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Neoproterozoic I-type granites geochronology and geochemistry of the Chinese Central Tianshan Block

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The Central Asian Orogenic Belt (CAOB), also known as the Altay orogenic belt, is the largest accretionary orogenic belt in the world. It is situated between the Eastern European, Siberian, Tarim, and North China cratons. The CAOB is a large and complex suture zone formed by amalgamation of diverse geologic units including several microcontinents, ophiolites, island arcs, seamounts and accretionary wedges. The evolution of the Precambrian basement in these microcontinents is central to understanding the accretionary and collisional tectonics of the CAOB as well as the evolution of Rodinia supercontinent. The Tianshan block, an important part of the CAOB, is located in the southwestern CAOB, and subdivided from north to south into North Tianshan, Central Tianshan-Yili blocks, and South Tianshan. The Central Tianshan block, located between the Tarim block, the Junggar block and the Kazakhstan block, is one of numerous microcontinental block within the CAOB that overlie Precambrian basement rocks. Constraining the evolution of these ancient basement rocks is central to understanding the accretionary and collisional tectonics of the CAOB, and its place within the Rodinia supercontinent. However, to date, the timing and tectonic settings in which the basement rocks in the Central Tianshan formed are poorly constrained, with only sparse geochemical and geochronological data from granitic rocks within the central segment of the belt. Here, we present a systematic study combining U-Pb geochronology, whole-rock geochemistry, and the Sr-Nd isotopic compositions of newly-identified granites from the Bingdaban area of Central Tianshan. The analyzed samples yield a weighted mean Neoproterozoic $^{206}Pb/^{238}U$ ages of 975-911 Ma. All have affinities with calc-alkaline, weakly-peraluminous, magnesian I-type granites. The samples are enriched in LREE, display relatively flat HREE patterns with negative Eu anomalies, and show a depletion in the high field strength elements (HFSEs) Nb, Ta, and Ti and enrichment in large ion lithophile elements (LILEs) Rb, U, Th and Nd geochemical characteristics indicative of subduction-related magmatism. All samples show initial $(^{87}Sr/^{86}Sr)_{(t)}$ ratios between 0.705136 and 0.706745. Values for $\varepsilon_{Nd(t)}$ in the granites are in the range -1.2 to -5.7, corresponding to Nd model ages of 1.6-2.1 Ga, indicating a role for Mesoproterozoic to Paleoproterozoic rocks in the generation of the granitic protoliths. The documented geochemical features indicate the protoliths for the granites had a similar petrogenesis and magmatic source, which may reflect partial melting of thickened crust with the addition of small amounts of mantle-derived material. The Tianshan Block probably constituted

part of an exterior orogen that developed along the margin of the Rodinian supercontinent during the early Neoproterozoic, and which underwent a transition from subduction to syn-collision compression at 975-911 Ma. This study reveals that crustal reworking may played a key role in Neoproterozoic crustal evolution in the Central Tianshan block and this block has a tectonic affinity to the Yili block.

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