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Linking the initial subduction of the South Tianshan Oceanic Plate and associated magmatism to Kazakhstan orocline: insights from petrogenesis of granites in the southern Yili Block

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The Kazakhstan orocline is a striking collage system of the Central Asian Orogenic Belt. It has been documented to be a composite continent via assembly of several orogenic components by the Devonian and finally to attain its U-shaped structure through oroclinal bending in the Late Paleozoic. In order to reveal the relationship between the Kazakhstan orocline and regional magmatism, granitic rocks including monzogranites and K-feldspar granites in the south limb of the orocline have been conducted geochronological and geochemical studies. Zircon LA-ICP-MS U-Pb dating of the monzogranites gave crystallization ages of 360±1.8 Ma and 360.5±1.7 Ma, and the K-feldspar granites have a coeval age (361.3±1.8 Ma). Both of the granites are high-K granites, and show enrichment in light rare earth elements (LREE) and obvious negative Eu anomalies. They display negative anomalies in Ba, Nb, Sr, Eu, and Ti. The K-feldspar granites have higher SiO_2, K2O contents and lower MgO, $Fe2O_3$T, Zr contents than those of the monzogranites. Geochemical data support that the K-feldspar granites are highly fractionated I-type granites, and the monzogranites are unfractionated I-type granites. Distinguishable Nd and Hf isotope suggest that the K-feldspar granites and the monzogranites may share a common magma chamber. The negative Eu anomalies and depletions of Ba and Sr possibly imply plagioclase as residue in the magma source. The Sr-Nd isotopic data and the εHf(t) values (-3.6 – 2.9) indicate that the parental magma was probably derived from crustal rock with minor mantle-derived melt. The new geochemical data and regional geology evidences indicate that the granites may be generated in a continental back-arc environment, which was inferred to be a response to the initial subduction of the South Tianshan Oceanic Plate. Given that the Kazakhstan orocline was developed during this period, it is plausible to link the initial subduction of the South Tianshan Oceanic Plate and associated magmatism to the Kazakhstan orocline in the Latest Devonian (ca. 360 Ma).