

Validation of Tsunami Run-up Simulation Using Observed Tsunami Heights in the Sendai Plain after the 2011 Tohoku Tsunami

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The accuracy of tsunami run-up simulations is important for predicting tsunami damage and taking countermeasures against it. The accuracy of numerical tsunami models has been verified by comparing them with analytical solutions and hydraulic experiments. On the other hand, the validation of numerical tsunami models should be done by comparing with field scale observations. The purpose of this study is to establish a new method to validate the tsunami run-up simulation by using the trace height data obtained from the survey in the Sendai Plain during the 2011 Tohoku Tsunami.

Since the tsunami trace height data measured in the field survey in the Sendai Plain was discrete, we created a continuous tsunami height distribution by using the spatial interpolation method. As a result of comparing several interpolation methods, the Natural Neighbor method was able to produce the most realistic tsunami height distribution. Thus, we were able to obtain the tsunami trace height data that existed uniformly in the whole inundation area, which enabled us to evaluate the tsunami inundation simulation without being affected by the bias of the survey points. Next, new indexes were proposed to compare the observed and simulated values, and the validity of the tsunami run-up model was confirmed. In determining the index, we considered that the index should be able to evaluate the entire inundation area without bias. Using the proposed indexes, the computational conditions that ensure the validity of the tsunami run-up simulation were investigated. As a result, the topographic resolution and the availability of topographic information were the most important factors to change the tsunami behavior.

Keywords: tsunami run-up simulation, tsunami trace height, Validation