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Tilt-induced wind turbine wake shape characterization[1] JULIAAN BOSSUYT, NASEEM ALI, RYAN SCOTT, RAUL BAYOAN CAL, Portland State University — The wakes of yaw-misaligned wind turbines have been shown to deflect downstream by the formation of a counter-rotating vortex pair, resulting in wake curling. Intentional misalignment of wind turbines thus allows for wake steering and can be successfully used for wind farm control and overall power optimization. Floating wind turbines operate in a dynamic state of misalignment because of surge, heave, yaw or tilt motions from wave and wind dynamics. In this work, wake deflection from static tilt is quantified in a scaled wind tunnel experiment to verify the importance of such turbine misalignments in floating wind farms. Cross-plane stereo particle image velocimetry measurements are performed for a scaled wind turbine rotor model, in a sheared boundary layer flow. Wake deflection caused by a counter-rotating vortex pair in the wake of tilted wind turbines is observed. In a sheared boundary layer flow, and with the presence of ground obstruction, a non-symmetrical behavior is observed, for positive and negative tilt, resulting in either a flying or crashing wake.

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