

石塊運動產生地表振動及空中聲音訊號之研究

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摘要 本研究於雲林縣華山溪河床中同時埋設三組地聲檢知器 (geophone) 及麥克風, 探討石塊運動產生的地表振動 (稱為地聲) 及空中聲音訊號的差異。實驗所得時域訊號利用快速傅立葉 (FFT) 及 Gabor 轉換展現在頻率域及時間-頻率域上。實驗結果顯示, 地聲及空中聲音訊號的頻率範圍介於 10Hz~150Hz 間, 訊號在高頻部分的衰減, 地聲比空中聲音訊號來得快。另本研究利用實驗時之氣候條件, 包括: 溫度及溼度, 代入聲音能量在大氣中的衰減理論計算後, 與實驗結果的衰減做比較。發現當空氣中的濕度高時, 聲音能量的衰減相當小, 且當訊號的頻率值越低時, 聲音能量的衰減也將隨之變小。

關鍵詞: 地聲、地聲檢知器、麥克風。

Underground and Airborne Sounds Generated by Movements of Rock

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ABSTRACT In this study, three sets of geophones and microphones were installed at Hua-Shan Stream in Yuen-Lin County to monitor both underground and airborne sounds produced by movements of rock in the riverbed. Fast Fourier Transform and Gabor Transform were applied to transform the time-series data into the frequency and time-frequency domains. The experimental data shows several important results. Frequencies of both the airborne and underground sounds are between 10 and 150 Hz. Furthermore, the higher frequency band of the underground sounds decays much faster than the airborne sounds. The spatial decay rate of the sounds in the air was also determined and compared with theoretical values. The decay rates of sounds are affected by both air humidity and sound frequency. Conc watersheds for water resources design work.

Key Words: underground sound, airborne sound, geophone, microphone.

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