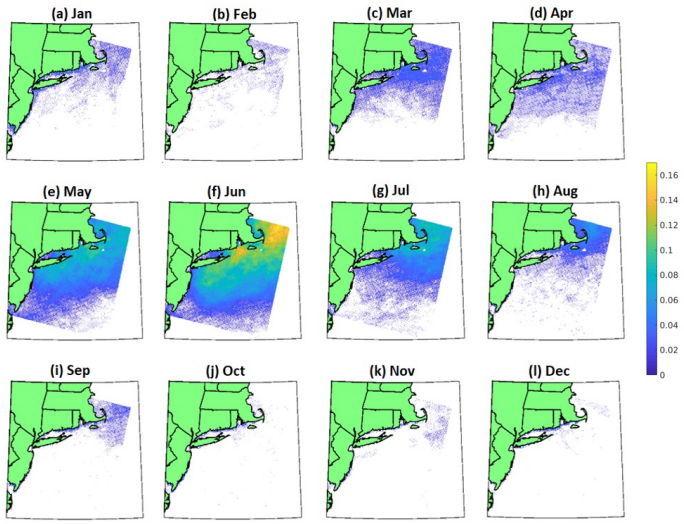
Low-level jets along the US east coast

U.S. Department of Energy | Office of Science
HYPERFACETS
A Framework for Improving Analysis and Modeling of Earth System and Intersectoral Dynamics at Regional Scales



Frequency with which low-level jets (LLJ, i.e. defined wind speed maxima below 500 m) are detected along the US east coast in high-resolution simulations with WRF.

Scientific Achievement

Low-level jets (LLJ) along the US east coast are diagnosed using vertical profiles of modeled wind speeds from a newly completed 2-year WRF simulation. LLJ with cores located from approximately 20 to 530 m above sea level exhibit highest frequency in south of Massachusetts, where LLJs are identified in up to 12% of hours in June. LLJs are considerably less frequent further south along the US east coast and outside of the summer season.

Significance and Impact

LLJs frequently occur at heights of relevance to pollution dispersion, aviation safety and that intersect the wind turbine rotor plane, and at wind speeds within typical wind turbine operating ranges. LLJs are most frequent, intense and have lowest core heights under strong horizontal temperature gradients and lower planetary boundary layer heights.

Research Details

2 years of very high resolution WRF simulations with triple nesting to an inner domain with grid spacing of 1.3 km are performed. We analyzed the output to extract the frequency and characteristics of low-level jets.

Aird J.A., Barthelmie R.J., Shepherd T.J. and Pryor S.C. (2022): Occurrence of low-level jets over the eastern US coastal zone at heights relevant to wind energy. *Energies*, 15, 445 doi: 10.3390/en15020445.