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Reliability of Turbulence Measurements by Radars

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The turbulent energy dissipation rate has been measured in the lower atmosphere, using VHF Doppler radars in southwestern Ontario. In order to estimate energy dissipation rate, the spectral width method has been applied, which can lead to occasional negative values for turbulent energy. Negative values are physically unrealistic, however they could arise from observational errors (i.e., beam broadening) or from geophysical effects like anisotropic scatter. Sometimes negative values should be included in the analysis, to avoid statistical bias, but in the cases that they are due to physical effects, they should be excluded. The main objective of this study is to present the reliability of negative values of energy dissipation rate, and distinguish between the different causes of negative values. This can be determined by studying the statistical characteristics of energy dissipation rate, wind velocity and half width-half power of radar beam.