Strong Motion Observation Network in the Kathmandu Valley, Nepal

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The Himalayan continental collision zone of the Indian plate and the Eurasian plate has experienced devastating earthquakes in the past. The Kathmandu Valley in Nepal is filled with soft lake sediment of Plio-Pleistocene origin, more than 650 m thick in the central part of the valley. The diameter of valley is about 25 km in length. The valley is susceptible to the high risks of not only the near-field strong ground motion, but also far-field long period strong ground motions like in the Mexico Valley during the 1985 Michoacan earthquake. In addition, the explosive population growth in recent years is increasing the earthquake damage risk in the valley. The 2015 Gorkha Nepal earthquake (M_W 7.8) resulted in over 8,000 deaths; about 1,700 deaths and 13% building damage inside the valley. The future great earthquakes in Nepal Himalaya have the potential to occur in the Central Seismic Gap of the Main Frontal Trust.

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There are eight known seismic observation sites in the valley: one station by USGS, three stations by the Department of Mines and Geology, Ministry of Industry, and four stations by the collaborative observation of Hokkaido University and Tribhuvan University (Takai *et al.*, 2016). In order to construct of the source and velocity structure models for the ground motion prediction, the strong motion observation network was initiated with ten strong-ground motion seismometers in the Kathmandu Valley from Nov. 2016 to May 2018. There is only one rock site station (Kirtipur) in the valley, therefore we installed the instruments to north, west, and east rock site stations. Moreover, we selected the heavy damaged area (Balaju) during the 2015 Gorkha Nepal earthquake and the low-density observation area as observation sites.

The installed instrument is Tokyo Sokushin Co. Network sensor CV-374A2 with the servo accelerometer (frequency range: DC~100 Hz). The data loggers can perform GPS time calibration. Due to long hours of power outage in Kathmandu, the observation systems have UPSs, down transformers and voltage stabilizers for smooth operation. These instruments were installed on the first floor of low-rise reinforced concrete buildings, and the accelerometers were fixed to the floor with bolts. We have recorded data continuously at all sites. The observation stations will be able to connect to mobile LAN in the future, since the selected instruments have Ethernet terminals.

We carried out the multi-channel surface wave method with active source around all installation sites to understand the shallow shear-wave velocity structure. Another group is trying to observe the ambient noise at our installation sites to know the deep shear-wave velocity structure of the valley by seismic interferometry and microtremor methods. We will construct accurate shallow-deep velocity structure by gathering the data of shallow and deep velocity structure and compare with the observed strong ground motion data of small to moderate size earthquakes around the Kathmandu Valley. Using this velocity structure, we will be able to predict strong ground motion precisely.

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