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Tsunami spectral analysis in and around Tokyo Bay

TAKIGAWA, Akira[1*] ; MUROTANI, Satoko[1] ; HEIDARZADEH, Mohammad[1] ; WU, Yifei[1] ; SATAKE, Kenji[1]

[1]Earthquake Research Institute, University of Tokyo

Coastal areas in the Kanto region have been damaged by large tsunamis in the past. The reported tsunami heights from the 1923 M7.9 Kanto earthquake show a great difference between in and around Tokyo Bay. Attenuation of tsunami heights was observed at the mouth of the bay. For example, tsunami heights were less than 1.0 m inside the bay at Shinagawa, Funabashi, and Chiba, although they were 3.0-10.0 m outside the bay (Hatori et al., 1973, ERI special publication).

On the other hand, the tsunams from the 2011 Mw 9.0 Tohoku earthquake did not experience such attenuation. For example, tsunami heights were 1.46 and 2.84 m inside the bay at Tokyo and Funabashi respectively, although they were 1.45 and 1.60 m outside the bay at Tateyama and Kyonan (Sasaki et al., 2012, CEJ).

It is important to know why this difference occurs, when estimating tsunami damage to the metropolitan area for future earthquakes. Therefore we conducted spectral analysis of tsunami waveform obtained by numerical simulations, and found that the dominant wave period in the bay is different for each earthquake. It is around 100 min for the Kanto earthquake tsunami and around 70 min for the Tohoku one. We inferred that the 100 min period may result from the normal mode of Tokyo bay (Aida, 1996, Zisin) and the 70 min period from the normal mode of Sagami Bay (Imai et al., 2011, SSJ meeting). In future, we will examine the relation between these different periods and tsunami behaviors.

Keywords: Tsunami, Spectral analysis, Tokyo Bay, 1923 Kanto earthquake, 2011 Tohoku earthquake