Very good agreement is obtained.