Comparison of meshless and meshbased numerical models for the assessment of wave impacts: efficiency and reliability

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ABSTRACT

Two different numerical models are compared in this work: i) the meshbased model based on finite volume method named IHFOAM (Higuera et al., 2014) and ii) the meshless model based on the SPH Lagrangian particle method named DualSPHysics (Crespo et al., 2015). A vertical structure with an overhanging horizontal cantilevering slab has been modelled by means of the two models. The free-surface elevation along the flume and wave forces exerted onto the structure are obtained using the meshbased and the meshless models and compared with the experimental data as shown in **Figure 1**. The accuracy of the numerical solutions is analysed by means of Taylor´s diagrams and a skill index based on parameters from those diagrams (correlation, root-mean-square differences and standard deviation). Both numerical results are in good agreement with the experimental data. The efficiency in terms of computational time is also analysed by comparing execution times of both models for different resolutions. The efficiency of DualSPHysics is shown to be lower than the one with IHFOAM. However, the efficiency of DualSPHysics can be highly improved by using the parallel processing power of the GPUs. Finally, the advantages and target applications of each model will be addressed.

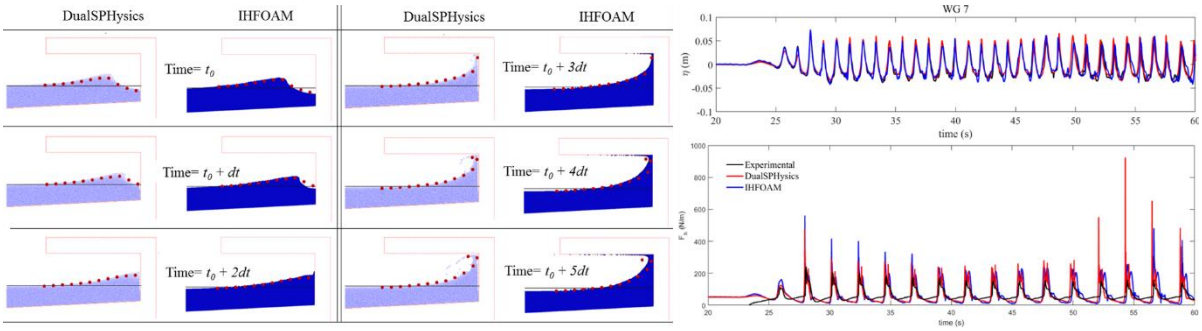

Figure 1. LEFT: Different instants of the DualSPHysics and IHFOAM simulation compared with the experimental wave profiles (red dots). RIGHT: Time series of numerical and experimental free-surface elevation (η) and horizontal force (F_h) exerted against the vertical wall.

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