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A comparison of the turbulent entrainment process in line plumes and wall plumes DAVID PARKER, HENRY BURRIDGE, JAMIE PARTRIDGE, PAUL LINDEN, Department of Applied Mathematics and Theoretical Physics, University of Cambridge — Flows driven by sources of buoyancy appear in a large number of geophysical and industrial applications. The process of turbulent entrainment in these flows is key to understanding how they evolve and how one might model them. It has been observed that the entrainment is reduced when a line source of buoyancy is positioned immediately adjacent to a wall. To gain insight into the effect of the wall on the entrainment process we perform simultaneous PIV and LIF on both line plumes, in the absence of any boundary, and when the source is adjacent to a vertical boundary forming a wall plume. The experiments are designed to isolate the effect of the wall by using the same experimental setup and parameters for both flows with the addition of the wall and half the buoyancy flux used in the wall plume case. Of particular interest is the effect the large scale eddies, forming at the edge of the plume and engulfing ambient fluid, have on the entrainment process. By using velocity statistics in a coordinate system based on the instantaneous scalar edge of the plume, a technique we have recently used to analyse similar effects in an axisymmetric plume, the significance of this large scale engulfment will be quantified.

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