



Petrogenesis and tectonic implications of the Late Paleozoic igneous rocks from the Alataw area of North Yili Block, NW China

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Late Carboniferous to Early Permian is a critical period for the final amalgamation and tectonic evolution of the Central Asian Orogenic Belt (CAOB). However, the amalgamation time and processes have been a matter of debated. In order to reconstruct the termination processes of the subduction of the Junggar oceanic plate in the Chinese western Tianshan, a suite of magmatic rocks including tuff, rhyolite and granite from the North Yili Block are studied systematically. Our secondary ion mass spectrometry (SIMS) zircon U-Pb dating of the tuff, rhyolite and biotite granite showed that they were formed at 300.4 ± 2.6 Ma, 298.6 - 302.6 Ma, and 287.5 ± 1.2 Ma, respectively. Geochemically, the tuffs have relatively low SiO_2 (65.8-71.5 wt.%) and Mg# (5.9-12.6) values, and exhibit arc affinity with significantly enriched in large ion lithophile elements (LILE) and depleted in high field strength elements (HFSE) such as Nb, Ta and Ti. The whole-rock $\epsilon\text{Nd}(t)$ and zircon $\epsilon\text{Hf}(t)$ values range from +6.9 to +7.0 and +9.86 to +14.07 respectively, indicative of a juvenile basaltic lower crustal origin. In contrast, the rhyolites have higher SiO_2 (72.7-74.0 wt.%) and K_2O (3.86-4.53 wt.%) contents, high zircon $\delta^{18}\text{O}$ (11.67-13.23 ‰) values and low whole-rock $\epsilon\text{Nd}(t)$ (+2.9 to +3.8) and zircon $\epsilon\text{Hf}(t)$ (+2.78 to +9.97) values, which show a significant involvement of sediments. The biotite granites have the highest SiO_2 (74.7-75.5 wt.%) contents and high whole-rock $\epsilon\text{Nd}(t)$ (+7.7 to +8.8), zircon $\epsilon\text{Hf}(t)$ (+9.81 to +12.71) and low zircon $\delta^{18}\text{O}$ (5.99-6.84 ‰) values suggest a juvenile basaltic lower crustal source. Moreover, the high zircon saturation temperatures (815-938 [U+2103]) of the tuffs and rhyolites demonstrate a possible genetic link with a break-off tectonic scenario. On the contrast, the very low zircon saturation temperatures (723-735 [U+2103]) of the biotite granites may suggest a hydrous partial melting of juvenile lower crust, whilst the abundant water-fluxes might have been introduced by the later stage of large strike-slip shearing along the North Tianshan Fault. Therefore, the magmatic rocks from the North Yili Block are suggested to be a magmatic probe for tectonic switch during the termination of accretionary orogenesis, which may be related to the evolution of the Kazakhstan Orocline.