

Abstract Submitted
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The Competition Between a Localised and Distributed Source of Buoyancy¹ JAMIE PARTRIDGE, PAUL LINDEN, Cambridge University —

We propose a new mathematical model to study the competition between localised and distributed sources of buoyancy within a naturally ventilated filling box. The main controlling parameters in this configuration are the buoyancy fluxes of the distributed and local source, specifically their ratio Ψ . The steady state dynamics of the flow are heavily dependent on this parameter. For large Ψ , where the distributed source dominates, we find the space becomes well mixed as expected if driven by an distributed source alone. Conversely, for small Ψ we find the space reaches a stable two layer stratification. This is analogous to the classical case of a purely local source but here the lower layer is buoyant compared to the ambient, due to the constant flux of buoyancy emanating from the distributed source. The ventilation flow rate, buoyancy of the layers and also the location of the interface height, which separates the two layer stratification, are obtainable from the model. To validate the theoretical model, small scale laboratory experiments were carried out. Water was used as the working medium with buoyancy being driven directly by temperature differences. Theoretical results were compared with experimental data and overall good agreement was found.

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