Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Collaborative Experiments and Simulations of an Unsteady Free-Jet Wind Tunnel for the Study of Gust Interactions[1] JOHN FARNSWORTH, KENNETH JANSEN, DASHA GLOUTAK, MARK BLANCO, University of Colorado Boulder — An unsteady wind tunnel facility was recently developed at the University of Colorado by incorporating a set of counter-rotating louver vanes at the inlet to the low-speed, open-return wind tunnel. The facility was designed such that the wind tunnel can be reconfigured for testing in both a standard closed test-section configuration and an open test-section or free jet configuration. In both configurations, the wind tunnel can operate with maximum test section velocities up to 30 m/s and an unsteady peak to peak amplitude on the order of 50% of the maximum. High fidelity computational fluid dynamics simulations of the unsteady wind tunnel facility were performed and are validated against experimental measurements. Operating the facility in the closed configuration produces a velocity perturbation that propagates through the test-section nearly instantaneously and thus can be assumed to be purely unsteady. In contrast, the open test-section or free jet configuration produces a velocity perturbation that propagates near the mean convective speed of the flow through the excitation of vortical structures in the surrounding shear layer.

[1]This material is based upon work supported by the Air Force Office of Scientific Research under award number FA9550-18-1-0311. Computer resources of the Argonne Leadership Computing Facility, a DOE Office of Science User Facility were used.

John Farnsworth
University of Colorado Boulder

Date submitted: 01 Aug 2019 Electronic form version 1.4