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A study on Wave Energy array with CFD combined with Multibody Dynamic Method

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Wave energy, as one of the most potential ocean renewable energy, is receiving more and more attention. Sometimes, a wave energy array consists of more than one WEC via mechanical connected linking arms, in order to improve the system stability and increase the total output power. See example of Squid WEC shown in Figure 1 [1].

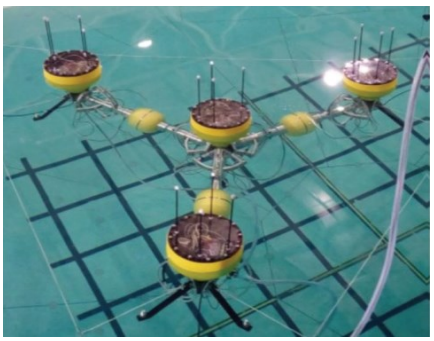

Figure 1 layout of a WEC array

Numerical study on this type of system is challenging because the dynamic response of one node is affected by other nodes and connecting mechanical elements. For example, the displacement in translational and rotational modes of one node can be restrained by the mechanical linking arms. In this study, a tool which combines Computational Fluid Dynamics (CFD) [2] and Multibody dynamic method [3] is developed to study the dynamic and hydrodynamic force responses of a WEC array under regular wave conditions. An array with 4-nodes is numerically simulated and the results are compared with the available wave tank experiment data. It is found that the predicted motion responses are in good agreement with experimental approach. To figure out the viscous and nonlinear impact on WEC performance, a potential-flow based software, ProteusDS [4] is utilized to simulate this problem. The comparison between two sets of results indicates that the nonlinearity affects the WEC dynamic motion significantly, which is subtle with a potential-flow tool.

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