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Earthquake detection from strong ground motion observation network in Himalaya, India

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It is an important subject to establish the technical issues and environment of data acquisition and analysis of natural hazards for the disaster mitigation, the first aid and recovery planning. The Indo-Japanese collaborative project on 'Information Network for Natural Disaster Mitigation and Recovery' of 'Science and Technology Research Partnership Sustainable Development International Collaborative Research Program' supported by JST and JICA, Japan initiated strong ground motion observation, crustal movement measurement, and building vibration measurement in Indo-Gangetic plain and foot hills of Himalaya, India.

We started the strong ground motion observation network with deployment of broadband velocimeters and digital equipments at 26 sites near the seismic active region in Himalaya, India by October 2012. The continuous time history of ground motion is digitally recorded with high resolution. Because of the broadband response of the sensor and the high resolution of the recorder, it is expected that the long- period motions or weak ground motions from small local earthquakes and distant earthquakes will be recorded as well as the short-period strong ground motions. It is a necessary task for the seismic data analysis to detect earthquakes using continuous records from the network. In this paper, we present a method developed for fast and precise earthquake detection from continuous records of the network.

The stations of the network are located in the compounds of local schools. The ambient noise is not always low but it changes as well as contains abrupt increases. We developed a detection method with simple algorithm adequate for the noisy circumstances. We compared our detections with the earthquakes reported in the NEIC catalogue. Our results show that the network detected all earthquakes of magnitude 7 or more, more than 90% of magnitude 6.5 through 6.9, more than 50% of magnitude 6.0 through 6.4 regardless of epicentral distances, and more than 80% of magnitude 6 or more from epicentral distances less than 100 degrees.

Several local earthquakes with short S-P times which were not reported in the NEIC catalogue were also detected by the network. Local seismicity is an index of the stress status, and detection of local earthquakes is important to understand the stress distribution in a small region. The preliminary results show that the network will provide data from local and global earthquakes to study the local seismic activity in the Himalayan region, the propagation path effects from the source to the stations, amplification effects at sites, the physical process of the seismic source, and subsurface velocity structure.

Keywords: strong ground motion, observation, network, earthquake detection