Abstract Submitted
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Overturning in a cylindrical filling box NIGEL KAYE, GARY HUNT, Imperial College London — We examine the overturning in a cylindrical 'filling box' driven by a single axisymmetric point source turbulent plume. We measure the initial penetration depth (h) of the buoyant flow that intrudes vertically up the side wall as a function of the box radius (R) and height (H). Dimensional arguments reduce the problem to finding $\eta = h/H$ as a function of the aspect ratio $\Phi = R/H$. We model the flow in two parts, the radial outflow from the plume along the base of the box and the flow up the side wall. The outflow is modelled as a forced constant buoyancy flux radial gravity current while the side- wall flow is modelled as a turbulent line fountain. Different flow regimes were found for small and large aspect ratios. Firstly, for small aspect ratios, the plume outflow is still adjusting toward a pure gravity current on impact with the vertical wall. For this regime the dimensionless rise height is given by $\eta \sim \Phi^{-1/3}$. Secondly, for larger aspect ratios, the outflow is fully developed before impact. In this case the rise height is given by $\eta \sim Const$. Experimental results show good agreement with these scalings.

Nigel Kaye
Imperial College London

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