FLUID AND MELT SLAB-DERIVED COMPONENTS IN THE SOURCES OF AVACHINSKY GROUP OF VOLCANOES

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The composition of island arc magmas reflect their multi-component origin, where both fluids and melts from the mantle wedge and subducted sediments, oceanic crust and mantle lithosphere play an important role [e.g., 1, 2, 3, 4]. These various subduction-related components can be recognized using trace element and isotope systematics of arc rocks. An important question pertaining island-arc magma genesis is the origin of an across-arc geochemical zoning, which is known for a long time [5] but was not explained in details yet. Here we report new data on trace elements in bulk tephra and volcanic glasses from Avachinsky and Koryaksky volcanoes in Kamchatka and discuss possible reasons of their different compositions despite of spatially close location.

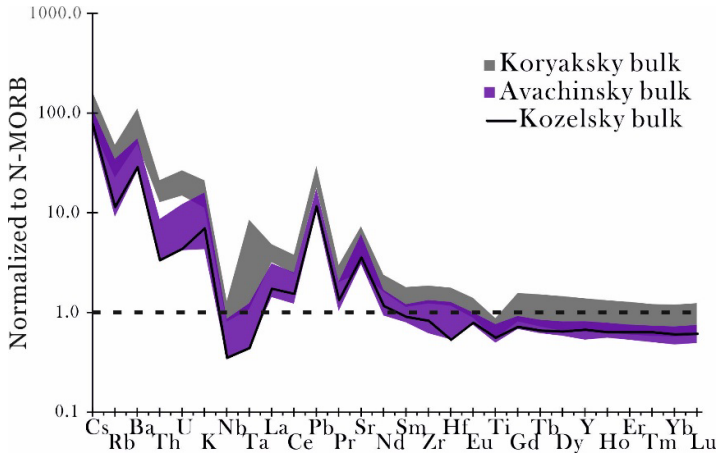

Fig. 1. Incompatible trace elements in Avachinsky (violet), Koryaksky (grey) and Kozelsky (black line) Holocene tephra normalized to N-MORB [6].

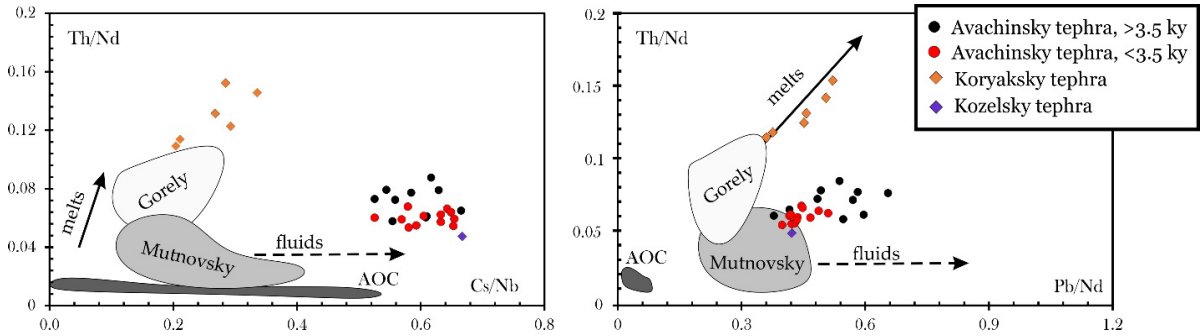

Fig. 2. Incompatible trace element ratios (Cs/Nb and Pb/Nd vs Th/Nd) indicate different conditions for slab components origin and their role in magma compositions produced by Avachinsky volcanic group in Holocene. Fields and trend directions used after [9].

The samples have N-MORB normalized spectra, which are typical for island-arc-type rocks and exhibit depletion in HREE, Nb and Ta and enrichment in LILE, HFSE and LREE (fig. 1). Koryaksky rocks are more enriched in incompatible elements and have different trace element ratios: lower ratios of more fluid-mobile elements over less fluid-mobile elements (Cs/Nb, Pb/Nd, Ba/Nb); lower Zr/Hf, and higher Th/Nd (fig. 2). Minor trace element difference (e.g., Th/Nd) also exists between the rocks of the andesitic stage (> 3.5 ky) and the stage of basaltic andesites (<3.5 ky) of Avachinsky volcano [7, 8]. Such a difference in incompatible trace element ratios can imply either different sources (AOC under Avachinsky, sediments

under Koryaksky) of the slab-derived components or different P-T conditions on the slab component origin from the same source in the slab [9, 10]. Our trace element modeling suggests that variations in P-T conditions of slab component origin provide the best explanation for the compositional difference between these neighboring volcanoes. A relatively low-temperature fluid-like component contributed to the origin of a frontal Avachinsky magmas, while a higher-temperature a melt-like component - to Koryaksky volcano just ~ 10 km behind the volcanic front.

This study supported by Russian Science Foundation grant # 16-17-10035.

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