Abstract Submitted
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Scaling and kinematics of a floating wind turbine under ocean waves and variable thrust: an experimental study CHRIS FEIST, St. Anthony Falls Lab, UMN, KELLEY RUEHL, Water Power Technologies, Sandia National Laboratories, MICHELE GUALA, St. Anthony Falls Laboratory, UMN — Scale model wave channel experiments were performed to study the motion of an offshore floating wind turbine in operational sea states. The model tests were conducted on a 1:100 Froude scaled Sandia National Labs 13.2 MW prototype offshore wind turbine with a barge style floating platform. The platform is modeled after the MIT/NREL Shallow Drafted Barge designed for the 5MW Offshore Baseline wind turbine. The wave environment used in the model tests is representative of the deep-water sea states off the coast of Maine as well as the Pacific Northwest. The purpose of the tests is to validate a computational model of the turbine-wave interaction where the effects of airflow are not considered. To simplify the tests and validation, the platform motion is restricted to two degrees of freedom, pitch and heave, by attaching two roller support types at the center of gravity along the pitch axis. The major aerodynamic force acting on the turbine, i.e. the rotor thrust, is provided by spinning a scaled rotor at a controlled rotational speed. A subset of experiments were performed to study the effect of a mean or fluctuating rotor thrust on the platform dynamics, exploring strategies to control the thrust as a function of platform pitch angle and minimize platform oscillations.

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