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Source and boundary condition effects on confined vertically distributed turbulent plumes NIGEL KAYE, Clemson University, PAUL COOPER, University of Wollongong — Recent experiments into the behavior of an enclosed vertically distributed source of buoyancy have shown that the plume partially detrains in the stratified region of the enclosure. This detrainment is not observed for enclosed constant buoyancy flux plumes. While models have been proposed to quantify the detrainment process it is still unclear why vertically distributed buoyancy sources detrain while constant buoyancy flux plumes do not detrain in the same physical geometry. One difference between distributed and localized sources is that the impact of non-ideal source conditions (i.e. where mass as well as buoyancy is added at the source) is distributed over the whole height of the enclosure for a vertically distributed source. Another difference is the presence of a solid boundary along the plume source leading to a retarding boundary shear stress. Herein the impact of non-ideal source conditions on a vertically distributed plume are analyzed and it is shown that, at any height, either the plume volume flow rate is significantly influenced by the wall source volume flux or the wall source buoyancy is greater than the mean plume buoyancy creating a non-self-similar horizontal buoyancy distribution in the plume. The impacts of source and boundary effects on previously published experiments of vertically distributed plumes are reviewed and the possible implications for plume detrainment are discussed.

Nigel Kaye
Clemson University

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