

Integration of Probabilistic Tsunami Hazard Assessments along Japan Trench, Nankai Trough and Sagami Trough

*Yuta Abe¹, Mariko Korenaga¹, Shinichi Akiyama¹, Hisanori Matsuyama², Yasuhiro Murata³, Kenji Hirata⁴, Hiroyuki Fujiwara⁴

1. ITOCHU Techno-Solutions Corporation, 2. OYO Corporation, 3. KOKUSAI KOGYO Co., Ltd., 4. National Research Institute for Earth Science and Disaster Resilience

We have conducted a probabilistic tsunami hazard assessment (PTHA) along the Japan trench (Hirata et al., 2015), the Nankai trough (Abe et al., 2016a) and the Sagami trough (Abe et al., 2016b) with taking into account various uncertainty. By integrating the results of PTHAs along the three trenches, a risk of tsunamis occurring in the sea around Japan is comprehensively examined.

We set focal areas with conforming long-term evaluations by the Earthquake Research Committee (ERC) and make more than one earthquake fault models for each focal area to take into account uncertainty of heterogeneous slip distribution. In order to assess earthquakes which are not evaluated by ERC, we uniquely set their focal areas and earthquake fault models. For small earthquakes, we set one earthquake fault model for each focal area and assess the effect of heterogeneous slip by a probabilistic model.

We examine two kind of PTHAs for evaluating tsunami risks in different time-scale; one is “Present-time hazard” which shows a tsunami risk for 30 years out by estimating earthquake occurrence probabilities applying a renewal process based on BPT. The other is “Long-time averaged hazard” which shows a tsunami risk occurring once in thousands or tens of thousands by estimating earthquake occurrence probabilities applying a stationary Poisson process. For earthquakes which are not evaluated by ERC, we estimate their occurrence probability by applying Gutenberg-Richter law observed in each seismic region. For integration of the three PTHA, we calculate tsunami hazard curves along the three trenches and assume the occurrence of earthquakes along each trench as probabilistically independent event. Calculating integrated tsunami hazard curves for all coastal points and referring arbitrary tsunami heights from the tsunami hazard curves, we make tsunami hazard maps which show spatial distribution of exceedance probabilities.

Keywords: probabilistic tsunami hazard assessment, probability, long-term evaluation, tsunami analysis