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Two Cases of Landslide Signal Mining from Massive Earthquake-Induced Landslides
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Tien-Chien Chen[1*], Ling-Qi Zhou[2], Wan-Jun Yang[2], Zong-Lian LI[2]
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[1]Associate Professor, Soil and Water Conservation, National Ping-Tech, Pingtung, Taiwan, [2]Graduate Student, Soil and Water Conservation, National Ping-Tech, Pingtung, Taiwan
[1]Associate Professor, Soil and Water Conservation, National Ping-Tech, Pingtung, Taiwan, [2]Graduate Student, Soil and Water Conservation, National Ping-Tech, Pingtung, Taiwan

The short-time Fourier transform (STFT) is employed to identify two landslide- induced seismic signals in Chi-Chi earthquake. 7 seismic signals registered by strong ground motion station that contains the ground motion caused by two earthquake -induced landslide, Tsaoling rockslide and Jiufengershan landslide, are studied in the paper. Tsaoling rockslide involved a mass movement of 125 million cubic meters transported a 2 km long was triggered during 1999 Chi-Chi earthquake in central Taiwan. The seismic signal was recorded by the strong motion station about 700 m north of the landslide. 4 strong motion stations are close to landslide within 0.7 to 10 km. The Jiufengershan avalanche was the second largest landslide triggered by the Chi-Chi earthquake, mobilizing about 36 million cubic meters,of rock and soil from a dip slope. The Jiufengershan avalanche transported a 42?65 m thick, 1.5 km long, 3 strong motion stations are surround the landslide within 5 to 8 km.

The study shows that the earthquake signal began with a band of low frequency waves from 0.1 to 20 Hz, and rose up to 40 Hz during the main shock; then, the high frequency decreased progressively from 20 to 10 Hz. For the case of Tsaoling landslide, the landslide seismic signals show a high frequency band up to 60 Hz at the rock block cracking period. And dramatic excitation occurs during the 37.5th to the 41th sec, this period is estimated as the rock block sliding. At last, the high frequency of 30 Hz registered at the 76th sec. which is likely to correspond to the sliding mass impacting on the old debris dam. Next, for the case of Jiufengershan, the main shock appears the frequency spectrum for 0.1 to 40 Hz because of strong ground stations was located very near the faults. However, after main shock period the seismic signal demonstrated a 20 to 40 Hz high frequency band with difference pattern to the earthquake wave.

Results suggest the significant frequency of 20-40 Hz found as in rockmass sliding. It can be distinguished clearly from the after main shock waves which have frequencies of less than 20 Hz, typically ranging between 0.1 Hz and 10 Hz. The high frequency signal will be attenuated highly, especially in vertical direction signals, as the increasing distance from landslide location to seismic station.

キーワード: Landslide signal, seismic wave, earthquake-induced landslide, short-time Fourier transform
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