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Experimental study on influence of pitch motion on the wake of a floating wind turbine model STANISLAV ROCKEL, ForWind - University of Oldenburg, Germany, RAUL BAYOAN CAL, Department of Mechanical and Materials Engineering, Portland State University, OR, JOACHIM PEINKE, MICHAEL HOELLING, ForWind - University of Oldenburg, Germany — Wind energy has become a major contributor to energy from renewable sources and is still demanded to increase its portion to the overall energy supply. Offshore wind energy was found to have the highest potential to fulfill these demands, due to better and steadier wind conditions found on seas. Offshore wind turbines which have been installed lately use monopiles as foundations and are feasible in shallow water up to a depth of 50m. Such shallow areas are rare and often exploited, so floating support structures for offshore wind turbines in deep water are possible solutions. The additional degrees of freedom of a floating support structure will influence the aerodynamics at the rotor and its wake. Wind tunnel experiments were performed using a classical fixed turbine model and a streamwise oscillating turbine in free pitch motion. For both cases the turbines were operated under same inflow conditions and wakes up to 7 rotor diameters were measured using 2D-3C stereographic particle image velocimetry (SPIV). The obtained data was statistically analyzed and a direct comparison of the wake of the fixed and oscillating turbine was performed. Our results show that inclinations and oscillations of the turbine have a strong impact on the structure of the wake and its development.

Stanislav Rockel
ForWind - University of Oldenburg, Germany

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