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Detrital thermochronology evidence of a major morphogenic phase of mountain building in the Himalayas at 10 Ma

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Constraining spatial and temporal patterns of topography and exhumation along the Himalayan orogen is a starting point for studies aimed at understanding the development of Asian climate and tectonic evolution. Starting from the pioneering work of Cerveny et al. (1988), many scientists have applied a detrital thermochronologic approach to reveal the Cenozoic exhumation history of the Himalayas. Thermochronologic studies involve analyses of modern river sediments and sedimentary successions either accreted on the southern side of the orogen or accumulated in the Indus and Bengal fans. As datasets have grown and techniques evolved, the available interpretations are often contradictory.

In this contribution, we analyse previously published detrital-thermochronology datasets in the Himalayan region using the interpretive keys illustrated in Malusà and Fitzgerald (2020). These keys reinforce existing approaches and provide new perspectives for the application of detrital thermochronology to tectonic settings where the geologic evolution is often still debated. Different thermochronologic systems applied to proximal and distal sedimentary successions derived from Himalayan erosion yield a complex exhumation and tectonic history, but a relatively consistent picture for the Cenozoic evolution of India-Eurasia collision emerges. Detrital thermochronology data are supportive of a progressive southward thrust propagation towards the Himalayan foreland, progressively involving new eroding sources. The onset of fast exhumation in the Lesser Himalaya is constrained by different thermochronologic methods and datasets, indicative of onset at ~10 Ma, in line with independent geologic evidence. Coeval fast exhumation is also recorded in detritus derived from the Greater Himalaya. These findings are supportive of a major morphogenic phase of mountain building in the Himalayas at ~10 Ma, prior to the onset of fast exhumation in the Namche Barwa syntaxis.

Cerveny PF et al (1988). *History of uplift and relief of the Himalaya during the past 18 million years: Evidence from fission-track ages of detrital zircons from sandstones of the Siwalik Group*. In: New perspectives in basin analysis, Springer.

Malusà MG, Fitzgerald PG (2020). *The geologic interpretation of the detrital thermochronology record within a stratigraphic framework, with examples from the European Alps, Taiwan and the Himalayas.* Earth-Science Reviews, https://doi.org/10.1016/j.earscirev.2019.103074