# Mesozoic-Cenozic Basin and Orogeny Evolution of Northern Tianshan: Different from Classic Foreland Thrust Belt

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The Central Asia orogenic belt is characterized by Late Paleozoic amalgamation of several blocks and Mesozoic-Cenozoic basin and orogeny coupling. Studies of the northern Tibetan plateau to the Tianshan region have primarily concentrated on the Paleozoic amalgamation history and on Late Cenozoic deformation. However, Mesozoic sedimentary basins around Tianshan with thicknesses exceeding 5 km attest to significant tectonism during this interval.

The analyses of depositional facies, sandstone composition, heavy minerals, and geologic information of several sections in the Tianshan Mountains and southern Junggar basin suggested that several separate small basins existed within Tian Shan during Jurassic time. The Triassic basin boundary was much smaller relative to that of the Jurassic basin (which migrated southward to near the turpan-Hami basin), and the Cretaceous basin boundary shrank near the southern Junggar basin boundary of today.

The Upper Jurassic Kalazha conglomerate and the basal Cretaceous conglomerate in the southern Junggar basin recorded obvious uplift and denudation during Late Jurassic to Earliest Cretaceous time that led to the Bogeda Mountain uplift that became another source provenance of the southern Junggar basin. Fission-track data from intra-Tian Shan show a complex thermal history with multiple paleothermal events during Late Jurassic-Early Cretaceous, Late Oligocene-Miocene time. The rate of uplift and denudation increased rapidly in the last ~10 m.y., especially during the last 5m.y. These Mesozoic- Cenozoic cooling events and rapid crustal shortening during the Late Cenozoic suggest rapid uplift of Tianshan during the Late Jurassic, the Earliest Cretaceous, and the Late Cenozoic. Moreover, the increase of unstable heavy minerals is consistent with Late Jurassic-Earliest Cretaceous, Late Cretaceous, and Late Cenozoic tectonism implying a temporal link between sedimentation and deformation. The Late Cenozoic fault-related folds are the basic deformation styles of the rejuvenationforeland- thrust wedge of northern Tianshan, including fault-bend folds, fault-propagation folds, duplex, pop up, etc. Stratigraphic analysis of northern Tianshan indicates that the Changjihe group (N1-2ch) (~10Ma~2.58Ma) represents a set of growth strata that proves that intensive uplift and deformation were initiated at about 10Ma; from Late Miocene to the Earliest Pliocene along the northern Tianshan. Since the Late Miocene until the Quaternary (mostly in the last 10 m.y.), thrusts and thrust-related folds propagated northward into the southern Junggar basin. This conclusion is also confirmed by apatite fission-track analysis and relative data modelling.

Thus, the Mesozoic stratigraphic record in Junggar basin supports the hypothesis that rejuvenation of the Tianshan markedly influenced the depositional succession during the Early Cretaceous period. Intracontinental deformation of central Asia during the Late Cenozoic has been attributed to the India-Asia collision and the intense deformation in Tianshan region led to the formation of a Rejuvenated foreland basin. In addition, petrology, apatite fission-track data, and tectonic analysis also supported active settings during the Late Jurassic-Earliest Cretaceous and the Late Cenozoic that led to the formation of composite petroleum system in southern Junggar basin.