南海トラフ、相模トラフ、日本海溝の3海域統合確率論的津波ハザード評価

Integrated Probabilistic Tsunami Hazard Assessment contributed from possible tsunami sources along Nankai Trough, Sagami Trough, and Japan Trench

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Last years, we presented regional Probabilistic Tsunami Hazard Assessments (PTHAs) for three coastal zones along Nankai Trough, Sagami Trough, and Japan Trench (Hirata et al., 2014, 2015, AGU; Hirata et al., 2016, SSJ). In three PTHAs, our procedures are follows; (i) we consider all possible earthquakes in the future, including those that Earthquake Research Committee (ERC), the Headquarters for Earthquake Research Promotion (HERP) of Japanese Government already assessed. (ii) We construct a set of Characterized Earthquake Fault Models (CEFMs), for all the possible earthquakes(Toyama et al., 2014, 2015, JpGU; Kito et al., 2016, JpGU). (iii) For all the CEFMs, we compute tsunamis by solving a nonlinear long wave equation, using FDM, including runup calculation, over a nesting grid system with a minimum grid size of 50 meters.(Saito et al., 2014, 2015, JpGU; Takayama et al., 2017, JpGU) (iv) Finally, we gather excess probabilities for variable tsunami heights, calculated from all the CEFMs, at every observation point along the coastal zone to get PTHA. We incorporated aleatory uncertainties inherent in tsunami simulation and earthquake fault slip heterogeneity in the integration process(Korenaga et al., 2014, JpGU; Abe et al., 2014, JpGU).
In this study, we integrate three of the regional PTHAs calculated from all possible earthquakes along Nankai Trough, Sagami Trough, and Japan Trench to get a nationwide PTHA. We will make two kind of the probabilistic tsunami hazard maps ; one is “Present-time hazard map” under an assumption that earthquake occurrence basically follows a renewal process based on BPT (Brownian Passage Time) distribution. The other is “Long-time averaged hazard map” under an assumption that earthquake occurrence follows a stationary Poisson process. The former is based on long-term assessments for the forthcoming large earthquakes in three subduction-zones. So it offers a probabilistic tsunami hazard map that naturally corresponds to a set of the long-term assessments of the forthcoming earthquakes, for three subduction-zones above, published by ERC/HERP. On the other hand, the latter is effective for us to make social/infrastructural preparations over hundreds year long.
A Present-time hazard map, showing the probability that the tsunami height will exceed 3 meters at coastal points in next 30 years (starting at 1st January, 2016), suggests high possibility over 60% in several coastal zones along the southern coasts of Shikoku to Tokai region, perhaps due to contribution from the next Nankai earthquake. Since the occurrence probability for the next 30 years, starting from 2013/01/01, is assessed 60% to 70% by ERC, this high possibility of 60% means that almost all the

tsunami heights in the several coastal zones will tend to be greater than 3 meters. However, a long-time averaged hazard map, showing the probability that the tsunami height will exceed 3 meters at coastal points in next 30 years, suggests a not-so high possibility less than 20-30% for coastal zones along the Pacific coast. This is because long-time averaged hazard maps do not present an impending danger but do give a long-term perspective over hundreds to thousands years.

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