

Abstract Submitted
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Experimental Validation Dataset for CFD Simulations of Buoyancy Opposed Convection¹ JEFF HARRIS, BLAKE LANCE, BARTON SMITH, Utah State University — New experiments in the Rotatable Buoyancy Tunnel are described. This unique facility was built specifically for computational fluid dynamics (CFD) validation experiments in natural, forced, and mixed convection in both buoyancy aided or opposed scenarios. The tunnel features clear walls for non-intrusive optical measurements, a heated wall (controlled to isothermal or constant flux conditions), and the capability to invert without changing the inlet or as-built dimensions. The wall temperature and inlet temperature are measured, along with the inlet velocity and turbulence profiles, to define simulation boundary conditions. The experiment includes acquisition of particle image velocimetry data at several streamwise locations in the boundary layer along the heated plate. Heat flux at those locations is also measured. The flow consists of natural convection driving air upwards combined with forced convection (fan driven) drawing air down. A RANS CFD simulation for this scenario is presented, with a comparison of several models' computed boundary layer flow, heat flux, and pressure drop to the measured values of the same.

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