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Post-seismic erosional characteristics of the Chiufenershan landslide : Implications for erosion process of tectonically active mountains

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The island of Taiwan is resulted from the collision between the Philippine sea plate and the Eurasian plate. The subtropical climate and averaging four typhoons annually, combined with frequent earthquakes, influence much of the Taiwan region. Due to the factors above, not only the active orogeny of Taiwan causes the high uplift rate at about 4 mm/yr, but also drive amazing erosion rate of about 3∼6 mm/yr. Previous study indicated approximately 1.9% of global suspended sediment is derived from the small island of Taiwan, which is only about 0.024% of Earth's subaerial surface. Furthermore, modern erosion rates are strongly influenced by large earthquakes and typhoons, and the sediment fluxes after the Mw 7.6 Chi-Chi earthquake of Taiwan are much higher than those before the earthquake. Here we study the Chiufenerhshan landslide, which is one of the large landslides triggered by the Chi-Chi earthquake in the central Taiwan. The avalanche transported a mass of sedimentary rock about 60 m thick and 1.5 km long. Based on the high-resolution topographic data sets from LiDAR or photogrammetry at various years and rain fall data, we have reached the following conclusions: In the period of 8.5 years after the Chi-Chi earthquake, almost 4.2% of the landslide deposits were transported out of the landslide system. Comparing with the mean annual erosion rate of 3∼6 mm/yr in Taiwan, the sediment brought out of Chiufenerhshan landslide area is 89.4 mm/yr, a significant amount contributed by the landslide. The mean sediment discharge from this small system is as large as 0.064% of the sediment discharge from the whole Taiwan annually; while the area is only about 0.005% of Taiwan's subaerial surface. Thus, the landslide process has contributed much more to the surface erosion of the Taiwan mountain than other erosion processes.