Uplift-emplacement process of the Poroshiri ophiolite-An approach from the metamorphic thermal structure

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The Poroshiri ophiolite is exposed in the northern to central part of the western flank of the Hidaka Metamorphic Belt, Central Hokkaido, Japan. This ophiolite has typical ophiolite succession from mantle peridotite to basaltic lava (Miyashita, 1983).

The Poroshiri ophiolite underwent a progressive metamorphism from west to east under the greenschist facies to the amphibolite facies at about 15Ma. The metamorphism accompanied with intensive deformation due to a right-lateral strike-slip movement, and the Hidaka metamorphic belt thrust over the Poroshiri ophiolite at the same time (Jolivet and Miyashita, 1985; Komatsu et al., 1989; Arai and Miyashita, 1994). The metamorphic thermal structure was studied by Osanai et al. (1986), Kizaki (1990MS; 2000MS), and Tanaka (2006MS). This study is focuses the uplift-emplacement process of the Poroshiri ophiolite based on the thermal structures of the Poroshiri ophiolite, protolith structure, and thrust fault movement.

The protolith structure of the Poroshiri ophiolite was showen by Miyashita (1983) and newly revised by Tanaka (2006MS) for the northern area. The protolith stuructures in the Shunbetsu River area of the southern area and, in the Niikappu River area of the centaral area are inferred to be a steeply inclined anticline, implying that the upward sequence appears from the western margin to the center with reverse structure, and then upward sequence appears again from the center to the east. The rapid metamorphic gradient along the western margin is consistent with the protolith structure, but it is not consistent in the eastern part. In the Nukabira River area of the central area of the ophiolite, metamorphosed cumulates of the lower sequence of the Poroshiri ophiolite are widely exposed in the central part of this area. The metamorphic thermal structure in the Nukabira River area shows the culmination at the central part. Protolith structure in the Chiroro River area of the northern area is inferred to be a tight anticlinal structure for the upper crustual sequence in the western part, but the lower crustal sequence in the eastern part shows a gentle synclinal structure. The metamorphic thermal structure of this area indicates a large temperature gap beyond the thrust fault between the western and the eastern parts.

The heat source of the metamorphism is the heat diffusion derived from the lower part of the Hidaka metamorphic belt which thurust upon the Poroshiri ophiolite, and from the lower sequence of the Poroshiri ophiolite (Osanai et al., 1986; Kizaki, 1990MS; 2000MS etc.). Osanai et al. (1986) and Arita et al. (1986) considered that the rapid metamorphic gradient at the western margin is formed by exhumation of the lower sequence with higher temperature conditions in the central part, which is caused by right-lateral strike-slip movement accompanied with uplift.

The gradual metamorphic thermal structures in the Shunbetsu River, Niikappu River, and Nukabira River area indicate that NW-SE trending the thrust faults in each area have not moved after the completion of the heat diffusion. On the other hand, a temperature gap beyond the thrust fault between the western part and the eastern part in the Chiroro River area indicates that the thrust fault in the central part in this area has still moved after the completion of the heat diffusion.

In the Futamatazawa River area, where is southern part of the Chiroro River, metamorphosed cumulates are exposed. These cumulates are metamorphosed under lower temperature conditions than that of the Chiroro River area, and not consistant with the cumulate showing higher temperature conditions in the central part of the Nukabira River area. This is explained that the synclinal structure in the eastern part of the Chiroro River area was formed precedent the metamorphism, and the cumulates of the Futamatazawa River area underwent the heat diffusion at the shallower part than those of the Chiroro River area.