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**Early Paleozoic subduction processes of the southern Paleo-Asian Ocean:
Insights from Paleozoic diorites and granitoids in the Alxa Terrane**

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It is generally accepted that the Central Asian Orogenic Belt (CAOB) grew southward, attributed to the consumption of the Paleo-Asian Ocean (PAO). Numerous studies have placed emphases on the multiple subduction processes of the southern PAO along the northern margins of the Tarim Craton and the North China Craton (NCC). However, connecting the Tarim Craton and the NCC, the Alxa Terrane in the westernmost Inner Mongolia received much less attention, which will hamper us from better understanding the accretionary orogenesis of the southern CAOB and the relevant subduction processes of the PAO.

In this study, new LA-ICPMS zircon U-Pb dating and whole-rock geochemical data reveal two groups of diorites and granitoids in the eastern and southern parts of the Alxa Terrane. One group comprises diorites and granitoids that were formed at 458-440 Ma and shows lower $\text{Al}_2\text{O}_3/\text{TiO}_2$ ratios and higher TiO_2 contents, suggesting high temperature - low pressure crystallization conditions and a shallow source region. In contrast, the second group consists of granitoids that were emplaced at 417-407 Ma, displaying high Sr and low high rare earth elements, with very high Sr/Y ratios and mostly positive Eu anomalies, which implies low temperature - high pressure crystallization conditions and source regions at deep crustal levels with the residual phase of garnet. Two groups show arc affinity with calc-alkaline to high-K calc-alkaline features, depletion in Nb, Ta and Ti and enrichment of Ba, K and Sr, which suggests that the southward subduction of the PAO beneath the Alxa Terrane have occurred since the Late Ordovician. Both zircon $\epsilon_{\text{Hf}}(t)$ and whole-rock $\epsilon_{\text{Nd}}(t)$ values decrease from 458 Ma to 440 Ma but increase from 417 Ma to 407 Ma, whereas whole-rock initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratios yield an opposite trend. Thus, a new model of a tectonic switch from an advancing to a retreating subduction setting in the Early Devonian is suggested.

On the basis of a regional comparison of Phanerozoic magmatism in terms of ages, rock associations and geochemistry, we suggest that the super-large early Paleozoic active continental margin on the northern margin of the NCC can be western extended to the Alxa Terrane induced by the southward subduction of the PAO in the early Paleozoic.

