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Study on the Wave Dissipation Performance of Double-Cylinder and Double-Plate Floating Breakwater

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Abstract : Floating breakwaters have several advantages, including being environmentally friendly, easy to construct, and cost-effective regardless of water depth. They have a broad range of applications in coastal engineering. However, they face significant challenges due to the unstable effect of wave dissipation, structural vulnerability, and high mooring system requirements. This paper investigates the wave dissipation performance of a floating breakwater structure. The structure consists of double cylinders, double vertical plates, and horizontal connecting plates. The investigation is carried out using physical model tests and numerical simulation methods based on STAR-CCM+. This paper discusses the impact of wave elements, relative vertical plate heights, and relative horizontal connecting plate widths on the wave dissipation performance of the double-cylinder, double-plate floating breakwater (DCDPFB). The study also analyses the changes in local vorticity and velocity fields around the DCDPFB to determine the optimal structural dimensions. The study found that the relative width of the horizontal connecting plate, the relative height of the vertical plate, and the size of the semi-cylinder are the key factors affecting the wave dissipation performance of the DCDPFB. The transmittance coefficient is minimally affected by the wave height and the depth of water entry. The local vortex and velocity field formed around the DCDPFB are important factors for dissipating wave energy. The test section of the DCDPFB, constructed according to the relative optimal structural dimensions, showed good wave dissipation performance during offshore prototype tests. The test section of DCDPFB, constructed with optimal structural dimensions, exhibits excellent wave dissipation performance in offshore prototype tests.

Keywords : floating breakwater, wave dissipation performance, transmittance coefficient, model test
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