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The origin and tectonic evolution of Hongguleleng ophiolite, Western Junggar, southwestern Central Asian Orogenic Belt

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We present a petrological and geochemical study of the Hongguleleng ophiolite in Western Junggar of Xinjiang (Southwestern Central Asian Orogenic Belt), which contains the classic Penrose-type ophiolite stratigraphic units. The ophiolite actually includes mantle spinel harzburgites, olivine-rich troctolites within the harzburgites, layered troctolites, plagioclase-bearing wehrlites, olivine gabbros, gabbros and a minor basalt proportion. Compared to other ophiolites from the accretionary orogenic belt, such as those from Tianshan and Inner Mongolia, the lower crust sequence of the Hongguleleng ophiolite is well preserved. The Hongguleleng spinel harzburgite is highly depleted, for instance as documented by the low whole-rock Al_2O_3 and CaO contents, the low REE concentrations of clinopyroxene, and the high Cr# [molar $\text{Cr}/(\text{Cr}+\text{Al})$] of spinel. Overall, the harzburgite chemical compositions document that these mantle peridotites underwent a high degree of partial melting, similar to mantle peridotites from supra-subduction zones. Remarkably, the trace element signature of clinopyroxene is similar in harzburgites and included olivine-rich troctolites, thereby providing evidence for formation of the olivine-rich troctolites by melt-peridotite reaction. On the other hand, the trace element compositions of clinopyroxene from other lower crustal rocks, including the plagioclase-bearing wehrlites, may be reconciled with crystallization from MORB-type melts. However, these clinopyroxenes locally display a significant enrichment in La, Ce and Pb, which could reflect either contamination of the MORB-type melts by continental crust material, or late infiltration of a melt enriched in La-Ce-Pb through the lower ophiolitic crust. To conclude, the Hongguleleng ophiolite shares close similarities to oceanic lithospheres formed at supra-subduction zones. Along with the coeval ophiolites from the Junggar and Tianshan area, the Hongguleleng ophiolites might represent the remnants of the Junggar Ocean during the initiation of subduction.