

Abstract Submitted
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Turbulent fountains as a model for mixing at a density interface

NIGEL KAYE, WILLIAM MARTIN III, Clemson University — Numerical results are presented for the change in flow rate in a round turbulent fountain as it rises and falls. The theoretical models of Bloomfield and Kerr (2000) are used to examine the entrainment across a density interface due to the impingement of an axisymmetric turbulent shear flow such as a plume or jet. The numerical results indicate that there are two mixing regimes, a low Froude number (weak fountain) regime in which the entrainment coefficient scales approximately on $\alpha \sim Fr^2$ and a high Froude number (forced fountain) regime in which the entrainment coefficient scales like $\alpha \sim Fr$. This is in contrast to the experimental parameterization of Kumagai (1984) which had the entrainment coefficient as $\alpha \sim Fr^3$ for low Froude numbers and α approaching a constant in the limit of high Fr . The numerical results are compared to a broad range of experimental measurements in the literature. The sensitivity of the calculated entrainment coefficients to the internal body force model and entrainment assumption is also examined. The results are discussed in relation to models for mixing efficiency in stratified flows.

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