

Researches in Cruise 38 of the R/V *Akademik Nikolaj Strakhov* in the Barents Sea

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Abstract—First results of the multidisciplinary expedition onboard the R/V *Akademik Nikolaj Strakhov* in the Barents Sea in August–September 2018 are presented. Hydrophysical sounding has been carried out on 41 stations, sampling of bottom sediments has been done using both grab and gravity corer. As a result of the geophysical investigations, areas with manifestations of current dangerous natural processes are identified. Four seismic bottom stations have been installed in the Pechora Sea.

Keywords: the Barents Sea, bottom sediments, seismic profiling, dangerous natural processes

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In 2018, Cruise 38 of the R/V *Akademik Nikolaj Strakhov* took place. The expedition aimed at carrying out comprehensive geological–geophysical, geochemical, and hydrophysical investigations in the Barents Sea. The researches participating in the cruise were from the Shirshov Institute of Oceanology, Russian Academy of Sciences; Geological Institute, Russian Academy of Sciences; Geological Institute of the Federal Research Kola Scientific Center, Russian Academy of Sciences; and Moscow State University.

The cruise lasted 38 days, with the time frame from August 4 to September 10, 2018, departing and arriving at the port of Kaliningrad. The main part of the works was concentrated in the southeastern part of the Barents Sea (the Pechora Sea) (Fig. 1). The works were carried out at ten sites, as well as en route between them. In total, more than 7500 NM of profiles of geophysical investigations and 45 stations of multidisciplinary investigations were carried out during the cruise, including the core sampling.

The main objectives of the investigations on the shelf of the Barents Sea were studying present-day dangerous natural processes (ice extraction impact, gas shows, and objects related to gas release processes — pockmarks, pingo-like features, etc.); extracting features that are peculiar to the relief structure and sedimentary strata and related to the paleogeography of the region, with the further justification of the most probable scenario of the development of environmental conditions of the western Arctic shelf of the Russian Federation on the background of the continuing climate warming, sea level rise, and growing impact of

anthropogenic factors; and determining the presence, boundaries, and dimensions of underwater permafrost rocks in the investigation area.

The main equipment used for solving problems of seabed mapping included a Reson Seabat 8111 multi-beam echosounder and an EdgeTech 3300 seismic profiler which are comprised in the standard hydro-acoustic equipment installed on the R/V *Akademik Nikolaj Strakhov*. In addition to the shipboard equipment, a high-frequency hydroacoustic complex was used in the cruise. The complex consisted of a WASSP WMB-3250 multibeam echosounder and SES-2000 Standard echosounder-profiler. The transceiver antennas of these devices were mounted on a dropping pivoted rod. Information about the structure of the upper part of the sedimentary strata was taken using the Geont-Shelf seismoacoustic complex with a sparker-type source. The investigations were carried out with a one- and multi-channel seismic streamer comprising 32 channels: two sections of the seismic receiving antenna with 16 channels in each of them. The quantity of work with the one-channel continuous seismic profiling system was about 2200 NM; with the multichannel system, about 200 NM. The hydrophysical investigations on the cruise were carried out on oceanographic stations using an SBE19+ CTD profiler with acquisition of data on temperature, pressure, electric conductivity, turbidity, chlorophyll fluorescence, and dissolved oxygen content in the water layer. In total, works at 41 stations have been performed.

Further, on Cruise 38 of the R/V *Akademik Nikolaj Strakhov*, sampling of bottom sediments was carried

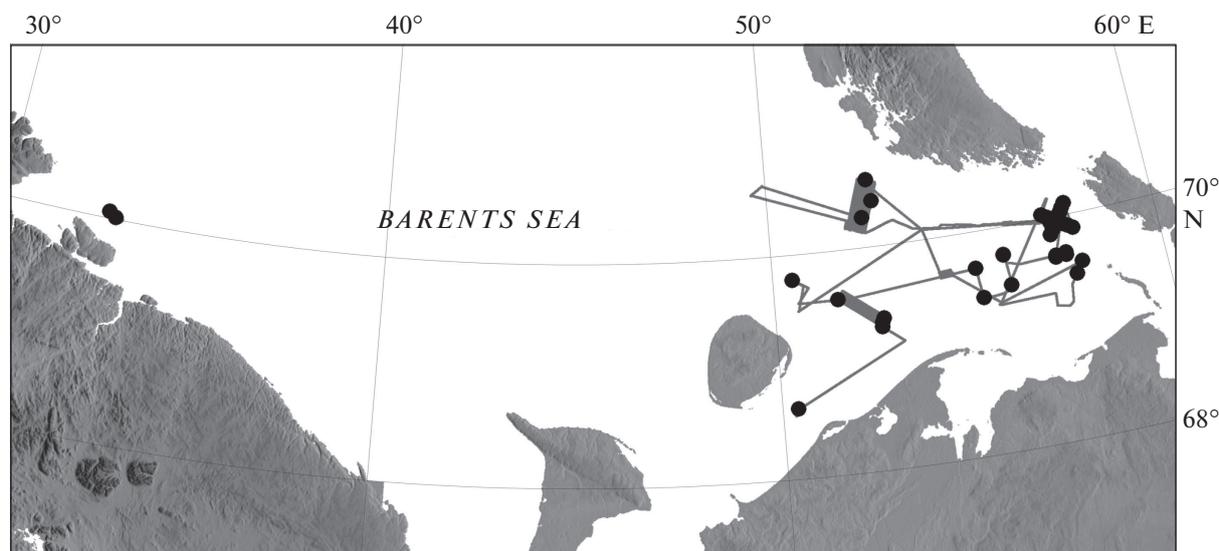


Fig. 1. Diagram of the exploration area of Cruise 38 of the R/V *Akademik Nikolaj Strakhov*. Gray lines show the obtained geophysical profiles; black circles, the multidisciplinary stations.

out using a grab (36 stations) and a gravity core sampler (11 stations). The maximum core length was 401 cm. The selected geological samples were lithologically described and photographed, the temperature and heat conductivity were measured. In the obtained cores, sampling for mineralogical, grain-size, geochemical, and micropaleontological analyses was carried out; 68 kinds of rock fragments were selected from morainic deposits for preparing of slides with the aim of studying the petrographic composition of the coarse-grained material.

To carry out geochemical investigations and, first of all, to determine the content of methane, water samples were taken with the use of bathometers. The methane content was also determined in the obtained geological cores. In total, 142 water samples at 39 stations and 88 sediment core samples at 37 stations were taken and analyzed for the methane content.

On the cruise, four seismic stations were installed. They will be ascended in the campaign of 2019. The chosen location of the seismic stations will make it possible to record and localize microearthquakes on a considerable part of the Pechora Sea shelf.

The performed investigations corroborated the wide occurrence of current dangerous natural processes in the region under consideration. Numerous areas with attributes of anomalous gas saturation of sediments have been revealed, present-day shows of gas to the water thickness have been located, and craters of gas vents (pockmarks) have been found, which indicates the existence of favorable conditions for degassing not so long ago. On the investigation area near the Rybachii Peninsula, several types of ice gouges have been identified. In the eastern part of the Pechora Sea, isometric-shape positive topographic

forms (the so-called pingo-like structures) have been found; apparently, they are relicts of the cryozone.

In the southwestern part of the Pechora Sea, glacial deposits expressed in the bottom relief by separate ridges have been revealed. The presence of moraines indicates the partial existence of glaciation in the Late Valdai glacial epoch, whereas the remaining part of the Pechora Basin was a low-lying dryland with a cryoarid subaerial landscape. The obtained data can be used for solving one of topical fundamental problems of Quaternary geology, geomorphology, and paleogeography, namely, refining the boundaries of the glaciation propagation on the shelf of western Arctic.

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