

Abstracts

Remote identification of areas of surface gas and gas emissions in the Arctic: Yamal Peninsula

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It is shown that the thermokarst lakes in the Northern Siberia are an active source of methane emissions to the atmosphere. The criteria to identify gas shows and gas emissions in the Arctic by example of Yamal lakes according to data of remote space sensing are developed. Search of surface gas should be based on a number of identified remote features which include: abnormal blue color of water, the craters at the bottom and gas seepage in water, the traces of gas clusters in seasonal ice cover, as well as an active coastal erosion and processes of permafrost heave near shore line. Identified features can be used for detailed mapping of gas in the high latitudes to a high degree of reliability.

Keywords: *the Arctic, Yamal peninsula, remote sensing, satellite photographs, degassing, gas shows, gas emissions, craters.*

Ferromanganese crusts of Mendeleev Swell: the features of composition and formation

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The materials for the study are based on the samples obtained during the Russian expedition «Arktika-2012» by dredging the southern part of the Mendeleev Swell. The material composition of ferromanganese crusts was studied, and their age was determined by the technique of excess ^{230}Th . There are three layers differing in color and thickness in the section of the crusts. Vernadite, ferrosigite, birnessite, goethite and todorokite have been found among the Mn and Fe minerals. Comparison of the average contents of Mn, Ni, and Co samples with cobalt-rich crusts of the Magellan Mountains indicates their depletion of these elements. At the same time, the maximum content of Co and Ni in the upper crusts is comparable to their content in the crusts of the Atlantic and Indian Oceans. The crusts of the Mendeleev Swell are characterized by a high content of Sc, As, Li, Th and V. Crusts composition is characterized by several major phases: manganese oxides, hydroxides ferrous and non-metallic clay and clastic minerals. Content of identified phases varies from layer to layer. Two main factors dominated in forming crust: deposition of ferromanganese bulk from the water column (with a substantial additional supply of hydrothermal substances in the early stages of their formation) and local impulses of ingress of terrigenous material.

Keywords: *ferromanganese crusts, Mendeleev Swell, ore minerals of manganese and iron, rare metals, rare-earth elements.*

Strategic research priorities of Russia and foreign countries in the Arctic Region

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Support and mechanisms for implementation of research activities in the Arctic are analyzed on the basis of analysis of Arctic strategy of Russia and foreign countries. The conclusion on strategic nature of international cooperation in the Arctic region is made.

Keywords: *the Arctic, development strategy, innovation, research activities, international co-operation.*

On tsunami hazard in the Arctic Region

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Tsunami hazard in the Arctic Region is discussed. The greatest danger of tsunami of seismotectonic origin for the Arctic coast of Russia comes from the earthquakes that occur in the area of underwater Gakkel Ridge. The earthquakes with magnitude $M_w \sim 6.5-7.0$ and frequency of 10-2 year⁻¹ and with magnitude $M_w \sim 7.5$ and frequency of 10-3 year⁻¹ may occur in this area. Using numerical scenario modeling, two of the most powerful earthquakes recorded in the basin of the Arctic Ocean: in the Baffin Bay (1933, $M_w = 7.7$) and in the Laptev Sea (1964, $M_w = 6.7$) where the maximum height of tsunami waves on the coast near the earthquake centre would reach 10 m and 0.3 m, were simulated.

Keywords: *the Arctic, the Arctic Ocean, shelf, tsunami, seismic activity, earthquake, scenario modeling.*

Development of methodological approaches to the assessment of economic losses caused by oil spills in formation of insurance protection of offshore facilities on the shelf

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Modern approaches to the assessment of economic losses caused by environmental violations and current methods for calculating the extent of damage caused by accidents at shelf facilities are analyzed. Methodical courses to determine the environmental damage and costs for elimination of the consequences of oil spills on the shelf are described. The factors that form the insurance coverage of offshore facilities are analyzed. The recommendations to determine liability limits for different types of insurance are made, and a standard program of insurance protection of operating facilities are proposed.

Keywords: *emergency oil spill, continental shelf, the economic losses from environmental violations, spill response, limit of liability, insurance protection program.*

Prospects for inclusion of Leshukonsky and Pinezhsky municipal districts of the Arkhangelsk Region to the Arctic zone of the Russian Federation

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The regional aspects of development of the Russian Arctic by the example of the Arkhangelsk Region are described; justification of expansion of its Arctic territories is given. Characteristics of Leshukonsky and Pinezhsky municipal districts that meet most of the criteria for classifying the areas as the Arctic zone of the Russian Federation are given.

Keywords: *Arctic zone of the Russian Federation, public policy, land areas, the Arkhangelsk Region, Leshukonsky and Pinezhsky municipal districts, socio-economic development, natural and economic systems, resource and industrial complexes, especially protected natural territories.*

Economic aspects of fisheries and sale of the north-east Arctic cod

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Analysis of Arctic cod fishery is performed. The factors of rising prices for cod in the domestic market are shown. The proposals on regulation of foreign economic activity of the fishing industry are substantiated. The recommendations on the financing of sectoral biological science are made.

Keywords: *the Western Arctic, fishing, cod, prices, food security, science, funding.*

Search-oriented geological-genetic model of tin placers of “tectonic terraces” of the Arctic Zone of the Russian Federation

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Tin is referred to a strategic group of metals, so Russia needs to renew its own tin production. Development of alluvial deposits is the most profitable. Russian reserves of alluvial tin are almost entirely concentrated in the eastern sector of the Arctic, more than half of them is in the placers of tectonic terrace zones. Creation of search-oriented model of alluvial deposits of this type will contribute to renewal of tin mining industry in Russia.

Keywords: *Arctic zone, placers, tin, search, model.*

Study of world experience of ice conditions control

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A general description of ice situation control system is given. Classification of trajectories and modes of icebreaker movement contributing to destruction of ice formations to reduce the load on protected facilities is studied. The tools and algorithms for computer simulation of operations to control the ice conditions are analyzed. The regulative documents for calculation of ice loads and organizational measures for ice situation control used in planning of new deposits development on the Arctic shelf are examined. The several areas of development of technology for ice conditions control are proposed.

Keywords: *ice, ice conditions control, method, algorithm, computer simulation, world experience.*

The prospects for development of nuclear-powered icebreaker fleet

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A forecast of development of Russian Arctic territories in easterly direction is given. The prospects of nuclear icebreakers in development of the Arctic shelf are studied, their role and place are defined. The technical characteristics of icebreaker leader and multifunction nuclear icebreaker of offshore type are given.

Keywords: *nuclear icebreaker fleet, nuclear-powered icebreakers, the Arctic transport system, the Northern Sea Route, year-round maintenance of the Northern Sea Route, development of the Arctic shelf, icebreaker leader, multifunctional nuclear icebreaker of offshore type.*

Effect of anthropogenic impact on ecological capacity of the Arctic territories of the Republic of Komi

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The northern territories are characterized by severe climatic conditions, low self-purifying and regenerative capacity of environment and point concentration of hazardous industries. The goal of the study is to assess the acceptable level of anthropogenic impact. An integrated approach using the statistical methods of economic, system-structural regional and microeconomic analysis is applied. A brief description of climatic indicators, landscape conditions, industrial activity and its decentralization in the studied area is given. Particular attention is paid to the analysis of the environmental situation and identification of the areas where it is most unfavorable. The package measures for waste disposal and their use as raw material for energy production.

Keywords: *Arctic territory of the Republic of Komi, industrial activity, environment sustainability, tension of ecological situation, damaged lands, waste recycling.*