Petrological characteristics of mantle peridotites from Izu-Ogasawara-Mariana and Tonga forearc; relation to on land ophiolites.

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Many ophiolitic igneous complexes in the ocean floor have been reported along trench inner wall. These igneous bodies are called as proto-ophiolite in this paper.

A) Serpentinite diapiric seamounts have been only reported from the forearc area of the Izu-Ogasawara-Mariana arc-trench system in the world. Mantle peridotites constituting those seamounts were depleted harzburgite and dunite.

B) Mantle peridotites recovered from the Tonga forearc exhibit wider chemistry including more fertile and intermediate as well as deplete peridotites (harzburgite, lherzolite and dunite). The Troodos and Semail opiolites can be assumed as a modern analog of proto-ophiolites in the Izu-Ogasawara-Marian and Tonga forearc, respectively.

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Serpentinite diapiric seamounts have been only reported from the forearc area of the Izu-Ogasawara-Mariana arc-trench system in the world. Petrological characteristics of mantle peridotites constituting those seamounts were summarized in comparison with other trench region peridotites. Mantle peridotites drilled from the Conical seamounts during ODP Leg 125 (Site 779) have distinctive compositions both in bulk rock chemistry and mineral chemistry. Their compositions suggest that they underwent a higher degree of partial melting (more than 30 %) that is related to island arc volcanism in the mantle wedge. Most of compositions of mantle peridotites collected by submersible dives from other serpentinite seamounts (the Pacman seamount by Alvin, the Hahajima seamount by Shinkai 2000 and the Chamorro seamount by Shinkai 6500) in the Izu-Ogasawara-Mariana forearc have also similar compositions to those from the Conical seamount. It indicates that most mantle peridotites from the seamounts are refractory residues (harzburgite and dunite) derived from partial melting in the high degree during the island-arc volcanism, including boninite and island-arc tholeiite.

On the other hand, mantle peridotites recovered from the Tonga forearc exhibit wider chemistry including more fertile and intermediate peridotites as well as deplete peridotites, suggesting that the former are residues of relatively lower degrees of partial melting. It is probable that they are related to the volcanism during the formation of the back arc basin. Furthermore, although mantle peridotites of the Tonga forearc are considered to be derived from a layered sequence from the upper crust through the lower crust to the upper mantle rather than serpentinite seamount. They are suggesting wider degrees of partial melting range, that is, they can include refractory residual peridotites (harzburgite, lherzolite and dunite) induced by the magmatic activities of high-magnesian andesite (including boninite) and island-arc tholeiitic basalt as well as back-arc basin basalt.

The "remnant mantle diapir (RMD)" hypothesis was previously proposed for origin of the mantle peridotites constituting serpentinite diapiric seamounts. It is plausible that part of RMDs constitutes the serpentinite seamounts. The Troodos and Semail opiolites can be assumed as a modern analog of proto-ophiolites in the Izu-Ogasawara-Marian and Tonga forearc, respectively.