Evolution of deep crustal roots of the Arkhangelsk Diamondiferous Province: Evidences from crustal xenoliths and xenocrysts from Devonian kimberlite pipes

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Juvenile continental crust of the Arkhangelsk diamondiferous province (ADP) crystalline basement consists of ca 2.0 Ga calc-alkaline granodiorites, gabbros, metasediments with minor 1.9-1.7 Ga granites. This crust was formed during evolution of the large Lapland-Kola-Dvina orogenic belt [1]. Investigations of crustal xenoliths and zircon xenocrysts from the Devonian kimberlites allow us to recognize several stages in evolution of deep crustal roots of the ADP.

The 2.0 Ga lower-crustal (8-16 kbar) xenoliths of calc-alkaline mafic and intermediate rocks with T_{DM}(Nd) model ages of 2.0-2.2 Ga possibly represent underplated melts of the subduction stage.

The 1.9-1.7 Ga zircon xenocrysts prevail in a whole zircon population of all kimberlite pipes. The zircons probably grew at collisional and post-collisional stages, because of wide range of geochemical features with distinct high-P garnet-equilibrium population.

The 1.5 Ga zircon xenocrysts occur in all kimberlite pipes and might be captured from deep rapakivi granite plutons that are not recognized on the ADP surface.

The 1.2-1.0 Ga zircon xenocrysts were found in all kimberlite pipes and these zircons might be captured from a lower crust reworked during the Grenville Orogeny event which is not revealed on the ADP surface.

The 0.38 Ga Gar-pyroxenite xenoliths (T_{DM}(Nd) model ages of 0.7-0.8 Ga) are common for the V.Griba pipe and might be regarded as a cumulus of Devonian mantle magmas buried (?) beneath the crust.

[1] Samsonov *et al*. (2009) Doklady Earth Sciences, 226–230.

The influence of fault-fracture network activity on fluid geochemistry and mineral precipitation at the Tolhuaca geothermal system, southern Chile

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The nature of the interplay between active tectonics and fluid flow is a key feature to better understand the chemical evolution of fluids in geothermal and hydrothermal systems.

The objective of our current research is to assess the nature of the interplay between brittle deformation and chemical evolution of fluids and mineral paragenesis in the geothermal field of Tolhuaca in the Southern Andes volcanic zone. Tol-1 is a vertical 1.080 m deep borehole which could yield relevant information regarding the evolution of the Tolhuaca geothermal system. The methodology includes the structural and geochemical analysis of oriented faults, fault-veins and veins in the core. Fluid inclusions analysis by microthermometry, LA-ICP-MS and Raman spectroscopy will allow a better understanding of the feedback between the fluid flow episodes and the mineralization. More than 120 structural measurements were performed and 47 samples were taken for thin & fluid inclusions sections.

Our preliminary results show that there is a strong correlation between abundance of structures and rock type. Lava intervals exhibit more intense fracturing and veining than tuff and volcaniclastic intervals. In the upper 300 m of the core, structures are primarily steeply dipping with a dominant normal sense of displacement (some dextral component). Below a cataclastic zone at 300 m, structures are more variable in dip and sense of motion, with some reverse faults. Fluid inclusions petrography reveals the periodically feedback between fault-fractures networks activation and mineral mineralization sealing the conduits for fluid flow.

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