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Oscillating water columns in shallow water: modelling and simulation

vendredi 4 décembre 2020 12:00 (30 minutes)

In this talk we present a nonlinear mathematical model of a particular wave energy converter, the so-called oscillating water column. In this device, waves governed by the one-dimensional nonlinear shallow water equations arrive from the offshore, encounter a step in the bottom topography and then arrive into a chamber to change the volume of the air to activate the turbine. The system is reformulated as two transmission problems: one is related to the wave motion over the stepped topography and the other one is related to the wave-structure interaction at the entrance of the chamber. The entry condition for the surface elevation is given and the one for the discharge is derived using the Riemann invariants as in [3]. Numerical simulations are performed using a fifth order finite volume WENO scheme based on Roe's approximate Riemann solver. This is a work in progress which follows [1] and whose well-posedness theory is a direct consequence of the one in [2].

[1] E. Bocchi, J. He, G. Vergara-Hermosilla, *Modelling and simulation of a wave energy converter*, Proceeding CEMRACS 2019, submitted, 2019.
[2] T. Iguchi, D. Lannes, *Hyperbolic free boundary problems and applications to wave-structure interactions*, to appear in Indiana University Journal of Mathematics, 2019.
[3] D. Lannes, L. Weynans, *Generating boundary conditions for a Boussinesq system*, Nonlinearity 33 (2020), no. 12, 6868–6889.

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