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Geological Structure and History of the Arctic Ocean

Petrov O.V.[1], Morozov A.F.[2], Shokalsky S.P.[1], Sobolev N.N.[1], Kashubin S.N.[1], Pospelov I.I.[1], Tolmacheva T.Yu.[1], Petrov E.O.[1]

[1]VSEGEI; 74 Spedny pr., St. Petersburg, Russia 199106; vsgdir@vsegei.ru
[2]ROSNEDRA; 4/6, B. Gruzinskaya, Moscow, Russia 125993

The beginning of XXI century was marked by a sharp rise in interest in the geological study of the Arctic. A huge amount of information was obtained by researchers of numerous countries on the geological structure of the deep-water part of the Arctic basin, as well as on its continental shelf and landframing. The main result of this generalization was the creation of the Atlas of geological maps Circumpolar Arctic - an international project under the auspices of CGMW. Geological map of the Arctic (Geological Survey of Canada, 2010), maps of potential fields (Geological Survey of Norway, 2008) have already been published within the framework of this project. The Tectonic Map (country-coordinator Russia) and Metallogenic Map (country-coordinator Norway) of the Arctic are in the final stages of creation.

Tectonic Map of the Circum-Arctic is supplemented by inset maps of the crust thickness as a whole, its sedimentary cover and consolidated crust, map of the crust's types, and map of the basement of the Arctic. The maps reflect the current realms of the oceanic crust - Norwegian-Greenland basin of the North Atlantic, Baffin Bay and Labrador Sea, as well as the Eurasian oceanic basin and, presumably, Canadian basin.

Canadian basin is surrounded by submerged (up to shelf, bathyal and abyssal depths) continental margins - Canadian-Greenland, Barents-Kara, Amerasian (Lomonosov Ridge, Alpha-Mendeleev Rise, Chukchi Borderland). Amerasian margin of the Eurasian oceanic basin (area of the Central Arctic submarine elevations or so-called "continental bridge" between Eurasia and North America continent) is generally regarded as the "Amerasian part" of the Arctic Ocean.

Arctic continental margins are characterized by a stretched continental crust, with thinning, and sometimes disappearing upper crust layer, for example, in the South Barents and Makarov depressions. In the Central Arctic elevations by the results of seismic surveys and rock sampling of the seabed scarps "Hyperborean platform" with Neoarchean-Paleoproterozoic continental crust is supposed. This platform encompasses Polar block of the Lomonosov Ridge, Alpha-Mendeleev Rise, Toll saddle, and possibly, at least, the western part of the Chukchi Borderland. It is possible that the basement of the "Hyperborean platform" of the Laurentian tectonism is represented by gneiss-granite (2.6-2.2 Ga), and the sedimentary cover – the Proterozoic red-colored quartzite-sandstones and dolomites with stromatolites which are unconformably overlapped by the Devonian-Carboniferous-Early Permian limestone with fossils, and terrigenous rock from the Devonian to Jurassic ages. Archean-Paleoproterozoic core of the platform is surrounded by accretion-collision belts of the Timanian and Grenvillian ages. They have been structurally reworked in the next phases of the Caledonian or Ellesmerian tectonic epochs. In the Eastern Arctic and Alaska the foldbelts with the crust of the Neoproterozoic and Middle Paleozoic (Caledonian-Ellesmerian) age underwent some stages of reworking during the Late Jurassic - Early Cretaceous. South Anyui ophiolite suture is the boundary between the mentioned platform and the Late Mesozoic - Cenozoic accretion-collision belts of the continental Pacific framing.

The heterogeneous architecture of the crust of the Arctic Ocean and its continental framing was formed in the Neoproterozoic and Phanerozoic due to the dual development and interaction of three largest paleooceans: Paleo-Asian, Paleo-Atlantic and Paleo-,Meso-Pacific. The current development of the Arctic Ocean is connected with the processes of the Cenozoic linear-axial spreading.