

On the seismic signals and self-potential data collected from an erosion test of a dam model and a slope model

*Zheng-yi Feng¹, Lu-jian Zhong¹

1. Department of Soil and Water Conservation, National Chung Hsing University, Taichung, Taiwan

We built a dam model and a slope model on a creek for an erosion test. The height of the dam model was about 3 m and 4.5 m for the slope model. The slope was about 35 m downstream away from the dam. We filled the dam with water and cause its overflow. The overflow water eroded the dam downward and formed a breach gradually. During the eroding process of the dam there were many collapsing/sliding events of the materials of the dam that induced seismic signals. The overflow water flushed downstream to the slope and eroded the toe of the slope and causing collapsing/sliding of the materials of the slope from place to place. We installed accelerometers on top of the dam and slope to collect the vertical seismic signals generated during the test. We also installed non-polarized electrodes under the surface of the dam and slope to detect the variation of the self-potentials of the dam and slope. The seismic signals were analyzed by the Hilbert-Huang Transform method to obtain the time-frequency spectra and the curves of the spectral magnitudes versus time. From the time-frequency spectra, the curves of the spectral magnitude and with the help of the test films, we identified when the collapsing/sliding events occurred and the range of the vibrational frequency. The erosion processes of the dam and slope can be corresponded to the curves of the spectral magnitude too. From the self-potential results, we found that the self-potential value increased when the water level reached the positions of the non-polarized electrodes. The variation of self-potential can be used to indicate the increasing water level of the ponding water behind the dam and when the function of the electrodes were lost due to collapsing. We also found that the self-potential decreased due to a sliding of the materials of the slope when the collapsing was close to that non-polarized electrode.

Keywords: dam, slope, erosion, landslide, seismic signal, self-potential