NONLINEAR WAVE TRANSFORMATION AROUND WAVE-PERMEABLE STRUCTURE

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The development of breakwater design methodology often require a condition of permitting for protection of ecosystem, it is also an alternative to massive gravity breakwaters in reduction of wave transmission.

The problem of wave partial/full reflection and transmission by wave-permeable structure is approached by solving the shape-related function with focus on the understanding of wave attenuation. 2D depth-averaged Boussinesq type wave equations are given with new damping item in simulating the nonlinear wave transmission through wave-permeable structure. 1D wave equation is examined to give the analytical expression of the absorbing coefficient, and is compared with laboratory data in flume to calibrate the coefficients, and the expression is applied directly in modified Boussinesq type equations (Madsen and Sorensen, 1992; Li, X.,etc.,2002).

We applied the model in the feasibility study of permeable breakwater constructed in Zhejiang, East Coast of China (Li and Yan, 2002). Compared with wave basin data for various incident wave conditions, we obtained accurate predictions of combined diffraction-refraction effects in simulating nonlinear wave going through wave-permeable breakwater in the engineering application. Figure 4(b) is the sample points in physical model. Figure 5(a) is the calculated wave elevation distribution (Tide=2.68m, $H_{13\%}$=1.98m). Figure 6(a-d) are comparison between numerical and physical models. It shows that wave-permeable breakwaters with proper absorbing effects can be used as an effective alternative to massive gravity breakwaters in reduction of wave transmission in shallow water.

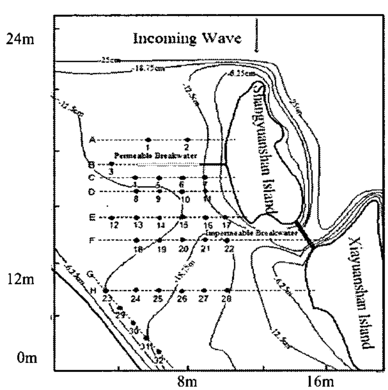

Fig. 4(b) Sample points in wave basin

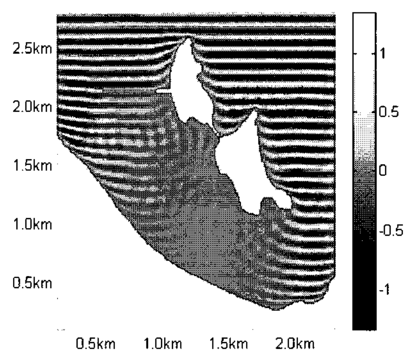

Fig. 5(a) Calculated wave elevation

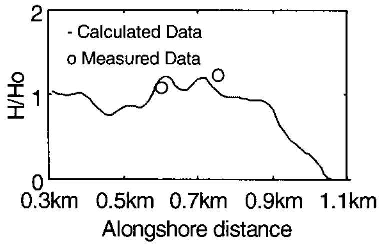

Fig. 6(a) Section A

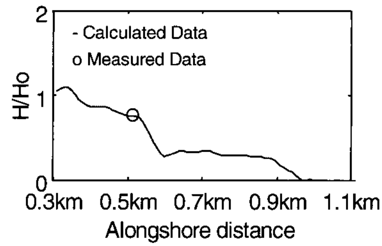

Fig. 6(b) Section B

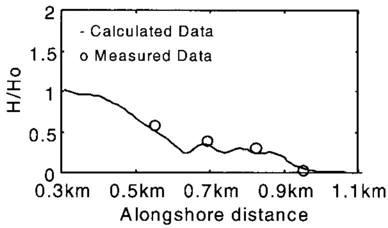

Fig. 6(c) Section C

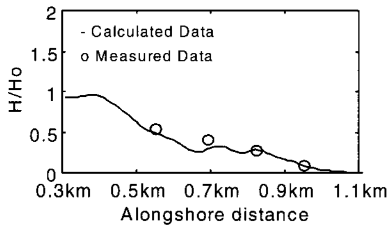

Fig. 6(d) Section D

Fig. 6 Comparison between numerical and physical models

REFERENCES

Li Xi, Wang Yigang, Sha Shuming, 2002. Numerical simulation of topography change in reclaimed land along coast of South China Sea. *Journal of Hydrodynamics, Ser. B*, Vol.14, No.1, 87-92.

Madsen, P.A. & Sorensen, O.R.,1992. A new form of the Boussinesq equations with improved linear dispersion characteristics. Part2. A slowly-varying bathymetry. *Coastal Engineering*, 18, 183-204.

Yan Yixin, Li Xi, etc. 2002. Foundation scour simulation around piers arrays under wave-current effects for Rizhao Port, technical report, Hohai University(*in Chinese*).