

Cryolithozone of Western Arctic shelf of Russia

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We propose a new original version of the structure of the cryolithozone of west Arctic seas of Russia. In contrast to variants of construction of sections and maps based on thermodynamic modeling, the authors have used electromagnetic, seismic, and thermal data including their own profile measurements by near-field transient electromagnetic technique and seismic profile observations by reflection method.

As a result, we defined the spatial characteristics of cryolithozone and managed to differentiate it to several layers, different both in structure and formation time.

We confirmed once again that the spatial boundary of cryolithozone, type and thickness of permafrost, chilled rocks and thawed ground are primarily determined by tectonic and oceanographic regimes of the Arctic Ocean and adjacent land in different geological epochs.

Permafrost formed on the land in times of cold weather, turn to submarine during flooding and overlap, in the case of the sea transgression, by marine sediments accumulating in the period of warming. We have been able to establish a clear link between the permafrost thickness and the geomorphological structure of the area. This can be explained by the distribution of thermodynamic flows that change the temperature state of previously formed permafrost rocks. Formation in the outer parts of the shelf which took place at ancient conversion stage can be characterized by the structure:

- permafrost table - consists of rocks, where the sea water with a temperature below 0 °C has replaced the melted ice;
- middle horizon - composed of undisturbed rocks, and the rocks chilled through the lower sieving underlay;

As a result of the interpretation and analysis of all the available data, the authors created a map of types of cryolithozone of the Western Arctic shelf of Russia. The following distribution areas are marked on the map:

- single-layer cryolithozone (composed of sediments upper Pleistocene and Holocene);
- monosyllabic relict permafrost;
- two-layer relict permafrost;
- three-layered cryolithozone (composed of Holocene rocks and two-layer relict mainly from permafrost rocks);
- three-layer cryolithozone (composed of Holocene rocks and two-layer relict mainly from chilled rocks);
- post-cryogenic thawed sediments.