

Approximation of tsunami transfer function by seiche spectra to the 2009 Papua tsunami

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A small tsunami, being accompanied with the 2009 Papua earthquake on 3 January 2009, was observed at the Pacific coast of southwest Japan. The tide gauge records were decomposed into amplitude spectra for the time history of six hours including the first arrival. The 14 used tide stations distribute from central Japan to Kyushu. A linear response theory reveals that output spectra is multiplication of input spectra and transfer function. Applying the theory to this tsunami observation we obtain output spectra as the synthesis of source model and seiche spectra. Analytical formula of Yamashita and Sato (1974) are used as the source model of tsunami and spectra of seiche observed by Abe (2005,2006) are used as the transfer functions. The source model was calculated based on parameters obtained by staff of Nagoya university. The source spectra was estimated under an assumption of 1000 m in sea depth at a propagation distance of 3840 km and for a relative azimuth of 250 degrees which is the value of Kushimoto tide station. Output spectra were obtained for all the tide stations using each seiche spectrum and the same source spectra, and compared with the observed spectra. The synthesis approximates observed spectra of the tsunami as shown in Figure 1. The figure is a result obtained at Kushimoto tide station. We can separate the seiche from the source spectra on a difference of half width of both the spectral peaks. This result suggests that a dominant period of seiche is important to understand resonance of tsunami because a spectral peak of tsunami appears as that of seiche.

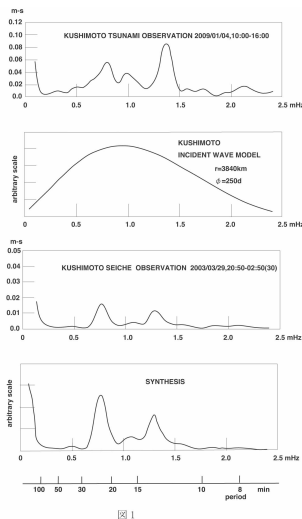


Figure 1