Toward a unified spectral element Boussinesq model for point absorbers

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ABSTRACT

The interactions between wave energy converters (WECs) and waves are modelled using linear radiation diffraction models. Lately, Reynolds averaged Navier-Stokes (RaNS) models are being employed for reserch purpose. However the first fails in capturing viscous and higher orders non-linear effects while the latter requires an impractible amount of computational power and time to evaluate the solution. We will present a medium fidelity model for nonlinear wave-structure interaction based on Boussinesq-type equations. These are based on vertically integrated dimensions, to obtain efficient models that take into account nonlinear effects. We have considered a wave-structure coupling inspired by the work of Jiang [2001]. The resulting model closely resembles the coupling between two depth averaged shallow water (or Boussinesq) models: a classical one for the outer free surface region and a variant based on pressure-velocity coupling for the inner region under the floating structure. A continuous spectral/*hp* element method is employed to discretize the equations in space and the coupling fluxes between the inner and outer domains are described by numerical fluxes as suggested by Eskilsson and Sherwin [2002] for discontinuous method. We will discuss the finite element discretization of the problem. We will consider in particular the coupling between different shallow water or Boussinesq models, as well as presenting the benchmark for the heaving box case. The continuation of this work will bridge these fundamental developments to applications of engineering relevance, and preliminary results will be presented.

REFERENCES

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