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Geochemical Characteristics of Mafic Rocks from the Xinlin Ophiolite, NE China

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1 Abstract

Located in the northern part of the Xinlin–Xiguitu suture zone, geochemistry and geochronology of the Xinlin ophiolite provide a unique opportunity to determine the the evolution of the eastern Xing'an–Mongolian Orogenic Belt. The Xinlin ophiolite was initially constrained roughly 21.5 km southeast of the Xinlin town by the First Regional Geological Survey Party of Heilongjiang Province. Subsequent work has shown that the mafic and ultramafic rocks in the adjacent Tayuan town was congenetic with the Xinlin ophiolite (Fig. 1). Over the past three years we have conducted a series of studies to the Xinlin ophiolite with the aim to better understand its characteristic and tectonic implications. The present work is is to provide our preliminary geochemical data of the mafic rocks of the Xinlin ophiolite and possible "congenetic" mafic rocks in the Tayuan town.

The mafic rocks of the Xinlin ophiolite including the gabbro, diabase and metabasalt show flat REE pattern [$(La/Yb)_N$ = 0.68~1.58] and no Eu anomalies, which are transitional between normal and enriched mid-ocean ridge basalts (N-MORB and E-MORB). They also exhibit flat patterns from Ba to Yb in the trace elements spider diagram, which lie between those of typical E-MORB and N-MORB but closer to the former. The mafic rocks in the Tayuan town consist mainly of hornblende gabbro with alkaline affinity and are characterized by enriched in light rare earth elements and large ion lithophile elements, depleted in heavy rare earth elements and high field strength elements (Fig. 2). The obvious differences in the geochemical characteristics indicate that the mafic rocks in the Tayuan town may not be cogenetic with those of the Xinlin ophiolite. This was further corroborated by their different formation time. Our zircon U–Pb dating indicates that the gabbro in the Tayuan town was emplaced during the late Carboniferous (~310 Ma; Fig. 3), significantly younger than the recently reported U–Pb ages for the mafic rocks of the Xinlin ophiolite (~510 Ma; Feng, 2015). Therefore, the two units appear as independent bodies and their origin and tectonic implication need to be further examined.

Acknowledgements

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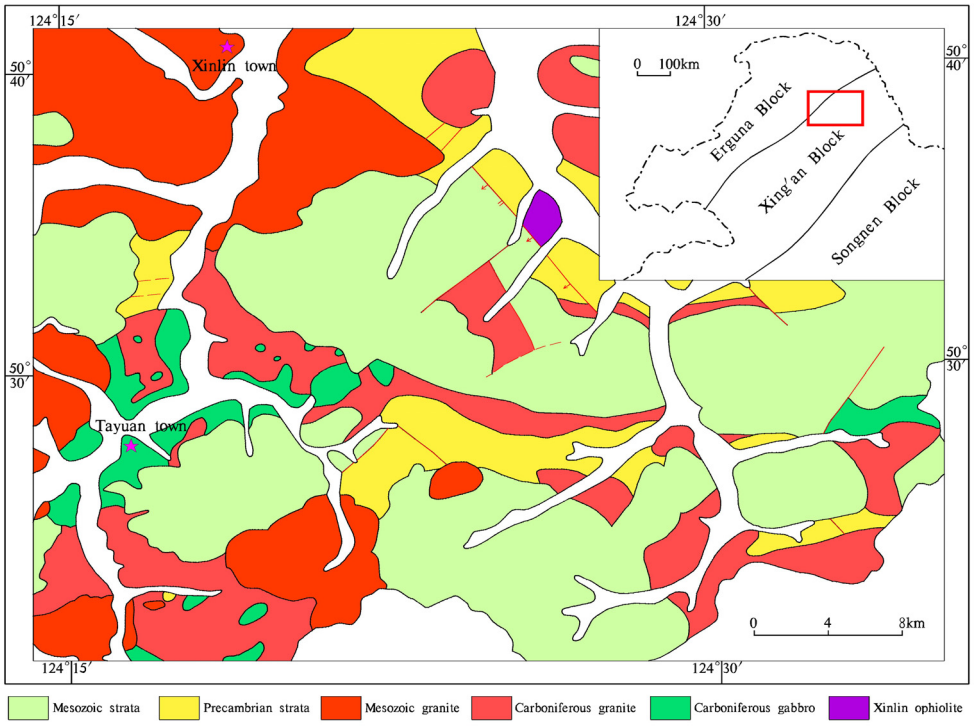

Fig. 1. Distribution of Xinlin ophiolite and Tayuan gabbro along the Xinlin–Xiguitu suture zone between the Erguna and Xing'an blocks in NE China.

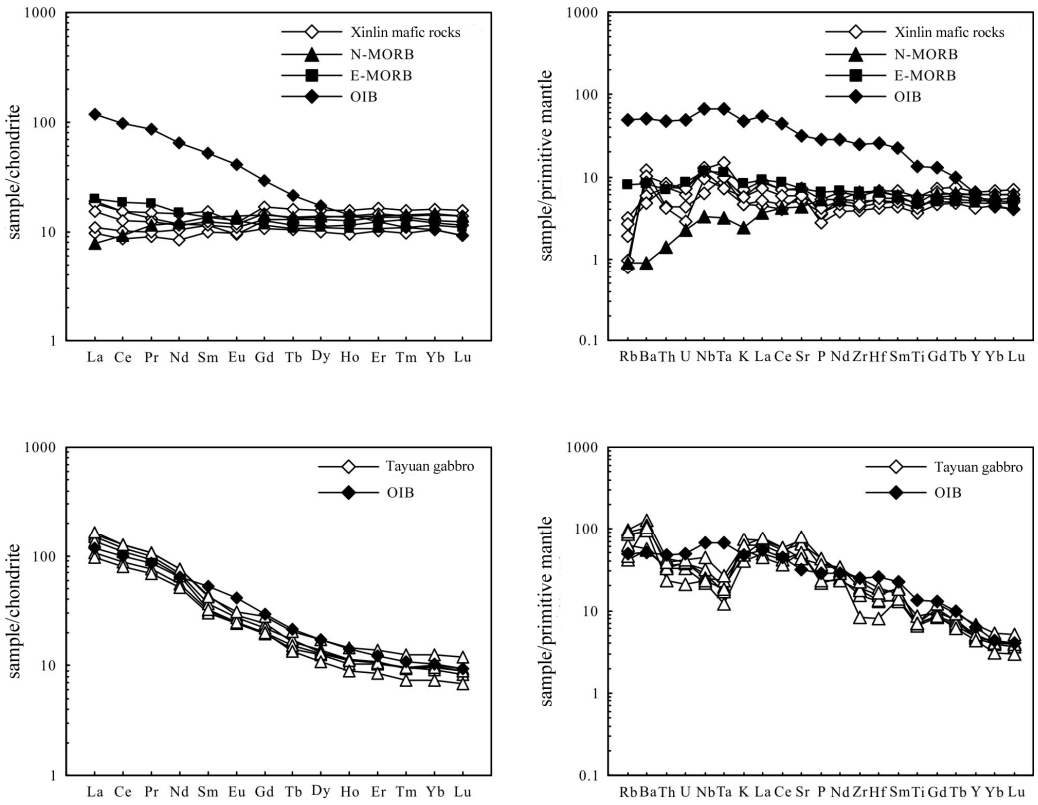

Fig. 2. Chondrite-normalized REE and primitive-mantle-normalized multi-element variation diagrams for mafic rocks of the Xinlin ophiolite and from Tayuan town. Chondrite normalization values are from Boynton et al. (1984), and N-MORB normalization values are from Sun and McDonough (1989). Also shown is the ocean-island basalt (OIB), N-MORB and E-MORB composition of Sun and McDonough (1989).

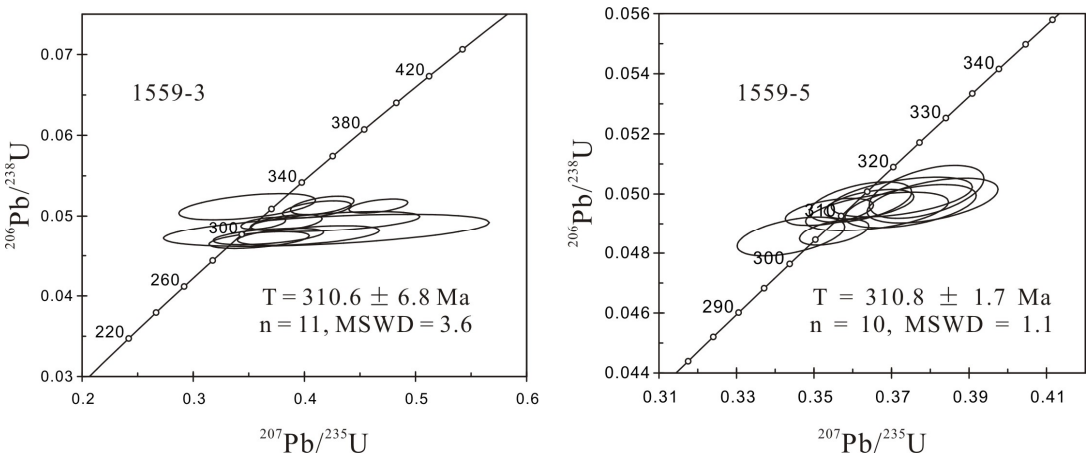

Fig. 3. Zircon U–Pb concordia diagram showing the weighted mean ages of hornblende gabbros from the Tayuan town.