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Interacting thermals

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A thermal is an instantaneous release in a gravitational field of fluid of a density that differs from that of its surroundings. Much work, both experimental and theoretical, has previously been done on the case of a single thermal in both stratified and unstratified environments. Indeed, it is worth noting that the impulsively accelerated equivalent of a shock passing through a bubble or droplet is also of interest to this community. This paper reports preliminary results of a novel study of thermals in the Boussinesq limit, with particular emphasis on the simultaneous release of multiple thermals and their subsequent interaction.

As the thermal propagates it entrains the surrounding fluid which, due to the interior motion of the thermal, becomes mixed throughout. In an array the amount of ambient fluid between each thermal becomes limited and consequently they will either merge or compete for this fluid. We utilise a combination of simple laboratory experiments and numerical modelling in our attempt to understand the dynamics.

This study, motivated in part by an analogy between multiple interacting thermals and Rayleigh-Taylor instability, will help provide insight into the processes of mode coupling and mode competition that appear important for understanding the growth of Rayleigh-Taylor instability.