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Major and Trace elements mineral composition in peridotites from the Ust'-Belaya ophiolite, Far East Russia

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The Ust'-Belaya ophiolite is exposed in the 80 km x 40 km area on the south of Ust'-Belaya (N65 30', E173 17'), Far East Russia (Sokolov et al., 2003, Geol. Soc. London, Spec. Publ., 218, 619-). The associated limestone suggests Devonian or older age of this ophiolite. It is an important character of this ophiolite that glaucophane-bearing rocks occur. Here we report the petrographical features and mineral chemistry of the peridotite from the Ust'-Belaya ophiolite and discuss about their metamorphism and metasomatism.

Mantle section of the Ust'-Belaya ophiolite is composed of fertile lherzolite to moderately depleted harzburgite. As a result of significant hydration, those peridotites contain various hydrous minerals such as amphibole, talc, secondary clinopyroxene and antigorite. In some of antigorite-bearing peridotites, olivine shows an apparent "cleavage". Such petrographical characteristics resemble those of the antigorite-bearing serpentinite from Mariana forearc (Ohara & Ishii, 1998, Island Arc, 7, 541-; Murata et al., 2009, Geosphere, 5, 90-).

Cr# of spinel in the Ust'-Belaya peridotite shows wide range from 0.1 to 0.5, which is similar compositional range to these of the mid ocean ridge peridotites. It is noteworthy that low-Cr spinel (Cr#=0.1) coexist with high-Na clinopyroxene. Such Na-cpx shows similar trace element pattern to the mid ocean ridge peridotite, which is explained by simple extraction of melts. Therefore such Na-rich clinopyroxene bearing peridotite may represent the deeper level of melting column. On the other hand, the other clinopyroxenes show LREE-enriched trace elements patterns, which is cannot be explained by simple extraction of melts. These patterns can be explained by influx melting.

Amphiboles show different compositional trend corresponding to the mineral assemblage. In Atg-free type rocks, amphibole covers a compositional range from tremolite to pargasite. Meanwhile, in Atg-bearing type rocks, amphibole covers a compositional range from tremolite to richterite with edenite. Trace elements patterns of the former amphiboles (magnesiohornblende) are similar to those of clinopyroxenes in the same sample. Therefore the fluid related to the influx melting was able to be responsible for the formation of these amphiboles. On the other hand, the latter amphiboles (Na-rich tremolite/richterite) shows low concentration and pronounced positive anomaly for Sr. This indicate introduction of Na and Sr coupled with removal of these elements.

The influx melting inferred from trace elements patterns of cpx, as well as the occur of glaucophane-bearing rocks, low equilibrium temperature of peridotites and the evidence of fluid-peridotite interaction are suggesting the Ust'-Belaya peridotite may represent a fragment of the pre-late Paleozoic forearc mantle wedge. Absence of highly depleted peridotite suggests that highly depleted peridotites are not necessary for every forearc environments.

Keywords: subduction zone, antigorite, amphibole, serpentinization