Development of a function in the home seismometer to discriminate seismic signal from noise event(2)

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Horiuchi et al., (2007) suggested home seismometer spread plan for the Earthquake Early Warning (EEW) system of the next generation. The home seismometer is a receiving unit of EEW with installing Mems type of a seismometer and A/D converter. It is designed to be set inside house. Since a felt earthquake occurs with the frequency of one time per several months to several years, while living noise of large amplitude may be generated several times per day, it is required to develop very good algorithm of earthquake and noise signal discrimination for the development of the real time earthquake information delivery system using home seismometer network. Here, we present the result of the development of the noise discrimination technique used in the home seismometer.

Seismograms for the vibration of indoor human activity have predominant frequency of several tens to one hundred and several tens Hz. It is difficult to filter out all of them because these signals are generated near the seismometer and have large amplitude. We developed the method to discriminate noise and seismic signal by computing the predominant frequency, which is calculated from average amplitude ratio of observed acceleration and its derivative developed by Nakamura (1988). However, the computed values for small events become unstable owing to high frequency back ground noise.

We tested several methods to calculate prominent frequency when high frequency back ground noise is included. It is concluded that the use of high cut filter is ineffective to get a stable value, since predominant frequency of noises also becomes low. We calculate predominant frequency by counting the number of zero cross with taking into account the noise level of back ground noise. We found that this method is simple but stable to get information about the inclusion of low frequency seismic signal.

A trigger test was performed using a vibration table. It was indicated that our event detection is successful for events having seismic intensity about 1, while noise level of home seismometer is about 1 gal.

Because there are large changes in the nature of the noise recorded at various installation sites, it's necessary to develop algorithm of earthquake and noise discrimination which is functional even the change of installation environment. We are improving our algorithm by correcting data observed at various sites.