Improvement of the discrimination algorithm between train-induced vibrations from seismic motions for EEW

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When the safety of railway facilities and running vehicles are threatened by large shakings of ground motions during earthquakes, railway operators stop trains as soon as possible (Nakamura, 1996; Ashiya et al., 2007; Yamamoto and Tomori, 2013). To stop trains rapidly, it is effective to utilize the P-wave whose propagation velocity is faster than the S-wave. At present the warning systems which estimate the epicenter location and the seismic magnitude using the initial P-wave information in several seconds are in operation to stop the trains (Odaka et al., 2003; Iwahashi et al., 2004).

It is necessary to discriminate clearly between the seismic motions and the train-induced vibrations regarding seismographs installed along railways, because the feeble vibrations are used typically to estimate the seismic parameters from the initial P-wave. The seismographs now in use are implemented with the algorithm to discriminate the train-induced vibrations from the seismic motions using the component ratio of amplitudes (Sato and Nakamura, 2005). In this study, we proposed the new discrimination index taking account of frequency characteristics and evaluated the discrimination performance. Further, we developed the new discrimination algorithm using the combination of the current and the proposed indices (Iwata et al., 2014).

The improvement of the warning reliability during earthquakes is expected by using the proposed method.

Keywords: earthquake early warning, seismic motion, train-induced vibration, noise discrimination, algorithm