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An Aeroelastic Perspective of Floating Offshore Wind Turbine Wake Formation and Instability STEVEN N. RODRIGUEZ, JUSTIN W. JAWORSKI, Lehigh University — The wake formation and wake stability of floating offshore wind turbines are investigated from an aeroelastic perspective. The aeroelastic model is composed of the Sebastian-Lackner free-vortex wake aerodynamic model coupled to the nonlinear Hodges-Dowell beam equations, which are extended to include the effects of blade profile asymmetry, higher-order torsional effects, and kinetic energy components associated with periodic rigid-body motions of floating platforms. Rigid-body platform motions are also assigned to the aerodynamic model as varying inflow conditions to emulate operational rotor-wake interactions. Careful attention is given to the wake formation within operational states where the ratio of inflow velocity to induced velocity is over 50%. These states are most susceptible to aerodynamic instabilities, and provide a range of states about which a wake stability analysis can be performed. In addition, the stability analysis used for the numerical framework is implemented into a standalone free-vortex wake aerodynamic model. Both aeroelastic and standalone aerodynamic results are compared to evaluate the level of impact that flexible blades have on the wake formation and wake stability.

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