

Calibration of amplification factors using KiK-net strong-motion records: more accurate estimation of seismic intensities

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The Real-time Earthquake Information System (REIS, Horiuchi et al., 2005; Yamamoto et al., 2005) detects events and determines earthquake parameters such as hypocenter, magnitude and origin time using the Hi-net (High-sensitivity seismograph network Japan) data. The system also predicts the arrival times of S waves and seismic intensities at a given site using a conventional attenuation relationship. However, the estimated intensities using a conventional method are not always in agreement with the observed ones. In this study we derive empirical amplification formulas at KiK-net stations in Hiroshima prefecture based on our previous results (Tajima et al., 2005; Hayashida and Tajima, 2006) and compare the estimated seismic intensities with the observed ones on the ground surface.

The amplification factors, i.e., ratios of peak amplitudes a_s/a_b , each of which is calculated from records on the ground surface or in the borehole. The ratios decrease with hypocentral distance in general (Hayashida and Tajima, 2005). Accordingly we derived empirical relations of the ratios using regression analysis. The estimated intensities using the site effective formulas show substantial improvement in comparison with those calculated using the conventionally used formulas at most of the stations. However, variance of estimation at several stations (e.g. HRSH01, HRSH03) has not been improved between events, especially for events which occurred within 100 km from stations. The ratios show large scatter relative to the empirical amplification formulas at the stations. The variation depends on the hypocentral location indicating that the ratios of a_s/a_b is also affected by the incident direction of seismic waves. The improvement of strong motion estimates would help provide more accurate intensity estimates on the ground surface.