

Coastal Boundary Layer Effects on Offshore Wind Energy Production in New Jersey

Nick Conlin* and Marcus Hultmark

*nconlin@princeton.edu



INTRO

The power produced by a wind turbine depends on the windspeed at the turbine height. Windspeeds variations occur on many timescales, from decades to milliseconds. Understanding these variations is important for planning, operation and stability of power networks. This study examined historical weather station data to determine patterns in windspeed variation on time scales from hours to years off the New Jersey coast. A novel measurement system was designed that tracks the motion of helium filled soap bubbles to characterize turbulence in the lowest region of the atmosphere. The system was deployed in a field campaign at Island Beach State Park.

METHODS

1. Analyzed 13 years of wind data collected by buoys off the New Jersey coast
2. Deployed particle tracking system in a field experiment at Island Beach State Park

DISCUSSION AND CONCLUSION

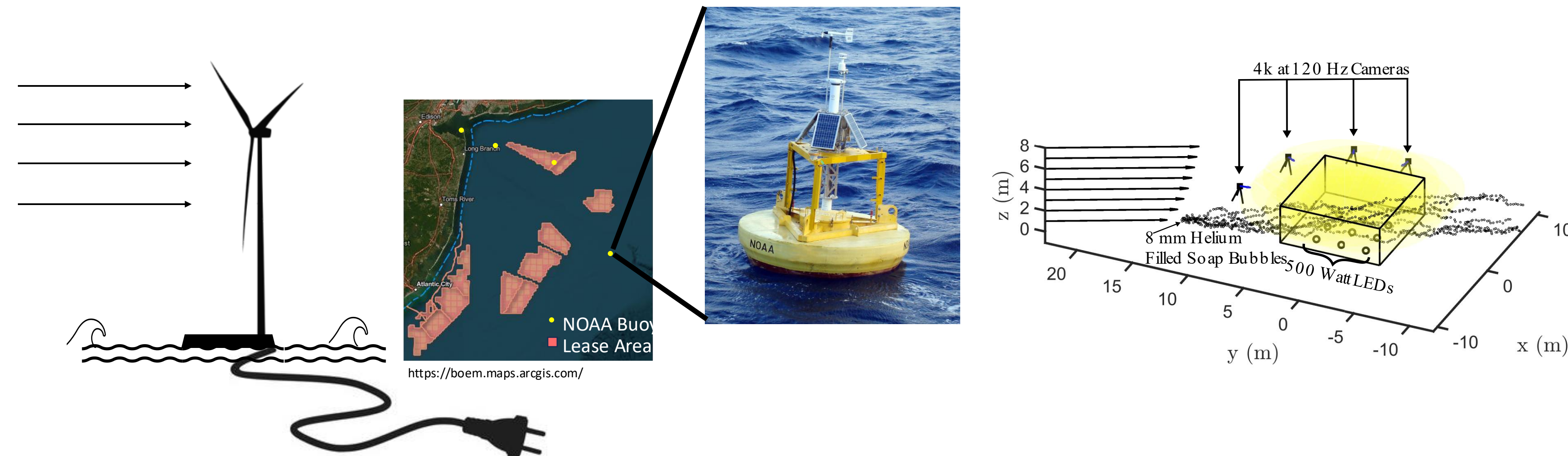
We have characterized surface layer wind speed fluctuations on a broad range of time scales and discussed implications for wind energy.

AUTHOR AFFILIATIONS

Department of Mechanical and Aerospace Engineering, Princeton University

ACKNOWLEDGEMENTS

The efforts of Dr. Nathan J. Wei and Hannah Even are gratefully acknowledged in supporting the field experiments



Key Points

- Expected wind power offshore is higher than onshore
- Expected offshore wind power is higher in the winter than summer
- Atmospheric surface layer turbulence can be characterized by tracking helium filled soap bubbles

