

Public Abstract

First Name:Ali

Middle Name:

Last Name:Koleiny

Adviser's First Name:Neil

Adviser's Last Name:Fox

Co-Adviser's First Name:

Co-Adviser's Last Name:

Graduation Term:SP 2009

Department:Soil, Environmental & Atmospheric Sciences

Degree:MS

Title:An Investigation into the Contribution of the Low-Level Jet (LLJ) to the Available Wind Resource in Missouri

This work uses data from a network of tall-towers to investigate the impact of the nocturnal low-level jet (LLJ) on near-surface winds in Missouri. Of particular interest is the contribution of the nocturnal jet to wind speeds at operational turbine heights. Significant LLJ contributions to the wind resource should allow for utilization of wind turbines in producing energy in a more efficient manner. However, these higher contributions in wind speeds may have potential drawbacks in the form of increased shear induced within the planetary boundary layer. This shear may result in adversely affecting operational turbines, as suggested by Pichugina et al. (2004). Therefore, measurements of shear were also calculated to qualitatively and quantitatively describe the turbulent nature of the boundary layer within part of the state. This study is part of a larger one which seeks to improve the wind resource assessment in Missouri.

The period of wind observations begins 1 September 2006 and stretches through August of 2007 so that a complete annual cycle of near-surface winds is observed. Analysis of 158 potential jet events reveals that the LLJ increases the mean wind speeds by at least 2 m s⁻¹, and sometimes 3 m s⁻¹ compared to times when the LLJ is not actively present, depending on tall-tower locations across Missouri. Comparison of two different measures of shear reveal that the alpha parameter, commonly used in the wind energy sector, may not be the best indicator of shear within the jet environment.