

Cenozoic magmatism in the northern flank of the Amur superterrane, Russia

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The Cenozoic magmatism in the northern flank of the Amur superterrane is manifested locally. It was being developed in two stages (report by [1]): 22.6-18.6 Ma ago the moderately andesite basalts and trachybasalts and 7.0-1.1 Ma tephrites were formed. Considering petrochemical features andesite basalts can be compared with the Aptian subduction rocks of the region in question, but they differ from the latter ones by the absence of Ta-Nb min on the diagram showing concentration of rare elements rated by a primitive mantle and high Ti contents. Trachybasalts are high titaniferous (TiO₂ up to 3.88 wt.%) and high calciferous (CaO up to 9.42 wt.%) occurrences. Tephrites contain MgO up to 12.81 wt.%. There are some regularities in the variation of rare elements in the sequence of andesite basalts – trachybasalts – trachytes: high REE concentration at an increase of Eu maximum; a decrease of La/Yb ratio. By Nb/Th-Zr/Nb, Zr/Nb-Y/Nb ratios they are similar to the Hawaiian lavas or OIB composition. But they show (although slight) negative correlation of Sm/Nd-La/Sm ratios [2] suggesting a probable mixing of melts of the different sources. Judging by La/Nb-Ce/Y ratio [3] they were formed due to a melting of the spinel-granite lithosphere mantle. In Nb/La and Ba/La coordinates they are located in the field of volcanic rocks of the mantle origin and La/Ta=10.2-16.6 value suggests their intraplate provenance.

Conclusion

If all the Cenozoic volcanism of the northern flank of the Amur superterrane is related to the development of a rift system, than a regularity of an alkalinity alteration at a formation of continental rifts is broken. [4]. Therefore, it is assumed that those are two magmatic cycles. The first cycle is related with riftogenic processes within the system of the Tanlu faults and the later one is associated with the riftogenic processes of the Baikal-Mongolian region.

[1] Derbeko & Koshkov (2001) Mesozoic and Cenozoic magmatic and metamorphic formations of the Far East. *Khabarovsk: Khabarovskgeologia*, 3-6. [2] Shaw *et al.* (2003) *Petrol.* **44**, 1657-1679. [3] Hoffman (1997) *Nature* **385**, 219-229. [4] Lukanin & Kadik (1982) II All-union Congress of Oceanologists. *Sevastopol*. Issu. 7, 120.

Hydrothermal systems of intraoceanic arcs

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Since 1998, concerted efforts to locate, delineate and characterise seafloor hydrothermal systems has occurred along intraoceanic arcs. These efforts concentrated firstly along the Kermadec arc, followed by surveys along the Mariana arc and southern Tonga arc, with 91 separate volcanic centers (some of which are host to more than one volcano) having been surveyed, representing ~43% of intraoceanic arcs worldwide. Initial studies focused on water column surveys of the hydrothermal plumes, in concert with detailed swath mapping of volcano bathymetry. Four dedicated plume surveys covered the Kermadec arc and part of the Tonga arc, and one along the Mariana arc. Forty three of the 91 (47%) volcanic centers of the combined Kermadec and Mariana inventory are host to active hydrothermal systems. This work showed increasing frequency of venting along the Kermadec arc, from south to north, with a less systematic pattern of frequency along the Mariana arc. Caldera volcanoes appear twice as likely as cones to be hydrothermally active along both arcs. Follow-up manned submersible (2) and AUV (1) cruises along the Kermadec arc, and ROV cruises along the Mariana arc (2) are consistent with the plume studies, showing many of the hydrothermal systems are low temperature, diffuse systems dominated by magmatic volatiles. Only 4 volcanic centers are known to host massive sulfide chimneys, expelling vent fluids up to 300°C. If the frequency of hydrothermal activity found along the Mariana and Kermadec arcs is projected along other intraoceanic arcs, then at least 100 submarine volcanoes might be active on all intraoceanic arcs. Hydrothermal emissions from intraoceanic arc sources equate to ~10% of that from the global mid-ocean ridge.