

Strong ground motion simulation for the July 23, 2005 northwestern Chiba earthquake by pseudo point-source model

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We propose a pseudo point-source model (Nozu, 2012) of the July 23, 2005 northwestern Chiba earthquake. The model is developed for the benchmark test (Hisada *et al.*, 2013) in which various strong ground motion generation methods are compared.

In the pseudo point-source model, detailed spatiotemporal slip distributions within a subevent are not considered. Instead, the source spectrum associated with the rupture of each subevent is specified and it is assumed to follow the omega square model. This model has been applied for some earthquakes and shows good agreement with observations.

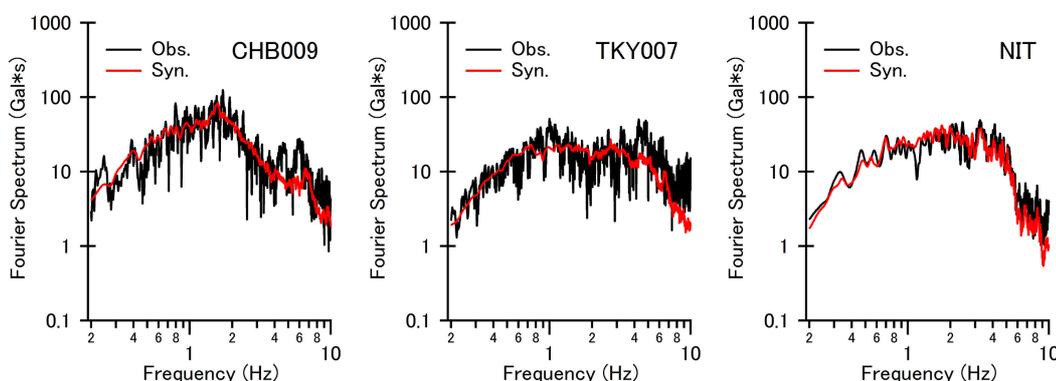
With this simplification, each subevent involves only six parameters, namely, longitude, altitude, depth, seismic moment, corner frequency and rupture time. In addition to these parameters, strike, dip and rake angles of the subevent are considered in this study in order to investigate the effect of radiation pattern while average value has been used in the previous studies. In this study, it is assumed that the theoretical radiation pattern becomes less evident with the increase of the hypocentral distance divided by the wavelength. This means that when the hypocentral distance is large of the wavelength is short, the radiation pattern is close to the average value rather than the theoretical value and vice versa. A new parameter Q_R is introduced to express this effect that determines how slowly the radiation pattern converges to the average.

The parameters for this particular earthquake are determined as follows. The hypocenter and the mechanism are from Koketsu and Miyake (2005). The seismic moment ($=9.11 \times 10^{17} \text{Nm}$), the density ($=3.2 \text{g/cm}^3$) and the S wave velocity ($=4.46 \text{km/s}$) in the source region are from the F-net. The corner frequency ($=0.75 \text{Hz}$) and $Q_R (=10\pi)$ are determined so that the synthetic velocity waveforms and the Fourier spectra become consistent with the observations.

The site amplification factor for the K-net or KiK-net sites is from Nozu and Nagao (2005). For other sites (Building Research Institute and UR sites), the site amplification factors are newly determined by using the spectral ratio of the observed records between the target site and neighboring K-net or KiK-net stations. In terms of the Fourier phase information, we pick up 3 earthquakes before the main shock and chose the best one for each site.

As an example of the result, the synthetic Fourier spectra at 3 sites are compared with the observations (see the Figure).

Keywords: pseudo point-source model, benchmark test, the 2005 northwestern Chiba earthquake, radiation pattern, site amplification factor



Comparison of acceleration Fourier spectrum
(CHB009 and TKY007: K-NET station, NIT: BRI station)