

Climate fluctuations in a landslide-dominated basin, SW Taiwan: insights from paleo-erosion rates derived by in-situ ^{10}Be

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As high tectonic uplift and frequent typhoons drive rapid landscape change, landslides are a dominant erosional process in Taiwan. In this study, we attempt to gain insights into sediment flux variability and past environmental change by analyzing cosmogenic nuclide concentrations within sedimentary archives to understand the contribution of landslides to long-term erosion rates in response to climate and tectonic forcing in mountainous regions. We investigate paleo-erosion rates in the Lao-Nung basin, southwestern Taiwan, using in-situ ^{10}Be concentrations from well-preserved and dated fluvial terraces spanning 450 to 17k years, along with modern channel sediments. These terraces provide a unique archive for assessing erosion variability over millennial timescales.

Our results show an average erosion rate of ~ 0.7 mm/yr, with notable temporal variations, i.e., a decrease at 12 ka coincides with a cooler, drier climate, as suggested by regional pollen records, and an increase at 6 ka coincides with widespread landslide fan formation, indicating intensified landslide activities, potentially linked to wetter conditions. However, the higher rate at 6 ka may also reflect increased uplift in upstream areas, where channel steepness progressively increases. Despite widespread modern landslides, present-day erosion rates remain relatively stable along the main trunk, except in the upstream area, suggesting that much of the landslide-derived sediment remains stored in headwater regions rather than being rapidly transported downstream.