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


SCG65-12 Room:A04 Time:May 26 12:25-12:40

# Strong motion simulation for the 2014 Northern Nagano Prefecture earthquake based on the pseudo point-source m

NOZU, Atsushi[1*]

[1]Port and Airport Research Institute

In our country, the characterized source model, which is composed of rectangular subevents generating strong ground motions, have extensively been used for the purpose of predicting strong ground motions (e.g., Kamae and Irikura, 1997). On the other hand, the author (Nozu, 2012) proposed a new source model, namely, the pseudo point-source model, which could be regarded as a simplified version of the conventional characterized source model. In the pseudo point-source model, the spaciotemporal distribution of slip within a subevent is not modelled. Instead, the source spectrum associated with the rupture of a subevent is modelled and it is assumed to follow the omega-square model (Aki, 1967). The source model consists of only six parameters for each subevent, namely, the longitude, latitude, depth, rupture time, seismic moment and corner frequency of the subevent. The model involves much less model parameters than the conventional characterized source model. Once the model parameters are given, by multiplying the source spectrum with the path effect and the site amplification factor, the Fourier amplitude at the site of interest can be obtained. Then, combining it with the Fourier phase of a smaller event, the time history of strong ground motions from the subevent can be calculated. Finally, by summing up contributions from the subevents, strong ground motions from the entire rupture can be obtained.

If such a simplified source model can explain strong ground motions with certain accuracy, it would be helpful in reducing costs for strong motion prediction especially a large number of scenarios are considered. Moreover, according to the results of past studies, the model can explain strong ground motions from a mega-thrust earthquake (Nozu, 2012) and an intraslub earthquake (Nagasaka et al., 2014), sometimes better than the conventional characterized source models.

Its applicability to short distances, however, could be restricted, because it is expressing the subevent with a point. Therefore, its applicability to shallow crustal earthquakes should carefully be examined by using observed records.

The examination of the applicability of the model to shallow crustal earthquakes has already been started (e.g., Hata and Nozu, 2012). In this study, a pseudo point-source model was developed for the 2014 Northern Nagano Prefecture earthquake and strong ground motions were simulated based on the model. The selected parameters are as follows: number of subevents=1, longitude=137.901, latitude=36.722, depth=4.6 km, seismic moment=2.0E+18 Nm, corner frequency=0.25 Hz. A medium density of $2.7\times10^3$ kg/m$^3$ and a shear wave velocity of 3.5 km/s were assumed. The mean value of 0.63 was used for the radiation coefficient. Another mean value of 0.71 was used for *PRTITN* (Boore, 1983), which is a coefficient indicating the partition of energy into two horizontal components. The Q value estimated in a past study (Satoh and Tatsumi, 2002) was used to represent the path effects. Records of the November 23, 12:46 aftershock were used to evaluate the Fourier phase. According to the results, the pseudo point-source model generally can explain strong ground motions around the source region fairly well, although there is still a room for future improvement (The figure shows the results for the velocity waveforms and the Fourier spectra at NGN002, NGN005 and NGN007).

Acknowledgement: Strong motion data used in this study were kindly provided by the NIED.

Keywords: the pseudo point-source model, the 2014 Northern Nagano Prefecture earthquake, strong ground motion, omega-square model, Fourier phase

SCG65-12 Room:A04 Time:May 26 12:25-12:40