Comparative study of the hydrodynamics of a heaving WEC using linear and non-linear wave theory

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This abstract refers to PhD research on numerical modelling of Wave Energy Converters (WECs). DualSPHysics [1], a numerical program that applies the Smoothed Particle Hydrodynamics (SPH), is employed in this research. SPH is a non-linear Lagrangian meshless method used in an expanding range of applications within the field of Computational Fluid Dynamics (CFD).

The defining characteristic of a WEC, distinguishing it from a simple floating body, is the power take-off (PTO) system. Within this PhD research DualSPHysics is employed for the modelling of a heaving WEC and results of the WEC's motion are compared to the results from WEC-Sim [2], which is based on linear wave theory and allows the modelling of a PTO system. In order to model such a PTO system in DualSPHysics, the coupling with Project Chrono is used [3]. Therefore the performed work fits in 'Working Group 1: Numerical hydrodynamic modelling of WECs' and more specifically refers to the topic of coupling between codes for WEC simulation.

It is possible to add a drag coefficient in linear models in order to get a better estimate of the WEC's motion. In this research it was studied how this drag coefficient can be estimated by using DualSPHysics. The results of the drag coefficient will then be compared with results that have been obtained from previous research with Computational Fluid Dynamics. The overall objective is to analyze the non-linearities that play an important role in the numerical modelling of WECs, especially when subjected to more extreme wave conditions.

References

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