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Assessment of potential catastrophic landslides in Taiwan by airborne LiDAR-derived DEM

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The heavy rainfall of Typhoon Morakot caused severe damage to infrastructures, property and human lives in southern Taiwan in 2009. The most atrocious incident was the Hsiaolin landslide, which buried more than 400 victims. After this catastrophic event, the recognition of localities of deep-seated landslides becomes a critical issue in landslide hazard mitigation induced from extreme climate events. Consequently the airborne LiDAR survey was carried out in first phase from 2010 to 2012 by Central Geological Survey, MOEA in Taiwan in order to assess the potential catastrophic deep-seated landslides in the steep and rocky terrain in south-central Taiwan. The second phase of LiDAR survey is ongoing from 2013 to 2015 for the recognition and the assessment of possible impact area induced by deep-seated landslide in the mountainous area of whole Taiwan. Transitionally, the recognition of potential deep-seated landslide sites is adopted in term of landslide inventories from space-borne images, aerial photographs and field investigation. However, it is difficult to produce robust landslide inventories due to the poor spatial resolution of ground elevation and highly dense vegetation in mountainous area in Taiwan. In this study, the 1 m LiDAR-derived DEM is used to extract key geomorphological features such as crown cracks, minor scarps, toe of surface rupture at meter to sub-meter scale hidden under forests with high degree of accuracy. Preliminary result shows that about 400 potential landslide sites have been recognized to improve the quality of landslide inventories. In addition, detailed contour maps and visualized images are reproduced to outline the shape of potential deep-seated landslides. Further geomorphometric analyses based on hillshade, aspect, slope, eigenvalue ratio (ER) and openness will be integrated to easily create landslide inventories to mitigate landslide disasters in Taiwan mountainous area.