LadHyX Seminar – May 19, 11:00, – LadHyX Library

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Inertial particle dynamics in (turbulent) flows

A particular form of multiphase flow consists in the association of a carrier fluid and particles. The particles can be of different natures (solid inclusions, drops, bubbles), shapes and sizes and their relative density with respect to the carrier fluid can go from a few to several thousands. The fluid can be at rest or in motion, laminar, in transition or turbulent and thus include one, several or a continuum of spatial and temporal scales. Finally, the particle loading can be reduced to one or reach volume or mass fractions of the order of unity. This great variety of parameters, all extending over large ranges, leads to a very large wealth of behaviors depending on at least five dimensionless numbers for the most idealized cases (particle inertia, relative density, Reynolds number of the carrier phase, loading rate, relative gravity).
The most spectacular behaviors are the tendency to preferential concentration and to the formation of more or less coherent clusters, the alteration of the sedimentation rate, the modification of the collision rates between particles and the modification of the carrier phase. These four aspects always involve several if not all the parameters of the problem and bring into play several forms of coupling which often coexist: the dynamics of the particles induced by the flow, the setting in motion of the flow by the agitation of the particles, the alteration of a carrier flow by the dynamics of the dispersed phase, these interactions which can possibly lead to fragmentation or coalescence. In this seminar, we will address the aspects of sedimentation, preferential concentration and the links between them.