INTERACTION OF NONLINEAR PROGRESSIVE WAVES WITH TWO SERIAL ARRANGED SUBMERGED OBSTACLES

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Due to increasing demands on environmental preservation, the installation of detached breakwaters is considered to be one of the best alternatives for shore protection from erosion. In recent years, the adoptions of submerged breakwater are thus proposed and associated studies were ongoing for clarifying the wave-structure interactions without breaking. Grue (1992) and Ohyama and Nadaoka (1994) modeled the nonlinear wave deformations theoretically, finding that the transformation of the oncoming waves near the obstacle can be characterized as harmonic generation processes or the decomposition of the harmonics into forced and free waves. Therefore, the purpose of the present study is to develop a numerical model to investigate the effects and characteristics as water waves propagate over a pair of impermeable submerged obstacles.

In terms of spatial harmonic evolutions of various cases, it is noted that present fluctuating mode of harmonic amplitudes exists at upstream and the gap between obstacles, shown in Figure 1. It implies that the nonlinearity of propagating waves becomes stronger than initial wave in such area, and it reveals in the wave profiles appearing much steeper than initial wave profiles. The fluctuating harmonic amplitudes vary with the distance of the gap. The vortices play an important role just like a water column wall as fully development on enhancing wave reflection The maximum reflection occurs in cases with gap S/L= 3/8 and S/L= 7/8 in this study, shown in Figure 2.

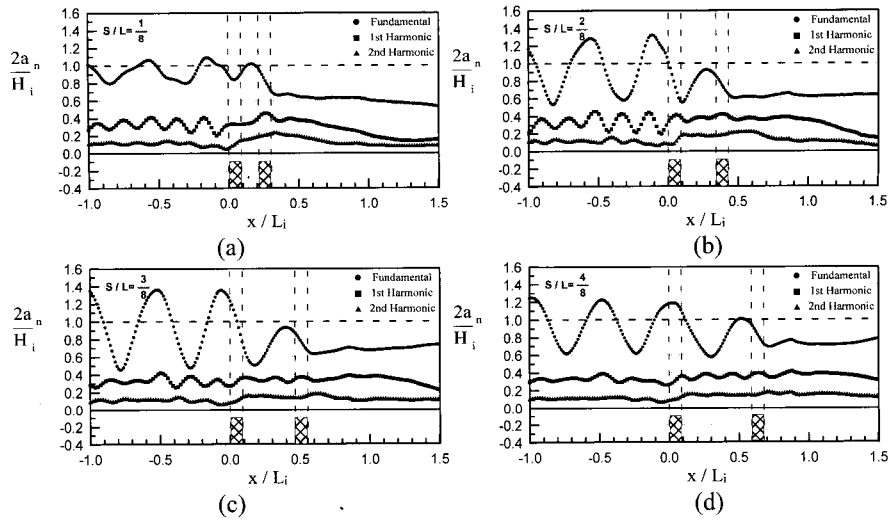

Fig. 1 Spatial evolution of harmonic amplitude for cases of various gaps between obstacles.

S/L=1/8, (b) S/L=2/8, (c) S/L=3/8, (d) S/L=4/8

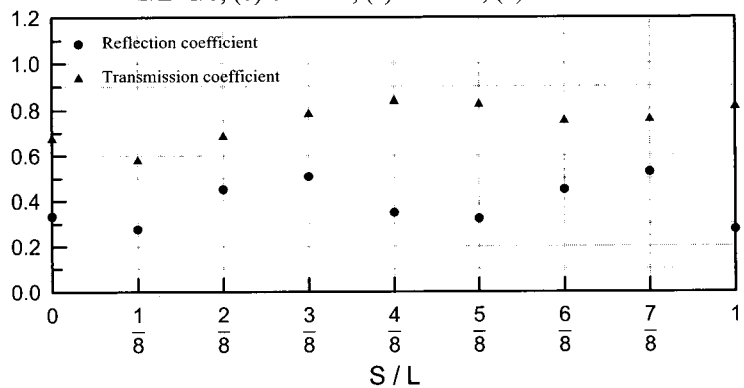

Fig. 2 Coefficients of reflection and Transmission distributed plot

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