

Grains in a fluid: sediment transport and rheology

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By means of two phase numerical simulations based on a discrete element method (DEM) for particles coupled to a continuum Reynolds averaged description of hydrodynamics, we have studied the properties of sediment transport by a flow [1] and the rheology of dense suspensions [2]. In the case of transport, we have investigated the transition from bedload to saltation when the particle to fluid density ratio is increased. In both cases, we have identified the mechanisms leading to the scaling laws relating the particle flux to the shear velocity of the flow. As for the suspensions, we have shown how the rheological laws of Bagnold and Newtonian regimes can be unified and expressed as a function of a single dimensionless number, by adding their contribution to the dissipation.

References

- [1] O. Durn, B. Andreotti and P. Claudin, *Numerical simulation of turbulent sediment transport, from bed load to saltation*, Phys. Fluids **24**, 103306 (2012).
- [2] M. Trulsson, B. Andreotti and P. Claudin, *Transition from viscous to inertial regime in dense suspensions*, Phys. Rev. Lett. **109**, 118305 (2012).