

# Hydrodynamic Analysis of Columns with Different Section Shapes Under Tsunami Waves

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## Abstract

Columns are one of the most common structures in the field of offshore and ocean engineering. Columns with different section shapes are widely used in various types of structures, such as cross-sea bridges, ocean platforms, aquaculture cages and so on. Columns in the ocean are inevitably subjected to various waves, one of which is the tsunami wave. Therefore, it is necessary to carry out numerical simulation research on the interaction between tsunami waves and columns. In this paper, solitary wave is used to describe the waves caused by tsunami. A numerical flume based on a Cartesian grid is first established to simulate the interaction between solitary waves and structures. Then, the problem of solitary wave propagation and the interaction between solitary waves and columns are simulated with the developed model, to verify its accuracy and reliability. On the basis, the hydrodynamic performance of columns with different section shapes under the effects of solitary wave is studied numerically. Three different section shapes including circle, square, and square with a guide angle are considered. The effects of section shape on hydrodynamic performance such as wave run-up, evolution of wave profile, and column surface pressure, are compared and analyzed. The results indicate that the column's section shape has a significant effect on its hydrodynamic performance.

## Keywords

Tsunami Wave, Solitary Wave, Cylinders, Hydrodynamic Analysis