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Distinct structural evolution of two contrasting litho-tectonic domains in the Chinese Altai: unravelling a complicated accretionary process of the western Central Asia Orogenic Belt

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The Chinese Altai, a key component of the western Central Asia Orogenic Belt (CAOB), is considered to be formed through multiple accretions of several terranes. However, the deformational histories of each terrane (tectonic domain), i.e. structural records before and after the accretion, are rarely studied and therefore greatly hindered our understanding of the accretionary processes. To fill this gap, a systematic macro- and microscopic structural analysis was carried out on two contrasting litho-tectonic units of the area, i.e. the Early Paleozoic low-grade Ailegedayi Ophiolitic Complex (AOC) juxtaposed to the high grade Tarlang Granitic Massif (TGM). Selected samples were analyzed for zircon U-Pb isotopic compositions to constrain the timing of polyphase deformations. Our structural and geochronological data indicate that the two litho-tectonic units have experienced distinct deformations under different P-T conditions prior to their juxtaposition. They were separated but both underwent a NWW-SEE-directed shortening deformational event (D_1) between 460 and 407 Ma, then juxtaposed with each other at ~407 Ma and jointly experienced a subsequent NE-SW-directed shortening deformation (D_2) that after ~383 Ma and ended before the commencement of the crustal-scale sinistral strike-slip shearing deformation (i.e. Erqis fault zone) at 290 - 240 Ma. Results of this study provide solid field-based evidence that the Chinese Altai initially underwent a NW-SE-trending subduction-accretion in the middle Paleozoic, before it was reoriented to present-day like E-W-trending orogenic fabric.

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