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DIACHRONOUS EVOLUTION OF BACK-ARC BASINS IN THE SOUTH TIANSHAN: INSIGHTS FROM STRUCTURAL, GEOCHRONOLOGICAL AND GEOCHEMICAL STUDIES OF THE WUWAMEN OPHIOLITE MÉLANGE

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The South Tianshan is located to the north of the Tarim block and defines the southern margin of the Paleozoic Central Asian Orogenic Belt (CAOB). This study presents new structural data, geochronological and geochemical results for the Wuwamen ophiolite mélange in the Chinese segment of the South Tianshan. In the south, the Wuwamen ophiolite mélange shows typical block-in-matrix fabrics and occurs in the footwall of a south-dipping thrust fault, hanging wall of which is composed of weakly metamorphosed and deformed Lower Paleozoic marine to deep marine sequences from the South Tianshan. In the north, a south-dipping thrust fault juxtaposes the Wuwamen ophiolite mélange in its hanging wall against the high-grade and strongly deformed metasedimentary rocks from the Central Tianshan in its footwall. Three stages of ductile deformation are distinguished on the basis of structural and kinematic analyses on different litho-tectonic

units across the region. They are, from older to younger: (1) regional top-to-the-north ductile shearing linked with subduction and accretionary tectonics; (2) widespread refolding of the earlier foliation, which likely resulted from a subsequent collision (or amalgamation) event; and (3) localized ductile right lateral strike-slip faulting attributed to late-orogenic extrusion tectonics. Geochemical data indicate that the igneous rocks in the Wuwamen ophiolite mélange include MORB and OIB-type volcanic rocks with arc-like features. Sr and Nd isotopic data further indicate that these igneous rocks were formed in a back-arc oceanic basin. Our zircon U-Pb ages combined with published data indicate that the igneous blocks in the mélange were formed during 334–309 Ma. An undeformed granite dike crosscutting the ophiolite mélange yielded an age of ~300 Ma and provides a minimum age of mélange formation. Meta-sandstones, which were previously interpreted as Devonian or Proterozoic in age, were deposited during the Late Carboniferous (~325–310 Ma) and yielded U-Pb detrital zircon ages consistent with a single Central Tianshan provenance. We propose an updated geodynamic model for the Paleozoic tectonic and paleogeographic evolution of the South Tianshan. We suggest that the Central Tianshan was locally separated from the Tarim block by back-arc oceanic basins during Devonian to Carboniferous. This study shows that the Paleozoic tectonics of the Central and South Tianshan was characterized by the opening and subsequent closing of back-arc basins prior to its final amalgamation to the Tarim block, similar to the Cenozoic tectonic evolution of the western Pacific region, and such processes may be a major characteristic of orogenic belts during the transition from accretionary to collisional systems.

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