Genesis of Quaternary volcanism of high-Mg andesitic rocks in the northeast Kamchatka Peninsula

*Tatsuji Nishizawa[1], Hitomi Nakamura[1,2], Tatiana Churikova[3], Boris Gordeychik[4], Osamu Ishizuka[5], Hikaru Iwamori[1,2]

1.Department of Earth and Planetary Sciences, Tokyo Institute of Technology, 2.Japan Agency for Marine-Earth Science and Technology, 3.Institute of Volcanology and Seismology, FED, RAS, 4.4Institute of Experimental Mineralogy, RAS, 5.Geological Survey of Japan, AIST

Arc magmatism is a product of subduction factory, involving thermal and chemical interactions between a subducted slab as a material input and mantle wedge as a processing factory. In turn, the compositions of arc magma provide invaluable information concerning the material input and the interactions. The northeast Kamchatka Peninsula is an ideal field to examine such interactions and relationships, being characterized by (1) subduction of the Emperor Seamount Chain (Davaille and Lees, 2004), and (2) possible material and thermal interaction among the subducted slab, the overlying mantle wedge and the sub-slab mantle via the edge of subducted Pacific slab (Portnyagin and Manea, 2008). Within this area, a monogenetic volcanic group occurs along the east coast, including high-Mg andesitic rocks and relatively primitive basalts (East Cones, EC (Fedorenko, 1969)). We have conducted geochemical studies of the EC lavas, with bulk rock major and trace elements, 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 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 bet ~1200 ℃ at 1.5 GPa, while the slab surface temperature is 620 –730 ℃ (at 50-80 km depth). Compared with the southern part of Kamchatka, the slab surface temperature beneath EC seems to be high due to the thinner Pacific slab associated with the seamount chain and/or the plate rejuvenation from a mantle plume impact (Davaille and Lees, 2004; Manea and Manea, 2007).

The K-Ar and Ar-Ar ages of the Middle Pleistocene are consistent with the tephrochronological study (Uspensky and Shapiro, 1984) and the present tectonic setting after 2 Ma (Lander and Shapiro, 2007). The high-Mg andesite with the highest SiO_2 content in the EC lavas shows the oldest age (0.73 ±0.06 Ma) within not only EC but also the northeast part of Kamchatka (e.g., Churikova et al., 2015, IAVCEI). On the other hand, the rest of EC lava samples show relatively younger ages to 0.18 ±0.07 Ma. 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 (Nishizawa et al., 2014, JpGU; 2015, JpGU).

Keywords: high-Mg andesite, island arc magma, Kamchatka arc, seamount subduction

