

Oligocene activity on the eastern margin of the Tibetan Plateau

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Differing proposed mechanisms of plateau formation and growth have different implications for the propagation of the Tibetan Plateau towards its current margins, and therefore for the timing of onset of uplift and deformation on the margins. On the eastern plateau margin, the Cenozoic uplift and deformation history has been extensively studied in recent years, but questions still remain. Numerous thermochronology studies have been conducted in the area, but the interpretations vary depending on the thermochronometers used and the sample distribution – particularly on whether the study is regional or is focused on specific structures. Many studies identify uplift at 10-12 Ma in the Longmenshan, and initiation of river incision within the plateau at the same time (Clark et al., 2005; Godard et al., 2009; Wilson and Fowler, 2011). However, there is increasing evidence of earlier uplift and deformation in the region. Wang et al. (2012) recognize a phase of rapid uplift at ~30 Ma in the central Longmenshan. We find activity at this time throughout the eastern margin region. In the southwestern Longmenshan, apatite and zircon fission track thermochronology shows a two-phase uplift history with rapid exhumation at ~30 Ma and at 3-5 Ma, roughly similar to the exhumation history of the central Longmenshan. To the west, in the Danba region, fission track and Ar/Ar thermochronology show that a portion of the folding and exhumation of the Danba region took place in the Cenozoic, starting at ~30 Ma and accelerating at ~10 Ma. Both apatite and zircon fission track ages are youngest in the core of the Danba antiform and increase steadily toward the antiform margins. Biotite and muscovite Ar/Ar ages from the region are highly variable, with Oligocene ages within shear zones and 50-90 Ma ages elsewhere throughout the region. These data allow us to constrain the magnitude, distribution, and timing of Cenozoic exhumation in the region. To the southwest of the Danba antiform, migmatite on the eastern boundary of the Gongga granite contains zircons with U-Pb ages of ~30-35 Ma. These ages have been attributed to high temperature metamorphism and crustal melting by Li et al., (2013), but the driver of this melting remains unclear. Elsewhere on the eastern margin, there is evidence of Oligocene hydrothermal and magmatic activity with gold deposits, a large REE complex, and high potassium intrusive rocks, all dated to ~25-35 Ma (Hou and Cook, 2009). The contemporaneous uplift and deformation in the Longmenshan and Danba regions and emplacement of ore deposits and magmatic rocks throughout the eastern margin suggests a regional response to plateau propagation on the eastern margin by the Oligocene.

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