

Integration of hazard curves in Probabilistic Tsunami Hazard Assessment in Japan

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Probabilistic Tsunami Hazard Assessment (PTHA) requires to simulate occurrences of several types of earthquake. We construct tsunami source models for each type of earthquakes and conduct numerical simulation of them to predict tsunami heights. Hazard curves for earthquakes are calculated by using predicted tsunami heights and setting occurrence probabilities, and then integrated to one hazard curve which assesses total tsunami hazard at a coastal site. We introduce a practical example of PTHA, specifically focus on the type of "off the Pacific coast of Tohoku Earthquake", and discuss a method for integration of tsunami hazard curve.

In order to take account for the uncertainties, we construct 106 tsunami source models for the type of off the Pacific coast of Tohoku Earthquake, which are difference in source region, magnitude, and slip distribution. As the first process of integration, we set weights for each source model. A tsunami height probability density distribution are calculated from tsunami heights and weights of each source model, and a hazard curve is calculated by multiplying the probability density distribution by the occurrence probability of off the Pacific coast of Tohoku Earthquake. The probability density distribution is depend on the setting rule of weight.

We experimentally examine PTHAs assuming different four weight setting rules. Mean values and standard deviations of the probability density distributions are calculated and compared to the observed tsunami heights in 2011 off the Pacific coast of Tohoku Earthquake. In one setting rule, which meet the policy of setting weights in the National Seismic Hazard Maps for Japan, mean $+1\sigma$ values are smaller than the the observed tsunami heights at almost every costal sites of Tohoku. By setting larger weights for the source models which have the magnitude of 9.1, or have large slip amounts near trench axis, mean $+1\sigma$ values become larger and include the observation values.

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