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Proper orthogonal decomposition analysis of the turbulence characteristics in a 3×3 wind turbine array boundary layer MAX GIBSON, Portland State University, HYUNG-SUK KANG, CHARLES MENEVEAU, Johns Hopkins University, RAUL CAL, Portland State University — Large wind-turbine arrays have been shown to depend on vertical entrainment to remediate the downstream momentum deficit. The largest scales of the flow are responsible for this entrainment. In addition, it has been determined that the large scale structures control the drop in coherence from the top to bottom of the wind turbine wake. Such large scale dependence lends itself to reduced-order analysis. Proper orthogonal decomposition will be used to analyze the flow over a wind turbine array. The data is taken from particle image velocimetry measurements of a wind- tunnel experiment on the flow within a 3×3 array of lightly loaded wind turbine models operating inside a turbulent boundary layer over a rough surface. It is expected that a limited number of energetic modes will sufficiently recapture the turbulent wake structures and give further insight into the vertical entrainment of momentum as well as the organized coherent structures.

Max Gibson
Portland State University

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