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Mixing induced by exchange flows in a confined volume of fluid A. KUESTERS, BP Institute, U. of Cambridge, ANDREW W. WOODS, (BPI) — We investigate the transient mixing and stratification associated with the buoyancy-driven exchange flow of a confined volume of fluid, connected to the exterior through two openings in the roof. The inflowing flux of dense exterior fluid develops a turbulent buoyant plume which mixes with the interior fluid as it cascades to the base of the volume. We show that the resulting transient stratification of the interior fluid asymptotes to a profile of constant shape with decaying amplitude. We show how contaminant, released locally, rises through the space to form a front of high concentration, with relatively little mixing by the plume. New laboratory experiments of the process are shown to be consistent with our predictions of the interior stratification and evolution of the flow. In enclosures with multiple stacks, the efficiency of mixing increases, although there are now multiple flow regimes which can develop. We show that the process is key for modelling the release of smoke or other contaminant through a roof stack from an enclosed space.

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