



Rainfall-induced landslides in Chenyulan River watershed, Central Taiwan: An example illustrates the impact of Chi-Chi earthquake on subsequent rainfall induced landslide

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Landslides of the Chenyulan River watershed in central Taiwan were used to illustrate how the catastrophic Chi-Chi earthquake in 1999 influences the subsequent rainfall-induced landslides in an intensively disturbed region. Landslides identified from 9 SPOT and 9 FORMOSAT 2 images that cover 14 typhoons from 1996–2008 are used to differentiate the variations of landslide occurrence and intensity prior to and after the earthquake. The impact of the Chi-Chi earthquake was evaluated by comparing the PGA of the earthquake with the occurrence of landslides, the landslide intensity, and the corresponding rainfall data of each typhoon. The rainfall information in places where landslides occurred is interpolated from one hour interval rainfall data recording at by using Kriging method.

Compared with the data obtained from images before the Chi-Chi earthquake, the landslides intensity increased significantly after the earthquake and it gradually decreases. Landslide intensity obtained from images taken after typhoon Kalmaegi in 2008 is still near twice of that obtained from typhoon Herb in 1996 although the cumulative precipitation of Herb is six times of the Kalmaegi. Besides, landslides before the Chi-Chi earthquake were mainly distributed in mid-slope areas, with slopes of 30°–40° but they still shift to the places with slopes 40°–50° in the Kalmaegi. In addition, after the Chi-Chi earthquake till the Typhoon Aere in 2004, it shows that landslide intensity is always greater in area with larger PGA without regarding to the cumulative rainfall and maximum rainfall intensity of typhoon. After the Aere, for the same typhoon, landslide intensities in area with different PGA are well correlated with rainfall intensity of Typhoon without regarding the suffered PGA. Consequently, we conclude that the Chi-Chi earthquake still influence the occurring of landslides in the Chenyulan river watershed at present. However, landslide intensity is dominated by ground motion of the Chi-Chi earthquake till Typhoon Aeae in 2004, and then it is dominated by rainfall intensity and cumulative rainfall