

Modelling of moored floating structures and marine renewable energy technologies using a non-linear numerical approach and experiments in wave testing facilities

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Moored floating structures are connected to the seabed through mooring line systems composed of cables or chains, and have wide applications in coastal and offshore engineering. Moored floating offshore wind turbines and Wave Energy Converters (WECs) are examples of such structures from the field of Marine Renewable Energy (MRE).

Mooring systems can represent a considerable part of the total cost of MRE technologies and they influence their dynamics. Therefore it is crucial to accurately model their behavior in a cost-efficient way. In the proposed research this will be achieved by employing a Smoothed Particle Hydrodynamics model as the basis of a numerical platform able to accurately predict the behaviour of moored floating structures and WECs with their power take-off systems, in operational and in extreme sea states. Within this new post doctoral research which started in November 2020, a numerical platform will be developed and validated using the experimental database obtained from the upcoming 'WECfarm' project. During the 'WECfarm' project, WEC interactions in farm configurations will be studied experimentally at the new Coastal & Ocean Basin in Ostend, Belgium (www.cob.ugent.be).

The main objectives of the proposed research aim to cover current knowledge gaps which hamper further development and commercialisation of these MRE emerging technologies. Results' valorisation will be achieved through scientific dissemination and cooperation with academic and industrial players from the offshore and the MRE sectors who have direct interest in the outcome of this new research project. As such this research is situated in the topics of three WECANet COST Action CA17105 Working Groups, i.e. Working Group 1: "Numerical hydrodynamic modelling for WECs, WEC arrays/farms and wave energy resources", Working Group 2: "Experimental hydrodynamic modelling and testing of WECs, WEC arrays/farms, PTO systems, and field", and Working Group 3: "Technology of WECs and WEC farms".

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