

Paleoproterozoic ophiolite remnants in the northern Trans-North China Orogen as revealed by the Chicheng peridotite massif

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Precambrian peridotite massifs are exposed in the northern Tran-North China Orogen, as separate tectonic boudins within Archean gneisses of the Hongqiyingzi Group, along with retrograded eclogites. These peridotites are composed of harzburgites and dunites, with minor ultramafic cumulates. High Mg# (91.2-93.5), low Al₂O₃ and CaO contents of harzburgites and dunites, as well as the high Fo values of olivines and Cr-number of spinels show that they were highly refractory residues of partial melting. The ultramafic cumulates might be early ultramafic cumulates, as indicated by their relatively low Mg-number (87.0 and 91.8). Thus, Chicheng peridotites may represent fragments of ancient sub-oceanic lithospheric mantle. The peridotites, retrograde eclogites and gneisses in the northern TNCO form the ultramafic to felsic rock sequences of a Paleoproterozoic ophiolite suit. This ophiolite experienced emplacement on the margin of continent and subduction into eclogites facies during the formation of TNCO. The metasomatized orthopyroxene in Chicheng peridotites and flat REE pattern of whole rocks indicate melt/magma metasomatism on residual peridotites during the post-melting stage. The ubiquitous existence of amphiboles in peridotites suggests that the ophiolites had undergone the amphibole-facies metamorphism before their exposure during the exhumation in Phanerozoic. The recognition of Chicheng ophiolite and its evolution history suggests that modern-style plate tectonics began at least in Paleoproterozoic.