EGU2020-6692
https://doi.org/10.5194/egusphere-egu2020-6692
EGU General Assembly 2020

Cenozoic tectonic evolution of the Pamir-Tian Shan convergence zone: evidence from detrital zircon U-Pb provenance analysis

Yingying Jia[1,2], Christoph Glotzbach[2], Todd Ehlers[2], and Lixing Lü[1]
[1]Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, China (jiayingying@mail.iggcas.ac.cn)
[2]Department of Geosciences, University of Tübingen, Tübingen, Germany

The Pamir is an along-strike continuation of the Tibet-Himalaya orogen and penetrated ~300 km into the Tarim and Tajik basins in Cenozoic times. This northward indentation led to regional paleoenvironmental changes and facilitated northward transport of the far-field stress from the India-Asia plate boundary. Due to the compressional stress from the India-Asia boundary and Cenozoic lithosphere delamination, the Pamir underwent intense exhumations, which well recorded its Late Cenozoic mountain building processes. However, the very rapid Late Cenozoic exhumation also erased earlier cooling records and hinders a clear understanding of the Early Cenozoic tectonic evolution of Pamir. Thus, the onset and magnitude of the northward movement of Pamir are loosely constrained (Eocene-Late Oligocene) and long debated. In particular, the Early Cenozoic tectonic evolution of Pamir is unclear.

Provenance study of sediments in the adjacent sediment basins is a widely used method to reconstruct the tectonic-geomorphologic evolution of a mountain range. We carried out paleocurrent measurements and detrital zircon analysis of the Cretaceous-Pliocene sediments in the northern Pamir-Tian Shan convergence zone. Our study area, the Tierekesazi section, is located immediately south to the southern Tian Shan and is evolved in the present foreland basin of the southwestern Tian Shan. The provenance data show that the Tian Shan was the primary source area of the northwestern Tarim basin in the Cretaceous. The appearance of the Triassic-Jurassic detrital zircon grains and northward paleo-flow directions in the Eocene (~41 Ma) to Middle Miocene sediments suggest the Pamir became an important source area of the northwestern Tarim basin. Combining with the regional crustal shortening and paleoclimate data, we speculate that the northward indentation of the Pamir initiated before ~41 Ma. In contrast with the northward movement and Middle-Late Miocene accelerated exhumation of the Pamir, the source area of the studied section shifted back to the Tian Shan after the Middle Miocene. It consists with the Middle-Late Miocene uplift of the southwestern Tian Shan. Simultaneously, the crustal shortening of Pamir propagated to its northern foreland. Newly formed fold-and-thrust zones probably blocked the sediment transport from Pamir to the Tierekesazi section, and the present-day east flowing drainage system in the Pamir-Tian Shan convergence zone was established. We infer, in this period, the Pamir likely reached its present position, which is consistent with the appearance of an extreme arid climate in the Tarim basin.