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The sources of magmatic rocks matter of the Arctic Ocean and the Central Atlantic Ocean from isotopic geochemical data

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Magmatic rock (basalts, gabbroid, peridotite and plagiogranite) of Central Arctic Rises of the Arctic Ocean (AO) and the crest zone of Mid-Atlantic Ridge (MAR) (Fig. 1) were studied. Samples of basalt from boreholes drilled in the foot of Mendeleev Rise (AO) correspond to volcanic rocks of islands and ocean floor rises by initial isotope ratios of Neodymium (ε_{Nd}(t) +4.3 to +7.0) and Strontium ($^{87}Sr/^{86}Sr$ 0.70365 to 0.70495). Samples of gabbro-dolerite dredged from the slopes of Mendeleev Rise are grouped in the petrochemical field of low alkalinity, have broad variations of Neodymium isotopic composition (ε_{Nd} – 33.1 to +2.9) and Strontium ($^{87}Sr/^{86}Sr$ 0.7050 to 0.7233) and correspond to the composition of Siberian trapp and other rocks of continental origin (Fig. 2).

Zircons from rocks of AO and MAR are subdivided into two generations: magmatic (0,3-11,5 Ma, MAR and 151-237 Ma, AO) and xenogenic (1250, 1850, and 2500 Ma in AO and MAR) (Fig.3).

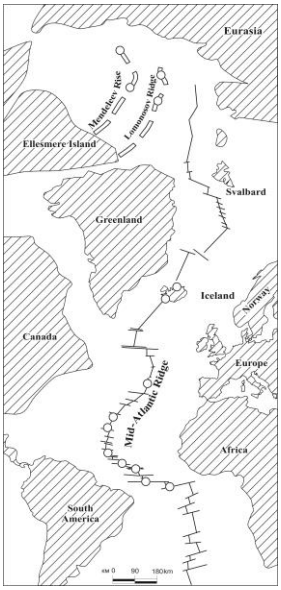

Figure 1: Sampling chart

Magmatic zircons of MAR have high values of $^{176}Hf/^{177}Hf$ = 0.28310-0.28332 and high positive values of εHf (до +21.81), which corresponds to parameters of depleted mantle (Fig. 4). Young magmatic zircons of AO are characterized by decreased values of $^{176}Hf/^{177}Hf$ (0.28214-0.28280) and negative values of εHf (up to −19.49), which corresponds to the parameters of continental crust (Fig.4).

In old zircons (1880 and 2500 Ma), initial ratios of Hf isotopes have close values: in AO rocks, $^{176}Hf/^{177}Hf$ = 0.28130 to 0.28195, and in MAR rocks, $^{176}Hf/^{177}Hf$ = 0.28133 to 0.28196. Values of ε_{Hf}(t) are heterogenic and vary in the range from −13.05 to +13.14, plotting symmetrically along chondrite line (Fig. 4), which suggests a single crustal source of matter for all ancient zircons of AO and MAR and supports the incorporation of the major part of xenogenic zircons from ancient Precambrian bedrock.

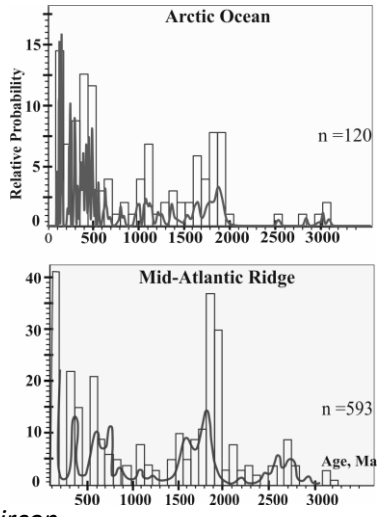

Figure 3: U-Pb histograms of zircon dating

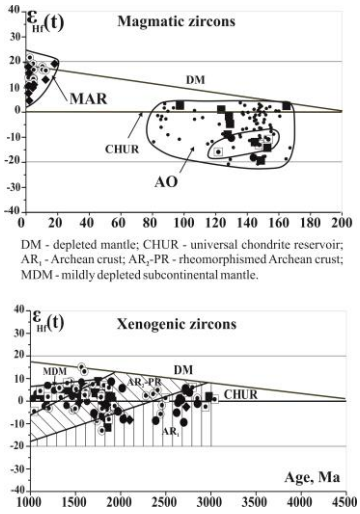

Figure 2: Isotope composition of Nd.

Figure 4: Diagram Hf U-Pb dating of zircons