



Magma system along fast-spreading centers controlled by ridge segmentation: Evidence from the northern Oman ophiolite

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Mid-ocean ridges are segmented at various scales with a hierarchy, from the biggest 1st-order to the smallest 4th-order segments. These segment structures control magmatic processes beneath the mid-ocean ridges such as mantle upwelling, partial melting of the upper mantle, and magma delivery system to form the oceanic crust (Macdonald, 1998). However, systematic studies on the segment control for magmatic processes are rare at modern mid-ocean ridges due to the difficulty of obtaining in-situ samples from different crustal-lithospheric depths. Sampling at ocean floors is generally exclusively limited only to the surface (i.e. the seafloor). Furthermore, the samples obtained from the surface of the ocean floor may likely represent the products of off-axis magmatism (Kusano et al., 2012). Therefore, studies of ocean ridge segmentation in ophiolites provide important constraints for the magmatic processes beneath seafloor spreading centers, because the precise 3-D architecture of the upper mantle and the crust (all the way to the uppermost extrusive layer) and their lateral variations could be observed and investigated in ophiolites.

We have studied the northern Oman ophiolite where a complete succession from the upper mantle peridotites to the uppermost extrusive rocks is well exposed. Miyashita et al. (2003), Adachi and Miyashita (2003) and Umino et al. (2003) proposed a segment structure in the northern Oman ophiolite; the Wadi Fizh area is regarded as a northward propagating tip of a mid-ocean ridge based on geological evidence (Adachi and Miyashita, 2003). On the other hand, the Wadi Thuqbah area, about 25 km south of Wadi Fizh, is regarded as a segment center based on the thickest Moho transition zone, well developed EW-trending lineations in the MTZ and layered gabbro, and the comparatively primitive compositions of the layered gabbros. Furthermore, the southern margin of the Hilti block (Salahi block), about 40 km south of Wadi Thuqbah, is inferred to be the segment-end, based on the compositional variations within the sheeted dike complex (Miyashita et al., 2003).

In this presentation, we document the occurrence of along-axis variations along the Moho transition zones, the wehrlite intrusions, the extrusive sequence and the upper gabbro unit, and discuss the significance of ridge segmentation as a major controlling factor of magmatic systems beneath mid-ocean ridges.

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