Abstract Submitted
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An investigation of the effect of upstream turbulence on Ocean Current Turbines: Large Eddy Simulations and Wake Interaction Models[1] PEYMAN RAZI, PRAVEEN RAMAPRABHU, University of North Carolina at Charlotte, CHRISTOPHER VERMILLION, NC State University, MIKE MUGLIA, NC Coastal Studies Institute — Arrays of Ocean Current Turbines (OCTs) deployed in the gulf-stream could provide a reliable source of renewable energy. In planning OCT array layouts, it is critical to consider the effects of upstream and wake turbulence on downstream devices. We extend a low-order analytical wake interaction model to include near-wake and turbulence effects in the upstream. The wake interaction model has been validated using Large Eddy Simulations (LES), which were driven by a synthetic turbulence inlet field generated to simulate properties of ocean turbulence from field measurements in the Gulf Stream. Individual turbines in the simulations are modeled using the widely used boundary element method. We find that both the turbulence intensity and the spectral content (narrowband vs. broadband) of the inlet flow conditions are relevant to the turbine wake properties, and the performance of the array. The results from the LES are compared with the modified wake interaction model.

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