

NUMERICAL ANALYSIS OF COASTAL STRUCTURES AT PROTOTYPE SCALE USING IH-2VOF

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ABSTRACT

Physical model experiments have been traditionally used to provide guidelines and semi-empirical formulations to design coastal structures. Although these empirical formulations have been proven to be successful, scale effects and other shortcomings are inherent to the results based on small-scale tests. The development and application of numerical models in the analysis of wave and coastal structure interaction has increased during the last decade. The traditional way of studying coastal structures is undergoing changes by the introduction of computational models which are able to overcome some of the limitations of the existing formulations and also by reducing costs associated at laboratory experiments. Among the codes currently available, IH-2VOF, an improved version of COBRAS-UC model (Losada et al., 2008), appears as the most extensively validated model. The accuracy of the model results has been proven on several coastal typologies, revealing its robustness and flexibility. In this work, a discussion on the applicability of this numerical model, based on the Volume-Averaged-Reynolds-Averaged Navier-Stokes equations, as a complementary tool in the design process of a coastal structure will be presented. The numerical model is integrated as part of a global methodology for the analysis of the functionality and the stability of two real breakwaters at prototype scale.

Figure 1 shows a wave run-up analysis for a rubble-mound breakwater due to a real sea state presented in the left panels. Wave run-up results are presented on the right panels. In the upper panel, the run-up time series is shown. The center panels show the run-up values histogram and the run-up probability distribution function. In the lower panel, upper and lower free surface envelopes and mean water level are shown.

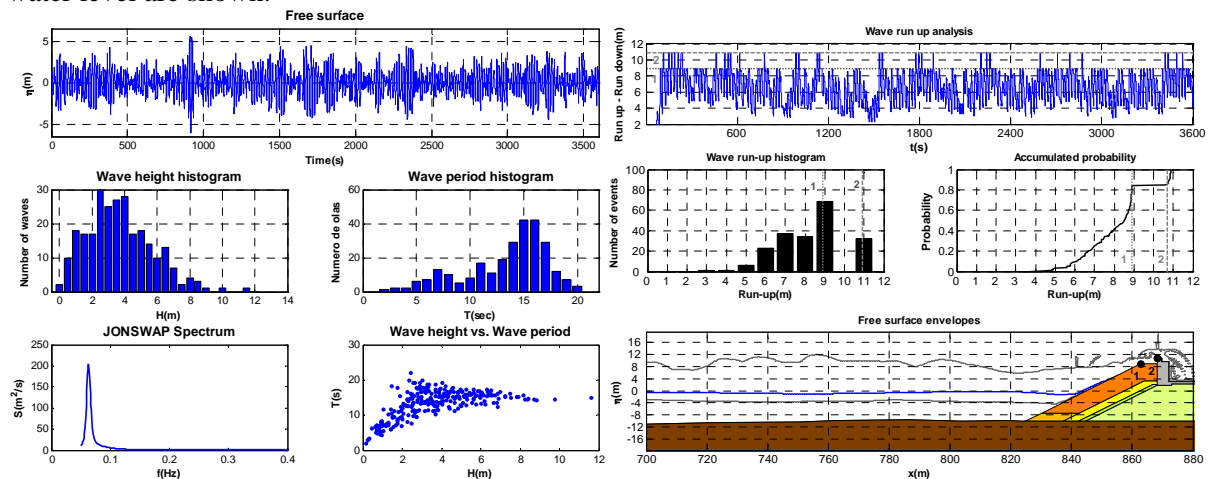


Figure 1. Left side: example of a target sea state. Right side: wave run-up analysis carried out for a sea state.

References

- [1] Losada, J.L. Lara, R. Guanche and J.M. González-Ondina, Numerical analysis of wave overtopping of high mound breakwaters, *Coast. Eng.* **55** (1) pp. 47–62 (2008),