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Radiation-induced turbulence in particle-laden buoyant flows REMI ZAMANSKY, Stanford University CTR, FILIPPO COLETTI, Stanford University Mechanical Engineering, MARC MASSOT, Stanford University CTR - Ecole Centrale de Paris EM2C, ALI MANI, Stanford University CTR — Particle laden flows are of tremendous importance in oceanography, geophysics, meteorology, astrophysics, and process technology. In the presence of thermal radiation, non-uniformities in particle concentration result in local temperature fluctuations (spatial and temporal), due to the different absorptivity between dispersed and carrier phases. Under the influence of gravity or other acceleration fields, fluid motion is induced by buoyancy, altering the particle distribution and possibly inducing higher non-uniformities. Numerical simulations have been performed which illustrate this effect. It is shown that for a broad range of parameters a (e.g. radiation intensity, acceleration, density ratio and number density) feedback loop between the local particle concentration, the temperature fluctuations and the buoyancy forcing can create and sustain turbulence. Inertial particles are observed to cluster and create high temperature plumes. When the particle response time is comparable to the characteristic lifetime of the plumes, the system exhibits intense fluctuations of turbulent kinetic energy and maximum concentration.

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