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Strong ground motion, cultural noises and undetected micro seismic events from an accelerometric perspective

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The 21 high gain short period velocimetric stations monitored by DMG/NSC allow detecting and locating every earthquake with magnitude greater than ML=2.2 within Nepal, insuring the trigger of the seismic alert for every event above ML=4.0. However, their dynamics is not sufficient to determine peak ground acceleration, velocity and displacement at short distances from earthquakes epicenter, information which is needed as critical input to seismic hazard assessment models.

In spite of extrapolating at short distances attenuation laws constrained by the weak motion database only, we decided to acquire a strong motion database. The project began with the installation in 2009 of 3 accelerometric lines (AC23 sensors and GSR24 digitizers) in Pokhara (POKHR at sediment), Kakani (KKN at rock) and Kathmandu (DMG at sediment).

Because the temporal variations of the noise level at some of the sites (i.e. DMG and POKHR) were important, due to high levels of cultural noise, a STA/LTA (short time average/ long time average) trigger mode has been chosen. During the first months of acquisition, more than 4000 detections were collected. The characteristics of the mostly cultural-events triggering the detector, as a function of time, are summarized. They allow constraining the envelopes of peak ground acceleration (PGA), velocity (PGV) and displacement (PGD) triggering the detector. Their comparison with the micro-seismic catalogue allows determining the maximum PGA, PGV and PGD generated by every undetected-by-accelerometers earthquake. These results enhance our knowledge of the ground motion they generate in Nepal, giving an upper limit to their reach.

Planned installation of additional stations, both at rock and sediment, and acquisition of the accelerometric signal over long time windows will help constrain a strong motion database as well as evaluate strong ground motion and its variability in Nepal.