

Ground response of the Kathmandu Sedimentary Basin during the 2015 Gorkha (Nepal) Earthquake Sequence

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An earthquake of Moment Magnitude (Mw) 7.8 occurred at 11:56 local time in the western part of Gorkha District in Western Nepal on the 25th April 2015. This earthquake as well as its strong aftershocks caused massive destruction in the northern part of hilly region as well as in the Kathmandu Valley. This is the first destructive earthquake, which occurred in Nepal and is recorded by modern instruments. The earthquake sequence, so far, has been reported to have claimed more than 8500 lives leaving thousands injured and similarly tens of thousands homeless.

The ground motion of the earthquake was recorded by five accelerometers installed in the Kathmandu sedimentary basin. Four accelerometers were installed by a collaborative project between Tribhuvan University, Nepal and Hokkaido University, Japan and the other accelerometer was installed by the United States Geological Survey, USA. One of the accelerometer is at bedrock and other four are at soil sites.

We have analyzed strong motion records of the 25 April 2015 Nepal Earthquake (Mw 7.8) and its three strong aftershocks recorded at one rock (reference) site and four soil sites in the Kathmandu Valley. Strong motion data at soil sites from all four events show systematic amplification relative to the rock site at multiple frequencies in the 0.1 to 2.5 Hz frequency range and de-amplification of frequencies larger than 2.5 Hz. The amplification ratio between a soil site and a reference rock site for the Mw 7.8 and Mw 7.3 events have smaller amplitude and frequency peaks relative to the ratios of the two other moderate events, thus, indicating nonlinear site response during the stronger events.

Repeated catastrophic valley infill following medieval earthquakes in the Nepal Himalaya

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Geomorphic footprints of past large Himalayan earthquakes are elusive, though urgently needed for gauging and predicting recovery times of seismically perturbed mountain landscapes. We present evidence of catastrophic valley infill following at least three medieval earthquakes in the Nepal Himalayas. Radiocarbon dates from peat beds, plant macrofossils, and humic silts in fine-grained tributary sediments near Pokhara, Nepal's second largest city, match the timing of nearby $M > 8$ earthquakes in ~1100, 1255, and 1344 C.E. The upstream dip of tributary valley fills and X-ray fluorescence spectrometry of their provenance rule out local sources. Instead, geomorphic and sedimentary evidence is consistent with catastrophic fluvial aggradation and debris flows that had plugged several tributaries with tens of meters of calcareous sediment from a Higher Himalayan source >60 km away.