Reconstruction on the dynamic rupture process of the 1999 Chi-Chi, Taiwan Earthquake

Wenbo Zhang[1], Tomotaka Iwata[2], Kojiro Irikura[1]

[1] Disas. Prev. Res. Inst., Kyoto Univ., [2] DPRI, Kyoto Univ.

The dynamic simulations on the earthquake rupture are the best ways to understand the physics of earthquakes. Because an earthquake can be considered to be a dynamically propagating shear crack that radiates seismic wave. In this paper, we will base on the dynamic source parameters obtained from previous study (Zhang, et al, 2001) to reconstruct the dynamic rupture process of the 1999 Chi-Chi, Taiwan earthquake by using a propagating crack model.

At first we assume that an initial rupture starts at the hypocenter area that has a low value of strength excess. Then use the finite-difference-method to directly solve the elastodynamic equation and analyze the stress field on the fault plane. During the dynamic rupture process, we apply a simple and typical slip-weakening frictional law for everywhere on the fault. Finally, we can obtain the whole pattern of the dynamic rupture process on the 1999 Chi-Chi, Taiwan earthquake. Compared our dynamic rupture result with the kinematic inversion result obtained by Iwata and Sekiguchi (2000), our result of the slip distribution on the fault is similar with that of kinematic result. But the rupture velocity is different with that of the kinematic inversion which has a constant rupture velocity. Our result shows that the rupture propagates fast in the areas with the low strength excess but slow in the areas with the high stress excess. We also give the preliminary simulation result on near ground motion to show the validity of our dynamic rupture model on the Chi-Chi earthquake.

Reference

Iwata, T., H. Sekiguchi, and K. Irikura (2000b), Rupture process of the 1999 ChiChi, Taiwan, earthquake and its near-source strong ground motions. Proc. International Workshop on Annual Commemoration of ChiChi Earthquake, Sept. 18-20, 2000, Taipei, Taiwan, Vol.1, 36-46.

Zhang, W. B., T. Iwata, and K. Irikura (2001), The characteristics of the dynamic source parameters of the 1999 ChiChi, Taiwan earthquake, and the 2000 Tottori, Japan earthquake, 2001 AGU Fall meeting, S22B-0645, San Francisco