



Study on a dip-slope by long-term monitoring of surficial and underground deformation at the Huafan University campus in northern Taiwan

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Slope failure events easily occur after intense rainfall, especially resulting from typhoons and accordingly cause a great loss of human lives and property. At the northern end of the Western Foothill belt in northern Taiwan, the Huafan University campus is founded on a dip-slope about 20° toward southwest, being composed of early Miocene alternations of sandstone and shale.

Within and outside the campus, tension cracks on the slope surface that may reflect slope movement were observed and have developed gradually. To understand the movement behavior of the dip-slope, monitoring systems, such as inclinometers and groundwater gauges at the campus were set. The former are to measure displacement amount of potential sliding surfaces with different depths underground and the latter are used to find correlation between groundwater table change and the displacement amount. In addition, a nail network (141 metal nails) has also been established since 2001.

Previous results acquired by the inclinometers reveal that creep of 2–3 mm of the dip-slope occurred monthly. In addition, monitoring results from the nail network show that the slope surface has maximum horizontal displacement of 19 mm in six years within the sliding area in the eastern part of the campus, which is consistent with that revealed by the inclinometers. In the western part of the campus, however, ground displacement of 6 mm is recorded, indicating that another sliding block probably has developed. On the other hand, by analyzing the time series of displacement along the slope profile, an arc-like pattern of movement in the crown part of the sliding blocks is observed. This finding of movement pattern of a sliding block possibly reveals an initial stage of slope failure, whose shallow material is composed of loose colluvium, regolith, or backfill.