



Low-temperature thermochronology of the central and northwestern Pamir gneiss domes

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The Pamir—the western prolongation of the Tibet–Himalaya orogen—resulted from N–S convergence between India and Asia. In the Pamir, the Cenozoic orogeny formed a high-relief mountain knot of ~500 km N–S extent, which contrasts with the ~1000 km wide, low-relief Tibet Plateau. About ~30% of the surface exposure of the Pamir comprises high-grade, middle to lower crustal metamorphic rocks exhumed in Cenozoic syn-orogenic domes; understanding the evolution of these domes is central to understanding the behavior of the Himalaya–Tibet–Pamir orogen because the domes expose a range of shallow to deep structural levels.

In the Central Pamir, the (from east to west) Shatput, Muskol, Sarez, and Yazgulem domes form a nearly continuous anticlinorium of greenschist- to mostly amphibolite-facies crystalline rocks, framed by mostly unmetamorphic volcano-sedimentary rocks. The crystalline rocks contain Mesozoic intrusives. The Cenozoic evolution shows a pre-~20 Ma prograde evolution and a post-~20 Ma retrograde evolution accompanied by N–S extension that is replaced since ~10 Ma by renewed N–S shortening. Cenozoic magmatic activity spans 40–15 Ma. Here, we focus on a characterization of the post-~20 Ma exhumation history in the central Pamir domes, employing zircon and apatite fission-track and (U–Th)/He thermochronology. These domes yielded apatite fission-track ages between 15 and 6 Ma; there are several trends: (1) Younger ages occur in the west; this is interpreted as an effect of erosional exhumation along the deeply incised western Pamir. (2) Ages young toward the bounding normal shear zones. (3) Age versus elevation relationships indicate most rapid exhumation at ~10 Ma.

In the Southern Pamir, low-temperature thermochronology records a longer extensional exhumation history, ending at ~5 Ma in the Alichur dome and ~2 Ma in the Shakhdara dome.

In the Northern Pamir, the Triassic Kurgovat gneiss dome shows Cenozoic exhumation from less than 10 km depth; Cenozoic exhumation is earlier than in the Central and Southern Pamir domes.