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Prediction of ground motion using real time monitoring -for real time ground motion prediction -

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Earthquake Early Warning (EEW) aims at mitigation an earthquake disaster by giving people enough time to take appropriate safety measures in advance of strong ground shaking. EEW system of the Japan Meteorological Agency(JMA) determines quickly the hypocenter and magnitude (M) of the earthquake, and then predicts seismic intensity using empirical attenuation relation and site amplification factors. During the 2011 off the Pacific Coast of Tohoku Earthquake, the JMA EEW was issued to the Tohoku district as expected, but it was not issued to Kanto district because of the underestimation of seismic intensity. The underestimation can be attributed due to the large extent of the later fault rupture. For several weeks after the mainshock, when earthquakes sometimes occurred simultaneously over the wide source region, the system became confused, and did not always determine the location and magnitude correctly, which leaded to some false alarms.

To solve above problems, Hoshiba(2011) proposed a method for expectation of ground motion based on Kirchhoff Fresnel integral method, in which hypocenter and M are not required. In this method, real time monitoring and estimation of wavefield and propagation direction of the waves are important. The Green function is required beforehand.

In real applications for prediction of ground motion, site amplification factors are important. Though the site amplification factors are scalar values for current JMA EEW system, Iwakiri and Hoshiba(2011) concluded that the preciseness will be improved by 20% when frequency dependency is introduced into the site amplification correction. When the correction can be applied in real time manner, it become possible to synthesize the waveform by combining the application of the Kirchhoff Fresnel integral method, which leads us to real time ground motion prediction.

For ground motion prediction for scenario earthquakes, source parameters such as the location of initial rupture and asperities are assumed and then waveforms are synthesized from the information. For real time ground motion prediction, waveforms are observed in real time manner and then predict based on the information. The real time ground motion prediction is expected to apply to the Earthquake Early Warning.

Keywords: Earthquake Early Warning, Real time, Monitoring, Ground motion prediction