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20 million years of continuous deformation along the Karakorum fault, Western Tibet:

a thermochronological demonstration

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The tectonic role of the Karakorum fault zone (KFZ) is debated. South of 33˚N, ongoing dextral-oblique slip along the SW edge of the Gar pull-apart basin exhumes metamorphic and magmatic rocks of the Ayilari range. Most minerals have recorded a continuum of deformation from temperatures higher than 500˚C down to $<$250˚C. The ^{40}Ar/^{39}Ar ages, the oldest being 21.2$\pm$1.0Ma, yield minimum estimates for the initiation of the KFZ. These are in agreement with the U-Th/Pb ages constraining the onset of deformation along the KFZ at $>$=23-25Ma.

Thermochronologic results show a slow cooling rate ($<$14˚C/Ma) for the period $\sim$21-14Ma, followed by a rapid cooling ($\sim$40˚C/Ma) during the time period $\sim$14-4Ma.

These demonstrate that right-lateral motion was already in progress in the early Miocene and that shear continued at least until 4Ma, pointing to at least 20 My of deformation along the fault.

Greenschist facies deformation is superimposed upon, the high-grade deformation, marking a kinematic change from purely dextral to dextral-normal motion. This kinematic shift produced the increase in cooling rate at $\sim$12-16Ma, correlatively with the

rise of Ayilari range and the incision of major river courses. The Indus River might have become captive of the relief at this time; the 120km of apparent offset of this river by the KFZ implies dextral motion at a long-term average rate of $>=8.5\pm1.5$mm/yr.

Reconstruction and balancing of the Gar-Baer pull-apart basin suggests that a blind pure strike-slip fault strand crosses the Gar-Baer pull-apart and/or that the blocks surrounding the KFZ deform internally.