Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

HSC24-04 Room:101B Time:May 24 17:00-17:15

Tsunami hazard assessment project in Japan-in the case where tsunami sources are confined in Japan Trench region -

HIRATA, Kenji[1*] ; FUJIWARA, Hiroyuki[1] ; NAKAMURA, Hiromitsu[1] ; OSADA, Masaki[1] ; OHSUMI, Tsuneo[1] ; MORIKAWA, Nobuyuki[1] ; KAWAI, Shin'ichi[1] ; AOI, Shin[1] ; YAMAMOTO, Naotaka[1] ; MATSUYAMA, Hisanori[2] ; TOYAMA, Nobuhiko[2] ; KITOU, Tadashi[2] ; MURASHIMA, Yoichi[3] ; MURATA, Yasuhiro[3] ; INOUE, Takuya[3] ; SAITO, Ryu[3] ; TAKAYAMA, Junpei[3] ; AKIYAMA, Shin'ichi[4] ; KORENAGA, Mariko[4] ; ABE, Yuta[4] ; HASHIMOTO, Norihiko[4]

[1]NIED, [2]OYO, [3]KKC, [4]CTC

In 2012, NIED started a probabilistic THA (PTHA) project in Japan to support various kind of measures by sectors such as local governments, life-line companies, etc (Fujiwara et al., 2013, JpGU). In our strategy, we divide nationwide coast lines into several regions such as Japan Trench, Nankai Trough, etc and will investigate region-wide PTHA for each region in turn so that we finally will get nationwide PTHA in Japan. Hirata et al. (2014, JpGU) reported the basic concept of region-wide PTHA and showed a prototype of PTHA for Japan Trench region last year. Here, we will report their revised ones.

Procedures for region-wide PTHA are follows; (i) we consider all of possible earthquakes in future, including those that the Headquarters for Earthquake Research Promotion (HERP) of Japanese Government evaluated. We assume probabilities of earthquakes' occurrence (PEO) determined by HERP if they gave those. If HERP does not, we calculate it by assuming that earthquake occurrence follows stationary Poisson process and a standard Gutenberg-Richter laws. We then introduce seven categories of earthquake type; (1) "repeating interplate earthquakes"(within single domain), (2) "Tohoku Earthquake-type earthquakes", (3) "tsunami earthquakes", (4) "intraplate earthquakes", (5) "maximum-sized earthquakes", (6) "multi-domain earthquakes other than (2) and (5)", and (7) "background earthquakes". HERP evaluated PEOs for (1)-(4). (ii) We construct a set of simplified earthquake fault models, called "characterized earthquake fault models (CEFMs)", for all of the earthquakes mentioned above by following prescribed rules (Toyama et al., 2014, 2015 JpGU; Korenaga et al., 2014, JpGU). (iii) We solve a non-linear long wave equation, using staggered leap-flog, finite difference method (FDM), including inundation calculation as coastal boundary condition, over a nesting grid system with the minimum grid size of 50 meters, to calculate tsunamis for each of initial water surface distributions generated from a large number of the CEFMs. (iv) Finally we integrate information about coastal maximum tsunami heights from the numerous CEFMs on the basis of probabilistic approach (Abe et al., 2015, JpGU) to get region-wide tsunami hazard curves, defining excess probability, for coastal tsunami heights, incorporating uncertainties inherent in tsunami forward calculation and earthquake fault slip heterogeneity (Abe et al., 2014, JpGU).

Next, we briefly show the latest result of PTHA for Japan Trench region, which are expressed by maximum coastal tsunami heights at exceedance probability in exposure time of next 30 years (measured from 1st Jan. 2014). For simplicity, we choose four points, Hachinohe (Aomori pref.), Okatsu (Miyagi pref.), Iwaki (Fukushima pref.) and Onjyuku (Chiba pref.) to discuss the PTHA results. By comparing at the same exceedance probability level, coastal tsunami heights at Hachinohe and Okatsu are assessed to be higher than those at Iwaki and Onjyuku. At Hachinohe, the most affecting tsunamis are "the northern Sankiku earthquake", included in the category (1), for coastal tsunami heights lower than 20 m and the category (5) earthquakes for those higher than 20 m. Coastal region in Hachinohe should continue to pay attention to "the northern Sanriku earthquake". At Okatsu, "the northern Sanriku earthquake" and the category (6) earthquakes evenly contribute coastal tsunami heights lower than 10 m, whereas the category (5) earthquakes become predominant for coastal tsunami heights higher than 10 m. At Iwaki and Onjyuku, on the other hand, the most affecting tsunami of higher than 5 m comes from the category (5) earthquakes and the second contributing one is the category (6) earthquakes. Especially, coastal tsunami heights of higher than 3 m is mostly controlled by the category (6) earthquakes, because the category (6) includes multi-domain earthquakes that rupture a region off Boso Peninsula which the 2011 Tohoku Earthquake (M9.0) did not break.

Keywords: tsunami, hazard assessment, probability