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Episodic growth of topography in eastern Tibet

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High topography associated with the eastern portions of the Tibetan Plateau is thought to have developed as eastward flow of deep crust from beneath central Tibet drove crustal thickening and attendant surface uplift along the periphery of the plateau. The onset of rapid Late Miocene exhumation (ca. 10-15 Ma) in deep canyons of eastern Tibet is inferred to herald surface uplift which enabled rapid fluvial incision and the development of high topographic relief. Although consistent with geophysical data, this model struggles to explain the timing and amount of Cenozoic shortening adjacent to the Sichuan Basin. Here we report cooling histories of rocks currently exposed along a $\sim$3 km vertical section adjacent to the Sichuan Basin derived from multiple low-temperature thermochronologic systems including apatite and zircon fission-track and (U-Th)/He. Our results reveal that this margin of the plateau was subject to slow, steady exhumation during early Cenozoic time, requiring that limited topographic relief (<1000m) was present prior to initial collision of India and Asia. Moreover, thermal models of exhumation-driven cooling demonstrate that subsequent exhumation of >10 km occurred in two temporally-distinct episodes, during Oligocene ($\sim$30-25 Ma) and Late Miocene ($\sim$10-15 Ma) time, separated by a hiatus of at least 10 Ma. These results challenge the notion that the plateau in eastern Tibet developed as a singular consequence of lower crustal flow. Rather, our findings require a punctuated history of mountain building that potentially reconciles conflicting models for relative roles of upper crustal shortening and lower crustal flow in the development of topography adjacent to the Sichuan Basin.