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Scaled Experimental Investigation of Downburst Physics in a Crossflow SKYER JACOB, JAMEY JACOB, Oklahoma State University — The behavior of downbursts in a crossflow and their interaction with the ground is investigated in order to better understand their complex behavior and derive appropriate scaling relations. Downbursts are extremely powerful and relatively under-examined atmospheric phenomena that cause extensive damage to both ground structures and aircraft within the vicinity. Most damage is generally caused by an outburst of descending air upon impact with the ground. Tests are performed in a water tunnel using an elevated cylinder of dense fluid to simulate the high-density air seen within the downburst. The fluid is released and its interaction with the ground is observed using qualitative and quantitative flow visualization techniques, including particle image velocimetry. Observations quantified to develop scaling laws to apply to full-scale downbursts. Conditions analyzed include a range of quiescent and crossflow conditions as well as a variety of densities and varying sizes and volumes of the downburst as previous tests showed correlation between these factors and the resulting outburst strength. Results are compared against other experimental simulations, theoretical scaling, and atmospheric observations.

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