Geophysical Research Abstracts
Vol. 13, EGU2011-7043, 2011
EGU General Assembly 2011

Bottom pressure distribution due to wave reflection at a submerged obstacle

Julien Touboul and Vincent Rey
Université du Sud Toulon Var, CNRS LSEET, La Garde Cedex, France (rey@univ-tln.fr)

In coastal areas, rapid changes in the seafloor are known to have a strong impact on the dynamics of water waves. Strong variations in bathymetry, or submerged obstacles are responsible for a partial reflection of incident wave energy. This phenomenon has been widely used to design coastal structures, as, for exemple, the submerged horizontal plate. This breakwater has been largely studied in the last thirty years. One may cite the works of [1] and [2], who described the power of reflection of the plate as a function of the wavelength. They showed analytically the presence of maxima and minima in reflection, due to interference processes above the plate. This phenomenon was detailed analytically and experimentally by [3], who showed the necessity to take evanescent modes into account to describe the phenomena. Since [4], who demonstrated that the interaction of two waves propagating in opposite directions in deep waters was responsible for a second order pressure term not depending on the depth, the pressure induced at the bottom by the wave-structure interaction was not really investigated. However, it remains of major interest since it is partially responsible for soil erosion in the vicinity of submerged structures. The purpose of this study is to investigate the pressure distribution at the bottom, near the submerged plate, especially for incident waves in deep water conditions. The evanescent modes due to the wave-structure interaction are expected to play a significant role, for both order one and two. Our approach is experimental and theoretical. A series of experiments were conducted in the Ocean Engineering Basin (BGO) FIRST, in La Seyne Sur Mer, in the framework of the GIS HYDRO (Financial support CG Var). Furthermore, the analytical model initially introduced by [5] is extended up to order two. Results are compared, and the role of the evanescent modes is emphasized.

References:
[1] Patarapanich, M., 1984a. Maximum and zero reflexion from submerged plate. J. Waterway, Port, Coast. Ocean Eng. 110 (2), 171-181.
[2] Sturova, V., 1991. Propagation of plane surface waves over an underwater obstacle and a submerged plate. J. Appl. Mech. Techn. Phys. 32 (3), 453-479.
[3] Rey, V., 1995. A note on the scattering of obliquely incident gravity waves by cylindrical obstacles in waters of finite depth. Eur. J. Mech. B. Fluids 14 (1), 207-216.
[4] Longuet-Higgins M. S., 1950. A theory of the origin of microseisms. Phil. Trans. R. Soc. Lond. A. 243, 1-35.
[5] Takano, K., 1960. Effet d'un obstacle parallélépipédique sur la propagation de la houle. La Houille Blanche 15, 247-267.