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Uncertainty for sunami hazard caused by heterogeneous slip on the characterized source model

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In preparation for probabilistic tsunami hazard assessment for the whole of Japan, we discuss uncertainty for tsunami heights due to a difference in slip distribution of source models.

In the process of probabilictic tsunami hazard assessment, tsunami heights at assessment points are estimated by numerical simulations. We calculate crustal deformations from source models, which are assumed as initial sea surface displacements, and then simulate tsunami propagations till tsunamis arrive in coastal sites. A simulation result changes depending on fault parameters of a source model such as magnitude, location, dip, strike, rake and slip distribution. Therefore, tsunami hazard includes uncertainties due to variability of fault parameters.

For the cases of subduction-zone earthquakes, focal mechanism is thought to be subject to a plate boundary in the characterized tsunami source model defined by probabilistic tsunami hazard assessment for the whole of Japan (Toyama et al., 2014, JpGU). On the other hand, magnitude, location and slip distribution are thought to have large varieties and their variabilities will create a large difference in tsunami height distributions. We therefore take account of the variabilities by calculating a number of source models with the different fault parameters. In this study, we give a qualitative verification for the variation in tsunami height due to slip distribution for the purpose of simplifying the hazard assessment process by using a probabilistic model for the uncertainty due to slip distribution. We examine a parameter study for several models with different slip distributions using two topography models, an uniform water depth model and a real ocean floor topography model. As the result, there is little to distinguish of geometric standard deviations between the two topography models, the values are 0.09 at a maximum.

This study was performed as a part of research for "Tsunami hazard assessment for the whole of Japan" in NIED.

Keywords: Tsunami, Probabilistic Hazard Assessment, Characterized tsunami source model, heterogeneous slip distribution