



## **Quantitative Process of CAOB Orogeny: Insights into the Geometry and Kinematic Evolution of the Central Segment of Wu'erhe-Xiazijie Fault at the Northwestern Margin of Junggar Basin, China**

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How do the Central Asia Orogenic Belts (CAOB) accrete or propagate since the Carboniferous Period is a key issue to understand its orogenic style and evolution processes. To make use of the new acquired seismic data, 2-D and 3-D, drilled cores and logging data, and surface geology at the Wu'erhe-Xiazijie thrust zone (WXTZ) at the northwestern margin of Junggar Basin, the paper studies the geometry and kinematics of the central segment of WXTZ. At the end of Carboniferous, it formed a fault-bend fold in the Carboniferous with the thrust fault (F1) soled into the intra-Carboniferous detachment zone and stepped-up to the surface and subjected to erosion, and thus with the very lowest Permian Jiamuhe Formation (P1j) unconformably overlain it. The slip and horizontal shortening of F1 are 2.69km and 2.66km respectively. The second phase of thrusting was in the depositional stage of Early Permian Fengcheng Formation (P1f). By utilizing the old lower flat (F1) and a new upper detachment (F2) in the top Carboniferous it formed a tectonic wedge with a back-thrust fault developed in the overlying strata. The slip and horizontal shortening of the wedge are 9.93km and 9.43km respectively. Then it subsided and filled with thick-sediments till the earliest Triassic Period. The third phase of thrusting formed a meso-scale fault-bend fold in the Permian with the F2 as the lower detachment and the upper flat (F3) located at the base of Fengcheng Formation (P1f). The slip and horizontal shortening of the fault (F2 or F3) are the same as 4.48km. The fourth phase of thrusting took place at the latest Triassic, the fault (F4) cutoff F2 downwards and propagated upward into the upper Permian and formed a fault-propagation fold in the Triassic strata, with the fault-slip and horizontal shortening of 4.67km and 4.07km respectively. The fault-propagation fold is so-called Fengcheng anticline and a giant oil field nowadays. Besides thrusting of F4, the thrust faults, Wulanling (F5) and Da'erbut (F6) thrust also into the basin in a backward sequence at this time of period. Since Jurassic, it evolved into a quiescent period with the Jurassic, Cretaceous, and Paleogene strata upwardly overlapping the thrust zone. However, the Da'erbut Fault (F6) reactivated during the Late Neogene to the Quaternary. It showed a composite character of sinistral strike-slipping and reverse-faulting, which modified the structure of WXTZ. WXTZ shows episodic thrusting during Carboniferous to Triassic and exhibits a breaking-backward style with the fault-slip and horizontal shortening more than 21.74km and 20.64km respectively.