Re-evaluation of near source strong ground motion during the 1995 Kobe earthquake

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The authors have successfully simulated the severely damaged zone known as the 'Damage-Belt' during the Hyogo-ken Nanbu (Kobe) earthquake of 1995 in the eastern side of city of Kobe (Matsushima et al., 2000). In this study, we try to simulate the strong motion distribution in the Kobe area with more accuracy. In the previous study, we were successful in simulating the strong motion and the damage distribution in the eastern part of Kobe, but the fit in the western part was not quite well. So we try to re-estimate the rupture model by using 3-D reciprocal Green's functions (RGFs) calculated considering Betti's relations (Graves and Wald, 2001) and searching for a best fitting case by grid-search technique assuming a rectangular strong motion generation areas (SMGA). We calculate the 3-D RGFs using the modified 3-D basin model (Matsushima et al., 2001) at the plane of the assumed source region. The western plane has a strike of N53E and a dip of 90 degrees and the eastern plane has a strike of N233E and a dip of 85 degrees. Both of the planes interchange at the depth of 21.6 km on a line with the strike of N53E extending from the epicenter (34.603N, 135.028E). We assume nine parameters to search, location (X0,Y0), size (L,W), maximum slip velocity (Vd), time of maximum slip velocity (td), duration (tr), coefficient decay of 1/sqrt(t), and rake angle. The rupture velocity is generally kept constant at 2.8km/s (i.e., 80% of S-wave velocity). The target data are velocity waveforms of N33W component at sites JMA, KBU, MOT, and TKT. We consider a fifth SMGA in the shallow part of the third SMGA to fit the data at TKT. We modify the velocity structure referring to studies such as Takenaka et al. (2001) and shift the depth contour of 1km closer to the basin edge. The calculated velocity waveforms for the newly estimated 3-D basin structure by the five SMGA rupture model show very good fit to the data. For the PGV distribution, regions corresponding to the areas of about 90 to 100 cm/s or greater are in good fit compared to the region of the Seismic Intensity scale VII of JMA.

References

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