



## Polyphase deformation of a Paleozoic metamorphosed subduction-accretionary complex in Beishan Orogen, southern Altaids

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The Lebaquan Complex in central Beishan plays a significant role in understanding the subduction-accretion-collision processes of the Beishan orogenic collage, southern Altaids. This complex is a polyphase deformed upper greenschist to lower amphibolite facies metamorphic rock assemblages composed of metasedimentary sequence, gneissic plutons, metacherts, amphibolites and marbles, with multiple generations of syn-tectonic leucogranite-pegmatite and post-tectonic mafic dykes. Lithologic and geochemical characteristics show the Lebaquan Complex is a forearc-arc complex. Four stages of deformation can be recognized for the Lebaquan Complex. The D1 deformation is defined by pervasively developed foliations (S1) defined by alternative metamorphic layering and intrafolia isoclinal folds of quartz veins (F1). The D2 deformation is indicated by crenulation cleavage (S2) mainly developed in the schists, extensively-developed tight to open folds and asymmetric folds (F2) and pinch and swell structures. The D3 deformation is characterized by high-strain ductile shearing, which modified earlier structures. Small-scale asymmetric folds,  $\sigma$ -type porphyroclasts and S-C fabrics indicate dextral sense of shearing in east-west direction. The D4 deformation is represented by ductile to brittle structures including open/gentle folds, kink folds and small scale thrust faults which overprint earlier deformations. The overall deformation of this complex indicates a geodynamic setting change from initial north-south directed strong compression to later east-west directed transpression and finally extension. LA-ICP-MS zircon U-Pb dating was performed on key lithologies. Youngest age peak of detrital zircons from a garnet-mica-quartz schist is  $\sim$ 424 Ma, constraining the depositional age for the protolith of the metasedimentary sequence. A syn-deformation leucogranitic dyke that underwent D2 but did not experience D1 and a post-deformation mafic dyke that intrudes all the lithologies were formed at  $\sim$ 423 Ma and  $\sim$ 280 Ma, respectively. These indicate that D1 occurred in the interval 424-423 Ma, D2 occurred at or shortly after 423 Ma, D3 and D4 in the period 423-280 Ma. These structural patterns and magmatism events can be interpreted as a result of northward subduction of the Niujuanzi Ocean to the south of the Lebaquan Complex during the Paleozoic. The Lebaquan Complex represent a subduction-accretionary complex probably formed in a forearc setting. Combined with other published data, we conclude that the Beishan orogen may have undergone multiple subduction-accretionary processes during the Paleozoic.