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Disequilibrium Between Short Term and Long Term Exhumation Rates in the Gongga Granite, Western Sichuan

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The Gongga Shan granite, a Cenozoic intrusive body southwest of the Longmen Shan range, remains a poorly understood feature of the eastern margin of the Tibetan Plateau. U-Pb zircon ages from throughout the granite suggest that it was emplaced in several phases between ~35 and ~10 Ma, and thermochronology data throughout the granite body and the surrounding region indicate that the granite has been exhumed more rapidly than the surrounding rocks. Zircon fission track ages from within the granite range from 2 to 8.4 Ma, in contrast with rates in the units to either side, which generally range from ~12 to ~30 Ma (Xu and Kamp, 2000). The cooling ages do not vary systematically from north to south within the granite, and suggest relatively rapid exhumation at rates on the order of 1-2 km/My. In contrast to the consistency of the thermochronology data, the topography of the granite region is highly variable. The southern section of the granite contains extremely high relief and steep slopes, while the central section of the granite contains gentle slopes and low relief. The northern section of the granite contains a single high peak, but otherwise intermediate topography. Despite the difference in exhumation rates

between the granite and the surrounding rocks suggested by the thermochronology data, there is not a clear topographic signature of a difference in uplift rates. Preliminary cosmogenic ¹⁰Be basin wide erosion rates suggest that the short-term exhumation rates vary by an order of magnitude between the southern and central segments, and that erosion rates are in line with the topographic variations. In the southern section, erosion rates as high as 1.8 mm/yr are consistent with thermochronology-based exhumation rates; however, in the central section, erosion rates of 0.15 and 0.11 mm/yr are an order of magnitude slower than long-term exhumation rates. This requires a significant slowdown of erosion rates and likely an associated reduction in relief and hillslopesteeptness in this section of the granite.

Key words: Gongga granite, erosion rates, fission track thermochronology

References

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