

Differential exhumation rates across the Longriba fault system : insights from low temperature thermochronology

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The eastern Tibetan margin forms one of the steepest topographic escarpment in the world. Most of the current deformation of this area appears to be accommodated in the Longmen Shan thrust system whose major seismogenic potential is attested by the 2008 Wenchuan earthquake. Yet, the velocity gradient across the margin revealed by GPS measurements decreases significantly 200 km north the Longmen Shan. These observations suggest that other tectonic structures might contribute to the global deformation in eastern Tibet, in particular the Longriba fault system (LFS).

For over fifteen years, the Longmen Shan have been the focus of many thermochronological investigations, which have gradually contributed to produce a large database and allowed to better constrain the history and patterns of exhumation of the eastern Tibetan margin. Comparatively, there is significantly fewer thermochronology data near the LFS. This structure has been recognized as a main structure of the margin accommodating much of the Aba block motion (with respect to the Longmen Shan). But, although its Holocene tectonic activity has been investigated, its long-term behavior remains unclear, and its present-day geodynamical role over Late Cenozoic timescales is still uncertain. To better constrain this issue, we used fission tracks and (U-Th)/He on apatites and zircons, on samples located across the two main faults of the LFS and more particularly on both sides of the Maoergai fault. The results show two very contrasted Late Cenozoic exhumation patterns: at the Oligocene, samples north but very close to the fault display an exhumation rate of 40 m/Ma, while at the Miocene, samples south the fault show an exhumation rate of 170 m/Ma. Such discrepancy could reflect two distinct incision periods of the margin and could also highlight the role of the Maoergai fault in the control of this incision pattern.