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An experimental study on the near-source region of lazy turbulent plumes[1] FRANCESCO CIRIELLO, GARY R. HUNT, Univ of Cambridge — The near-source region of a 'lazy' turbulent buoyant plume issuing from a circular source is examined for source Richardson numbers in the range of 10^1 to 10^7. New data is acquired for the radial contraction and streamwise variation of volume flux through an experimental programme of dye visualisations and particle image velocimetry. This data reveals the limited applicability of traditional entrainment laws used in integral modelling approaches for the description of the near-source region for these source Richardson numbers. A revised entrainment function is proposed, based on which we introduce a classification of plume behaviour whereby the degree of 'laziness' may be expressed in terms of the excess dilution that occurs compared to a 'pure' constant Richardson number plume. The increased entrainment measured in lazy plumes is attributed to Rayleigh-Taylor instabilities developing along the contraction of the plume which promote the additional engulfment of ambient fluid into the plume.

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