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Characterizing an earthquake induced landslide from two different events in the same area

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A substantial body of research dealt with the behavior of landslides in response to a triggering factor, particularly emphasizing spatial relations and distribution. The general findings pointed to earthquake induced landslides (EILs) as events that can be attributed to geo-environmental precursors and seismic parameters such as fault type, displacement, earthquake depth and magnitude. These parameters were typically determined by comparing inventories from different study areas. Studies that relate EILs to certain parameters observed from a single area where different earthquakes occurred have been infrequent. The Beichuan area offered an opportunity for this kind of single-area observation. This study compared a recent massive EIL event (2008, Mw= 7.9) in Beichuan and a subrecent lesser event (1958, M= 6.2) in the same area. It conducted analysis of these two events through extensive image interpretations of the landslide type (slide, flow, creep, avalanche, etc.), subtype (translational, rotational, and complex) and material (rock, debris, earth) for the 2008 EIL inventory and the landslide type and subtype for the 1958 EIL inventory. The event inventories indicate that a total of 3,163 EILs affecting a total area of 25.2 km2 were related to the 1958 event, while 2,181 EILs with a total area of 74.6 km2 were related to the 2008 event. Landslide types mostly included translational rockfalls, rockslides, debris flows, debris slide, and minor rock avalanches. Further comparison of data on the 2008 and 1958 EIL events showed that a total of 1,142 EILs or 52 percent of the 2008 event overlapped with the 1958 inventory. Data further showed that these 1,142 EILs covered a total area of about 3.4 km2 or 13.5 percent of the 25.2 km2 of EILs covered by the 1958 event. In conclusion, this portion of the 2008 event (13.5 percent) might have been the same area affected by the 1958 event. This area, however, had not been considered in previous inventories and respective analysis. This study recommends further work in relating each inventory to geo-environmental and seismic parameters and ultimately to entire event inventories. This further work could be a crucial input parameter to more complex studies such as landslide susceptibility assessments or seismic acceleration models for a given earthquake and its associated landslide pattern. Consequently, these assessments and models will be useful tools in establishing relationships between landslide occurrence and seismic and geo-environmental factors.