

Modelling of Performance of Caisson Type Breakwaters under Extreme Waves

Gözde Güney Doğan, Gülizar Özyurt Tarakcıođlu, and Cüneyt Baykal

Middle East Technical University, Civil Engineering Department, Ocean Engineering Research Center, Ankara, Turkey
(gguneydogan@gmail.com)

Many coastal structures are designed without considering loads of tsunami-like waves or long waves although they are constructed in areas prone to encounter these waves. Performance of caisson type breakwaters under extreme swells is tested in Middle East Technical University (METU) Coastal and Ocean Engineering Laboratory. This paper presents the comparison of pressure measurements taken along the surface of caisson type breakwaters and obtained from numerical modelling of them using IH2VOF as well as damage behavior of the breakwater under the same extreme swells tested in a wave flume at METU.

Experiments are conducted in the 1.5 m wide wave flume, which is divided into two parallel sections (0.74 m wide each). A piston type of wave maker is used to generate the long wave conditions located at one end of the wave basin. Water depth is determined as 0.4m and kept constant during the experiments. A caisson type breakwater is constructed to one side of the divided flume. The model scale, based on the Froude similitude law, is chosen as 1:50. 7 different wave conditions are applied in the tests as the wave period ranging from 14.6 s to 34.7 s, wave heights from 3.5 m to 7.5 m and steepness from 0.002 to 0.015 in prototype scale. The design wave parameters for the breakwater were 5m wave height and 9.5s wave period in prototype. To determine the damage of the breakwater which were designed according to this wave but tested under swell waves, video and photo analysis as well as breakwater profile measurements before and after each test are performed.

Further investigations are carried out about the acting wave forces on the concrete blocks of the caisson structures via pressure measurements on the surfaces of these structures where the structures are fixed to the channel bottom minimizing. Finally, these pressure measurements will be compared with the results obtained from the numerical study using IH2VOF which is one of the RANS models that can be applied to simulate coastal structures (<http://ih2vof.ihcantabria.com/>).

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