ABSTRACT

In this work, the interaction of flexible floating breakwaters with linear monochromatic waves of long period (tsunami-type) is investigated. The examined heights of the tsunami-type waves are in the range of these ones that have been historically recorded in Greece. The floating breakwater is held in place by means of piles that allow only vertical displacements to take place. The numerical analysis includes both the three-dimensional hydrodynamic analysis of the flexible floating breakwater in the frequency domain and the analysis of the piles, where the stiffness of the soil is also taken into consideration. Bending modes are introduced to represent the flexibility of the floating breakwater along its length. The total number of the degrees of freedom of the examined structure are the six conventional body modes (three displacements and three rotations) when it moves as a rigid body, plus the extra bending modes. The minimum number of the bending modes that must be taken into account so that the response of the floating body is sufficiently represented is determined through an iterative procedure.

The effect of the number of the bending modes that are introduced, their stiffness as well as the height and the direction of the tsunami-type waves on the deflections of flexible floating breakwaters, the load level imparted on the piles and the reduction of the transmitted energy behind the breakwater is examined for three wave directions.

According to the results generated by the present study, pile-restrained floating breakwaters of relatively small length provide satisfactory effectiveness behind them for the case of earthquake tsunamis generated in Greece, for the case of wave direction equal to 45^{o} and wave height up to 0.5m. Thus, if the satisfactory effectiveness must be achieved for different wave direction and different wave height, the solution of floating breakwaters of larger length should be preferred, which results at higher technical and economic cost.