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Inundation hazard mapping toward probabilistic tsunami hazard assessment

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A method to obtain probabilistic hazard information on tsunami run-up and inundation area is described in this study, as part of the probabilistic tsunami hazard assessment research work [NIED]. A tsunami hazard assessment has been conducted to estimate frequency of exceedance wave height at several monitoring sites along coastal region, and to be useful for the study of coastal vulnerability, based on results from a tsunami simulation with an earthquake scenario and occurrence probability. Although the main target of a tsunami hazard assessment has contributed to quantify risk in critical infrastructure facilities, inundation hazard information for urban and river regions are also important. In a study of a probabilistic tsunami hazard assessment for Japan, tsunami exceedance wave height in coastal region is probabilistically derived from numerical modelling of tsunami sources available. However, horizontal resolutions in the model is only 50 m of minimum in a land region due to computational cost constrained by tsunami simulation for Japan, which is not enough resolution to assess inundation hazard mapping on a urban area. A detailed inundation hazard assessment is expected as a result of implementing smaller grid size than 50 m.

Here we provides a technical note for estimation of inundation hazard mapping resulted from a simulation run at horizontal resolution 10 m, and show their results at Rikuzentakata, one of example. A horizontal distribution of the probabilistic inundation is calculated from hazard curves on every grid cells in inundation area. Earthquake scenarios are set by many tsunami sources and occurrence frequencies around Japan trench. An annual exceedance probability of inundation when reaching threshold is calculated from tsunami sources and occurrence probability of the earthquake scenarios. This describes the benefit of tsunami inundation hazard mapping. We could successfully show this point clearly for the first time.

Keywords: Tsunami hazard, Tsunami inundation, Probability, Hazard curve