



Cenozoic cooling history of the southwestern Longmen Shan

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Since the May 2008 Mw7.9 Wenchuan earthquake in western Sichuan province, considerable attention has been focused on the tectonics of the Longmen Shan region. While a number of recent studies have discussed the cooling and exhumation history of the Pengguan Massif and northeastern Longmen Shan, the southwestern section of the Longmen Shan has received relatively little attention. We present a dataset of apatite and zircon (U-Th)/He and zircon fission track ages from the Baoxing region that provide the first comprehensive thermochronologic constraints on the Cenozoic cooling history of the southwestern Longmen Shan.

The Baoxing region is cut by a series of west-dipping margin-parallel faults. The easternmost, the Shuangshi Fault, cuts the Mesozoic foreland basin sequence. To the west, the Erwangmiao Fault thrusts the Precambrian and Paleozoic rocks of the Baoxing Massif onto Upper Triassic foreland basin deposits. On the western side of the Baoxing Massif, a normal fault of unknown age places Permian and Triassic rocks above the Precambrian rocks of the massif. Several km farther west, the Wulong thrust places another body of Precambrian rocks above Paleozoic strata. Although the Wulong Fault and the Shuangshi Fault are often correlated with the faults that ruptured in the Wenchuan earthquake (the Beichuan and Guanxian Faults, respectively), the relationship between the northern and southern structures is unclear.

We collected a suite of samples from the two bodies of Precambrian rocks in the Baoxing region. All of the measured ages are reset. Zircon fission track ages range from 5.8 to 14.6 Ma, zircon (U-Th)/He ages from 5.7 to 17.3 Ma, and apatite (U-Th)/He ages from 3.1 to 10.1 Ma. The age distribution suggests that cooling of the Baoxing region was ongoing by ~15 Ma, and that at least ~8 km of exhumation has taken place. For all three thermochronometers, the samples on the western side of the Wulong Fault give ages that are younger than the samples to the east, indicating that there has been differential exhumation along the Wulong fault since ~10-12 Ma. However, samples on both sides of the fault give Cenozoic ages, suggesting that the Wulong fault does not play the same structural role as the Beichuan Fault, which separates units with reset and unreset ages. A Cretaceous AFT age obtained by Arne et al. (1997) from the Triassic strata east of the Erwangmiao Fault, but west of the Shuangshi Fault, indicates that the Erwangmiao Fault also accommodated significant Cenozoic exhumation, and that the degree of exhumation along the Shuangshi Fault was smaller. The cooling ages from the Baoxing Massif generally agree well with ages from the Pengguan Massif, suggesting that the onset of exhumation was synchronous along strike in the Longmen Shan.