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Cryolithic zone and Arctic shelf under conditions of climate changes as exemplified by the Kara Sea basin

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In 2009-2011, a number of interdisciplinary surveys were carried out in the Lower Yenisei River, the Kara Sea shelf. Comprehensive analysis of the environmental state revealed no significant anthropogenic effect on atmosphere and water bodies in the Kara sector of the Arctic.
Morphotype diversity of cysts of chrysophycean algae were for the first time studied in water and bottom sediments in the mixing zone of marine and river waters. A collection was composed from 100 strains of organotrophic psychrotolerant microorganisms with different level of activity. There was recorded a great variety of spore forming microorganisms of the genus Bacillus tolerant to extreme natural conditions. Distribution patterns of organic material were determined in the coastal-shelf zone of the Kara Sea. Shores composed of glacial complex contributed a large amount of organic carbon (2-3%) to the seas. Concentrations of organic carbon and nitrogen in sediments depended on type of sediments and sedimentation conditions. Concentration ratio Corg/Norg and isotopic ratio 13C/12C demonstrated that contribution of terrigenous component to organic matter of sediments decreased towards the open sea. Comprehensive survey of 7 thermokarst lakes (from 66.6º to 72.7º N) showed that these lakes are low-mineralised (30-80 mg/l) with high oxygen content (9-11 mgO/l). Degradation of permafrost for the past 170 years was reconstructed using results of analyses of chemical and biological composition of bottom sediments in thermokarst lakes. Degradation process of permafrost causing the formation of these lakes started in the 1930-60s. Beginning from the 1950s, this process accelerated followed by temperature maxima with the time lag of 5-7 years. These reconstructions of paleogeographic conditions of the past based on studies of thermokarst Arctic lakes appeared to be prospective and require further investigations.
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