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Coupling effect analysis between landslides, river channel changes and sediment budgets – extreme climate events in Laishe River, southern Taiwan

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Taiwan, due to the high seismicity and high annual rainfall, numerous landslides triggered every year and severe impacts affect the island. Concerning to the catastrophic landslides, the key information of landslide, including range of landslide, volume estimation and the subsequent evolution are important when analyzing the triggering mechanism, hazard assessment and mitigation. Thus, the morphological analysis gives a general overview for the landslides and been considered as one of the most fundamental information. Typhoon Morakot brought extreme and long-time rainfall for Taiwan in August 2009, and caused severe disasters. In this study we integrate several technologies, especially by Unmanned Aerial Vehicle (UAV) and multi-spectral camera, to decipher the consequence and the potential hazard, and the social impact.

In recent years, the remote sensing technology improves rapidly, providing a wide range of image, essential and precise information. This study integrates several methods, including, 1) Remote-sensing images gathered by Unmanned Aerial Vehicle (UAV) and by aerial photos taken in different periods; 2) field in-situ geologic investigation; 3) Differential GPS, RTK GPS geomatic measurements. The methods allow to constructing the DTMs before and after landslide, as well as the subsequent periods by using aerial photos and UAV derived images. The data sets permits to analysis the morphological changes.

In the past, the study of sediment budgets usually relies on field investigation, but due to inconvenient transportation, topographical barriers, or located in remote areas, etc. the survey is hardly to be completed sometimes. In recent years, the rapid development of remote sensing technology improves image resolution and quality significantly. Remote sensing technology can provide a wide range of image data, and provide essential and precious information. The purpose of this study is to investigate the phenomenon of river migration and to evaluate the amount of migration along Laishe River by analyzing the 3D DEM before and after the typhoon Morakot. The DEMs are built by using the aerial images taken by digital mapping camera (DMC) and by airborne digital scanner 40 (ADS40) before and after typhoon event. Recently, this research integrates Unmanned Aerial Vehicle (UAV) and oblique photogrammetric technologies for image acquisition by 5-10cm GSD photos. This approach permits to construct true 3D model so as to decipher ground information more realistically. 10-20cm DSM and DEM, and field GPS, were compiled together to decipher the morphologic changes. All the information, especially by means of true 3D model, the datasets provides detail ground information that may use to evaluate the landslide triggering mechanism and river channel evolution.

The goals of this study is to integrates the UAS system and to decipher the sliding process and morphologic changes of large landslide areas, sediment transport and budgets, and to investigate the phenomenon of river migration. The results of this study provides not only geomatics and GIS dataset of the hazards, but also for essential geomorphologic information for other study, and for hazard mitigation and planning, as well.