



Mean wind speed profiles over the U.S. state of Iowa during hours when a LLJ was detected and when no LLJ is present. (values indicate the mean height of the WRF vertical layers).

Scientific Achievement

Low-level jets (LLJ) are present in the lowest 500 m of the atmosphere in at least one WRF grid cell within Iowa on 98 % of nights. These nocturnal LLJs are most frequently associated with stable stratification and low turbulent kinetic energy and hence are more frequent during the winter months. The spatiotemporal mean LLJ maximum (jet core) wind speed is 9.55 m s^{-1} , and the mean height is 182 m.

Significance and Impact

LLJ have important implications for loading on structures, moisture and heat advection and atmospheric pollution dispersion/transport. For example, they play a key role in dictating wind resources, wind turbine rotor plane aerodynamic loading, turbine structural loading and turbine performance.

Research Details

We present a method to characterize LLJ and apply it to output from simulations at 4km by 4km with the WRF model. Sensitivity of LLJ characteristics to the (i) LLJ definition and (ii) model vertical resolution are examined.