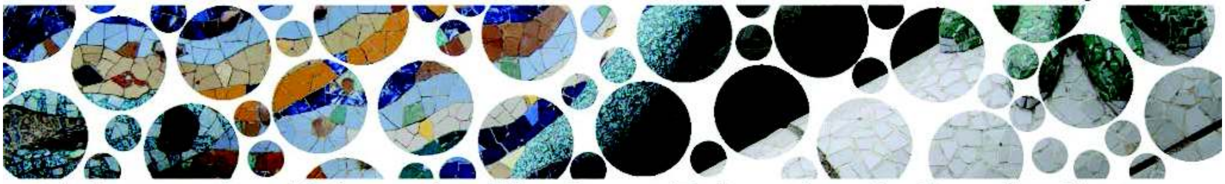
Barcelona 21-26 July 2013



7th International Discussion Meeting on Relaxations in Complex Systems

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New results, Directions and Opportunities

Book of Abstracts

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GJ-19

Jamming transition and critical scaling in a three dimensional spiral model

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Disordered systems like granular media, colloids or atomic liquids when compressed or rapidly cooled from an initial equilibrium liquid state undergoes a transition to an amorphous solid like phase at higher densities . Such glass / jamming transitions are characterized by the onset of slow dynamics, where molecular motion are locally constrained due to the presence of other neighbors leading to a very high relaxation times. One of the simplest finite dimensional representation of such dynamics is by kinetically constrained models [1-5] where a spin /particle is only allowed to flip or move when a certain constraint is satisfied locally by its nearest neighboring sites. Spiral model [4-7] is one of such class of model that is previously shown [5] to undergo an ideal glass-jamming transition at a occupation density $r_c < 1$ in two dimension. In the present work we numerically study the culling dynamics [8] of spiral models in two as well as in three dimensions. The average cull time as obtained at different initial occupation density shows a sharp peak at a critical density $r_c < 1$ in both cases, implying correlation over long length scales and presence of percolating clusters in the system. We find a different critical density $r_c \sim 0.35$ in 3D which is lower than the critical density ~ 0.7 as predicted for two dimensional spiral model. We further perform system size analysis, obtain and compare the scaling exponents at the critical density in both the dimension.

[1] G. H. Fredickson, and H. C Anderson, Phys. Rev. Lett. 53, 13, 1984.
[2] P. Sollich and M R Evans, Phys. Rev. Lett., 83, 3238-3241, 1999.
[3] C. Toninelli, G. Biroli, and D. S. Fisher, Phys. Rev. Lett. 96, 035702, 2006.
[4] C. Toninelli and G. Biroli, J. Stat. Phys. 130, 83 , 2008.
[5] G. Biroli and C. Toninelli, Euro. Phys. Journ. B 64, 567 , 2008.
[6] F. Corberi and L. F Cugliandolo, J. Stat. Mech, P09015, 2009
[7] Y. Shokef and A. J. Liu, Euro Phys Lett, 90, 26005, 2010.
[8] M. Jeng and J. M. Schwarz, Phys. Rev. E 81, 011134, 2010.

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GJ -20

Representing microstates of static granular matter in a stress phase space

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A stress phase space is proposed to compare the static packings of a granular system (microstates) that are compatible to a macrostate described by external stresses.
The equivalent stress of each particle of a static packing can be obtained from the mechanical interaction forces, and the associated volume is given by the respective Voronoi cell. Therefore, particles can be located at different stress levels and grouped into categories or configurations, which are defined in base of the geometrical features of the local arrangement (in particular, of the number of forces that keep them force-balanced). They can be represented as points in a stress phase space.
The nature of this space is analyzed in detail. The integration limits of the stress variables that avoid or limit tensile states and the capability of each configuration to represent specific stress states establish its main features. Furthermore, if some stress variables are used, instead of the usual components of the Cauchy stress tensor, then some symmetries can be found. Results obtained from molecular dynamics simulations are used to check this nature.
Finally, some statistical ensembles are written in terms of the coordinates of this phase space. These require some assumptions that are made in base on continuum mechanics principles.