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Run-up heights of nearshore tsunamis based on quadtree grid system

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Abstract

To investigate the run-up heights of nearshore tsunamis in the vicinity of a circular island, a numerical model has been developed based on quadtree grids. The governing equations of the model are the nonlinear shallow-water equations. The governing equations are discretized explicitly by using the leap-frog scheme on adaptive hierarchical quadtree grids. The refined quadtree grids are generated around a circular island on a combined domain of rectangular and circular grids. The predicted numerical results have been verified by comparing to available laboratory measurements. A good agreement has been observed.

Keywords: Quadtree; Nearshore tsunami; Run-up; Shallow-water equations; Circular island; Finite difference scheme

1. Introduction

Tsunamis are large water waves set in motion either by landslides, submarine volcanic explosions, or sea-bottom deformations associated with large submarine earthquakes. During the last decades several devastating tsunamis have occurred around the Pacific Ocean area (Gonzalez, 1999). These tsunamis not only killed many human beings but also caused serious property damages. Especially, nearshore tsunamis could cause severe coastal flooding and huge property damage; because it takes a few minutes to reach a coastline and the time to seek refuge from

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