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Dilution and Compression of Thermals in Stratified Domains

EVAN ANDERS, University of Colorado – Boulder, DANIEL LECOANET, Princeton Center for Theoretical Science, BENJAMIN BROWN, University of Colorado – Boulder — Dense downflows are observed in the atmosphere (leading to cold pools), and may exist in stars. These downflows can be modeled as dense, negatively buoyant thermals. We present an analytical theory describing the evolution of dry thermals with depth, and verify the theory with 3D simulations of thermals in stratified atmospheres. Our results show that dense thermals fall in two categories: a stalling regime in which they slow down and expand, and a falling regime in which they accelerate and shrink as they propagate downwards.

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