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Buoyancy-Induced Columnar Vortices MARK SIMPSON, ARI GLEZER, Georgia Institute of Technology — Large-scale inherent instability of a thermally stratified air layer is exploited for deliberate formation of intense vertical column vortices. In hot-climate regions, buoyancy-driven vortices ("dust devils") occur spontaneously, with core diameters of 1-50 m at the surface, heights up to one kilometer, with induced air flow of considerable angular and linear momentum. Meter-scale laboratory experiments have demonstrated the nucleation and sustainment of strong buoyancy-driven vortices over a plane heated surface driven by a controllable power source. Optical diagnostics includes high-speed video imaging and particle image velocimetry. It is shown that vortices having a nominal 10 cm diameter core with nearly-uniform vorticity distribution can be triggered by and "anchored" to small ground protrusions, and their circulation and angular momentum can be controlled by geometrical modifications of these surface protrusion and by simple flow vanes.

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