



Preservation and transportation of landslide deposits under multiple timescales in the Taiwan mountain belt

Chan-Mao Chen (1), Hsiu-Kuo Tsui (2), and J. Bruce H. Shyu (3)

(1) National Taiwan University, Geosciences, Taiwan (leo22704543@gmail.com), (2) National Taiwan University, Geosciences, Taiwan (alan498235002@gmail.com), (3) National Taiwan University, Geosciences, Taiwan (jbhs@ntu.edu.tw)

Landslide is one of the most important surface processes along active mountain belts. The evolution, such as preservation and transportation, of landslide deposits, however, has not been fully understood. The island of Taiwan is a young orogenic belt characterized by rapid tectonic activity and rock uplift, together with a tropical monsoon climate. Frequent earthquakes and typhoons induce numerous landslide events on the island every year. Whether the landslide deposits remain in the hinterland for an extended period of time or they are soon transported downstream would have important implications for surface processes and mass balances for active mountain belts. To obtain more information toward answering such questions, we observed decadal and millennial timescale erosion and preservation of landslide deposits at several sites in the Taiwan mountain belt.

More than 9,000 landslides had been triggered within thirty days after the 1999 Chi-Chi earthquake. Using DEMs and satellite images obtained from multiple periods and augmented by field investigations, we compared two largest landslides and analyzed the preservation of the deposits. We found that the one near a major river has lost more than one third of the total volume since 1999. On the contrary, the other one that is sitting on the hillslope and far from any major river has not yet been significantly eroded. These observations demonstrate a close relationship between sediment storage and erosional processes.

In a much longer timescale, many large tributary fan terrace systems are present along the Laonong River, southern Taiwan. Based on a large number of radiocarbon dating results, most of these fan terraces developed during specific time periods in the Holocene. We reconstructed the original shape of eight terrace systems with a 5-m resolution DEM and calculated the eroded amount of these terraces since their formation. The results show that about six sevenths to two thirds of the total volume of the deposits may have been eroded away since their formation a few thousand years ago. The percentage of eroded/remaining deposit appears to be independent of time in the millennial timescale. Our results would provide important constraints on the fate of landslide deposits and the roles they play in the sediment transportation in active mountain belts of the world.

Keywords: landslide deposit; surface processes; sediment storage; mass balance; Taiwan