

Spatial variation of mineral compositions in the northern Fizh mantle section from the Oman ophiolite

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The northern Fizh block in the Oman ophiolite has been considered as a paleo-fast-spreading ridge system associated with segment boundaries (e.g., Nicolas et al., 2000; Miyashita et al., 2003; Adachi and Miyashita, 2003; Umino et al., 2003). To understand mantle dynamics beneath fast-spreading ridge and segment boundaries we investigated spatial variations of mineral compositions for peridotites collected from the mantle section of the northern Fizh block in the Oman ophiolite. The peridotites used for this study are 72 samples and consist of harzburgites and lherzolites without dunite.

Most harzburgites are strongly depleted in melt components due to high degree of partial melting and melt extraction although the peridotites located near the basal thrust and the Moho are less depleted. Here, we use Cr# ($=100 \times \text{Cr}/\text{Cr} + \text{Al}$ molar ratio) of spinel, and Al and Cr contents of orthopyroxene and clinopyroxene as depletion indicators. The Fo mol% of olivine varies in a limited range from Fo90-91.5 thereby not suitable as depletion indicator. The analytical results show that the depletion of peridotites are asymmetric between northern and southern parts of the studied area. In the northern part, the most depleted peridotites are distributed from the center toward the basal thrust while in the southern part they are located from the center toward the Moho.

The spatial variation of mineral compositions observed in the northern Fizh block may be explained by two hypotheses. In the first hypothesis, the decrease in the extent of depletion from the basal thrust toward the Moho may have been resulted from an increase in the degree of partial melting of the uppermost mantle. The less depleted peridotites near the Moho could be due to a refertilization of once depleted uppermost mantle by a MORB melt. Another hypothesis is the remelting of depleted peridotite in the center of the mantle section. The most depleted peridotites are aligned with a NW-SE trend in the studied area being consistent with the direction of low-T shear zones in the northern Fizh block. A fluid flowing along shear zone may have lowered the solidus temperature of depleted peridotite thereby causing the remelting of the mantle peridotite.