

## **Early Eocene reactivation of Tian Shan orogenic belt, western China: constrains from the metamorphic zircons in eclogite**

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Field investigation combined with thermochronological constrains have revealed that the intra-continental deformation in Tian Shan orogenic belt was reactivated during the late Cenozoic in response to the India-Asia collision. Better understanding of the erosion and exhumation history of Tianshan is very crucial to decipher the feedbacks between tectonics, erosion and climate. Determining the onset time of reactivation of the Tian Shan orogenic belt is crucial to understand the inter-continental crustal deformation process. In this study, we pioneerly discovered zircon grains with metamorphic age of *ca.* 30-45 Ma in eclogites from HP-UHP metamorphic belt of western Tian Shan, China. Those zircons coexist with quartz, epidote, calcite, paragonite, amphibole, chlorite and titanite. Zircon-quartz oxygen isotope thermometer gives the metamorphic temperature of about 400 °C. The Cenozoic zircons also grow as the rims around the Triassic zircons. The oxygen isotope values of these Cenozoic zircons are very homogeneous ( $\delta^{18}\text{O}_{\text{VSMOW}} = 6.82 \pm 0.67$ ), significantly lower than those of other age groups (Carboniferous and Triassic zircons). We thus suggest that the greenschist facies metamorphic event occurred during the early Eocene corresponding to the initial reactivation of the Tian Shan during the Cenozoic. Our new finding pushes back the initial reactivation of the Tian Shan from late Eocene – Oligocene to early Eocene. We further propose that the northward penetration of the stress in response to the India-Asia collision is much faster than previous estimate, to some extent in agree with the distributed continental deformation in the East Asia.