Abstract Submitted
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Experimental validation of a Fluid-Structure interaction model for simulating offshore floating wind turbines[1] ANTONI CALDERER, CHRIST FEIST, St. Anthony Falls Lab, University of Minnesota, KELLEY RUEHL, Sandia National Lab, MICHELE GUALA, FOTIS SOTIROPOULOS, St. Anthony Falls Lab, University of Minnesota — A series of experiments reproducing a floating wind turbine in operational sea conditions, conducted in the St. Anthony Falls Lab. wave facility, are employed to validate the capabilities of the recently developed FSI-Levelset-CURVIB method of Calderer, Kang and Sotiropoulos (JCP 2014) to accurately predict turbine-wave interactions. The numerical approach is based on solving the Navier-Stokes equations coupled with the level set method, which is capable of carrying out LES of two-phase flows (air and water) with complex floating structures and waves. The investigated floating turbine is a 1:100 Froude scaled version of the 13.2 MW prototype designed by Sandia National Lab; it is installed on a cylindrical barge style platform which is restricted to move with two degrees of freedom, heave and pitch in the vertical plane defined by the direction of the propagating 2D waves. The computed turbine kinematics as well as the free surface elevation results are compared with the experimental data for different free decay tests and wave conditions representative of the Maine and the Pacific North West coasts. The comparison shows promising results indicating the validity of the model for simulating operational floating turbines.

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