Middle Paleozoic ophiolites of the Ust-Belaya terrane (Western Koryak accretionary complex, Russian Far East): ultramafic and mafic rocks as indicators of geodynamic setting

Suren A. PALANDZHYAN

Geological Institute of Russian Academy of Sciences, Moscow, Russia (suren@ginras.ru)

Large ophiolitic massifs composed of lherzolite and fertile harzburgite, are developed in the Koryak and Kamchatka regions in addition to suprasubduction ophiolites dominated in the Circum Pacific foldbelt. Geodynamic settings, in which these ophiolites were originated, can be recognized by studies of petrography, mineralogical and chemical compositions of both mantle and crustal rocks.

The Ust-Belaya terrane, which is cropped out at the area exceeding 300 sq. km. in the right bank of the Anadyr River, locates in the north of the Western Koryak fold system. The latter resulted from the accretionary stage of Asian continental margin in the Aptian – Albian time. The terrane is made up several tectonic nappes, which are divided into large separate blocks. The upper part of the ophiolitic association is exposed in the Otrozhnaya block, where it is represented by the Early Devonian (pre-middle Devonian) MORBs intruded by dikes of diabases and early Mesozoic (218-178 Ma) plagiogranites. The mafic horizon, which is composed of olivine gabbro, gabbro, plagioclase-bearing dunites and troctolite, crops out in the Central block and is about 1 km thick. The gabbroids are amphibolized; and Ar-Ar age of amphilboles is 400 and 370 Ma, i.e. Early to middle Devonian. Restites of the Central block are represented by lherzolites; the transitional zone is thin and includes dunites, wehrlites and pegmatitic gabbros. The mafic horizon of gabbros and troctolites are absent in the Northern block, where the Fe-rich ultramafic and mafic cumulates are developed along the eastern edge. Mantle peridotites are depleted relative to those from the Central block. Lherzolites constitute the low structural horizon only the western edge. In the east the lherzolites are replaced by diopside-bearing harzburgites and harzburgites; and the dunite layer of about 1 km thick occur next to cumulative complex. In the Northern block the cumulative complex is represented by thinly interlayered dunite, cortlindite, wehrlite, pyroxenite, hornblendite and fine-grained gabbro. In the east the cumulative complex is limited by normal fault: and the large mafic bodies were not found there. The dunite zone and dunites of the cumulative complex contain numerous small podiform bodies of high-Al cromitites. All ultramafics of the layered complex have yellow-green accessory spinels.

Based on composition of spinels, ortho- and clinopyroxenes, two groups of peridotites can be divided.

1. The least depleted peridotites are characterized by very low values of $Cr\#_{Spl}$ (< 0.25), high ratio of Na/Cr_{Cpx} (>2) and Al_2O_{3Opx} contents (< 5 %). The compositional variations in minerals are typical of peridotites from low-spreading mid-oceanic ridges and abyssal peridotites formed near passive continental margins (early stages of an ocean opening).

2. The more depleted lherzolites and harzburgites that grade into dunites and cumulates in the Northern block contain clinopyroxenes with the elevated $Cr\#_{Spl}$ (0.25-0.5) and low Na/Cr_{Cpx} (<2). The compositional variations observed in peridotites indicate that partial melting took place in the presence of H_2O fluid. The compositional variations in spinels mean that peridotites were formed in mid-oceanic ridge setting.

The spatial relations between ultramafics and mafics of various compositions combined with compositional peculiarities of minerals allow us to reconstruct geodynamic settings and transformations of the Ust-Belaya terrane ophiolites. We suggest that cumulative complex, dunite zone and harzburgites as well as metamorphic transformations in the mafics resulted from within-plate magmatism in the middle – Late Devonian time. The within-plate magmatism took place in the areas where the ensialic basin lithosphere formed in the early Devonian time but not a subduction zone already existed.

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