Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

The building blocks of Dynamical Heterogeneities in dense granular media RAPHAEL CANDELIER, OLIVIER DAUCHOT, GIULIO BIROLI, CEA — Unveiling the connection between the short term relaxation and the long term dynamical heterogeneities as observed near the glass transition in super-cooled liquids and the jamming transition in granular materials remains a major challenge in the physics of glassy systems. On one hand, KCM models relate dynamical heterogeneities to a non trivial structure in the trajectory space, inherited from the local dynamical rules. On the other hand, recent studies of hard spheres close to isostaticity suggest that the collective aspect of the relaxation would stem from the extended character of the softest degrees of freedom, along which the system yields from one meta-bassin to another. There is still no direct experimental evidence in favour of one or the other mechanism in super-cooled liquids nor in dense granular media. Here we will show that for a dense granular layer under cyclic shear dynamical heterogeneities result from a two timescales process. Short time but already collective events consist in clustered cage jumps, which concentrate most of the non affine displacements. Such clusters aggregate both temporally and spatially within an avalanche process, which ultimately builds the large scales dynamical heterogeneities. The typical timescale of the dynamical heterogeneities appears as the crossover between the short time separating successive event within the avalanches and the long time separating the successive jumps of any given particle.

Raphael Candelier
CEA

Date submitted: 10 Nov 2008 Electronic form version 1.4