

多期UAV地表模型建立集水區坡面土砂變遷分析

Analyze the Sediment Variation of Debris Flow Catchment Based on Multi-UAV-DSM

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摘要

本研究以嘉義縣中埔鄉嘉縣DF051土石流潛勢溪流為主要研究範圍，其分別於2023年受小犬颱風及2024年受日降雨影響造成上游坡面發生崩塌，致使嘉縣DF051發生土石流事件，大量土砂阻塞過路箱涵，土砂淤埋下游1棟民房並堆積於嘉141線及台3線上，範圍約130公尺。本研究分析自2024年8月15日、10月11日、11月25日及2025年3月19日等四次外業調查及UAV拍攝產製DSM成果，以分析該該集水區經歷多場颱風事件之坡面及河道土砂變動情形。由現地調查資料顯示，坡面及河道仍殘留有大量土砂，顯示於颱風豪雨事件發生時，坡面土砂往下移輸送並堆積於河道上。由多期UAV所產製DSM進行坡面及河道土砂變遷分析，目前上游坡面崩塌料源殘存於坡腹處，顯示仍有受颱風豪雨誘發土石流形成可能性。此外，該處土石流潛勢溪流上游於2025年3月已新建完成1處梳子壩，以防止大量土石下移，建議可定期現地UAV拍攝，並配合縮時攝影機觀測河道土砂變化，以評估土砂流出致災潛勢。

關鍵字：土石流、UAV、DSM、土砂變遷

Abstract

This study analyzes the sediment variation of a debris flow potential torrent (DF051) located in Jhongpu Township, Chiayi County. During Typhoon Koinu in 2023 and the heavy rainfall event in 2024, an upstream slope landslide occurred, and a large amount of sediment was transported downstream into the river. Both the nearby house and the traffic artery of Provincial Highway No. 3 were buried and blocked by sediment. Four field surveys were carried out on August 15, October 11, November 25 in 2024, and on March 19 in 2025, respectively. The Digital Surface Model (DSM) produced by UAV photos was used to analyze the sediment variation within the catchment of this debris flow potential torrent. The field survey results indicate that there is still a large amount of sediment deposited in the upland and the river, which was transported by the typhoon and heavy rainfall event. The analysis of multiple DSM data showed that most landslide sediment deposits were in the upland area, which could potentially be remobilized as debris flow by heavy rainfall with a high possibility. Additionally, the local government had built a slit dam in the upstream area to mitigate downstream sediment flow. Regular monitoring and investigation utilizing UAV and time-lapse photography are recommended for evaluation of potential sediment runoff risk.

Keywords: Debris flow, UAV, DSM, Sediment variation