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On the characterization of coherent structures within a neutrally-stratified atmospheric boundary layer GIUSEPPE ROSI, BENEN LE BASTIDE, University of Calgary, JULIA GAEBLER, University of Calgary, Technische Universitaet Berlin, MATIAS KINZEL, California Institute of Technology, DAVID RIVAL, University of Calgary — Up to this point, a clear characterization of wind turbulence and extreme gust events through experimentation has frustrated countless researchers. The statistical analysis of fluctuating components has been exhausted while the conditional analysis of extreme events, though insightful, often results in constricted conclusions that cannot be bridged from study to study. Thus the current study shifts towards an understanding of the fundamental turbulent flow structures within a neutrally-stratified atmospheric boundary layer. Two approaches to characterize coherent wind structures are presented. The first approach identifies hairpin-vortex heads by correlating three-dimensional, fluctuating data from two high-speed anemometers situated at 40m and 50m heights on a wind mast. The model assumes that a hairpin-vortex head can be approximated as a transverse vortex with a Vatistas viscous core of assumed radius when the hairpin-vortex head impinges onto the two anemometers. The second approach employs large-scale particle tracking velocimetry to follow seeded bubbles next to the wind mast. The results obtained with both approaches are then compared, and the advantages and shortcomings of each method are discussed.

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