Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

SSS40-P01 Room:Convention Hall Time:May 21 13:45-15:15

Estimation of extended source area during a great earthquake for upgrading the EEW system

KURAHASHI, Susumu[1*], IRIKURA, Kojiro[1]

[1]Aichi Institute of Technology

1. Introduction

The seismic intensities predicted by the Earthquake Early Waning are possibly underestimated in comparison with the observed one for great earthquakes. It is caused to the fact that the attenuation-distance relationships of PGV and PGA for such earthquakes are well expressed as a function of not epicentral distance but shortest distance from site to source fault. So far, we have found that the attenuation-distance relationships of both horizontal and vertical PGAs tend to have some saturation near the source faults during large inland earthquakes. We have also found that the time of the saturation of the vertical PGA is generally earlier than that of the horizontal PGA. Based on the above results, we can provide the information about the rupture extension before the arrival of the main motions for large inland earthquake (Kurahashi et al., 2010).

The 11 March 2011 giant earthquake with Mw 9.0 occurred off the Pacific coast of Tohoku, and is one of the historically largest subduction earthquakes in or near Japan. We examined the saturation of the vertical PGAs near the source area of this earthquake. In this study, we try to check the applicability of our methodology to the EEW information for great subduction earthquakes.

2. Procedure

The procedure to calculate seismic intensity using our methodology for great subduction earthquakes is shown as follows.

1: The extent of the source fault is assumed from the distribution of stations where vertical PGAs of more than 200gal are observed. 2: The vertical PGA at each site outside the source extent is calculated using the empirical attenuation-distance relationship of the vertical PGAs and shortest distance from each site to the source fault. 3: The seismic intensity at each site is predicted using the empirical relationship between vertical PGA and seismic intensity.

3. Check the applicability of our methodology

First, we compare source extent estimated from saturation of the vertical PGAs with rupture area from inverted source model. In this study, source area is defined as follows. The source length is diameter of the extent of the observation points where PGA exceeds 200 gal. The source width is assumed as half of the source length. We confirmed that the source area above estimated approximately coincides with the rupture area from the scaling relation of rupture area vs. seismic moment for subduction earthquake by Murotani et al. (2010).

Next, we examined attenuation relationship of the vertical PGAs. The decay of the PGA with distance beyond the saturation extent has almost same tendency independent of seismic magnitude. In this study, the attenuation relationship distance used Nishimura and Horike (2003). Vertical PGAs at target sides outside the source extent are calculated from the attenuation distance relationships.

4. Result and Conclusion

The predicted seismic intensity map obtained from vertical PGAs of Tohoku earthquake is shown in Fig 1. The predicted seismic intensity agrees well with to observed seismic intensity.

We found that vertical PGAs at stations near the source fault of the Tohoku earthquake have some saturation, although the saturation levels are changeable due to site effects. The extent of the source fault is assumed from the distribution of stations where vertical PGAs of more than 200gal are observed. The seismic intensity at each site is predicted using the empirical attenuation-distance relation of vertical PGA and shortest distance to the source fault. This methodology is available as one of updating EEW system.

Keywords: The Earthquake Early Warning, great earthquake

SSS40-P01 Room:Convention Hall Time:May 21 13:45-15:15