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Initial Descent of a Thermal and the Application to Downdraughts EMILY KRUGER, University of Cambridge, HENRY BURRIDGE, Imperial College London, GABRIEL ROONEY, MET Office, PAUL LINDEN, University of Cambridge — Downward moving cold air within thunderstorms, known as downdraughts, can be used to determine the severity of a storm. Therefore an understanding of them is useful for weather forecasting. Typically in weather forecasting these downdrafts are modelled using the theory of a plume from from Morton, Taylor and Turner (1956), which inherently assumes that the plume is long and thin. Downdrafts are generally wider than they are high and hence deviate from the Morton, Taylor and Turner theory. We perform experiments using finite releases of dense fluid from a cylinder of varying lengths. By tracking the edges of the release we can find the velocity and radius of the descent and gravity current after impact. In doing so we find that the descent has two regimes, an initial phase and then a self similar thermal, and the axisymmetric gravity current varies depending on which regime the descent impacts the ground in. A theoretical model is proposed for this initial phase and compared to the experimental data. We hope that these results and future work will allow us to better inform forecasting of weather arising from such downdraughts.

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