



Design, Implementation, and Preliminary Outcome of the National Seismic Monitoring Network in the Kingdom of Bhutan

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Bhutan Himalayan district is located along the plate collision zone between Indian and Eurasian plates, which is one of the most seismically active region in the world. Recent earthquakes such as M7.8 Gorkha Nepal earthquake in April 25, 2015 and M6.7 Imphal, India earthquake in January 3, 2016 are examples of felt earthquakes in Bhutan. However, there is no permanent seismic monitoring system ever established in Bhutan, whose territory is in the center of the Bhutan-Himalayan region.

We started establishing permanent seismic monitoring network of minimum requirements and intensity meter network over the nation. The former is composed of six (6) observation stations in Bhutan with short period weak motion and strong motion seismometers as well as three (3) broad-band seismometers, and the latter is composed of twenty (20) intensity meters located in every provincial government office. Obtained data are transmitted to the central processing system in the DGM office in Thimphu in real time. In this project, DGM will construct seismic vault with their own budget which is approved as the World Bank project, and Japan team assists the DGM for site survey of observation site, designing the observation vault, and designing the data telemetry system as well as providing instruments for the observation such as seismometers and digitizers. Additionally, the RIMES (Regional Integrated Multi-hazard Early Warning System for Africa and Asia) is also providing eight (8) weak motion stations and we are keeping close communication to operate them as one single seismic monitoring network composed of fourteen (14) stations in near future.

We already started the operation of our own six (6) weak motion stations as well as twenty (20) intensity meter stations. Although we still have various initial troubles of the system, we obtained preliminarily located hypocenters with more than four (4) stations including two (2) additional offline stations for several months. Hypocenter distribution within only three months shows similar tendency that ISC indicates in their 20 years catalogue such as high seismicity in the south western part of Bhutan. Some of the hypocenters located by USGS shifted more than 30 km in our preliminary catalogue.

This network will be definitely utilized for not only for seismic disaster mitigation of the country but also for studying the seismotectonics in the Bhutan-Himalayan region which is not yet precisely revealed due to the lack of long term observation data in the past.