

A decade analysis of landslide distribution in the dense-landslide watersheds in Taiwan

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The research focuses on using the multi-annual landslide inventories to observe the characteristic evolution of landslide after 2009 Typhoon Morkot in Taiwan. The research area includes Chengyulan river watershed (abbreviated as CRW) in the Central Taiwan, the Ailiao river watershed (abbreviated as ARW) in the South Taiwan and the Taimali river watershed (abbreviated as TRW) in the East Taiwan. Typhoon Morakot dumped more than 2000 mm rainfall during 2 days in southern Taiwan. After that, long-term evolution of landscape is developed from large area of landslides which are associated with specific typhoon events in landslide-prone sub-watersheds. The landslide ratio, i.e. the ratio of landslide area to the watershed area, in the three watersheds achieves the historical peak in 2009 or 2010, and that was 3.03% in CRW, 7.76% in ARW and 10.7% in TRW. This data means long-term evolution of landscape is related to the event-based large area landslide after few years, and the drop in three watersheds are determined to be that 1.87% to 3.03% higher than 1.21% to 1.73% in CRW, 3.27% to 7.76% higher than 1.41% to 2.23% in ARW and 3.96% to 10.7% higher than 1.98% to 2.73% in TRW. According to the above-mentioned data, the spatial and temporal characteristics of landscape is the point of the current study. Separate landslide ratio also appear in different sub-watersheds in the three watersheds, the landslide ratio are 11.16% to 24.17% of north-south flow direction sub-watersheds higher than the east-west flow direction sub-watersheds (2% to 5.24%) in ARW. The landslide ratio in some specific sub-watersheds has a dramatic increasing due to 2009 Typhoon Morakot. For example, the landslide ratio in the Heshe river watershed, i.e. a sub-watershed in CRW, after 2009 Typhoon Morakot was estimated as 2.76% to 6.53%, i.e. 3.6 to 4.3 times larger than that before 2009 Typhoon Morakot. Another obvious cases are the sub-watersheds in TRW, i.e. the Douli-douli river sub-watershed. The landslide ratio in the Douli-douli river sub-watershed after 2009 Typhoon Morakot was estimated as 7.3% to 24.5%, and that was around 2.9 to 6.3 times larger than that before 2009 Typhoon Morakot. The decade analysis from the landslide distribution data shows that the landslide ratio was hard to decrease as the landslide-prone sub-watersheds gather in the neighborhood.

Keywords: Taiwan, rainfall-induced landslide distribution , landslide characteristic