Abstract Submitted
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Coherent Structure Dynamics of the wake developed downstream horizontal hydrokinetic tidal turbines using three coupled DES-Actuator Model approaches[1] JORGE SANDOVAL, KARINA SOTO, Pontifical Catholic University of Chile, CLEMENTE GOTELLI, Marine Energy Research and Innovation Center, CRISTIAN ESCAURIAZA, Pontifical Catholic University of Chile — Numerical simulations are necessary tools to assess the interactions between the surrounding flow and Marine Hydrokinetic (MHK) turbines. They provide detailed information and support a wide range of application cases. The representation of these interactions implies three key modelling decisions: (1) A flow solver approach to compute the velocity and pressure field; (2) a computational turbine representation in the model; (3) a methodology to compute the local interaction between the flow and the turbine blades. In this study we present a comprehensive analysis of the hydrodynamic behaviour of the wake generated downstream a tidal turbine using three different actuator approaches to represent turbines in the flow: Actuator Disks Model (ADM), a model based on Blade-Element Momentum (BEM) theory and an Actuator Lines Model (ALM). Each computational turbine models was coupled with a Detached-Eddy Simulation (DES) flow solver and compared with experimental results. We demonstrated that the dynamical formulation of the model has a strong influence in both instantaneous and mean flow field, especially in the topology and dynamics of turbulent coherent structures. These mechanisms control the evolution of the wake downstream the devices and lead wake recovery dynamics.

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