Impact d'événements extrêmes sur les structures de protection côtière

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Abstract
The present work aims to investigate the water waves impact on coastal protection structures. The primary focus of this research is to assess the ability of CFD tools to accurately model and predict the impact of extreme wave loads on conventional rubble mound breakwaters with crown walls, a structure commonly designed to mitigate wave-induced forces and fight the threats associated with sealevel rise. To carry out with this investigation, the numerical toolbox OpenFOAM is employed and the problematic is approached from two key perspectives : the impulsive wave loads acting on recurved parapets (the upper portion of breakwaters) and the wave transformation through the revetment (the porous media at the base). Initially, non-linear Stokes waves are used to evaluate the performance of the numerical solver to reproduce realistic wave breaking on a vertical wall attached with a recurved parapet, and to assess the related impact pressure records. The computed results are validated against experimental data from the large wave flume (GWK) in Hannover (Germany), provided as part of the ISOPE 2022 benchmark. Next, the physics of waves interaction with submerged crested breakwaters is investigated experimentally. In fact, the present work also investigates the capability of the solver to simulate the most relevant hydrodynamics that occurs between waves and submerged breakwaters. Finally, this work discusses the advantages and the limitations of these numerical methods used in coastal engineering. The different findingss of this study serve to adress INGEROP's inquiry regarding the suitability of CFD for their industrial applications