



Large landslides triggered by the M 8.0 Wenchuan Earthquake of 12 May 2008, China

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Due to the high magnitude, long duration of vibration, and complicated geological environment of the disastrous area, the moment magnitude (M) 8.0 Wenchuan earthquake of 12 May 2008 triggered more than ten thousand of landslides, most of which were shallow disrupted rock falls and slides which had been common in many previous disastrous earthquakes in the world, throughout an area of about 100,000 km². The strong ground shaking also triggered many larger deep landslides. We identified 112 landslides of larger than 50 000 km² and mapped their area, runout and estimated their volume, using aerial photographs (post the earthquake, 0.5m), topographic maps (1:50 000) and field investigation data. The largest landslide triggered by this event is Daguangbao Landslide in Anxian County. Its area was 7.12 km² and the volume was about 742×10⁶m³. It was the largest earthquake-triggered landslide that had been recognized in our country and it had the highest landslide dam for the height was as high as 690m. Most large landslides showed the features of long runout and debris fluidization. Wenjiagou Landslide in Mianzhu City had the longest flow distance of 4km and it was the second largest landslide triggered by this earthquake.

These large landslides were concentrated in five zones around the seismic fault Yingxiu-Beichuan Fault. Further deep study suggested that the concentration areas of these large landslides matched the dislocation, transition and ending positions of Yingxiu-Beichuan Fault. These positions were the stress-concentrated areas, which released more energy in the earthquake so that more and larger landslides were triggered. The number of large landslides in the concentration area of HongBai Town of Shifang City - Chaping Town of An County was the highest, and the two largest landslides (Daguangbao Landslide and Wenjiagou Landslide) were distributed in this area. This may have something to do with the obvious dislocation of Yingxiu-Beichuan Fault.

The distribution of large landslides is strictly determined by the seismic fault. Of the 112 large landslides, 44 were distributed in the range of 1km from Yinxiu-Beichuan Fault, occupying 39.3% of the total number. More than 80% of the landslides were distributed in the range of 5km from Yingxiu-Beichuan Fault and the longest was 13km. Moreover, the distribution of large landslides had clear "hanging wall effects", for 91 large landslides [U+FF08] 81.3% [U+FF09] are located in the hanging wall of Yingxiu-Beichuan Fault.

From the statistic analysis of the sliding direction of large landslides, we found that NW sliding direction was more than SE direction (the direction of Yingxiu-Beichuan Fault is NE) when the sliding direction was vertical to that of seismic fault, thus the slopes opposing the seismic fault were more likely to have landslides than the slopes facing the seismic fault. However, when the sliding direction was parallel to that of seismic fault, many landslides showed NE sliding direction and very few landslides showed SW sliding direction. As most landslides are distributed in NE of seismic source, thus the slopes opposing the direction of seismic source were more likely to have landslides than the slopes facing the direction of seismic source.