Structural analyses of peridotite xenoliths from the Avacha Volcano, Kamchatka Peninsula

Tatsuya Oohara[1]; Katsuyoshi Michibayashi[2]

[1] Inst. Geosciences, Shizuoka Univ.; [2] Inst. Geosciences, Shizuoka Univ

The aim of this study is to understand the structure of the uppermost mantle wedge beneath the volcanic front. Peridotite xenoliths from the Avacha volcano, derived from the mantle beneath the volcanic front of the Kamchatka arc, are mainly spinel harzburgites. They are divided into two types: C-type (coarse-grained type) and F-type (fine-grained type). This study reports about C-type peridotites. The main constituent minerals are olivine, orthopyroxene, spinel and minor amount of clinopyroxene and amphibole. They usually exhibit granular textures with partly extended olivine grains (average grain size: 0.57mm). They are metasomatized to various extents, with the formation of secondary orthopyroxene replacing primary olivine. Olivine and pyroxenes crystal-preferred orientations (CPOs) were measured in highly polished XZ thin sections using a SEM system equipped with electron back-scattered diffraction (EBSD). Olivine CPOs are dominantly (001)[100] patterns. The fabric intensity (J-index) given an indication of strain ranges from 3.75 to 21.14. The Fo% of olivine and Cr# [=Cr/(Cr+Al) atomic ratio] of spinel range from 90 to 92 and from 0.5 to 0.8, respectively, indicating that they are mostly depleted peridotites. Equilibrium temperatures estimated by Ca in orthopyroxene geothermometer are approximately 800-1050 degrees. These results show that the peridotites, having higher strain and equilibrium temperature tend to show the extended and irregular olivine grains. Moreover, low J-index types tend to show similar values of all pfJ (the pole figure index) but high J-index types tend to show the strongest pfJ of [100]-axis. The low J-index types are similar to Ichinomegata volcano peridotite xenoliths from the back-arc region. These indicate that the peridotites beneath the volcanic front have probably preserved the record of the oceanic lithospheric mantle, whereas the high J-index types may be dominantly developed beneath the volcanic front.