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Entrainment in negatively buoyant jets and fountains[1] LIAM MILTON-MCGURK, NICHOLAS WILLIAMSON, STEVEN ARMFIELD, MICHAEL KIRKPATRICK, Univ of Sydney — Turbulent negatively buoyant jets (NBJs) occur when the buoyancy of a jet opposes its initial momentum. A vertically aligned NBJ discharged from a round source will be decelerated by the opposing buoyancy force until its axial momentum is reduced to zero, reaching a stagnation point. Here the flow reverses direction and returns annularly towards the source, mixing with the opposing fluid and forming a fountain. The flow during the initial stage will be referred to as a 'negatively buoyant jet', while the fully developed, quasi-steady, stage will be considered a 'fountain'. The present experimental investigation uses 2D particle image velocimetry (PIV) and planar laser induced fluorescence (PLIF) to obtain data during both the NBJ and fountain stages, for source Froude and Reynolds numbers in the ranges $15 \leq Fr_o \leq 30$ and $4500 \leq Re_o \leq 6000$. The study examines how classical integral models typically applied to jets and plumes can be used to describe fountains and NBJs, and we investigate different approaches to describing entrainment between the inner and outer flow regions.

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