[JJ] Evening Poster | H (Human Geosciences) | H-DS Disaster geosciences

[H-DS10]Tsunami and Tsunami Forecast

convener:Naotaka YAMAMOTO CHIKASADA(National Research Institute for Earth Science and Disaster Resilience), Kentaro Imai(Japan Agency for Marine-Earth Science and Technology), Hiroaki Tsushima(気象庁気象研究所)
Wed. May 23, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

This session discusses issues related to improving real-time and long-term prediction accuracy of tsunami from earthquakes, landslides, and volcanoes, which include such as a better understanding of tsunami dynamics, new real-time tsunami observing systems deployed in the open ocean and coastal waters, methodologies of more rapid and accurate prediction during tsunami emergencies, more extensive and accurate inundation maps, and long-term tsunami potential forecast.

[HDS10-P07]Characterized Fault Models estimated from the Tsunami height of the1944 Tonankai earthquake, the 1854 Ansei-Nankai earthquake and the 1854 Ansei-Tokai earthquake

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Keywords:1944 Tonankai earthquake, 1854 Ansei-Nankai earthquake, 1854 Ansei-Tokai earthquake , Characterized fault model, Long-term evaluation

1. Purpose

NIED (National Research Institute for Earth Science and Disaster Resilience) has been conducting the project on the probabilistic tsunami hazard assessment along the coastline in Japan (Fujiwara et al., 2013, JpGU). We have already constructed characterized fault models and conducted probabilistic tsunami hazard assessment using the tsunami heights estimated by tsunami simulations along the Japan trench, Kuril trench, Nankai trough and Sagami trough. To carry out such assessment, the framework of characterized fault models is needed to be effective. This effectiveness may be verified when we confirm that a tuned characterized fault model reasonably reproduces the tsunami trace heights of historical earthquakes. We have already confirmed the effectiveness of the characterized fault models for the 2003 Tokachi-oki earthquake and the 1946 Nankai earthquake. In this study, we constructed characterized fault models to reasonably explain the tsunami trace heights of the 1944 Tonankai earthquake on the basis of the source model of the 1944 Tonankai earthquake (HERP, 2009) and the tsunami receipt (HERP, 2017) issued by the Headquarters for Earthquake Research Promotion.

2. Method

We used element faults with approximately 5km in length and 5km in width that were configured on the surface of the Philippine Sea plate beneath the Nankai trough (the cabinet office, 2012) to take account of fault models on the three-dimensionally undulated surface of the subducting plate. The slip angle of each element fault is determined on the basis of the direction of the relative motion between the Philippine Sea plate and the Eurasia plate (Loveless and Meade, 2010). The macroscopic parameters of the characterized fault model such as fault area, seismic moment and average slip amount were set to be 20175 km^2, 2.51×10^{21} Nm and 2.49 m, respectively, on the basis of the seismic source model of the 1944

Tonankai earthquake by the Headquarters for Earthquake Research Promotion (2009). The fault area with relatively large slip amount is represented by a rectangular large slip area on the basis of the slip distribution of the source model for the 1944 Tonaikai and the 1946 Nankai earthquakes (the cabinet office, 2015). We constructed the characterized fault models varying the microscopic parameters such as the area ratio of the large slip area with respect to the source area (20%, 28% and 31%) and slip amount ratio between the large slip area and the average slip amount (2.0, 2.2 and 2.4 times). We calculated initial water surface deformation for each characterized fault model using the methods of Okada (1992) and Tanioka &Satake (1996), and then carried out tsunami simulation to calculate the tsunami height along the coast. The calculated tsunami heights were compared to the tsunami trace height to evaluate the reproducibility of the models.

3. Evaluation of the reproducibility of the models

The residual sum of squares between the calculated tsunami height and the tsunami trace height was used to evaluate the reproducibility of the models. The tsunami trace height data of the 1944 Tonankai earthquake were obtained from Japan Tsunami Trace database (Tohoku University, http://irides.tohoku.ac.jp/ project/tsunami-db.html). We used tsunami trace height data with more than 50 cm height, the confidence level of A, B, C and D, and the run-up distance of less than 100 m. The model showing the smallest residual sum of squares was selected as the highly reproducible model. The area ratio of the large slip area of the selected model is 31% and the slip amount ratio between the large slip area and the average slip amount of the selected model is 2.4. The geometric average K and geometric standard deviation κ for the selected model are estimated to be 1.17 and 1.37, respectively. The selected model may be considered to be a characterized fault model to reasonably explain the tsunami trace heights of the 1944 Tonankai earthquake. We will show the highly reproducible models for the 1854 Ansei-Nankai earthquake and 1854 Ansei-Tokai earthquake as well. To verify the effectiveness of characterized fault models, we are planning to construct characterized fault models to reproduce tsunami trace heights of historical earthquakes in the various regions around Japan.

This study is conducted as a part of the research project “Research on the hazard risk assessment” at NIED.