Abstract Submitted
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Effects of ambient turbulence on a particle plume[1] ADRIAN C.H. LAI, Singapore-MIT Alliance for Research and Technology Centre, J.W. ER, ADRIAN W.K. LAW, Nanyang Technological University, E. ERIC ADAMS, Massachusetts Institute of Technology — We investigated experimentally the effects of ambient turbulence on a particle plume. Homogeneous and isotropic turbulent ambient water was generated by a random jet array in a glass tank. Glass beads of different particle diameters were released continuously into this turbulent ambient using a submerged hourglass, forming particle plumes with a constant efflux velocity; different initial velocities were tested for each particle size. We focused on the region in which the integral length scale of the ambient eddies is larger than that of the particle plume size. Following the arguments of Hunt (1994) and the observation of Hubner (2004) on a single-phase plume, it is expected that in this region, the internal structure or Lagrangian spreading of the particle plume, will not be significantly affected, but the plume centerline would meander due to the ambient turbulence leading to an increase in the Eulerian width. In the presentation, first, we will present our preliminary experimental data which showed that this is also true for two-phase particle plumes. Second, based on this observation, we developed a theoretical framework using a stochastic approach to predict the spreading of the plume. Predictions of the model will be compared with our experimental data.

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