Geophysical Research Abstracts
Vol. 18, EGU2016-147-2, 2016
EGU General Assembly 2016

Engineering geological aspect of Gorkha Earthquake 2015, Nepal

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Strong shaking by earthquake causes massif landsliding with severe effects on infrastructure and human lives. The distribution of landslides and other hazards are depending on the combination of earthquake and local characteristics which influence the dynamic response of hillslopes. The Himalayas are one of the most active mountain belts with several kilometers of relief and is very prone to catastrophic mass failure. Strong and shallow earthquakes are very common and cause wide spread collapse of hillslopes, increasing the background landslide rate by several magnitude. The Himalaya is facing many small and large earthquakes in the past i.e. earthquakes i.e. Bihar-Nepal earthquake 1934 (Ms 8.2); Large Kangra earthquake of 1905 (Ms 7.8); Gorkha earthquake 2015 (Mw 7.8). The Mw 7.9 Gorkha earthquake has occurred on and around the main Himalayan Thrust with a hypocentral depth of 15 km (GEER 2015) followed by Mw 7.3 aftershock in Kodari causing 8700+ deaths and leaving hundreds of thousands of homeless. Most of the 3000 aftershocks located by National Seismological Center (NSC) within the first 45 days following the Gorkha Earthquake are concentrated in a narrow 40 km-wide band at midcrustal to shallow depth along the strike of the southern slope of the high Himalaya (Adhikari et al. 2015) and the ground shaking was substantially lower in the short-period range than would be expected for and earthquake of this magnitude (Moss et al. 2015).

The effect of this earthquake is very unique in affected areas by showing topographic effect, liquefaction and land subsidence. More than 5000 landslides were triggered by this earthquake (Earthquake without Frontiers, 2015). Most of the landslides are shallow and occurred in weathered bedrock and appear to have mobilized primarily as raveling failures, rock slides and rock falls. Majority of landslides are limited to a zone which runs east-west, approximately parallel the lesser and higher Himalaya. There are numerous cracks in the ground especially in the epicenter area. Similarly, liquefaction occurred in the different parts of Kathmandu valley. However, the recording in KATNP and DMG indicate that the ground motions that resulted from the quake were not strong enough to fully weaken liquefiable materials and in most cases incipient or "marginal" liquefaction was observed. Here, we will present a compilation of the different types of mass wasting that have occurred in this region and discuss their location and hazard potential for local communities.

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