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Dynamic Mode Decomposition Analysis of Wind Turbine Wakes¹ VAUGHAN THOMAS, Johns Hopkins University, CLAIRE VERHULST, United States Military Academy at West Point, CHARLES MENEVEAU, DENNICE GAYME, Johns Hopkins University — In this work we explore the use of dynamic mode decomposition (DMD) to analyze three dimensional large eddy simulations (LES) of wind farms in order to isolate the temporal characteristics of key flow structures. There are a number of variants of DMD that each produce a reduced order linear system that approximates the dynamics of the original system. Here, we are interested in finding the lowest order system which captures the wake dynamics and other essential flow features. When DMD is applied to wake regions of LES of wind farms, the results isolate the mean wake and flow structures whose oscillation determines the meandering behavior of the wake. This ability to capture the wake dynamics has important implications for wind farm modeling and control as they permit the construction of time-varying wake models that can capture time-varying effects such as wake meandering.

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Vaughan Thomas Johns Hopkins University

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