Geophysical Research Abstracts
Vol. 16, EGU2014-3061, 2014
EGU General Assembly 2014

Reduced carbonic fluid and possible nature of high K magmas of Kamchatka.

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High potassium magmatism in Kamchatka is usually interpreted as reflection of the small degree mantle melting in back arc environment. Strong eruption of Tolbachik volcano located in typical subduction magmatism setting and lasted for several months in 2012-2013 argues against such interpretation. Erupted basaltic magmas contain up to 2.5-3.5 wt.% of K_2O. They bear all attributes of high-K magmas such as high Ba (600 ppm) and Zr (250 ppm) contents [Volynets et al., 2013]. Moreover recent [Ponamareva et al., 2013] estimates of the volume of the compositionally similar early Holocene pyroclastics from located nearby Plosky volcano give significant value of ca 10 km^3. Syneruptive probing of the fluid on Tolbachik [Zelensky, in preparation] yields high CO_2 and SO_2content and reveals micro-inclusions of elemental carbon and native alloys of Ni-Fe, Pt and Pt-Ag. These observations stay for the intrinsic reduced carbon-bearing nature of this fluid.

We suggest that nature of the fluid plays decisive role in the potassium magma specialization. New experimental data on the melting with reduced carbon bearing fluid supports this suggestion. Experiments have been performed in IHPV at P=2-5 kbar and T=900-1000^{o}C. Initial content of CO in the dry CO_2-CO mixture was about 14 wt.%, maximum final water content of H_2O in the final fluid was about 13 wt.%. At dehydration melting through CO_2-CO fluid transport of the spilitized basaltic andesite we get melt with up to 330 ppm of ZrO_2 and 9 wt.% of K_2O (source rock contains only 1 wt.% K_2O). With oxidized carbonic fluid normal sodium bearing melt was produced.

Carbon enrichment of the mantle fluid can be explained as follows. Current geodynamic regime and volcanism in Kamchatka are affected by geologically recent accretion of Kronotsky paleoarc approximately 5 Myrs ago (northern part). In the new geodynamic model [Simakin, 2013] at the certain rheologic parameters accreted terrains are overstepped by subduction zone with temporary inversion of the subduction direction. At such regime large blocks of the accreted arc are pushed under the mantle edge. Krontsky paleoarc was formed at the latitudes close to the equator in Cretaceous time being enriched in organic and silicified carbonates rocks. Large masses of such rocks may ascend in the form of the sedimentary plumes or dykes in the mantle wedge and provide source for the reduced carbonic fluids at certain depth. By the slow circulation in the mantle wedge carbonatized zones would shift trench-ward with time and now reach position of CKD under Tolbachik volcano.

Literature.

Ponamareva V., Portnyagin M. et al., 2013. Geol Rundsch 102:1673–1699.

Simakin A.G. 2013. Terra Nova. Published online.

Volynets A.O., Melnikov D.V., Yakushev A.I. 2013. Proceedings of RAS, v.452, p.303-307 (in Russian).