TITLE: Falling clouds of particles
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ABSTRACT:

The time evolution of clouds of particles settling under the action of gravity in an otherwise pure liquid is investigated both experimentally and numerically. It is found that an initially spherical cloud containing enough particles is unstable even in the complete absence of inertia. The cloud slowly evolves into a torus, which breaks up into secondary droplets, which deform into tori themselves in a repeating cascade. The discrete nature of the particles is fundamental in the understanding of these instabilities. Faster breakup is observed for clouds of anisotropic particles such as fibers due to the self-motion of the anisotropic particles. When inertia is finite, the cloud also deforms into a flat torus that eventually destabilizes and breaks up into a number of secondary droplets. While this behavior bears some similarity with that observed at zero-inertia, the underlying physical mechanisms differ. Moreover, the evolution of the cloud deformation is accelerated as inertia is increased. Two inertial regimes where macro-scale inertia and micro-scale inertia become successively dominant are clearly identified.

SHORT BIO:

Élisabeth Guazzelli is Senior Researcher (Directeur de Recherche) at the CNRS (Centre National de la Recherche Scientifique) and affiliated with the IUSTI Laboratory of Polytech'Marseille (Aix-Marseille Université), of which she is Vice Director. A physicist by training, her research interests are in the field of particulate multiphase flows, such as granular media, fluidized beds, suspensions, and sedimentation. She is responsible for a very active and diversified research group in Marseille composed of ten people. Since 2005, she has been an Associate Editor of the Journal of Fluid Mechanics.