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Analysis of large-scale landslides triggered by the 2008 Wenchuan Earthquake

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The devastating 2008 Wenchuan Mw 7.9 earthquake that occurred on the Longmen Shan fault zone was the largest seismic event in China in more than 50 years. It triggered more than 60,000 landslides over a broad area. Among them about 130 large-scale landslides with a volume larger than 1 million m³ caused a large number of fatalities and severe property damage (see Figure 1). Therefore, understanding the controlling factors and failure mechanism of large-scale coseismic landslides is significantly important for hazard assessment and prevention of earthquake-induced geological hazards. This study investigates the contribution of triggering factors (i.e. distance to fault, PGA, fault slip rate, fault type) and the geo-environmental factors (i.e. slope, internal relief, aspect, curvature, lithology, geological structure, distance to river) to the occurrence of the 130 large-scale landslides triggered by the Wenchuan earthquake. The result shows that apart from the PGA, the fault slip rate and fault type are rather important triggering factors, while the slope, internal relief and geological structure are the controlling geo-environmental factors. Detailed field surveys of some representative large-scale landslides allow us to look into their failure mechanism. We found that the site specific features such as the amplification effect of seismic waves, geological structure and local topography played a crucial role in the failure and also magnitude of the large-scale landslides.

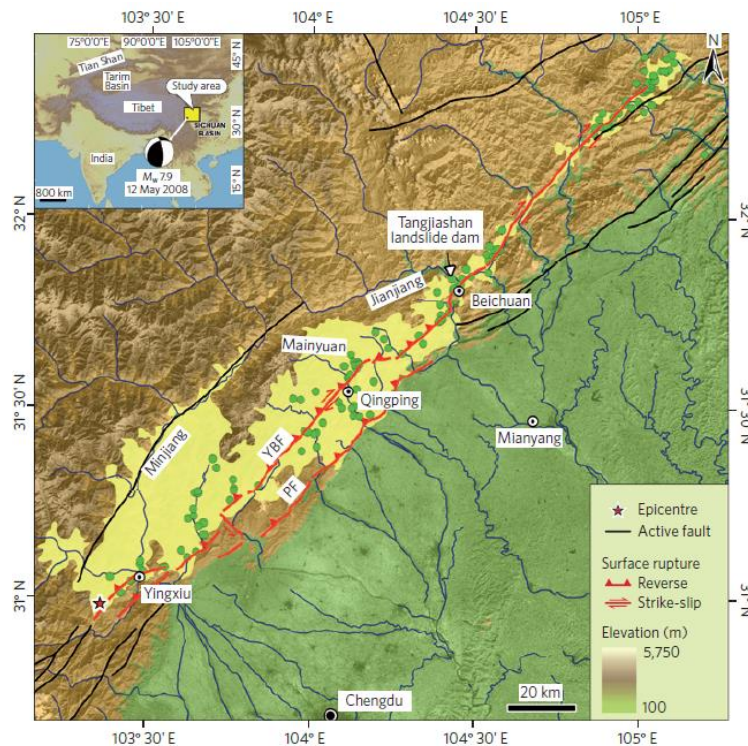


Figure 1: The distribution of 130 large-scale landslides triggered by the Wenchuan earthquake. The region of high landslide density, with more than 0.1% of the area affected by landslides within a moving window of 1 km² (light green zone), is widest southwest of the town of Beichuan. The Wenchuan earthquake occurred on the Yingxiu-Beichuan fault (YBF) and Pengguan fault (PF) (red).

