

Modelling and simulation of a wave energy convertor

The goal of this project is to model and to simulate a system used to convert the energy of waves into electricity. In this system, waves arrive from offshore, encounter a first obstacle (a step in the topography) and then arrive in a chamber that isolate a volume of air thanks to a partially immersed wall. When waves arrive in this chamber (passing through the immersed obstacle), the change of air volume is used to activate a generator (see picture).

The modelling and simulation will be based on the shallow water equations and will require four preliminary steps of independent interest:

1. Entry condition. Water elevation is given at the entrance of the computational domain. This has to be implemented using Riemann invariants
2. Interaction with the submerged step. This will be treated as a transmission problem between two nonlinear shallow water systems with different reference depth
3. Interaction with the partially immersed wall. This will be modelled using a recent approach in which the problem is reduced to solve the nonlinear shallow water system with a partial and localized constraint in the surface elevation
4. Wall boundary condition at bottom of the chamber.
5. Mixing all these points to obtain the full mechanism of the wave energy convertor

