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Distribution Pattern of Earthquake-induced Landslides Triggered by the 12 May 2008 Wenchuan Earthquake

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The catastrophic 12 May 2008 Wenchuan earthquake (Mw=7.9) occurred on the NE-SW trending Longmenshan fault zone at the eastern margin of the Tibetan Plateau, just west of the Sichuan basin, China. This extraordinary event triggered a large number of landslides, rock avalanches and debris flows, causing fatalities of more than 80,000, more than 374,176 people injured and serious economic loss. Our work shows the preliminary results of an extensive study on the mapping of the distribution of landslides triggered by the earthquake. An extensive landslide interpretation was carried out using a large set of optical high resolution satellite images (e.g. ASTER, ALOS, Cartosat-1, SPOT-5 and IKONOS) as well as air photos for both the pre- and post-earthquake situation. Landslide scarps were mapped as points using multi-temporal visual image interpretation taking into account shape, tone, texture, pattern, elevation and ridge and valley orientation. Nearly 60,000 individual landslide scarps were mapped. The landslide distribution map was compared with the inventory map that was prepared directly after the earthquake, which contains about 11,000 individual landslide points, through the calculation of normalized landslide isopleths maps. Remarkable differences were observed, as the earlier inventory mapping didn't consider the pre-earthquake situation and did not consider all individual landslides. As part of the landslide inventory, all landslides were identified that had blocked the drainage and had formed landslide dams. Detailed event-based landslide dam inventory map was prepared to show the landslide dam distribution and characteristics. The landslide distribution was compared with a number of aspects, such as the seismic parameters (distance to epicenter, distance to fault rupture, co-seismic fault geometry and co-seismic slip rate distribution), and geology. The most remarkable correlation found was with the co-seismic slip rate distribution and the fault geometry. Landslide distribution in the section of the fault that had mainly a thrust component with low angle fault plane was found to be much higher than the sections that had steeper fault angles and a major strike slip component. Follow-up work will concentrate on the use of the point database in an object oriented image classification using for detecting the actual landslide areas as polygons and the use of pre- and post-earthquake DEMs for volume calculation and runout analysis.