

APPLICATION OF A HYBRID APPROACH FOR BROADBAND GROUND MOTION SIMULATIONS TO THE 2008 IWATE-MIYAGI NAIRIKU EARTHQUAKE

Luca MORATTO, Imoratto@inogs.it

Alessandro VUAN, avuan@inogs.it

Angela SARAÒ, asarao@inogs.it

Centro Ricerche Sismologiche,
OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Trieste, Italy

A hybrid procedure is developed merging the full-wave low-frequency signals with stochastic high-frequency synthetics to simulate broadband strong ground motion for engineering applications. The synthetic seismograms are computed utilizing a deterministic approach in the low frequency range (COMPSYN) while a stochastic procedure (EXSIM) is applied to generate the signals in the high frequency range. The stochastic synthetics are rescaled and combined with the deterministic signals applying weighting functions at intermediate matching frequency.

We validated our approach reproducing, within the known source and velocity model constraints, the Kik-NET and K-net accelerometric data recorded during the 2008 Iwate-Miyagi Nairiku earthquake (Mw 7.0).

The results show that this procedure is able to simulate satisfactorily the observed waveforms and the related response spectra over the broadband frequency range. To evaluate the effects of the hybridization in the peak and spectral parameters we calculated the goodness of fit: if we use the low-pass filtered recordings instead of deterministic calculated seismograms, the overall fit improves, evidencing that a good reproduction of low frequencies is necessary to obtain reliable results even in the high frequency range. Peak ground velocities are well reproduced by our approach; peak ground accelerations show larger discrepancies due to the intrinsic characteristics of the stochastic model and the small-scale heterogeneity that affect the seismic radiation and propagation at high frequencies.

