Geophysical Research Abstracts
Vol. 16, EGU2014-1878, 2014
EGU General Assembly 2014

Two major types of transitional chambers of magmatic systems: Evidence from the Paleoproterozoic large igneous provinces from the eastern Fennoscandian Shield

Evgenii Sharkov, Alexey Chistyakov, and Maria Bogina

Institute of Geology of Ore Deposits, Petrograpgy, Mineralogy and Geochemistry RAS, Petrology, Moscow, Russian Federation (sharkov@igem.ru, +7-495-951 1587)

During ascent to the surface, mantle-derived melts usually passed through a system of transitional magma chambers. One of best areas to study the structure of such systems occurred is the Precambrian shields which have undergone intense tectonic reworking and uneven erosion. As a result, the different parts of these systems became available for study by geological and petrological methods, which can help to reveal definite mechanisms for transformation of primary mantle-derived magmas. It is obviously that we can see such parts of different magmatic systems because lava plateaus above definiteconcrete deep-seated intrusion were annihilated by erosion and, usually we can judge about them only from geological, petrological and geochemical data. However, these pieces of data may compose a puzzle and a general picture will emerge.

Of particular importance is the study of transitional magma chambers where such melts accumulated and experienced crystallization differentiation, mixing, and crustal contamination. The deepest of such solidified magma chambers survived as large layered mafic-ultramafic intrusions. We studied two examples of such intrusions from different Paleoproterozic large igneous provinces (LIPs) in the eastern Fennoscandian Shield (Sharkov, Bogina, 2006). The comparison of REE distribution in the lava series of the plateaus of these LIPs and cumulates in the layered intrusions allowed us to identify the two types of such intrusions. One of them was solidified practically without removal of evolved melts from solidified intrusive chamber and under conditions of limited replenishment of fresh magma portions. This type may be exemplified by the Monchegorsky layered mafic-ulramafic pluton (2.5 Ga) in the Kola Peninsula which belongs to the early Paleoproterozoic LIP of the siliceous high-Mg series.

The second type of the layered intrusions represents transitional magma chamber sensu stricto, which was periodically replenished with new portions of magmas arrived from below and underwent by crystallization differentiation; evolved melts periodically left this chamber and began own life on their way to the surface. These portions of melts are depleted in components, which remained in crust as cumulates, and become enriched in components that stayed in the melt. Example of such chamber is represented by titaniferous carbonatite-bearing Elet'ozero ultramafic-mafic-alkaline massif ($\sim$2.04 Ga) in Northern Karelia. This massif was derived from moderate-alkaline Fe-Ti basaltic melt and belongs to the mid-Paleoproterozoic LIP.

So, we suggest that large layered intrusions represent solidified transitional chambers of magmatic systems where original mantle-derived melts were accumulated, subjected to crystallization differentiation, mixing with evolved magmas, and contaminated by wall-rocks. Melts equilibrium with cumulates that remained in the crust became enriched or depleted in some essential components. These melts, when left such chambers, couldbe accumulated in new transitional chambers on their further way to the surface. As a result, the lava plateaus of LIPs are formed by irregular mixture of flows of variably differentiated melts, which arrived from different depths, whereas primary mantle-derived melts are very rare or missing.