



Geochemistry and geochronology aspects of ophiolites in the southern part of the Sakhalin

Antonina Alenicheva and Yurchenko Yuri

A.P. Karpinsky Russian Geological Research Institute (VSEGEI), Department of regional geology and mineral resources of Eastern areas of Russia, St.Peterburg, Russian Federation (antonina_alenicheva@vsegei.ru)

Under the federal project «Geological mapping at 1:1,000,000 scale» magmatic rocks of the Sakhalin south-eastern coast were studied by isotopic and LA-ICPMS methods. Our new geochronological data on mafic-ultramafic complexes in the Tonin-Aniva peninsula indicate, that the U-Pb zircon age of the novikovski metagabbro is 161.1 ± 1.4 Ma, Rb-Sr isochronous age of the vodopadnenski harzburgite (wr, Hbl) is 250 ± 45 Ma, initial ratio of strontium isotopes $87\text{Sr}/86\text{Sr} = 0.706594 \pm 74$. The peridotites is mostly harzburgitic, containing magnesian olivines (70-90%) and orthopyroxene (15-30%). The accessory minerals are represented by a spinel. The ore minerals are chromite. The harzburgites are enriched in chromium and depleted by rare earths ($\Sigma\text{REE} = 0.217\text{-}0.447$ ppm). The harzburgites Nd isotopic composition indicate derivation from a long-depleted mantle source, with positive value $[\text{U}+0510]\text{Nd} = 6.6\text{-}8.1$. Mafic-ultramafic plutonic rocks are represented by lenticular bodies and tectonic plates, which are preserved fragments of ophiolite sequence in the Tonino-Aniva zone. At the base of ophiolite complex there is a complex of tectonic serpentine melange. The Tonino-Aniva accretionary zone consist of large and small blocks and tectonic plates of relatively deep-seated siliceous, limestone and fine-grained terrigenous deposits, olistostromic formations, pillowed basalts, serpentinized dunite-grazburgites and gabbros. Vodopadnenski harzburgite and lertzolite, novikovski metagabbro and oceanic basalts (Sm-Nd age 195-145) Ma mark the old oceanic crust in the subduction zone. Basalts geochemical features (Nb-Ta minimum, high Ba (702 ppm) and the lithologic-stratigraphic analysis of radiolarian associations of silicon plates, as well as the results of modern radiological determinations suggest that the accretion complexes were shaped, as a result of the long-lasting subduction. It developed on the margin of the Asian continent as a convergent interaction with the oceanic plate in the Triassic-Middle Jurassic time. In the north part of the Sakhalin (Schmidt Peninsula) ophiolite occur as nappe complex marking suture zone. There is the ancient ophiolite sutures, that fixes the suprasubduction zone. Schmidt Peninsula zone is composed of harzburgites, dunites, serpentinites, globular lavas of basalts-dismembered components of ophiolites. New geochemical and isotopic data indicate that vodopadnenski harzburgite complex of Tonin-Aniva zone is similar to Levenshtern Triassic-Jurassic dunite-harzburgite complex on the Schmidt Peninsula. On the surface, the subduction zone is expressed by deep faults extending along of Sakhalin. The existence of an ancient subduction zone confirms by the similarity of the deep structure of the northern and southern parts of the Sakhalin. The model geophysical section across Tonin-Aniva zone demonstrates the asthenospheric diapir above the ancient subduction zone, analogic to the Schmidt Peninsula. There is magmatic foci with high temperatures at a depth of 25-30 km.

References

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