

論文 / 著書情報
Article / Book Information

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Title(English)	Magmatism and tectonics in the northern Kamchatka Peninsula
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種別(和文)	論文要旨
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論文要旨

THESIS SUMMARY

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要旨 (英文 800 語程度)

Thesis Summary (approx.800 English Words)

Magmatism and tectonics on the Kamchatka Peninsula which is a prominent and wide volcanic arc located near the northern edge of the Pacific Plate were investigated based on petrological and geochemical approaches. In most of the previous petrological and geochemical studies on arc magmatism the key processes and mechanisms for arc magmatism are attributed to those in mantle wedge and arc crust (i.e., a region "subducted" by the slab) assuming a rather homogeneous "subducting" slab. On the other hand, this study partly aims at shedding light on how heterogeneity of "subducting" materials, including seamount and associated materials, may affect the arc magmatism.

Chapter 1 constitutes a general introduction of this thesis. We overview the geological and geophysical processes in subduction zone and their roles in the Earth's system. In addition, the geological characteristics of the Kamchatka Peninsula and the Kamchatka subduction zone are described, based on which the main aims of this thesis are described.

In Chapter 2, the monogenetic volcanic cones (East Cone volcanic group, EC) dated at <1Ma in the northeastern forearc area of the peninsula beneath which the extension of the Emperor Seamount Chain is subducted from the southeast. Despite their limited spatiotemporal occurrence of the EC cones, remarkable compositional variations were observed, including primitive basalt and high-Mg andesite including ultra-high-Ni (up to 6300 ppm) olivine. The melting and crystallization conditions of these lavas indicate a locally warm slab, facilitating dehydration beneath the forearc region, and a relatively cold overlying mantle wedge fluxed heterogeneously by slab-derived fluids. It is suggested that the collapse of a subducted seamount triggered the ascent of Si-rich fluids to vein the wedge peridotite and formed a peridotite-pyroxenite source, causing the temporal evolution of local magmatism with wide compositional range.

In Chapter 3, petrological and geochemical characteristics are described for the lavas from the northern Sredinny Range (N-SR) which is the northernmost part of the backarc volcanic line in the Kamchatka Peninsula. Even though N-SR is located 100 km north beyond the subducting slab edge of Pacific Plate, we found the arc-type Quaternary volcanism which shows two distinct characteristics in terms of their geochemistry; (1) ~20 lavas have positive Ce anomalies ($Ce/Ce^* > 0.1$) accompanied with high La contents and are accounted for by contribution of a fluid dehydrated from the subducted deep sea ferromanganese crust having positive Ce anomaly, (2) most lavas from N-SR exhibit variable degrees of HFSE-enrichment which is likely caused by contribution of the slab-derived fluids from deep dehydration. These evidences suggest that, although no region with a high seismic velocity was detected beneath N-SR, subducted materials likely exist to cause the Quaternary volcanism.

In Chapter 4, in order to better constrain the processes and mechanism, including the magmatism in N-SR as well as the tectonic evolution of the entire Kamchatka Peninsula, we utilize the new data obtained in this thesis as well as published data from literature concerning the age, composition and tectonic-geophysical setting over the Kamchatka Peninsula. The transition of magmatism in time and space indicate that a drastic eastward shift of the volcanic front occurred in 1 Ma, which is caused by the eastward trench retreat accompanied with slab roll back. The propagation of slab rollback from south to north could have caused a massive northward mantle flow in the wedge, which would supply metasomatized mantle and/or fluids to the northern Kamchatka region including N-SR beyond the slab edge. On the other hand, according to the several observations including distinct geochemical characteristics with positive Ce anomaly, another scenario that a subducting slab (e.g., subduction of the Bering Sea Plate and/or forearc slivers) exists beneath N-SR and supplies slab-fluids to cause the N-SR volcanism cannot be ruled out at this stage. High resolution seismic tomography would provide better constraints on the origin of the N-SR volcanism.

備考：論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。

Note: Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1 copy of 800 Words (English).

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