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Late Cenozoic extension and crustal doming in the NE Chinese Pamir

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The northward motion of the Pamir indenter with respect to Eurasia has resulted in coeval thrusting, strike-slip and normal faulting. The eastern Pamir is currently deformed by east-west oriented extension, accompanied by uplift and exhumation of the Kongur Shan (7719 m) and Muztagh Ata (7546 m) gneiss domes. Both domes are an integral part of the footwall of the Kongur Shan Extensional System (KES), a 250-km-long, north-south oriented graben. Why active normal faulting within the Pamir is primarily localized along the KES and not distributed more widely throughout the orogen, has remained unclear. In addition, relatively little is known about how deformation has evolved throughout the Cenozoic, despite refined estimates on present-day crustal deformation rates and microseismicity, which indicate where crustal deformation is presently being accommodated. To better constrain the spatiotemporal evolution of faulting along the KES, we present 39 new apatite fission-track, zircon U-Th-Sm/He, and 40Ar/39Ar cooling ages from a series of footwall transects along the KES graben shoulder. Combining this data with, present day topographic relief, 1D thermo-kinematic and exhumational modeling documents successive stages, rather than synchronous deformation and gneiss dome exhumation. While Kongur-Shan-exhumation started during the late Miocene, Muztagh Ata began earlier and has slowed down since the late Miocene. We present a new model, suggesting that thermal and density effects associated with a lithospheric tear fault along the eastern margin of the subducting Alai slab localizes extensional upper-plate deformation along the KES and decouples crustal motion between the Central/Western Pamir and Eastern Pamir/Tarim basin.