Spatial compositional variations in mantle section of Oman ophiolite: implications for melt segregation in uppermost mantle

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We studied spatial compositional variations in Fizh mantle section of northern Oman ophiolite to understand a scale and mechanism of melt segregation in uppermost mantle. Fizh mantle section of Oman ophiolite consists of mainly harzburgite with less amount of dunite from the Moho to the basal thrust. Generally dunite is considered as a product of reaction between harzburgite and MORB melt (e.g., Kelemen et al., 1990), thereby indicating melt pathway in the uppermost mantle. In this study we have analyzed mineral compositions of harzburgite corrected from Fizh mantle section in a wide area of 25 km x 15 km. Our results show Fo contents of olivine and Cr# (=Cr/[Cr+Al]) of spinels are mostly consistent with those of abyssal peridotites indicating their residual origin after partial melting and melt extraction beneath mid-ocean ridge. We also found that presence of highly refractory harzburgites in which Cr# of spinels exceed 60, the maximum for ocean floor peridotites (Arai, 1994). They occur as patches in a scale of hundreds of meters to a few km in Fizh mantle section. These highly refractory peridotites might have formed by remelting of harzburgite through a reaction with migrating fluid as suggested by Matsukage et al. (2001). Our results indicate that the fluid may have locally migrated in the uppermost mantle in a scale of hundreds of meters to a few km. In the field, a shear zone closely developed near the regions with highly refractory peridotites. We propose that the fluid may have been supplied through this shear zone. Moreover, the areas for highly refractory harzburgites are characterized by a greater amount of dunite compared to other areas, i.e., volume ratio of dunite against harzburgite is greater in the areas with highly refractory harzburgites. It is also noted that these dunite are accompanied by podiform chromitite deposit in a scale of several cm to tens of meters. This fact may indicate that the formation of podiform chromitite is also closely associated with remelting of uppermost mantle.