Abstract Submitted
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**Plume Splitting in a Two-layer Stratified Ambient Fluid**[1] YONGXING MA, Department of Earth Atmospheric Sciences, University of Alberta, MORRIS FLYNN, Department of Mechanical Engineering, University of Alberta, BRUCE SUTHERLAND, Departments of Physics and Earth Atmospheric Sciences, University of Alberta — A line-source plume descending into a two-layer stratified ambient fluid in a finite sized tank is studied experimentally. Although the total volume of ambient fluid is fixed, lower- and upper-layer fluids are respectively removed and added at a constant rate mimicking marine outfall through diffusers and natural and hybrid ventilated buildings. The influence of the plume on the ambient depends on the value of $\lambda$, defined as the ratio of the plume buoyancy to the buoyancy loss of the plume as it crosses the ambient interface. Similar to classical filling-box experiments, the plume can always reach the bottom of the tank if $\lambda > 1$. By contrast, if $\lambda < 1$, an intermediate layer eventually forms as a result of plume splitting. Eventually all of the plume fluid spreads within the intermediate layer. The starting time, $t_v$, and the ending time, $t_t$, of the transition process measured from experiments correlate with the value of $\lambda$. A three-layer ambient fluid is observed after transition, and the mean value of the measured densities of the intermediate layer fluid is well predicted using plume theory.

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