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\textbf{Shift in Temporal Pattern of Dome Formation and Extension of the NE-Pamir Plateau}

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Over decades there have been speculations about the geodynamic implications of the shift from a long phase of Cenozoic orogen-perpendicular crustal shortening, growth and uplift, to orogen-parallel extrusion that accommodates further shortening within the Tibetan plateau. The Pamir mountains, the NW-prolongation of Tibet, appears to have undergone a similar tectonic and morphologic history, however it's evolution is not well constrained. To address this problem we documented the crustal behavior through geologic time by analyzing the orientation of the formation of metamorphic dome complexes through the late Cenozoic.

The geologically young NE-Pamir is an excellent study location, as two generations of dome complexes are exposed. During the Oligocene-Miocene, E-W-striking Muskul and Sares domes exhumed mid-crustal rocks to the surface, followed by the late Miocene N-S-trending extension driving the rise of two giant metamorphic dome complexes, the Kongur Shan (7719 m) and Muztagh Ata (7546 m). Both domes are situated in the footwall of the west dipping Kongur detachment system. Previous studies documented two detachment generations along the southwestern termination of Muztagh Ata dome and late Miocene onset of rapid exhumation of Kongur Shan-rocks from mid crustal depth. Our goal is to better constrain the temporal and spatial variation of deformation and exhumation in order to track changes in the upper crustal stress state of the orogen.

Twenty new apatite fission-track (AFT) as well as zircon U-Th/He (ZrHe) cooling ages from a series of vertical profiles in the footwall and spot hanging-wall-samples of the Kongur detachment have been analyzed. This data is combined with published ^{40}Ar-^{39}Ar mica data. In general, our new AFT and ZrHe cooling ages show significantly younger cooling ages in the vicinity of the domes compared to rock samples analyzed further along strike and from the hanging wall rocks. The youngest ages, between $<$1 and 2 Ma, were obtained along the central portion of the detachment, between the Kongur Shan and Muztagh Ata domes. Older ages of 2 to 4 Ma to the NW and 4 to 6 Ma along the southern termination of the Muztagh Ata dome were measured. We observe that in regions with the youngest ages, thermochronologic results are not concurrent, as ZrHe were often younger than AFT ages.

Taken together, these results suggest that along the southern termination of Muztagh Ata, exhumation must have been high between $\sim$10 to $\sim$5 Ma ($>$3 mm/a), however, since then exhumation rates have slowed down and not achieved rates $>$0.5 mm/a. Structural observation and pervasive Ar-cooling ages of 10-8 Ma suggest that the rocks forming the southern termination were exhumed along a N-S-deforming detachment (Shenti Fault) during the middle Miocene before deformation shifted to E-W-oriented deformation along the Kongur detachment. Thus this forms an important constrain for the transition from N-S-to-E-W-oriented fault displacement. Preliminary 1D thermo-kinematic and erosion modeling suggests that dome exhumation rates between the time of peak metamorphism and the present has been as high as $>$3 mm/a, consistent with previous studies. Along strike towards the NW rates decreased to $\sim$0.7 mm/a over the last 3 Myr. Rocks forming the hanging wall of the Kongur Detachment have been affected by relatively low exhumation, with rates between 0.3 and 0.5 mm/a over the last $\sim$8 Ma, if not longer.

These results, in combination with structural observations, suggest a shift from N-S-to-E-W directed dome exhumation occurred $\sim$8 Ma. Since then, focused erosion and exhumation has been limited mainly to the vicinity of the domes, allowing them to exhume with up to threefold higher rates than the surrounding Pamir; the Kongur-detachment accommodates the majority of fault displacement. One can speculate whether the observed change in stress field of the NE-Pamir reflects a change in either rheology, boundary conditions or gravitational potential energy, as discussed for Tibet.