

## Investigation for earthquake early warnings of long-period ground motion

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Sometimes seismic intensity cannot express difficulty of action and indoor situations in high rise buildings properly when severe long-period ground motion occurs. To notify people of such situations and facilitate effective countermeasures, JMA started to provide information on long-period ground motion from March 28th, 2013. And now, we are investigating for an earthquake early warning for long-period ground motion.

There are some techniques for prediction long-period ground motion, and we investigate attenuation relationships of response spectrum because it can calculate at any given seismic parameter and calculate fast.

We investigate following three relationships that they are used for governmental studies, we can get their coefficients and detail information on amplification factors, and they have different equation format or adjustment techniques.

- Sato et al.(2010) and Sato et al.(2012)
- Morikawa and Fujiwara(2013)
- Yokota et al.(2010)

We use earthquakes that earthquake early warnings were issued, their magnitudes are bigger than 5.5, and maximum seismic intensities are 3 or larger, and we calculate absolute velocity response spectrum for seismic parameters of each earthquake early warning information and JMA seismic catalog. Prediction points are JMA seismic stations, K-net stations and KiK-net stations, and prediction element is intensity scale of long-period ground motion.

As a result, every equation represent trend properly. Especially, the probability that intensity scales fall inside the error of +/- 1 is 70 to 80 percent when we use seismic parameters of JMA seismic catalog. But there is a tendency that prediction intensity scale is bigger than one of calculated from real wave form near the epicenter because we use the shortest distance from source faults to observation stations which depend on Mw. In addition, calculated results are affected accuracy of seismic parameters of earthquake early warnings. Therefore there is need to discussion when we issue prediction information and what information number we should use.

Keywords: long-period ground motion, JMA, EEW, attenuation relationship, response spectrum