Study on the real-time strong motion estimation system on the basis of the site-type classification maps of Japan.

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It is important to quickly estimate the strong ground motion immediately after the earthquake for emergency response. When we estimate the strong ground motion, we need accurate site amplification factors covering a wide area. In this paper, we first construct on the database of site amplification factor, second we the strong motion (seismic intensity) for the real-time purpose, third we also evaluate the accuracy of the site amplification factor. For those purpose, we use the recent three earthquakes, 1996 off Chiba pref., 1998 Tokyo bay and 2000 Northeastern Chiba pref. earthquakes.

In order to make the database of the amplification factors of Japan, first, we digitized the site-type classification maps (1:200,000 or 1:100,000 scale) into 500 m mesh sizes. Although the digital site-type classification maps of 1 km mesh are commercially available, we found our digital maps are more appropriate and accurate, because of their higher resolutions. Next, on the basis of the empirical method by Matsuoka and Midorikawa (1993) together with the digital height data (250m mesh), we calculated the site amplification factors of Japan of 500 m mesh.

For estimating the strong motion for the real-time purpose, we used the two methods; one is based on a source model, which is quickly estimated after an earthquake and empirical attenuation relations. The other is based on an interpolation technique using actual strong motion records, where, we used the triangle interpolation as an interpolation technique, and the observation records by the K-Net. By comparing the estimations and the observations, we found that the second method gave more reliable results than the first method, because the first method strongly depended on accuracy of source parameters. However the second method also has a problem when evaluating the seismic intensities immediately after an earthquake; That is, we may not be able to obtain quickly the strong motion records near the epicenter. Therefore, it will be efficient to evaluate the intensities using the first method immediately after an earthquake, then to replace them by the second method after getting the strong motion records.

Finally, we compared the site amplification factors evaluated by the two methods. The first is based on the average of shear wave velocities from the free surface to the 30m depths using boring data (Midorikawa, Matsuoka and Sakugawa, 1992). The second is the above-mentioned method using the site-type classification and height. Since the depth of k-net sites are only down to 20 m, we estimated the average of shear wave velocities following to Si and Midorikawa (1999). The comparisons showed that the first method was more accurate. For this reason, it may be necessary to replace the site amplification maps of Japan, which are based on the second method, by the first method, when we obtain boring data.