Geochemistry of high-Mg andesitic rocks in NE Kamchatka

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The northeast Kamchatka Peninsula is characterized by unique tectonic regimes: (i) the triple junction ~30 km off the east coast [1], (ii) subduction of the Emperor Seamount Chain [2], and (iii) possible asthenospheric flow between the mantle wedge and the sub-slab mantle via the edge of subducted Pacific slab [3]. Within this area, a monogenetic volcanic group occurs along the east coast, including high-Mg andesitic rocks and relatively primitive basalts (East Cones, EC [4]). We have conducted geochemical studies of the EC lavas, with bulk rock major and trace elements, Sr-Nd isotopic compositions, and K-Ar and Ar-Ar ages, based on which a possible contribution of subducted seamounts and its relation to the tectonic setting are discussed.

The elemental and isotopic compositions indicate that the lavas from individual cones have distinct mantle sources with different amounts and/or compositions of slab-derived fluids. Based on mass balance, water content and melting phase relations, we estimate the melting P-T conditions to be ~1200 °C at 1.5 GPa, while the slab surface temperature is 620 – 730 °C (at 50-80 km depth). The Sr-Nd isotopic compositions is close to Late Cretaceous Emperor Seamount Chain, especially Detroit [5]. The K-Ar and Ar-Ar ages of the Middle to Late Pleistocene are consistent with the present tectonic setting after 2 Ma [6].

These results suggest that the EC lavas including high-Mg andesite and basalt were generated by mantle flux-melting induced by dehydration of a subducted seamount inheriting a local thermal anomaly [7, 8]

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