



Landslides triggered by the 20 April 2013 Lushan earthquake, Sichuan Province, China : A case study in a region near the epicenter

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Abstract: The 20 April 2013 Lushan earthquake with a magnitude of M_s 7.0 induced widespread landsliding along the south segment of the Longmen Shan fault zone. This paper presents a preliminary analysis of the characteristics of these co-seismic landslides triggered in an area of 732 km² around the epicenter. A total of 755 landslides with a total area of 1.414 km² were identified from digital aerial photography taken after the Lushan earthquake on April 22-28, 2013. About 56% of the landslides were small (less than 1000 m²), whereas about 9 % were large (10,000 m² or more). The size of the landslides is in general much smaller than those which were triggered by the Wenchuan earthquake. The most common types of landslides in the study area were rock falls and shallow, disrupted landslides from steep slopes, typically involving the top few meters of weathered bedrock and colluviums. During the seismic shaking slope failures occurred much more often near river channels and along roads.

In this study, the relation between the landslide distribution and five main factors: slope angle, elevation, lithology, epicenter and fault proximity was analyzed. Our results show that landslides induced by the Lushan earthquake mainly occurred on locations with slopes between 20° and 50°, especially on slopes exceeding 30°. In addition, the areal frequency of co-seismic landslides was the highest at elevations between 700 and 1300 m asl., with a significant decrease in frequency at elevations above 1500 m. Over 95% of the landslides occurred in three geologic units: Paleogene mudstones, Triassic dolomites, and Cretaceous mudstones and sandstones while almost half of the total co-seismic landslide area was triggered on slopes consisting of Cretaceous mudstones and sandstones. The landslide area as a percentage of the total landslide area (LAP) and the landslide area density (LAD) value tend to decrease with distance to the Shuangshi-Dachuan fault. The LAP value within a distance of 4 km from the fault amounts to 71.5 %. The location of the hanging wall and the footwall of the fault do not seem to have an important effect on the landslide distribution in the Lushan earthquake area. This is in contradiction to what has been reported in other earthquake areas such as the Wenchuan area.

Key words: Lushan earthquake; co-seismic landslides; spatial distribution; landslide concentration