Using multi-temporal geomorphological data to assess the denudation rate and erosion characteristics of Gutingkeng mudstone in SW Taiwan

Abstract

The south-western part of the Western Foothills is located at the deformation front of Taiwan Orogen. As the southern section of the Western Foothills is a part of incipient collision zone, the Plio-Pleistocene Gutingkeng Mudstone crops out extensively. The terraces, meanders, badlands and mud volcanoes are the most distinct landscapes in the Gutingkeng mustone area, and this area has been known to have high rates of erosion and drastic landform changes. This study used multi- temporal geomorphological data to analyze the landform changes in Gutingkeng mudstones, and to elaborate the denudation rate and erosion characteristics in the mudstone area.

This study adopted the Digital Elevation Model generated from 1921’s topographic map and 1980’s Orthophoto Base Map to assess the denudation rate; and used the archived satellite images to analyze the erosion characteristics of the mudstone area; finally estimated the surface erosion rate of a reserved mud-volcano district measured by 3D ground-based laser scanner in a typhoon event.

The results showed the erosion rate of the Gutingkeng mudstone is about 39 mm/yr in the last 60 years by subtracting the 1980’s DTM from the 1921’s ; The bald mudstone area has extended at a rate of 2.5 km²/yr in the last 7 years estimated from satellite image analysis, and the bald mudstone area encroaches on the vegetated lands in an outward and backward fashion. Using a 3D ground-based Laser Scanner to monitor the mud volcanoes changes, the results showed an high erosion rate in the Gutingkeng mudstone of at least 9.8 cm yearly, especially when attacked by the typhoons or/and torrential rainfalls.