BIG energy seminar series

Addressing the scale and complexity of the global energy challenge.

Downwind Impacts of Wind Energy: Measurements and Simulations of Wind Turbine Wakes

Dr. Julie Lundquist

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Date: Tuesday, April 29th, 2014 at 6:00 pm
Location: Discovery Learning Center, Bechtel Collaboratory

Abstract:

As wind energy deployment grows, questions arise regarding how wind plants affect the local environment. The turbine wake, or region of air immediately downwind of a wind turbine, consists of lower wind speeds and higher turbulent levels than ambient flow. The degree of wind speed reduction and turbulence enhancement – and therefore the impacts of the wake on downwind turbines and downwind environments – depends on the character of the ambient flow as well as on the turbine size and operating characteristics.

Using a suite of remote sensing, tower-based, and kite-based instruments, our research group quantifies wind turbine wake variability in the real atmosphere. Our observational campaigns take place here in Colorado at the National Wind Technology Center and at operating wind farms around the United States. We compare these observations to simulations from numerical models with both fine-scale (eddy-resolving) and mesoscale approaches. These comparisons enable improvements in the numerical models and also help generalize the observations. Animations from observations with scanning lidar and from numerical simulations will be presented here quantify the impact of wind turbines on downwind environments.

Bio:

Prof. Lundquist leads an interdisciplinary research group in the Dept. of Atmospheric and Oceanic Sciences at the University of Colorado, with a joint appointment at the National Renewable Energy Laboratory. Her research group uses observational and computational approaches to understand atmospheric stability influences on turbine productivity, turbine wake dynamics, and downwind impacts of wind turbines and wind farms on local and regional meteorology. Her Ph.D. is in Astrophysical, Planetary, and Atmospheric Science from CU-Boulder. She studied English and Physics as an undergraduate at Trinity University. She has authored or co-authored over 35 refereed publications in scientific journals and over 100 conference presentations. In May 2013, she was honored to receive the Women of Wind Energy's "Rising Star" award in recognition of her efforts to enhance wind industry-academia collaborations.

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