STUDY ON APPROPRIATE MODELING OF TSUNAMIS IN MALAYSIA FOR RISK EVALUATION

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ABSTRACT

In order to design a tsunami warning system in a region, there are three major issues in developing the data base or estimating tsunami risk; the first is the assumption of tsunami sources by selecting the potential and past earthquakes and others, the second is accuracy and stability on the numerical model with the computational regions for tsunami propagations, the third is output such as water level and velocities from the model to provide the warning and to estimate the risk. In this study, a numerical simulation of tsunamis in the Sabah coast is conducted. Two types of models are developed in this study: (1) a numerical model of the generation and trans-oceanic propagation of tsunamis using linear theory in spherical coordinate system and (2) a numerical model based on the nested grid system in Cartesian coordinate system using linear and non-linear theory with a two different spatial grid sizes. Six cases of fault ruptures are considered in the Manila trench for the earthquakes with magnitudes of 9.0, 8.5 and 8.0 which are corresponding to the earthquakes with the return periods of 667, 205 and 63 years, respectively. In the nested grid system model, the linear shallow water wave theory in spherical coordinate system is used for tsunami simulation in the large area covering Southeast Asia while the non-linear shallow water wave theory in Cartesian coordinate system is used for tsunami simulation in the Sabah coast region. It is found that the tsunamis arrives the Northern part of Sabah in approximately 2 hours after an earthquake occurred and the maximum tsunami height calculated is more than 1 m for the M_w 9.0 earthquake. Finally, a few computational instability problems are introduced and discussed in this paper.

Keywords: Numerical Model, Tsunami Simulation, Nested Grid System

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