EGU2020-8293
https://doi.org/10.5194/egusphere-egu2020-8293
EGU General Assembly 2020

2015 Nepal Earthquake: A Comparison between Landslide Inventories

Andrea Valagussa[1], Paolo Frattini[1], Elena Valbuzzi[1], Malcolm Billinge-Jones[2], and Giovanni Battista Crosta[1]

[1]University of Milano - Bicocca, DISAT_CSS1, Milano, Italy (andrea.valagussa@unimib.it)

[2]Aspen Reinsurance, London, United Kingdom

Three landslide inventories were prepared for the area affected by the 7.8 Mw Nepal earthquake (April 25, 2015). The first inventory contains 21,151 earthquake-induced landslides (EQL), directly associated to the 7.8Mw earthquake, mapped by using Google Earth's pre and post-earthquake images, helicopter footage and Google Crisis data. Landslides were classified as debris flows, shallow translational landslides and rotational landslides. This last class included a relatively small number of events. The second inventory includes only pre-event shallow landslides (PESL) to evidence those landslides which were already active before the 2015 earthquake. This inventory includes more than 2,500 landslides. The third inventory includes almost 20,000 large landslides (LL), consisting mostly of rock avalanches, slumps, rockslides, and deep-seated gravitational slope deformations (DSGSD). The spatial distribution of the three inventories was analysed with respect to land surface parameters. The EQL inventory shows in general a different spatial distribution with respect to the other two inventories. This is probably related to the seismic triggering and to the characteristics of the geographic area. A joint analysis of the LL and the EQL inventories shows that only a few earthquake-induced landslides (about 15 %) are directly associated to reactivation of LL.

A Principal Component Analysis (PCA) and a Discriminant Analysis were performed to analyse the controlling parameters on EQL and PESL. The analyses were based on: 1) land surface parameters, 2) hydrological parameters, 3) seismic parameters, 4) lithological parameters, 5) land cover, and 6) meteorological parameters. The statistical analyses show that the most critical variables for landslide triggering during an earthquake are associated to the land surface parameters, in association with the cosesimic displacement and the PGA, that show an effect on the landslide size and density respectively. PESL seem to be mainly controlled by land surface parameters, with some of them (e.g. elevation) showing a slightly inverse relationship with landslide density. Agricultural land use, slope gradient and rainfall (reference period 1980-2000) show a high correlation with the PESL landslide triggering in absence of earthquakes.