

Ridge subduction accompanied by slab roll-back in the
CAOB: Evidence from late Carboniferous–early
Permian A-type granites and granitic dikes in the
Alataw Mountains, northern Xinjiang (NW China)

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The ridge subduction and slab roll-back are a common tectonic feature along the modern Pacific Rim. The upwelling of asthenospheric mantle through the slab window may produce specific magmas, including adakites, high-Mg andesites, alkaline magmatic rocks and dikes. In the Alataw Mountains of the northwestern Tianshan Orogenic Belt (NTOB), northern Xinjiang (NW China), the A-type granites and dikes are widely distributed. In this study, we present new results of zircon U-Pb geochronology, major and trace elements, and Sr-Nd isotope and zircon Hf isotope for the A-type granites and dikes from this area. Geochemically, the granitic intrusions and dikes (301-297 Ma) are characterized by high SiO₂ and total alkalies (K₂O+Na₂O), high Zr, Nb, Ta content, and Ga/Al ratio with prominent negative Ba, Sr, P, Eu, and Ti anomalies, analogous to those of A-type granite. The depleted Nd isotope compositions of the granitic intrusions and dikes are consistent with those of the Carboniferous volcanic rocks in the Alataw Mountains, especially Carboniferous adakites ($\epsilon\text{Nd}(t) = +3.6$ to $+6.6$), suggesting that they were likely generated by partial melting of less evolved crustal materials, such as oceanic crust stored in the middle and/or lower crust or Carboniferous volcanic arc crust. In addition, three main episodes arc rocks have a general younging trend from west to east or northeast indicating that the magmatic front associated with subduction of the northern Tianshan ocean magmatic front probably moved further east or northeast due to the changing of the subduction angle. Therefore, the widespread late Carboniferous–early Permian magmatism in the NTOB may have been related to a ridge subduction accompanied by slab roll-back of the subducting plate of the North Tianshan Ocean.

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