

# **Assessment of Active Tectonics Using Geomorphic Indices in the Badlands of Southwestern Taiwan**

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## **Abstract**

Southwestern Taiwan is characterized by significant tectonic activity, influenced by the convergence of the Eurasian Plate and the Philippine Sea Plate, which forms a prominent fold-and-thrust belt. This study aims to assess long-term deformation processes within the badlands of southwestern Taiwan by analyzing geomorphic indices that reflect tectonic uplift and erosion. Satellite data, including GPS velocity fields and InSAR-derived maps, are utilized to identify uplift areas associated with underthrusting. RTK UAV-derived Digital Surface Models (DSMs) and a 1-meter Digital Elevation Model (DEM) provide a detailed landscape analysis focused on tectonic processes. Key geomorphic indices, including basin relief and the hypsometric integral (HI), are analyzed to assess their correlation with tectonic uplift and erosion. Preliminary results indicate that Site 1 exhibits more active tectonics, while Site 2 is in dynamic equilibrium. Site 3 displays a range of HI values, with higher values indicating active uplift and lower values reflecting erosion-dominated landscapes. Most HI values in Site 3 align with a mature stage of geomorphological development. The analysis reveals varied convex, S-shaped, and concave hypsometric curves across these sites. ArcGIS is used for extracting stream networks, and MATLAB is utilized for calculating geomorphic indices, ensuring precise analysis. This study enhances the understanding of tectonic forces shaping the landscape of southwestern Taiwan and elucidates the interplay between tectonics and geomorphology.

**Keywords:** Tectonic uplift, Geomorphology, Badlands, Landscape Analysis, Digital Elevation Models, Uplift Rates, Erosion.