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Zircons from mafic dykes as a tool for understanding of composition and structure of continental crust: on the example of Mesozoic olivine dolerite dykes, Schirmacher oasis, Antarctica

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High mechanical and chemical resistance of zircon allows to use its U-Pb isotope system for investigating sedimentary rocks with the aim to reconstruct paleodynamics and paleoclimate, to analyze the sources of sediments (provenance analyses, Fedo et al., 2003). At the same time, high temperature of melting and a wide range of temperatures of zircon crystallization allows to date not only the processes of metamorphic (metasomatic) recrystallization but also crystallization of protoliths for metamorphic rocks by investigation of zoned zircon crystals from metamorphic rocks. Successful appliance of additional information on structure and chemical/isotope composition of zircon (Rubatto, 2002; Hawkesworth & Kemp, 2006; Kelly & Harley, 2005) for interpretation of the obtained age data allow to correlate age estimations with certain geological events in the course of evolution of host rocks and to determine the source of inherited zircons (Whitehouse & Kamber, 2003; Belousova et al., 2006) which is especially important for granitoids with moderate temperatures of crystallization. At the same time, for basic and ultrabasic rocks with silica deficiency and low Zr content it is more possible to expect crystallization of alternative Zr phases – baddeleyite, zirconolite etc. In this case, zircon contained in mafic-ultramafic bodies is captured from the rocks in the course of intrusion of these bodies into the crust. If interaction of basic magma with the captured zircon was short-term (which is characteristic for dyke bodies and small intrusions) then information contained in zircon will reflect mainly the crust features of the region and the mafic bodies themselves could be considered as natural samplers. Efficiency of such sampling for investigation of crust section in-

creases with using young dyke swarms in the regions of old stability but with limited bedrock outcropping.

We have studied a number of samples of Mesozoic olivine dolerite dykes from Schirmacher oasis (Antarctica) which represent the latest stage of magmatic activity in the region (central part of Queen Maud Land). Composition (SiO_2=41-46, MgO=10-14, TiO_2=1.5-2.0, Fe_2O_3=11-16 %) and age (160-178 Ma) of the studied dykes allow to correlate them with a phase of plume magmatism known in this region as Karoo-Maud plume. The investigated seven samples characterize the dyke swarm in the whole region of its distribution (35 km^2). It is necessary to point out, that isotope and geochemical characteristics of dolerites evidence to insignificant contamination of primary melts by crust material ($^{87}Sr/^{86}Sr_i$=0.7045-0.7047, ε_{Nd}=+1$\sim$+2). At the same time, there have been mark the presence of xenoliths of host magmatic and metamorphic rocks in the dyke bodies. Amounts of zircon separated from the samples under study vary from several and dozen grains to some milligrams. Mineralogically studied zircons are characterized by development of rounded (partly molten) prismatic, polyfaceted and isometrical forms. From one hand it evidences to the obvious capturing of zircons from host rocks and from the other hand, it points to polygenetic origin of zircon (magmatic and metamorphic as well). Local U-Pb isotope analysis (SHRIMP II) has allowed to determine some discrete events in geological history of the region: 560-640, 690-770, 970-1010, 1715-1820, $\sim$2500, 2810 m.y. ago. Zircon composition (trace element and REE patterns) allows to mark out with considerable reliability primary magmatic zircons and metamorphic ones and, also, to evaluate (model mixing, Sambridge & Compston, 1994) relative share of different genetic rock types in the structure of the region: 2810 Ma magmatic rocks – 4% of total crustal volume, 2500 Ma mainly metamorphic rocks – 7%, 1770 Ma magmatic rocks – 15%, 990 Ma magmatic rocks – 8%, 770 Ma magmatic and metamorphic rocks – 21%, 610 Ma magmatic and metamorphic rocks – 45%. It is necessary to point out, that together with well known stages of geological history (Pan-African, Grenvillian, early Proterozoic) developed in this region, it was possible for the first time to identify Archaean crustal component, the presence of which had been supposed earlier on the base of Nd isotope composition.

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