NEW DEVELOPMENTS FOR NUMERICAL WAVE TANKS FOR COASTAL AND OFFSHORE APPLICATIONS

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ABSTRACT

The use of OpenFOAM to build numerical wave tanks (NWT), has become more popular among existing CFD tools in recent years with the aim of improving knowledge in the field of wave-structure interaction (WSI), both fixed and floating. OpenFOAM has reached a very competitive stage to be used for coastal and offshore applications due to the continuous incorporation of wave boundary conditions without the use of relaxation zones. IHCantabria (https://ihcantabria.com) in the frame of the IHFOAM project (https://ihfoam.ihcantabria.com) is continuously developing and adding more functionalities to the official release of OpenFOAM (https://www.openfoam.com/)

Additionally, IHFOAM project has hosted other developments, some of them oriented to reduce the learning curve for new users, such as a graphical user interface (GUI) or fully detailed online tutorials, and others focus on incorporating new physics and capabilities for NWT, such as the use of overset methods to simulate floating bodies or waves induced by submerged landslides, the developing and/or linking of existing libraries for mooring systems, the implementation of a new coupled porous media solver with free surface flows and the implementation of new solvers for hybrid techniques for the study of WSI problems for two-dimensional and three-dimensional domains with the aim of reducing the computational cost.

The presentation will include the description of the mathematical and numerical methods used in the new developments, and several examples of the new capabilities of the solvers, including validation with laboratory measurements. Some of the examples to be shown are presented in figure 1, which includes a new porous flow solver, tsunamis generated by submerged landslides by means of an overset library and the simulation of large displacement in moored floating bodies.

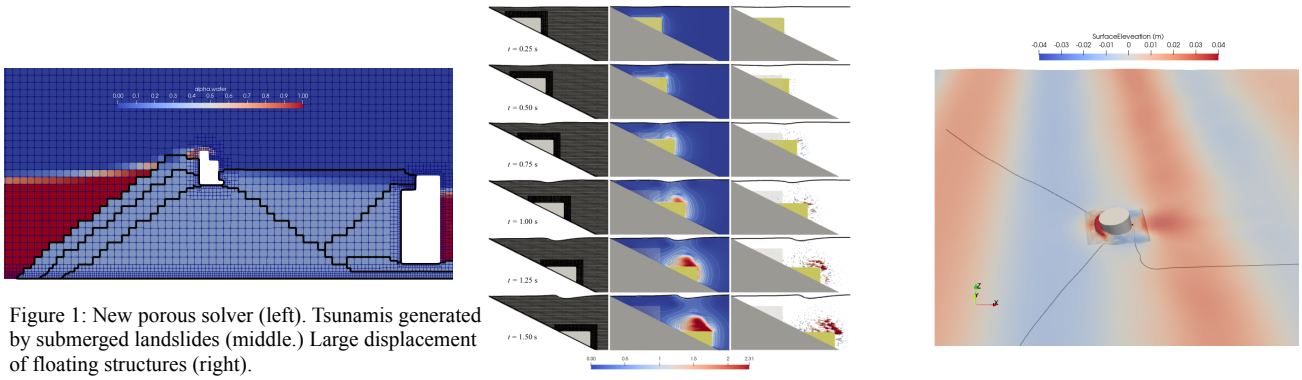

Figure 1: New porous solver (left). Tsunamis generated by submerged landslides (middle.) Large displacement of floating structures (right).

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