

Abstract Submitted
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Effects of heterogeneous peri-urban landscape and thermal stability on wind profiles at Cedar Rapids, Iowa ROBERT AHLMAN, WEI ZHANG, Mechanical Engineering, Cleveland State University, COREY MARK-FORT, IIHR, University of Iowa — The atmospheric boundary-layer wind over heterogeneous urban and peri-urban areas is challenging to characterize using standard models due to variability in the urban canopy structure, underlying terrain, and thermal stability. Often wind measurements are made by meteorological towers at fixed elevations, and data are extrapolated up to the height of interest. However, wind constantly adapts to the changing surface and thermal conditions, hardly reaching an equilibrium state assumed in theoretical models. Therefore, tower measurements are highly site specific and require careful evaluation in the urban or peri-urban areas. This study investigates the variability of wind profiles with a year of wind data from a 106-m met tower on the south edge of Cedar Rapids, Iowa. The mean wind profiles can be well described by the power law model, where the shear exponent generally increases from unstable to strongly stable cases. The complex terrain reveals pronounced effects on horizontal turbulence intensity, showing a peak value at 32 *m* aloft from the ground level, attributable to the wake induced by the upwind tree canopy above the rolling hill terrain. This study sheds light on the effects of peri-urban landscape and thermal stability on wind profiles at a realistic field site.

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