# Formation and reactivation of the Pamir-Tian Shan suture: insights from apatite triple dating

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The structural architecture of Central Asia formed during the closure of the Palaeo-Asian Ocean and underwent multiple reactivations in response to distant tectonic events at the Eurasian plate margin. Given the complex reactivation history, the exact timing of deformation and associated mountain building is rather difficult to constrain. In this study, we used three thermochronometers on apatite samples taken along one of the most fundamental structural contacts in the Central Asian edifice: the Pamir-Tian Shan suture. The resulting thermal history reconstruction elucidates the timing of three different events of fault activity.

Apatite U-Pb analyses yield consistent ages with a mean value of 251 ± 2 Ma. This age is ~30Ma younger than published zircon U-Pb data for the sampled rocks. The late Permian apatite U-Pb age is interpreted to date the formation of the suture in response to the final closure of the Palaeo-Asian Ocean. Apatite fission track thermochronology reveals two low-temperature (<120°C) thermal events at ~25 Ma and ~10 Ma, representing fault reactivation and associated exhumation in response to tectonic activity at the distant southern Eurasian margin. The Oligocene – early Miocene cooling age is interpreted to be related with the India-Eurasia convergence. The late Miocene cooling age is confirmed by apatite (U-Th-Sm)/He data and marks the onset of modern mountain building within the southern Tian Shan.

This study illustrates how multi-method thermochronology applied on apatite samples near major faults can provide insights into discrete events of fault activity.