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Field geology, geochronology and geochemistry of mafic-ultramafic rocks from Alxa, China: Implications for Late Permian accretionary tectonics in the southern Altaids

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The termination of orogenesis for the southern Altaids has been controversial. Systematical investigations of field geology, geochronology and geochemistry on mafic-ultramafic rocks from the northern Alxa of the southern Altaids were conducted to address the termination controversy. The newly discriminated mafic-ultramafic rocks belt is located at Bijiertai, Honggueryulin, and Qinggele areas, stretching from west to east for about 100 km in length. All of the three rock associations contact tectonically with the adjacent metamorphic and deformed Precambrian rocks as tectonic blocks or lenses, and are composed of peridotite, pyroxenite, gabbro, and serpentinite, most of which have subjected to pronounced alteration, i.e. serpentinization and chloritization. Geochemically, the rocks are characterized by a uniform trend of compositional distribution, e.g., with low SiO_2-contents (42.51-52.21 wt.%) and alkalinity (Na2O+K2O) (0.01-5.45 wt.%, mostly less than 0.8 wt.%), and enriched in MgO (7.37-43.36 wt.%), with Mg# = 52.75-91.87. As the rocks have had strong alteration and have a wide range of loss-on-ignition (LOI: 0.44-14.07 wt.%), the rocks may be subjected to considerable alteration by either sea-water or metamorphic fluid. The REE and trace element patterns for the rocks show a relatively fractionated trend with LILE enrichment and HFSE depletion, similar to that of T-MORB between N-MORB and E-MORB, indicating that the parental melt resulted from the partial melting of oceanic lithospheric mantle overprinted by fluid alteration of island-arc subsequently. The ultramafic rocks are relics derived from the magma after large degree of partial melting of the oceanic lithospheric mantle with overprinted by island-arc processes under the influence of mid-ocean-ridge magmatism. LA – ICP MS U – Pb zircon ages of gabbros from the three spots are 274 $\pm$ 3 Ma (MSWD = 0.35), 306 $\pm$ 3 Ma (MSWD = 0.49), 262 $\pm$ 5 Ma (MSWD = 1.2), respectively, representing the formation ages of the mafic-ultramafic rocks. Therefore, considering the other data published previously, we suggest that the mafic-ultramafic rocks are products of a south-dipping subduction, most probably a ridge subduction for the Paleo-Asian Ocean beneath the Alxa block in the Late Carboniferous to Late Permian before the Paleo-Asian Ocean completely closed. This shed light on the controversial tectonic history of the southern Altaids and support that the termination of the orogenesis was in the end Permian to Triassic.