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Geochemical, petrological and geophysical segmentation of the Mid-Oceanic Ridges and its relationships with geodynamic parameters of the oceanic lithosphere accretion

Northern part of Knipovich ridge geological structure

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Studying of Knipovich ridge structures, including its northwest and western flank, up to Borrey basin, by complex of geologic-geophysical methods during 24 -th expedition of R/V "Academik Nikolaj Strahov" has shown, that basalts composing heights to the west of Knipovich rift valley can characterize initial stage of extention between Greenland and Spitsbergen with formation of diffuse spreading structures. Local basalt volcanism took place in formed multiple-aged rift structures. In the beginning of Miocene basic stretching zone has been localized within a modern rift valley of Knipovich ridge. Thus absence of magmatic material to the north of 77o54' N probably testify about amagmatic stage of the most northern ridge segment. Here thinning of continental crust is not enough for generation and outflow of oceanic basalts. To the south, despite occurrence of volcanic activity signs in the form of volcanic constructions and flows, slopes of a rift valley are substantially composed of Oligocene - Miocene lithificated sedimentary rocks.

Studying of deformations in deposits and taking into account morphological relief features testifies that in Knipovich ridge area extensional deformations (normal faults) prevail, compression results in the form of upthrusts and gentle folds in deposits are seen less often. Both from our point of view are the result of global right-lateral shift movements in an area between Spitsbergen and Greenland, localized in various structures and existing for long time (Low Paleocene rocks are touched by these movements).

Molloy basin located to the north can be considered also as a result of initial stage of extension of crushed Spitsbergen island western continental margin which have not reached stage of generation and outpouring of basaltic melts.

pronounced in near bottom surface conditions and corresponding to low temperature.Modeling Data can be applied to reconstruction of geodynamic conditions favourable for serpentinite hosted Hydrothermal system formation.

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Transoceanic East-West zones with "forearc" properties cross MAR and abyssal plains of Atlantic Ocean

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Observed along Mid Atlantic Ridge (MAR) geological-geophysical data shows the presence of two systems of facts describing the structural aspects, tectonics, geodynamics and petrology of the rocks comprising MAR: the system of ocean crust accretion along MAR axis and the transoceanic superimposed system, crossing MAR and abyssal plains.

The fact system of ocean crust accretion along MAR, which was the object of investigation by L.V.Dmitriev, is presented by following sequence:

- the types of basaltic magmatism, P-T-conditions of mantle substance emerging and magma generation and its relation to geodynamic conditions;
- high degree of correlation between petrological properties of basalts along MAR and geophysical and seismological parameters;
- constituting of a logically undiscrepant reason-consequence system by petrological and geophysical data, joining into united fact chain of petrology and geodynamics of MAR [Dmitriev et al, 1999; Dmitriev et al, 2003; Dmitriev et al, 2006]

This fact system presents integrated and renewed description of the classical processes known at divergent oceanic border.

In 2003 L.V.Dmitriev had initiated the study of MAR geodynamical condition typization by cluster analysis of geological and geophysical data. This analysis was done for all territory of Atlantic Ocean, including abyssal plains and continental slopes (except Scotia and Caribbean seas). The analysis had lead to the substantial detection of seria of east-west transoceanic zones with "**forearc**" properties crossing Atlantic from east to west. "Forearc" character of these zones was defined from combination

of extremal values of absolute maximums of Bouguer anomalies and minimums of Isostatic anomalies, and also was approved by the existence of thrust structures on the north-south seismic sections. It is defined at least 7 zones of this kind between Bouvet and Iceland islands, and two of them are spatially correlated with forearc and subduction zones of Scotia sea and Puerto Riko trench.

In the areas of intersection of these zones with MAR it could be observed the phenomena of convergence of transform faults passive parts, the presence of discontinuity zones in the structure of MAR rifts and formation of short transforms with almost zero offsets and oblique orientation to the MAR axis. By the mentioned observations the second fact system - transoceanic superimposed system, which apparently is not genetically related to the first system. Its existence could be explained only by the modification of current geodynamical model of oceanic evolution and (or) by the considering of an **alternative source of horizontal tectonic forces**.

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Geochemical source for tholeiite magmas enrichment at the Knipovich ridge

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The Knipovich Ridge is the northern extremity of the whole spreading system of the Atlantic Ocean and has been forming at minimal velocities. Abnormal structure of the Norway-Greenland basin's bottom expressed in asymmetry of the ridges' margins, mixed character of magnetic anomalies, mosaic structure of transform zones [Crane et al., 2001] has been caused by general evolution of Norway-Greenland basin. Its development took form of pulses with shifting of spreading axes, the main pulsing event was in Neogene, when the present position of the Knipovich ridge close to the western margin of Spitsbergen island had been fixed. Shifting of the spreading axis of the Knipovich ridge and the successive opening coincides in time (about 20 Ma ago) with magmatic activity at Svalbard archipelago developed, as a rule, in the form of cover basalts.

In Quaternary time, about 1 million years ago, this process caused formation of three volcanoes which are alkaline by magma composition. The spreading activity of the Norway-Greenland basin could stimulate magmatic activity within continental margin of Svalbard archipelago [Crane et al., 2001]. Primary melts of alkaline magmas were formed from enriched,

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