

2004 年七二水災神木村土石流地聲特性之研究

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摘 要 敏督利颱風於民國九十三年七月一日侵襲台灣，隨後引發「七二水災」造成嚴重的土砂災害，其中在南投縣神木村愛玉子溪即發生數起土石流事件；水土保持局設置於當地之神木土石流觀測站成功地收集到現場之即時資料。本文主要將七二水災期間神木土石流觀測站所量測之土石流地聲時域訊號，利用快速傅立葉轉換（FFT）與 Gabor Transform 進行分析，探討土石流地聲在時域、頻域之相關特性，所獲得之結果可作為訂定該地區土石流地聲警戒基準值之參考。分析結果顯示土石流波湧前端之地聲訊號頻率約在 10 到 30Hz，而當波湧通過時地聲頻率範圍較寬，在 10 到 250 Hz 之間；尾流部分之地聲頻率則在 60 到 80 Hz 之間。由序列式地聲檢知器之地聲訊號求得第三場土石流波湧之平均流速為 13.3 m/s。此外，比較分別裝設於乾砌石護岸及混凝土結構物中地聲檢知器所測得之土石流地聲訊號，發現後者所測得地聲之速度振幅遠較前者所測得的低。

關鍵詞：土石流、七二水災、地表振動、地聲檢知器、頻率、土石流觀測站。

Ground Vibrations Generated by Debris Flows in Shenmu Village during the Flood on July 2, 2004

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ABSTRACT Typhoon Mindulle struck Taiwan on July 1st, 2004, and resulted in the "Flood on July 2", which in turn caused several debris flows in Aiyuzih Creek, Shenmu Village, Sinyi Township, Nantou County. The debris flow monitoring station at Shenmu established by the Soil and Water Conservation Bureau (SWCB) successfully collected the real-time data for these debris flows. The objective of this study is to analyze the ground vibrations generated by debris flows that collected by the Shenmu debris flow monitoring station. The results can be utilized as reference for defining the debris-flow warning thresholds in this region. The time-domain signals of ground vibrations were transformed into the frequency domain by using the Fast Fourier Transform and into the Time-Frequency domain by using the Gabor transform. The ground vibrations produced by the third debris flow at Aiyuzih Creek

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on July 2, 2004, reveal that the frequency of the ground vibration produced by the forefront of debris flow ranges from 10 to 30 Hz; after the front passed, the frequency spectrum lies between 60 and 80 Hz. At the moment the main front passed the sensor, the frequency spectrum covers a wide range, from 10 to 250 Hz. The mean velocity of the main front of the third debris flow was 13.3 m/s. In addition, the geophone mounted in the concrete revetment is less sensitive to ground vibration caused by debris flows than a geophone embedded in the earth.

Key Words: debris flows, flood on July 2, ground vibrations, geophones, frequency, debris flow monitoring station.