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Evaluation of actuator disk model on predicting turbine wakes for different inflows[1] XIAOLEI YANG, ZHAOBIN LI, Institute of Mechanics, Chinese Academy of Sciences — Advanced turbine models have been developed in the literature, such as the actuator surface models for turbine blades and nacelle. However, the actuator disk (AD) model is still preferred for simulating large utility-scale wind farms because of its less requirements on grid resolution. In this work, we evaluate the capability of the AD model in predicting the velocity deficits, turbulence kinetic energy and the DMD (dynamic mode decomposition) modes by comparing the simulation results from the AD model with those from the actuator surface model for uniform inflow and fully developed turbulent inflow. For the uniform inflow cases, the predictions from the AD model are significantly different from those from the AS model in terms of time-averaged velocity, turbulence kinetic energy, dominant DMD frequencies and DMD modes. For the turbulent inflow cases, on the other hand, the differences in the time-averaged quantities predicted by the AS and AD models are not significant especially at far wake locations. As for the DMD modes, despite differences in dominant DMD frequencies, similarities on the spatial patterns of the dominant DMD modes are observed.

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