



Constraints on Cenozoic Tectonics and Sedimentation at the eastern Margin of the Tibetan Plateau based on Apatite Fission Track Thermochronology, Sedimentology and Provenance Analysis.

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The Tibetan Plateau represents the most impressive geomorphic expression of the effects of continental collision on the Earth's surface. Despite being the focus of much research over the last decades, there are still numerous outstanding questions regarding the mechanisms and timing of plateau formation. Field data are urgently required to test the various tectonic models of plateau formation that have been proposed, involving lateral crustal extrusion, rotation of crustal blocks, and the flow of lower crustal material. The eastern margin of the plateau is a particularly key location for the assessment of these tectonic models. This margin, commonly referred to as the Longmenshan, presents a formidable topographic front, yet has not experienced significant shortening since the Triassic, and is not accompanied by major Cenozoic thrusting and an associated foreland basin within the adjacent Sichuan Basin. The means by which such extreme relief is produced and maintained are therefore somewhat enigmatic.

Our field observations demonstrate the existence of a major unconformity across the western Sichuan Basin and the eastern plateau margin between the Eocene and the late Neogene. Field mapping demonstrates that the late Neogene sediments (Dayi Conglomerates) in the Sichuan Basin are more widespread than previously recognized, representing the first preserved sediments shed off the eastern Tibetan Plateau during the late Cenozoic. The most easterly extent of these sediments is delimited by the NNE-SSW trending Longquanshan anticline which effectively acts as a sediment dam for both the Neogene and Quaternary deposits. The late Neogene sediments (which

reach a maximum thickness of c. 300 m in the subsurface) were deposited predominantly within small to large alluvial fans, but also in fluvial, lacustrine and pedogenic environments. The Neogene alluvial fan deposits exposed along the mountain front exhibit marked along-strike variability in source types, which contrast greatly with the modern river systems. Heavy mineral and clast compositional analysis allows reconstruction of the drainage pattern reorganization that has taken place between the late Neogene and Recent.

These late Neogene sediments are also deformed in many locations, most noticeably adjacent to the mountain front, and in the northeast-southwest trending Xiongpo anticline. Detrital apatite fission track samples from the cores of the anticlines are either fully or partially reset, allowing us to put constraints on the magnitude and timing of Cenozoic exhumation, and of post-exhumational deformation, adjacent to the eastern Tibetan Plateau.