An experimental and numerical study of floating breakwaters

Abstract

Breakwaters are used to provide sheltered areas for loading and unloading of ships, and coastal protection. Often the breakwaters are bottom mounted such as rubble mound breakwaters. However, there can be several advantages to use a Floating Breakwater (FB). Therefore, the objective of this paper is to study the effect of two different damping mechanisms of a floating breakwater. Three basic cross-sections of FBs were tested and analysed in 2D; a regular pontoon (RG), a regular pontoon with wing plates attached (WP), and a regular pontoon with wing plates and porous media attached to the sides (WP P100). The damping of the FB motions was due to wave radiation and viscous damping. The viscous damping originated mainly from vortex generation around the edges of the structure and due to energy loss inside the porous material attached to the vertical sides of the floating breakwater. Attaching wing plates to the floating breakwater significantly reduced the motion, which was also anticipated. When the porous sides were attached the motion of the FB increased compared to the (WP) cross-section, but the wave transmission was reduced. The possibility for incorporating the effect of the damping in the radiation/diffraction code WAMIT was assessed. The study showed that the cross section with wing plates reduced the motions of the breakwater to the largest extend, while the cross section with wing plates and porous media attached to the sides reduced the reflection and transmission most effectively.