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Taiwan's mountain building and landscape evolution: A cosmogenic perspective

Lionel L. Siame[1], Romano Clementucci[2], Chu-Chun Kang[3], Hao-Tsu Chu[4], Chung-Pai Chang[3], Jiang-Chen Lee[5], Leatitia Leanni[1], Braucher Régis[1], and ASTER Team[1,6]

[1] Aix-Marseille Univ, CNRS, IRD, INRAE, CEREGE, Aix-en-Provence, 13545, France
[2] Institute of Geology at ETH Zurich (Swiss)
[3] National Central University (Chungli, Taiwan)
[4] Central Geological Survey (Taiwan)
[5] Institute of Earth Science (Academia Sinica, Taiwan)
[6] Georges Aumaître, Karim Keddadouche, Fawzi Zaidi

The intricate evolution of landscapes is controlled by the combined influences of tectonic forces and climatic conditions. Taiwan, with its dynamic geology and extreme climate, serves as a distinctive natural laboratory for unraveling the interplay between geological forces and climatic factors in shaping topographic relief. Over the past two decades, researchers have extensively employed in-situ produced cosmogenic radionuclides (CRNs), specifically in situ 10Be found in quartz-bearing rocks, to assess bedrock erosion rates and investigate landscape evolution on a global scale. In Taiwan, pioneering erosion studies by You et al. (1988) and Lee et al. (1993) marked the inception of using cosmogenic atmospheric Be-10 to measure sedimentation rates along continental margins. Subsequent innovations in methods paved the way for explorations by Siame et al. (2007) and Carcaillet et al. (2007) into in situ-produced 10Be exposure dating of glacial features, shedding light on Taiwan's Pleistocene and Holocene climate. Further contributions by Tsai et al. (2008) and Siame et al. (2012) focused on stream terraces, showcasing the versatility of atmospheric and in-situ produced Be-10 in dating terraces and determining soil ages, enhancing our understanding of surface deformation rates. The true potential of cosmogenic 10Be unfolded when examined in modern river-borne sediment, revealing its capacity to address surface processes at the orogen scale. Siame et al.'s (2011) comparative analysis of denudation rates from in situ-produced cosmogenic nuclides and contemporary sediment load data paved the way for a comprehensive grasp of erosional processes in Taiwan. In a pivotal moment, Derrieux et al. (2014) quantified centennial denudation rates at the orogen scale, unraveling a tectonic influence on regional patterns in the mature, steady-state segment of the orogen's evolution. Subsequently, researchers such as Fellin et al. (2017), Deng et al. (2020, 2021), and Chen et al. (2019, 2021) expanded the horizons of cosmogenic studies in Taiwan, comparing detrital fission track data with in-situ produced 10Be, focusing on the southern tip of Taiwan. Chen et al. (2019) explored the impact of landslide sediment on 10Be concentrations. Subsequently, Deng et al. (2020) compiled diverse approaches for quantifying atmospheric Be-10 fluxes, offering a comprehensive perspective on previous erosion rate studies. Finally, Chen et al. (2021) furthered the field by providing nuanced insights into the spatial patterns of erosion rates at the catchment scale. These collective endeavours significantly enriched our understanding of the geomorphic evolution of Taiwan, showcasing the multidimensionality and complexity of erosional processes influenced by tectonic and climatic factors. Beyond the historical aspect of this presentation, we will introduce a whole series of unpublished data that spatially and temporally

complements our understanding of the evolution of the topography in Taiwan in relation to the construction of the central mountain range.

Keywords: Mountain Building, Landscape Evolution, Cosmogenic Nuclides