

高精度・高速の緊急地震速報を目指して - Hi-net 地震計の気象庁地震計への統合処理 -
Achievement of Faster and More Accurate Earthquake Early Warning System - Combining JMA and Hi-net data -

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Earthquake Early Warning systems (EWS) are designed to quickly determine locations and magnitudes of earthquakes and then provide predictive warnings about the arrival time and amplitude of the strong shaking. Current JMA EWS uses data from two seismic networks: JMA accelerometer network and NIED high sensitive seismometer network (Hi-net). Currently, these two datasets are processed in the different scheme and the results are merged to issue a warning. Combining these two datasets and processing in the same framework should improve the accuracy and speed of the warning.

In this study, we tried to develop a method to use these two dataset in the same framework. A major barrier to do this is that the instrument responses are different in these networks. Hi-net seismometers are velocity-type sensor with the corner frequency of 1Hz, which means that the response of long-period components underestimates ground motions. It also saturates for very large ground motions. We need a special care to use this Hi-net data in the same framework.

We applied time-domain recursive filters to correct instrumental response of Hi-net sensors and adjust them to the response of mechanical seismometers. We successfully developed a method to produce records with the same response to the JMA acceleration data. We evaluated the saturation of the Hi-net data with the data in 2 month after the Tohoku earthquake, and found the effect of saturation was minor. Therefore, we can use Hi-net data and JMA acceleration data in the same scheme theoretically. Speed of the warning improved by 3 seconds in the average for the inland earthquake by combining these two networks.

Keywords: earthquake early warning, Hi-net, saturation, instrument response