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Towards detailed tsunami hazard assessment for specific regions

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NIED began research projects regarding tsunami hazard assessment (THA) in Japan to support various kind of measures against possible tsunami attacks in future by sectors such as local governments, life-line companies, etc after the national tragedy caused by the 11st March 2011 Tohoku earthquake (Mw9.0) (Fujiwara et al., 2013, JpGU). One of the research projects is a research of probabilistic tsunami hazard assessments (PTHA) in which we consider all of possible tsunamis that may affect coastal regions in future. The research of PTHA consists of two subjects; (1) nation-wide probabilistic tsunami hazard assessment (NWPTHA) (Hirata et al., 2014, JpGU) and (2) detailed probabilistic tsunami hazard assessment for specific regions (DPTHASR). We briefly show outlines of (2) here.

The objective of DPTHASR is to bridge the gap between probabilistic tsunami hazard assessment and local measures for disaster prevention in city-scale. In the research and development process of DPTHASR, we are planning to conduct several kinds of tsunami inundation assessment for specific regions by using tsunami propagation and inundation simulations based on a non-linear long wave equation with staggered leap-flog, finite difference method (FDM) over a nesting grid system with the minimum grid size of 10 meters. As for presentation tools of DPTHASR, we are planning to present (a) inundation flow depth hazard curve (excess probability) at specified point and (b) probabilistic spatial distribution of inundation flow depth as well as we are also planning to investigate development of (c) probabilistic inundation flow velocity assessment that is closely related to tsunami destructive force against buildings, etc. and that can be directly applied to risk assessments. As the first attempt in researches regarding DPTHASR, we are investigating a probabilistic method of depth flow assessment in which both of probabilistic assessment for inundation flow depth distribution and inundation flow hazard curves (excess probability) are presented (Saito et al. 2014, JpGU).

For a high-precision forecast of inundation phenomena based on tsunami run-up calculation in DPTHASR, it is the most important to use fine and precise topographic data with detailed information on breakwaters and seawalls in coastal region and riversides. We make effort to collect these information and will have to investigate relationship between inundation flow assessment and destruction conditions of coastal infrastructures in near future. The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) of Japanese Government recommends users for tsunami runup calculation to basically use high-precision topographic data acquired with airborne laser scanning (MLIT, 2012, Guideline for tsunami inundation forecasting). The Geospatial Information Authority of Japan (GSI) is progressively releasing the precise coastal topographic data acquired with airborne laser scanning. DPTHASR will be advanced using processed data, converted for tsunami simulation, created from high-precision topographic data acquired with airborne laser scanning by GSI.

Keywords: tsunami, hazard assessment, runup, probability, local tsunami forecast, utilization