Simulating the hydrodynamic response of a floater–net system in current and waves

We present a novel numerical model for simulating current and wave interaction with a floater–net system. The main contribution of the paper is the integration of the floater motion and the fluid–structure interaction analysis of the net structure in the same modelling framework via the computational fluid dynamic approach. The sinker and the mooring lines were not directly resolved, but their effects were partially modelled. The model couples a hydrodynamic solver, a rigid body motion solver, a mesh motion solver and a structural solver in a segregated manner. In the numerical model, the net structure was modelled as a set of dynamic porous zones. A lumped mass model was coupled with it to realize fluid–structure interaction analysis for the net structure. The floater was treated as a rigid body, which was resolved by the body-fitted computational mesh in the fluid domain. The motion equation for the floater was set up based on the principle of linear and angular momentum balance. Different motion integration schemes were implemented and tested in the numerical model. The numerical model was validated against three sets of available experimental data in the open literature. The first set of validation cases treated the floater motion in regular waves. The second set of validation cases focused on the fluid–structure interaction analysis of the net structure. The final one was related to the whole floater–net system in regular waves, and combined current and wave condition.

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