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Numerical investigation of interactions between marine atmospheric boundary layer and offshore wind farm¹ PIN LYU, WENLI CHEN, HUI LI, Harbin Institute of Technology, LIAN SHEN, Univ of Minnesota - Twin Cities — In recent studies, Yang, Meneveau & Shen (Physics of Fluids, 2014; Renewable Energy, 2014) developed a hybrid numerical framework for simulation of offshore wind farm. The framework consists of simulation of nonlinear surface waves using a high-order spectral method, large-eddy simulation of wind turbulence on a wave-surface-fitted curvilinear grid, and an actuator disk model for wind turbines. In the present study, several more precise wind turbine models, including the actuator line model, actuator disk model with rotation, and nacelle model, are introduced into the computation. Besides offshore wind turbines on fixed piles, the new computational framework has the capability to investigate the interaction among wind, waves, and floating wind turbines. In this study, onshore, offshore fixed pile, and offshore floating wind farms are compared in terms of flow field statistics and wind turbine power extraction rate.

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