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A stochastic analysis and an uncertainty assessment of tsunami wave height using a random source parameter model

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In this paper, we conducted a stochastic tsunami hazard assessment including various uncertainties using a logic tree with targeting a region of the 3.11 Tohoku earthquake and investigated how heterogeneous slip faults generated by CRSP (Correlated Random Source Parameter) model influence the stochastic tsunami hazard assessment. In the assessment, observed tsunami wave height 6.7m in the 3.11 Tohoku Earthquake corresponded to 1112 year (0.50 fractile point), 1129 year (simple average) and 490 year (0.95 fractile point) for return period. Next, we investigated an influence that the number of slip patterns has on the results of the assessment. While the number of slip patterns had little impact on the results of the stochastic assessment in cases which a target wave height was comparatively low (2.0m), the return period at each fractile point was overestimated in case of 3 slip patterns and 5 patterns than 1 pattern when a target wave height was comparatively high (6.7m or 10.0m). We can conclude that the number of slip patterns had a great impact on the stochastic assessment depending on the target wave height. To clarify the uncertainties of tsunami wave height, we defined a 90 percent confidence interval and a coefficient of variation as indexes which can quantify the uncertainties of tsunami wave height. Basically, the 90 percent confidence interval had high value where the wave height at each fractile point was high. In addition, we confirmed that changing of maximum wave height due to changing of the asperity location in the assuming fault had a great impact on the coefficient of variations in the offshore point of the Ibaraki coast. The coefficient of variation in the offshore point of peninsula located in ria shoreline of the Iwate coast was comparatively higher than a result in closed-off section of bay located in ria coast. This result indicates an effect due to a characteristic topography in ria coast.

Keywords: probabilistic tsunami hazard assessment, uncertainty analysis, rogic tree, CRSP model