

Research Topic for the ParisTech/CSC PhD Program

Subfield: Soft condensed matter Physics.

ParisTech School: ESPCI

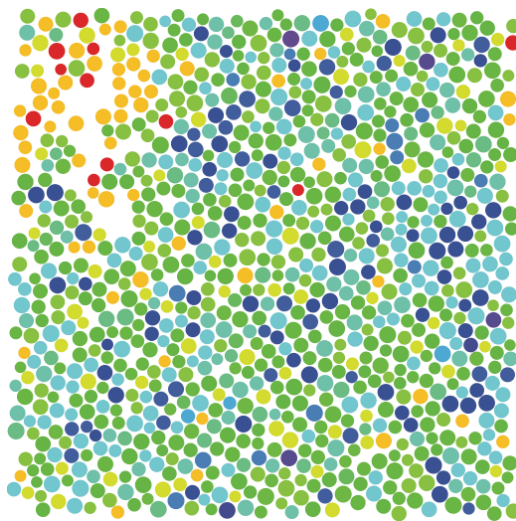
Title: Mechanical and rheological behaviour of granular systems

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Website: <https://www.pmmh.espci.fr/fr/morphodynamique/>

Short description of possible research topics for a PhD:

Granular materials belong to the class of amorphous materials like emulsions, foams and colloids that may resist to a shear stress while they do not present any long-range translational order at the microscopic scale. They exhibit a rigidity transition, which means that their dynamical behaviour switches from solid-like to liquid-like behaviour, when a control parameter crosses a threshold value. The PhD thesis will aim to investigate numerically the mechanical and rheological behaviours of these systems across this transition. In particular, it will focus on the emergence of non-local effects, on the origin of hysteresis, on the thermal activation of contacts and on the influence of particle cohesion forces. These studies will have applications to the dynamics of granular avalanches and to the formation of small solar system bodies.



Required background of the student: Physics

Last relevant publications of the group:

Bouزيد M., Trulsson M., Claudin P., Clement E. & Andreotti B. 2013 A non-local rheology for granular flows across yield conditions, Phys. Rev. Lett. 111, 238301.

Trulsson M., Bouزيد M., Kurchan J., Clement E., Claudin P. & Andreotti B. 2015 Athermal analogue of sheared dense Brownian suspensions, Eur. Phys. Lett. 111, 18001.

Peshkov A., Claudin P., Clement E. & Andreotti B. 2016 Active dry granular flows: Rheology and rigidity transitions, Eur. Phys. Lett. 116, 14001.

Favier de Coulomb A., Bouزيد M., Claudin P., Clement E. & Andreotti B. 2017 Rheology of granular flows across the transition from soft to rigid particles, Phys. Rev. Fluids. 2, 102301.