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The exhumation history of the southeastern Tibetan Plateau: Insights into the plateau formation processes

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The Tibetan Plateau, the roof of the world, has been produced by the convergence and collision between India and Eurasia. The southeast Tibet lies between the Sichuan basin and the eastern Himalayan syntaxis and its topography changes from the high-elevation low-relief interior to the moderate-elevation high-relief margins. Three of the largest rivers of Asia flow across the low-relief ancient surface and carve up to 3 km deep gorges into the terrain(Liu-Zeng et al., 2008). How did these topographies establish? Studying the exhumation history of southeastern Tibet may help us to understand the landform evolution and deformation mechanism of southeastern Tibet.

Twelve Hundred thermochronometric data have been collected across the southeastern Tibetan Plateau allowing for investigation of the evolution of this orogen, which is subject to changes in climate and geodynamics. We find that the exhumation rates are initially fast in the Longmen Shan region at 25 ± 3 Ma, following southward expansion, and accelerated to 0.6 ± 0.2 mm/yr at 14 ± 3 Ma. The fast exhumation with the rate of 1.0 ± 0.3 mm/yr expanded most parts of southeastern Tibet at 3 ± 1 Ma. Together with previous thermochronology studies and climate results, we suggest that the high terrain may be uplifted by the tectonic in the late Oligocene and middle Miocene. Since the late Pliocene, the increased climate volatility accelerated the erosion process, and the intensified rainfall enhanced fluvial transportation, therefore, more detrital was transported out of the mountains, and terrains were carved deeper, which would lead to the altitude difference and isostatic rebound, and cycle positive feedback.

[1] Liu-Zeng, J., Tapponnier, P., Gaudemer, Y., and, Ding, L., 2008. Quantifying landscape differences across the Tibetan plateau: Implications for topographic relief evolution. Journal of Geophysical Research Earth Surface.