

Using LiDAR Derived Digital Terrain Model to Identify Deep Seated Landslides in Mountainous Areas of Taiwan

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In August 2009, Typhoon Morakot triggered thousands of landslides and debris flows, and more than 600 people were dead or missing, and the economic loss was estimated at hundreds million of USD. Among these landslides, large deep seated landslides are critical and deserve attention, since they are evolve in destructive failures. For example, one deep seated landslide, the Hsiaolin landslide, with an area of about 250 ha, buried the entire village of Hsiaolin in Kaohsiung County causing 397 casualties, the disappearance of 53 others, and buried over 100 houses (Lin et al., 2011; Tsou2011). After the catastrophic Hsiaolin landslide, the recognition of areas where deep seated landslides may occur become a critical issue for landslide hazard mitigation for government and for peoples living in mountain area of Taiwan.

In 2010, Central Geology Survey of Taiwan initiates a project to establish 1 meter resolution LiDAR derived Digital Terrain Model through the island for helping recognition of potential geohazards in mountainous area. LiDAR capability to detect the bare ground elevation data also in forested areas, it was possible to recognize in detail landslide features also in remote regions difficult to access. In this paper we illustrate the high resolution LiDAR DEM is a very powerful tool to identify deep seated landslides in forest area comparing to the traditional interpretation technique by using stereo aerial photos.

According to landslide features such as arcuate crown escarpments, trenches, multiple ridges, down slope scarps, up slope scarps, transverse scarps, over hundreds of deep seated landslides with an area larger than 10 ha have been recognized in last two years by using inclination shading images and slope maps constructing from 1 m mesh Digital Elevation Model (DEM). Among these landslides, over 40 landslides were confirmed and investigated in the field. In this study, some of field examples are used to illustrate the efficiency of using LiDAR derived DEM in study of deep seated landslides in heavy forest areas.

Keywords: LiDAR, deep seated landslide, digital terrain model