Development of Realtlime Long-Period Ground-Motion Prediction System and Demonstration Experiment

*Shin Aoi[1], Takeshi Kimura[1], Takashi Kunugi[1], Wataru Suzuki[1], Yadab Prasad Dhakal[1], Naoto Kojya[2]

1. National Research Institute for Earth Science and Disaster Resilience, 2. Japan Meteorological Agency

Current technology seems to be hard to predict an occurrence of earthquakes, but is capable to deliver realtime earthquake information just after the occurrence. For railway systems, the earthquake early warning (EEW) system for Shinkansen was utilized in 1990s. For nationwide warning and alerts, Japan Meteorological Agency (JMA) has operated the EEW system since 2007, and realtime information of ground motion plays an important role in society.

On the other hand, the JMA EEW provides only seismic intensities, and not yet to alert broader ground motion information such as long-period ground motions. Long-period ground motions generated during large earthquakes shake skyscrapers in urban area and cause furniture overturning and damage of elevators in them. Recently, JMA issues the long-period ground motion levels based on 5%-damped absolute velocity response spectra in the period range of 1.6 to 7.8 s to respond beyond the seismic intensity measures. Dhakal et al. [2015] constructed a ground motion prediction equation (GMPE) for absolute velocity response spectra in the period range of 1 to 10 s using 36 earthquakes and 12,401 strong motion recordings observed at K-NET and KiK-net stations. The GMPE can provide accurate predictions with correction factors that use depths of the Vs 1.4 km/s layer beneath the sites from the subsurface velocity model provided by the Japan Seismic Hazard Information Station (J-SHIS). The GMPE has an advantage to use the JMA magnitude Mj that is available immediately after the earthquake, not moment magnitude Mw. We developed realtlime long-period ground-motion prediction system using the GMPE of Dhakal et al. [2015] and hypocenter locations and earthquake magnitudes provided by the JMA EEW.

JMA plans to deliver alerts of EEW for long-period ground motions that are similar to the current EEW for seismic intensities. A working group to investigate prediction information for various needs has been established at JMA to activate the plan. Realtime prediction information for ground motions is not allowed to open to the public based on the weather service law. Therefore, NIED collaborates with JMA, and performs demonstration experiments to deliver prediction information of long-period ground motions where NIED acts as a virtual business predictor. The demonstration experiments consist of two types. One is an experiment to use automatic processed prediction information. The other is an experiment to use spatial distribution of prediction information.

In this presentation, we introduce demonstration experiments, results, and future perspectives to deliver observation and realtime prediction information to users using long-period ground-motion prediction system and API and long-period ground-motion monitor.

Keywords: long-period ground-motion, realtlime prediction, earthquake early warning, demonstration experiment

