Abstract Submitted
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Estimating Wind Turbine Inflow Using Sparse Wind Data[1] RAJ RAI, JONATHAN NAUGHTON, University of Wyoming — An accurate spatially and temporally resolved estimation of the wind inflow under various atmospheric boundary layer stability conditions is useful for several applications relevant to wind turbines. Estimations of a wind inflow plane in a neutrally stable boundary layer using sparse data (temporally resolved but spatially sparse, and spatially resolved but temporally sparse) has shown good agreement with the original data provided by a Large Eddy Simulation. A complementary Proper Orthogonal Decomposition-Linear Stochastic Estimation (POD-LSE) approach has been used for the estimation in which the POD identifies the energetic modes of the flow that are then used in estimating the time dependent flow-field using LSE. The applicability of such an approach is considered by simulating the estimation of the wind inflow using data collected in the field. Modern remote measurement approaches, such as Lidar (Light detection and ranging), can sample the wind at the multiple locations, but cannot sufficiently resolve the inflow in space in time that is required for many wind turbine applications. Since inflow estimations using the POD-LSE approach can simultaneously provide spatial and temporal behavior, the use of the approach with field data for better understanding the characteristics of the wind inflow at a particular site under different atmospheric conditions is demonstrated.

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