

Abstract Submitted
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Sedimentation from Particle-Laden Plumes in Stratified Fluid

BRUCE SUTHERLAND, University of Alberta, YOUN SUB HONG, University of Toronto — Laboratory experiments are performed in which a mixture of particles, water and a small amount of dye is continuously injected upwards from a localized source into a uniformly stratified ambient. The particle-fluid mixture initially rises as a forced plume (which in most cases is buoyant, though in some cases due to high particle concentration is negative-buoyant at the source), reaches a maximum height, collapses upon itself and then spreads as a radial intrusion. The particles are observed to rain out of the descending intrusion and settle upon the floor of the tank. Using light attenuation, the depth of the particle mound is measured after the experiment has run for a fixed amount of time. In most experiments the distribution of particles is found to be approximately axisymmetric about the source with a near Gaussian structure for height as a function of radius. The results are compared with a code that combines classical plume theory with an adaptation to stratified fluids of the theory of Carey, Sigurdsson and Sparks (JGR, 1988) for the spread and fall of particles from a particle-laden plume impacting a rigid ceiling. Re-entrainment of particles into the plume is also taken into account.

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