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Landslides triggered by the January 12, 2010 Port-au-Prince, Haiti Mw 7.0 earthquake

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The January 12, 2010 Port-au-Prince, Haiti earthquake (Mw 7.0) triggered tens of thousands of landslides. The purpose of this study is to investigate correlations of the occurrence of landslides and its erosion thickness with topographic factors, seismic parameters, and distance from roads. A total of 30,828 landslides triggered by the earthquake cover a total area of 15.736 km^2, and the volume of landslide accumulation materials is estimated to be about 30,000,000 m^3, and throughout an area more than 3,000 km^2. These landslides are of various types, mainly in shallow disrupted landslides and rock falls, and also including coherent deep-seated landslides, shallow disrupted landslides, rock falls, and rock slides. These landslides were delineated using pre- and post-earthquake high-resolutions satellite images. Spatial distribution maps and contour maps of landslide number density, landslide area percentage, and landslide erosion thickness were respectively constructed in order to more intuitive to discover the spatial distribution patterns of the co-seismic landslides. Statistics of size distribution and morphometric parameters of the co-seismic landslides were carried out and were compared with other earthquake events. Four proxies of co-seismic landslides abundances, including landslides centroid number density (LCND), landslide top number density (LTND), landslide area percentage (LAP), and landslide erosion thickness (LET) were used to correlate the co-seismic landslides with various landslide controlling parameters. These controlling parameters include elevation, slope angle, slope aspect, slope curvature, topographic position, distance from drainages, stratum/lithology, distance from the epicenter, distance from the Enriquillo-Plantain Garden fault, distance along the fault, and peak ground acceleration (PGA). Comparing of controls of impact parameters on co-seismic landslides show that slope angle is the strongest impact parameter on co-seismic landslides occurrence. In addition, it should be noted that the co-seismic landslides of our inventories is much more detailed than other inventories in several previous publications. Therefore, comparisons of inventories of landslides triggered by the Haiti earthquake with other published results were carried out and the reasons of such differences were presented. We suggest it should not be limited by past empirical functions between earthquake magnitude and co-seismic landslides or it is necessary to update the past empirical functions based on more and more latest and complete co-seismic landslide inventories. This research was supported by the National Science Foundation of China (41202235)