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A design of active flow control on vertical-axis wind turbines based on resolvent analysis[1] HSIEH-CHEN TSAI, National Taiwan University — We design an active flow control on vertical-axis wind turbines (VAWT) combining the resolvent analysis and direct numerical simulations (DNS). The immersed boundary projection method is used to simulate the two-dimensional incompressible flow around a NACA0018 three-bladed VAWT at low Reynolds numbers. Localized body forces are placed on the surfaces of the turbine blades to mimic the streamwise plasma jets generated by Dielectric barrier discharge (DBD) actuators. The optimal actuator locations and the optimal actuation frequencies at various Reynolds numbers are determined by the resolvent analysis of the mean flow around the VAWT. Preliminary results show that by removing wake-capturing vortical structures observed in previous studies, the active flow control successively enhances the average torque generated by turbine blades.

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