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Detached-eddy simulations of hydrokinetic turbines using actuator disks[1] DOMENICO SCIOLLA, CRISTIAN ESCAURIAZA, Pontificia Universidad Catolica de Chile — The development of new technologies to harness energy from tidal currents in coastal areas requires an understanding of the interaction of the flow over arbitrary bathymetries and the marine hydrokinetic (MHK) turbines that can be potentially installed at a specific site. When computing realistic flows past multiple MHK devices, numerical models should satisfy the following attributes: (1) Resolve the rich dynamics of the wakes to capture the instantaneous interactions of the turbulent coherent structures; (2) Deal with complex arbitrary bathymetries of the natural channels; and (3) Employ low-cost modeling techniques to incorporate the regions of interest with good resolution and multiple turbine arrangements. In this investigation we simulate the flow past porous disks using the detached-eddy simulation approach (DES). The results show that the model reproduces accurately the mean flow and turbulence statistics of the wakes, and constitutes a powerful tool for analyzing the flow field in realistic conditions using low computational resources. The simulation results are also employed to determine the forces induced by the turbine array on the entire flow, parameterizing its effects to be incorporated in regional-scale models.

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Cristian Escauriaza
Pontificia Universidad Catolica de Chile

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