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Application of High-resolution LiDAR-derived DEM in Landslide Volume Estimation

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LiDAR(Light Detection and Ranging) is a relatively new technology and commonly applied for the accurate morphometric and volumetric measurement of land features. This study used high-resolution DEMs derived from multi-temporal airborne LiDAR to examine the volumetric variation of landslides in the Southern Taiwan. Airborne LiDAR data were acquired over the study area with a point density of at least 1 per m^2. Using a SCOP++ adaptable prediction interpolation, the DEM grids were generated at a 2m resolution. By comparing the LiDAR-based DEM in 2005 and 2010, an empirical relationship linking landslide area A (m^2) and volume V (m^3), $V=0.0146A^{1.523}$ is proposed in the present paper. This formula was obtained through linear fit of 488 points of landslides. It allowed estimating the total volume of landslide materials in an individual catchment. Besides, the results of cut and fill analysis between two-temporal LiDAR-based DEM in a catchment scale shows distinctly evolution processes of debris flow from the landslide mass source and subsequent deposition area. It is concluded that the approach of using multi-temporal high resolution LiDAR DEMs for understanding the time scale of landslide mass movement is important to determine the debris flow susceptibility in a catchment.