Y230-009 **Room: 101** **Time: May 17 16:00-16:15**

On prediction of shaking intensity using P wave strong motion data

Changjiang Wu[1]; Hiromitsu Nakamura[1]; Shigeki Horiuchi[1]; Paul Rydelek[1]

[1] NIED

The Hi-net seismic network takes an important role in the current Earthquake early warning system. As a high sensitivity network, Hi-net generally supplies high quality seismograms for small to medial size earthquakes . However, there are cases when most of Hi-net seismograms close to epicenter are clipped. We are hence making an EEWS using real-time strong motion network data for the better estimate of earthquake magnitude and seismic intensity. In this study, we investigate all the KiK-net records with a clear P wave first-arrival phase and systematically study the effectiveness of the methods previous proposed for an EEW system.

If earthquake rupture is deterministic, i.e., the endpoints of earthquake ruptures are determined by the initial ruptures, it follows that we can predict the final size of earthquake ruptures by using the information extracted from just several seconds of P-wave data even though at the same time the rupture may still be undergoing. This would make an EEW system very powerful, especially for those major earthquakes like the 2008 M_w7.9 Wenchuan earthquake. Two methods have been proposed: One is the predominant period method (e.g., Olson and Allen, 2005, Nature), the other is the peak ground displacement (PGD) method (Zollo, et al., 2006, GRL). These studies claimed that earthquake size could be determined from the first 2 or 3-seconds of P- (or S-) wave strong motion data. However, Rydelek and Hoiruchi (2006, Nature) invalidated the predominant period method using a larger set of high-quality waveform data. Application of the PGD method to using the K-NET and KiK-net strong motion data showed that the sizes of large earthquakes are difficult to estimate from initial information (Rydelek et al., 2007, GRL). Regardless to effectiveness of the two methods, meanwhile, there are some practical problems for an EEW system using strong-motion data. The predominant period method are usually estimated from velocity and displacement records, both method hence need twice integral, which might lead to a seriously distorted seismogram if the background noise at low frequencies is comparable with the seismic signals. In this study, we propose a de-noise method based on the fast wavelet transform, and re-investigate the two methods by using KiK-net strong-motion data recorded in the past three year.

We also investigate the effectiveness of prediction of S-wave intensity from P-wave intensity by using KiK-net strong-motion data. We picked up the P-phase first arrivals and calculate the seismic intensity every second by introducing a recursive filter which has the approximate amplitude response of the JMA filter. When we focus on the data recorded at stations within a epicenter distance of 150km, plot of Intensities from P-wave (denoted as I_p) versus those from S-wave (I_s) shows a clear linear dependence as follows,

I_s=aI_p+b

where a and b are 0.74 and 0.97 for 1 second time-window of P wave, 0.83 and 0.98 for 2 seconds time window, and 0.86 and 0.96 for 3 seconds time-window, respectively. A time window of 3 seconds yields sufficient small variation. The linear relationship between I_p and I_s suggests the effectiveness of on-site warning using P-wave strong-motion data. It also follows that the intensity magnitude method (e.g., Yamamoto et al., 2008, GRL) is effective if we have enough near-field strong-motion data. This would be more promising if we have strong-motion stations densely deployed along a known active fault.