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THE PRESIDENT OF RUSSIA AWARDED THE PARTICIPANTS OF THE HIGH-LATITUDE EXPEDITION

The President of Russia Vladimir Putin awarded highest national honorary titles to the participants of the High-latitude Arctic Deep-sea Expedition. The participants undertook the first world known bathyscaphe submersion to the bottom of the ocean in the North Pole area in August 2007.

Artur Chilingarov (Hero of the Soviet Union, Corresponding Member of the Russian Academy of Natural Sciences, a deputy of the State Duma, the special representative of the Russian President for the IPY of 2007/08, Head of Association of Polar Explorers of Russia), Anatoliy Sagalevich (Head of Laboratories of P.P.Shirshov Institute of Oceanology, RAS), and Evgeniy Chernyaev (Captain of the submersible craft from P.P.Shirshov Institute of Oceanology, RAS) were named Heroes of the Russian Federation for courage and heroism in extreme climates.

Vladimir Gruzdev, a deputy of the State Duma, was awarded the 3rd class Order of Service to the Fatherland for courage in extreme climates during the High-latitude Arctic Deep-sea Expedition.

Let us recall that during the expedition "Arctic 2007" Russian bathyscaphes "Mir-1" and "Mir-2" reached the North Pole at the bottom of the Arctic Ocean on the 2nd of August. The bathyscaphes stayed at the depth of 4261 and 4302 m almost an hour. It took them more than 8 hours to rise to the surface. A titanic national flag of the Russian Federation was mounted at the bottom of the Ocean, and the soil samples were collected.

According to http://www.edinros.ru, the official website of the major political party of Russia "Edinaya Rossiya" ("United Russia")

THE 7TH MEETING OF THE STEERING COMMITTEE ON THE PARTICIPATION OF THE RUSSIAN FEDERATION IN THE IPY OF 2007/08

The latest 7th meeting of the Steering Committee on the participation of Russia in the IPY of 2007/08 chaired by A.I.Bedrickiy and A.N.Chilingarov took place in Roshydromet (Hydrometeorology and Environmental Monitoring Agency) on the 4th of December. The Head of the NIAC (National Information Analysis Center) of the IPY 2007/08 and Deputy Director of AANII (Arctic and Antarctic Research Institute) A.I.Danilov reported on the “Accomplishment of the events of the Scientific research program realization concerning the participation of the Russian Federation in managing the International Polar Year of 2007/08 in 2007” and on the plans in 2008. The major goal of the realization plan is handling of Russia’s participation in the events of the IPY of 2007/08 according to the policy of sustainable development of the Arctic zone in Russia, efficient use of the natural resources potential of the Arctic region, and strengthening of the geopolitical presence of Russia on the Antarctic Continent.
87 expeditions and field work projects (53 in the Arctic and 24 in the Antarctic) were organized in 2007 on the basis of coordinated hydro-meteorological and geophysical observations, modern information technologies and equipment to obtain new data on natural phenomena in the polar regions, to evaluate on a large scale and make predictions about the condition of the environment of the Arctic and Antarctic under the global climate change.

Projects on modernization of hydro-meteorological network and increase in observations were implemented. In the events of 2007 76 national and international organizations, including 46 Russian organizations of 8 departments, took part.

Talking about the exploration works it is important to single out extensive marine explorations in the high-latitude Arctic. First of all, it is the expedition “Arctic-2007” on board of the expedition vessel “Akademik Fedorov” (AARI) in the North Pole region. During this expedition, carried out in ice-bound conditions, important research data were collected through the use of unique underwater technologies and the flag of the Russian Federation was mounted at the bottom of the ocean at the North Pole spot.

The opening of the drifting station “North Pole-35” and the research works of the expedition vessels “F.Nansen” (PINRO – Polar Research Institute of Marine Fisheries and Oceanography), “Mstislav Keldysh” (IO RAN – Institute of Oceanology of the Russian Academy of Sciences) and “Victor Buinicky” (MUGMS – Murmansk Department of Hydrometeorology and Monitoring of Environment), “SEVER” (TOF – Pacific Ocean Fleet), “Ivan Petrov” (SUGMS – Central Siberian Department of Hydro-meteorology and Monitoring of Environment) are also among the notable exploration achievements.

The geography of the high-latitude marine explorations covers the Barents Sea, the Kara Sea, the East Siberian Sea, the Chukchee Sea, and the Laptev Sea.

During the observations the extremely warm condition of the marine Arctic was marked to the northeast from the archipelago Severnaya Zemlya. The surface of the Arctic ice cover at the beginning of the fall was 4.2 million km², which is 1.4 million less than in the “record-breaking” 2005.

The results of the expedition “Arctic-2007” on board of the nuclear-powered icebreaker “Rossiya” are of high geopolitical and economic importance. During the expedition new data on the verification of the external frontier of the continental shelf in the Arctic were collected. These data will be included in the package of documents to be presented to the UN Committee for Marine Law by Russia. It is important to note geological and geophysical explorations carried out on board of the expedition vessel ”Akademik Strakhov” (GIN RAN – Geological Institute of the Russian Academy of Sciences).

A considerable complex of explorations and research works was accomplished by the organizations of Roshydromet, MPR (Ministry of Natural Resources), RAN and others on the Svalbard archipelago and its near shore waters.

Measurement of permafrost conditions and its fluctuations were made during 10 overland and near shore expeditions undertaken mainly by efforts of the RAN institutes. Explorations took place in the estuary of the Pechora River, on the Yamal Peninsula, the Yugorsky Peninsula, and the Taimyr Peninsula, on the coasts of the Laptev, Barents, and Kara Seas, in Yakutsk and in Magadan regions. Geological and geophysical works were undertaken by efforts of the organizations within the RAN on the Svalbard archipelago, Novaya Zemlya, the New Siberian Islands, in the Laptev Sea, and also in the regions of Lake Onega and Lake Ladoga.

Ethno-ecological and socio-economic research in the near shore Arctic zone was carried out to evaluate adaptation capacity of the population from the near shore settlements within the natural and man-caused changes. Within the framework of the health evaluation of indigenous people and newcomers advanced methodologies in child and adolescent health monitoring were developed.

Considerable efforts were invested in the development of the permanent network of observations in the Arctic, reestablishment of the number of stations.
and types of hydrometeorological observations, modernization of the technological base and reconstruction of the infrastructure of the polar stations of the Northern, Yakutsky and Chukotsky UGMS (Departments of Hydrometeorology and Monitoring of Environment).

About 200 research and educational projects in accordance with the Scientific Research program of the participation of Russia in the IPY of 2007/08 were undertaken.

Within the framework of the IPY of 2007/08 and during the seasonal exploration works in the Arctic in 2007 Roshydromet accommodated automatic facilities for geomagnetic and meteorological observations at Molodezhnaya station, purchased meteorological, oceanographic and geophysical equipment for drilling and core analysis at Vostok station.

Within the framework of the subprogram “Creating shared network of information on the condition of the World Ocean” of the Federal Target Program “The World Ocean” the corpus of hydrometeorological information on the Polar regions of the Earth was established in 2007. It will accumulate the results of the research projects during the IPY of 2007/08 and provide information to the users on both the national and international levels. The Policy and the Plan on Data Management of the Russian Scientific Research Program of the IPY were devised. Progressive realization of the arrangements of the IPY of 2007/08 was started in the Arkhangelsk, Murmansk and Mahadan Regions, in the Yamalo-Nenets and Nenets national Okrugs, the Sakha Republic (Yakutia), and in other northern regions of our country.

Measures were taken to attract younger academic generation to polar explorations. Academic competitions were arranged in universities (RGGMU – Russian State Hydrometeorological University, RGPU – Herzen State Pedagogical University), as well as student field work projects were carried out (MGU – Lomonosov Moscow State University). Significant international and local scientific conferences on the research issues of the IPY and its recent results took place in Salekhard, Sochi, and Saint Petersburg. The International exhibitions “Neva-2007” in Saint Petersburg and “Ocean-2007” in Moscow covered the participation of Russia in the IPY.

The events of the IPY of 2007/08, and especially the expedition “Arctic-2007” on board of the expedition vessel “Akademik Fedorov”, were well illustrated by mass media.

A lot of scientific and informational publications on the explorations within the IPY of 2007/08 are out of print and more will be printed soon. Ongoing activities and events are reported in the monthly information bulletin “IPY 2007/08 News” (10 issues were out in 2007). On the whole, the IPY programs are being successfully realized and suggest outstanding research results. As for the scientific research program for 2008, the spokesperson noted that some corrections will be made to the plans of its realization, namely considering the schedule of the exploration works in the Arctic.

Altogether there will be 68 expeditions, including 29 marine expeditions and 39 overland expeditions. The plan of the marine exploration works comprises 9 expeditions in the high-latitude Arctic region, 15 expeditions in the Arctic seas and 4 marine expeditions in the Southern Oceans. The major participants of the exploration works are the organizations within Roshydromet, RAN, MPR and foreign NIU (National Research Universities).

Instrumental annual observations of the sea level, aerological and other observations at a number of polar stations as well as acquisition and installation of research and technical equipment will be continued. Resuming and developing the permanent network of observations in the Arctic are planned too. Added to this, 184 research projects and arrangements are going to be carried out by more than 60 organizations of 8 ministries and departments, including some public organizations.

The spokesperson underlined that given the abnormal condition of the Arctic seas in 2007 it is advisable to organize marine vessel expeditions in the key regions of the Arctic basin and the Arctic seas and use long-term automatic equipment installations for observations. This will provide unique information on the major processes and changing features in the waters of the Arctic in 2007–2008.

Deputy Director of IG RAN (Institute of Geography of the Russian Academy of Sciences) A.A. Tishkov reported on “The Results of the International Conference “Russia in the IPY – first results”.

120 researchers from 27 institutes of the RAN, Roshydromet, MPR, Minselhoz (Ministry of Agroculture) and other departments, including a group of specialists from Germany and the USA took part in the conference. 64 oral reports on various issues in the Arctic and...
Antarctic (44 reports on the Arctic and 20 reports on the Antarctic) and 26 poster presentations were made. The conference showed the high level of the exploration works undertaken in 2007 within the framework of the IPY. The heads of the projects and executive coordinators discussed the main problems and results of the recent Russian explorations in the Arctic and Antarctic. The Steering Committee highly appreciated the active involvement of the RAN and Roshydromet in the organization and management of the regular scientific forum¹ and recommended to expand the number of the discussion issues at the conference by attracting the participants from the Arctic regions to report on the results of socio-economic research.

Finally, A.I. Danilov reported on the preparations of the XXXth Session of the international Committee on Antarctic Research (SCAR) in Russia.

In 2008 SCAR will turn 50. The establishment of SCAR during the International Geophysical Year of 1957–1958, which, as a matter of fact, was another IPY, allowed undertaking of the first large scale explorations of the Arctic environment. SCAR coordinates the explorations of the Antarctic, and consequently, plays an important role in the Antarctic Treaty System. The USSR was one of the initiators of the SCAR establishment. Russia remains an active participant of this organization. Our researchers take part in the major SCAR scientific projects and cooperate with its operational bodies. SCAR was among the ones to suggest the arrangement of the IPY of 2007/08.

Since 2004 SCAR has not only been organizing its own sessions, but also open scientific conferences for a broader spectrum of specialists. The first SCAR open conference took place in Bremen (Germany) in July, 2004, the second one took place in Hobart (Australia) in July 2006. in 2004 during the 28th SCAR session Russia suggested that the 30th SCAR anniversary session and the 3rd SCAR open conference should take place in Russia. The 29th SCAR session supported this suggestion.

In connection with the beginning of the explorations works of the IPY of 2007/08 the SCAR administration together with the administration of the International Arctic Research Committee (MANK) proposed to hold the 3rd Open Scientific Conference SCAR-MANK “The prospects of the explorations in the Arctic and Antarctic during the IPY of 2007/08” from the 8th through the 11th of July, 2008 in Saint Petersburg. The conference will center round the results of the programs of the IPY of 2007/08.

Working meetings of the 30th SCAR session will take place on the 4th through the 7th of July, 2008 in Saint Petersburg, while the meetings of the SCAR national delegations on the 14th through the 17th of July, 2008 in Moscow.

Besides, the administration of the Committee of National Antarctic Programs (COMNAP) decided to hold the 19th COMNAP session during the period from the 30th of June to the 4th of July, 2008 in Saint Petersburg. The scientific program of the conference is developed by the International Scientific Committee comprising SCAR, MANK, WMO and ICSU representatives.

The Russian Steering Committee (co-chaired by deputy director of Roshydromet A.V. Frolov and member of the RAN V.M. Kotlyakov), established by Roshydromet, is responsible for the arrangement procedures.

The major events include the Open Scientific Conference, that will presumably accommodate 1400 participants, and also the 30th SCAR session (600–700 participants), not to mention “The IPY Forum” comprising about 100 specialists that will take place at AARI. The Forum organization is coordinated by E.I. Saruhanan (WMO).

Meetings of the SCAR national delegations will take place in the building of the Presidium of the Academy of Sciences in Moscow. The Steering Committee approved of the events and results of 2007, underlining their high scientific value and contribution to the realization of the IPY programs and the success of the joint expeditions supported by various departments with the use of expedition vessels and common observation platforms. The project of the realization of MNKK (Interdepartmental Committee on scientific research coordination) activities during 2008 was approved.

While discussing the reports the Steering Committee stressed the importance of managing the data collected during expeditions, especially the procedures of sharing international findings. The Committee also discussed the possibilities of publishing the information bulletin “IPY News” in English, creating popular scientific documentaries, and establishing the action group involved in the preparation of the special exhibition on the exploration of the Arctic to take place within the framework of the IPY events in 2008 in Russia.

More information on the recent meeting of the Steering Committee can be found at www.ipyrus.aari.ru.

A.I. DANILOV, V.G. DMITRIEV (AARI)

Photo by V.G. DMITRIEV
In 2007, the Institute of the Earth Cryosphere of Siberian Branch of Russian Academy of Science, under scientific supervision of V.P. Melnikov, full member of the Academy, organized and conducted two expeditions themed "Research in evolution of permafrost zones in near-shore marine and shelf regions of Russian Arctic" and "Dynamics of permafrost zones in Russian Arctic under climate change". The expeditions conducted studies of permafrost zones in polar areas on land and sea in European North, the Urals, Western and Eastern Siberia, the Kara Sea and the Laptev Sea.

Seven expeditionary groups were operating in these regions from July to October of 2007. Expeditions were participated by foreign scientists, as well as Russian undergraduate and graduate students, who conducted field research in the Lower Pechora area, the Yugorsky Peninsula in Polar Ural, the Yamal Peninsula – Bovanenkovo deposit field, Marresale Polar Station near Nadym and Urengoy cities in Western Siberia, and also on Taimyr in Eastern Siberia.

Monitoring of characteristics of permafrost zone on land and sea in 2007 allowed to investigate the following issues:

- cryogenic conditions and geologic processes on land and in near-shore marine areas;
- structure, properties and distribution of permafrost and post-cryogenic (melted permafrost) strata in openings and wells;
- climate and paleoclimate changes;
- Arctic terrestrial ecosystems;
- structure and thermal regime of shore and bottom deposits of the Kara Sea, the Barents Sea and the Laptev Sea sediments.

Expeditionary groups on Western Yamal and Western Taimyr. Dynamics of Russian Arctic permafrost was studied at Marresale test site located on the eastern bank of the Baydaratsk Bay of the Kara Sea in 2007, with the research focused on monitoring of continental and underwater permafrost in conditions of changing climate. Marresale is a cape in western part of the Yamal Peninsula, where Russian polar station is established. All expeditions have to take a helicopter flight to the otherwise inaccessible research area. For over 20 years it has been a home for geocryological studies of thermal regime and cryogenic structure of permafrost masses, as well as hydrological, climatic and geocryological factors causing coastal retreat of the Baydaratsk Bay. Acute discussion is provoked by issue of the origins of locally found large layered ice deposits. Their formation accounts for distribution of large permafrost sheets exposing engineering construction to risks such as ground subsidence at thawing and catastrophic consequences of cryogenic slope processes.

Many scientists believe the ice layers to be buried relics of surface and shelf glaciers, whereas geocryologists explain the formation of subsurface ice layers by cryogenic processes, such as penetration of frost through deposit sediments. Finding answers to these questions requires not only determination of the subsurface ice structure, but also clarification of the interaction between ice layers, enclosing rocks and cryogenic formations in overlying strata. Scientists often have to show the best of their acrobatic abilities to sample frozen sediments from coastal openings.

In Western Taimyr, explorations of the Enisey River banks and the Enisei Bay banks from Dudinka to Dikson were conducted from onboard of M/V Fyodor Nayanov, with the works covering the following topics:

1) geocryological researches of natural landscapes and openings;
2) geobotanical researches estimating the connection between structure/properties of frozen rocks and characteristics of landscapes including vegetation cover and soils.

It was preliminarily established and data obtained, that forest zone and other natural-climatic zones of Western Taimyr have moved northward up to 20 km during the last 30 years. Sopkarga station was made home to another test site to monitor recent formations of permafrost at low-accumulation marine plains, where the structure and properties of main types of frozen strata were studied. It was the first time, when the
Study of the Western Taimyr ice complex –
permafrost fine-dipersed sediments with large ice mines formed as a result of the frost-shattered cracking of the surface in recent years. Photo by E.Slagoda

Ice layers in thermo-cirque of the Penvaya Peschanaya river, 2007. Photo by E.Slagoda
scientists had been able to establish the borders and specific features of sediments in ice complex of the Taimyr Peninsula.

Undergraduate and graduate students studying Arctic natural environments at Moscow and Saint-Petersburg State Universities had their field practice at the station. Undergraduates and graduates used real natural objects to grasp the methods of Arctic landscape studies including exploration of vegetation and soil covers, as well as permafrost strata sections. The students collected factual data for their course and diploma papers, while also attending lectures on formation and evolution of permafrost strata and Western Taimyr landscapes, with natural samples serving as course materials. They took measurements and established dependency of speed and types of coastal retreat on main climatic parameters and their dynamics. Among other things, it was established, that summer shrinking of ice cover on the Kara Sea near the Yugorsky Peninsula makes thermal abrasion ever more responsible for retreat of ice-rich coastal bluffs.

Landscape surveys and satellite images classification were conducted to establish the dependency of coastal retreat rate on structure and spatial variability of landscapes, with thermo-erosion dynamics in climate changing also investigated. It was established that thermo-erosion plays principal part in coastal retreat during snow-abundant winters. As the spring and summer of 2007 were notable for large snow patches developed on the coasts of the Yugorsky Peninsula, and also for expansion of coastal ice-cover on the Kara Sea, active snow-melting and small wave action were enough for development of thermo-erosion.

In 2001–2007, the studies of coastal dynamics of the Yugorsky Peninsula (the southern coast of the Kara Sea) showed, that layered ice in geological sections determines the dominant part of thermodenudation in coastal deterioration. Two coastal types, thermo-erosional and thermodenudational ones, usually distinguished among permafrost coasts, fail to be helpful in dynamics-oriented researches. In short-term dynamics, not only every coastal section may suddenly switch from stability to rapid retreat, but also the dominant retreat process or even a complex of conjoined processes would suddenly alter. During the years of strong wave action, there increases the share of coasts with thermo-abrasive type of deterioration. Mixed type is pronounced, when upper crest retreats because of thermodenudation, whereas the lower crest is deteriorated by thermo-abrasion. In some years, thermo-erosion combined with thermodenudation and nivation may also dominate particular coastal sections.

Of all climatic factors determining the coastal retreat rate, the most influential one is total summer air temperature. Which particular mechanism would dominate in deterioration of a dynamic coast is determined by the following climatic parameters:

Map of denudation competence for landscape complexes near the Baydaratsk Bay, at the Pervaya Peschanaya monitoring site in the Yugorsky Peninsula:


7 – highly competent, 8 – medium competent, 9 – incompetent; 10 – the sea
– wave swash caused by early deterioration of marine ice-sheets and strong onshore winds;
– considerable winter precipitation resulting in formation of numerous snow-patches, which may cause active thermo-erosion and cryogenic landsliding when combined with high spring tides.

Landscape differentiation of the territory is a significant factor influencing thermodenudational processes. The retreat rate of thermodenudational terraces depends on dynamics of various landscape components and their combination, such as slope angle, surface drainage, moss formation and vegetation density. Apart from climatic influences, thermal denudation rates can also vary, as some bench crest approaches a different landscape type of higher thermal denudation competence.

The research groups studied sections and cryogenic formations in thermo-cirque walls, and also probed Pleistocene and contemporary precipitations of various genetic types. From onboard RV Ivan Petrov, they obtained cores and took the temperature of precipitations in the Baydaratsk Bay all along the Yugorsky Peninsula – the Yamal Peninsula profile to reconstruct the structure of shallow-water shelf and diagnose traces of cryogenesis in the bottom sediments of the Kara Sea.

**Research group operating near Pechorskaya Bay.** Geocryological test site on Bolvansky Cape located in the outflow of the Pechora River in the southern section of the Barents Sea became home to extensive research including:

– monitoring the geocryological parameters of permafrost strata and climatic conditions of southern tundra;

– taking measurements of coastal thermo-abrasion.

The survey provided data on thawing depth and temperature of the active layer in R24 zone of CALM II international project (Circumpolar Active Layer Monitoring). The obtained cores provided data on intra-year dynamics of temperature within the permafrost masses. Within the framework of TSP project (Thermal State of Permafrost), several new boreholes were established to monitor the permafrost condition.

The group conducted seismic research of roof structures of permafrost strata in the shallow-water shelf and developed methods for shallow water seismic sounding in near-shore areas.

**Groups operating in Central and Southern Yamal.** Within the framework of Greening of the Arctic and TSP projects, Nadym Station hosted landscape and geocryological research with international participation. The groups measured the depth of active layer thawing, the temperatures of permafrost strata in boreholes, as well as revealed variability of the geosystems and interdependency of vegetation on the depth of seasonal thawing and soil temperatures.

It was the first time, when the studies of aquatic geosystems had been conducted. Local lakes were classified on morphometric parameters such as temperatures at various depths and chemical composition of bottom sediments. Preliminary data were obtained on phitocenotic characteristics of vegetation groups and census of small mammals at monitoring sites, both unaffected and affected by denudation processes.

Measurements of seasonal thawing depths and borehole temperatures showed that the parameters tend to increase along with air temperature. Within the framework of Greening of the Arctic IPY initiative, Vaskiny Dachi Station near Bovanenkovo gas field (Central Yamal) and 147th km of Obskaya–Bovanenkovo railway near Laborovaya settlement (Southern Yamal) hosted internationally participated studies including measurements of the active layer thawing depths on newly established and regular monitoring sites. The survey provided comprehensive data on vegetation characteristics and allowed to compare the data of remote sensing of landscape structures of the Yamal Peninsula with field research data.

**Group operating in Novy Urengoy.** The territory of the Urengoy oil and gas condensate field (OGCF) hosted research within the framework of TSP project including:

– taking temperature measurements of permafrost masses at 8–11 m depth in 15 boreholes at regular testing sites, where 4 monitoring boreholes were equipped with 4-channel loggers, HOBO U12 type, for measuring temperatures at 0, 3, 5 and 10 m depth;

– summarizing data on multiyear variability of permafrost temperatures in typical and atypical landscapes of Urengoy OGCF, showing that the permafrost here has degraded unevenly, depending on landscape conditions.

In 2006–2007, within the framework of TSP project following IPY 2007/08 program, 6 monitoring boreholes located at the testing sites were equipped with 4-channel loggers, HOBO U12 type, to conduct standard temperature measurements at 0, 3, 5 and 10 m depth, with measurements taken at least twice a day.

Variability of average year soil temperatures is rather mild comparing to that of outer environments, such as air temperature variability, so that general geocryological tendencies can be clearly traced without getting blurred by fluctuations. At Urengoy OGCF, the permafrost temperature increased by some 1°C due to natural climate dynamics during 1975–1993. Technogenic factors added another 1.0–2.5°C, but this specific rise is only observed in the immediate surroundings of particular engineering structures. Significantly, the variability of ground temperature varies with each type of landscape (stow level geosystem), with variability range being rather extended. Southern forest-tundra ecotone features
permafrost temperature growth that varies from 0.6 to 2.1 °C. Northern forest-tundra and southern tundra show somewhat lower rise (from –0.1 to 1.6 °C). Regular monitoring in 1994–1997 showed slowdown in temperature growth. Next 5 years’ data confirmed these results, which is suggestive of a switch from warming to cooling cycle.

Even in high-bush tundra, where a lot of snow is accumulated during winter season, and where at the beginning of warming cycle the ground temperatures were approaching 0 °C, permafrost is steadily degrading, so that the permafrost roof can only be observed under 10 m depth. The same process is taking place in forest stows, where even now the permafrost is thawing away.

In mid-1990s, tundra stows and mashes witnessed cooling of permafrost after the warming period, with the most pronounced fall in ground temperatures detected on elevated spots.

Interestingly enough, as a result of temperature shifts, initially different geosystems develop identical ground temperatures: approximately 0 °C for masses of degraded permafrost and 1.0–1.4 °C – for preserved permafrost areas.

The same processes occur in southern tundra landscapes, though at much lower temperatures. All geosystems (stow level) develop slight temperature increase, with various boreholes within tundra zone showing very close and rather low temperature values: 4–5 °C for typical conditions.

During the short period of three years, 2007 inclusive, the common tendency for the north of Western Siberia consists in slight increase of ground temperature comparing to the growth slowdown in 1994–2004. Therefore, the general trend for average year temperature of rock masses has not been yet established. The group conducted various geological and geocryological surveys from onboard RV Ivan Petrov, in the context of combined expedition of AARI and VNIIOceangeologia (Russian Research Institute for Geology and Mineral Resources of the World Ocean). The expedition works included testing of bottom sediments in the Barents, the Kara and the Laptev Seas, temperature measurements, studies of sediment cores and searches of post-cryogenic textures in thawed sediments at maximally 12 m below the sea bottom.

Documenting results, testing geological sections of sea-shore openings and bottom sediment cores in the Kara Sea. In 2008–2009, within the framework of IPY program, it was planned to conduct several international expeditions to the Arctic, covering the Pechora Bay, the Yugorsky and Yamal Peninsulæ, as well as Nadym, Urengoy, Bely Island (Western Siberia), Taimyr (Eastern Siberia) and shallow-water sections of the Barents and Kara Seas. It is also planned to measure various geocryologic parameters at the monitoring sites, conduct studies of cryologic processes, landscapes and quarter sections, as well as carry out borehole core analysis and researches of various cryogenic phenomena. Collaborative expeditions participated by AARI and VNIIOceangeologia would investigate surface, marine and other geology issues.

E.A. SLAGODA (ECI SB RAS)

The state of the Arctic climate systems and the natural environment is influenced by significant anomalous climate forming processes (atmospheric, ice, and oceanological). Over recent years there has been an anomalous increase in the temperature of Atlantic sea waters entering the Arctic Ocean. In certain areas this significantly exceeded the average temperature that had been observed over almost 150 years observation.

In order to evaluate the climatic changes and how the Arctic environment reacts to them it is necessary, to develop future rational recommendations on natural resources management, timely forecasts and warnings or for minimising undesired consequences, to carry out continual integrated sea research. At the same time it is sensible to minimise costs by finding representative observation points near research stations with developed infrastructures.

Data shows that Grenfjord (Western Spitsbergen Island) is a convenient and sufficiently representative region to conduct integrated observations, which can help to assess the scale and effect of climate changes on the natural environment and, as a consequence, on economic activities. The goal of the integrated oceanographic research in Grenfjord, resumed by AARI in 2006 [M.V.Tretyakov et al., 2007], was to resolve the following basic tasks:

– assessment of the possibility of obtaining a representative signal on the variation of the West Spitsbergen Current (WSC) (fig. 1) as an indicator of the variation of heat supply entering the Arctic Ocean, based on analysis of the variation in the flow of Atlantic water into Grenfjord.


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ACTIVITIES IN THE ARCTIC

– study of the variation of oceanographic fields in the region of the Spitsbergen Archipelago as part of environmental systems atmosphere-cryosphere-hydrosphere-biosphere in conditions of the quickly changing Arctic climate;
– assessment of the role played by water masses from the Atlantic in forming the fresh water balance of Grenfjord. Grenfjord is in the western part of the Spitsbergen Archipelago between 77.96 and 78.11° N and 13.95 and 14.32° E. The bay goes from south to north and is about 16.5 km long. Its width varies from 1.8 (at the top part) to 5.4 km at the border with Isfjord. The body of water occupies about 47 square kilometres. The harbour bottom’s relief has a regular u-shaped form with a slope towards the open border. Depth varies from 50 (at the top part) to 170 m at the fjord exit. Several rivers and streams flow into the harbour. The largest rivers at Grenfjord catch basin are Gren, Grenfjord, Breferna, Aldegonda, Brude and Congress. These rivers, in the period of maximum flow, carry into the bay a large amount of debris [I.Yu.Solovyanova, M.V.Tretyakov, 2004]. The total water flow of these rivers can reach 30 meters cubed per second.

Further, are presented the main results from AARII expedition research in 2006–2007 on the condition of water in Grenfjord according to oceanographic, hydrochemical and hydrobiological factors.

In addition, part of this work was carried out in partnership with the Norwegian Polar Institute (NPI) and the University Centre in Svalbard (UNIS) as part of the IPY project “Research into the current state of the climate system of Spitsbergen”.

Sounding of Grenfjord water column was carried out on board the Norwegian research vessels Lance and Haakon-Mosby (fig. 2) and also on a Russian boat using a mini STD sounder.

Temperature and salinity measurements in Grenfjord in summer 2006 and 2007 were carried out at all cross sections. The central points of the cross sections and stations at the top of the harbour form a longitudinal section. The distribution of the stations is shown on fig. 3 and corresponds to the distribution standard network of hydrological stations. This was carried out by the zonal hydrometeorological observatory Barentsburg (ZHMO) in the 1980’s. In the areas where the rivers Aldegonda and Gren flow into the fjord, additional observations were taken of soundings to the bottom as well as soundings of just the upper layer.

In 2007, for the first time in the history of Grenfjord observations, an automatic buoy station ABS-1 was set up in the central area on the traverse of Cape Finneset (point Fin2 on fig. 3). It was first set up between 18–25 June. The STD sounder was fixed at 106 m (depth of the spot 143 m). The measuring resolution was equal to 10 minutes. The second was ABS-2 from 26 July – 7 September 4 with a measuring resolution of 30 minutes from the sounder to a line at 120 m.

In 2006 and 2007 the following hydrochemical observations were carried out in Grenfjord:
– first day analysis of determining temperature, pH, electrical conductivity and dissolved oxygen content;
– sampling of sea water to determine several biogenic elements (concentration of reactive phosphorous, phosphates, silicon, nitrates, nitrites and ammonia);
– sampling of sea water to determine the qualitative and quantitative development indicators of bacterio-, phyto- and zooplankton.

Fig. 1. Map of circulation and maximum water temperature in the Spitsbergen archipelago region [Walczowski W., Pechura J., 2007]
The oceanological surveys of Grenfjord relate to different phases in its hydrological regime and were conducted during the period of maximum as well as during the period of lower river flow. The data obtained by NPI from the ship Lance in 2006 show the thermohaline structure of Grenfjord water at the very beginning of the summer. The results from the period of the AARI expedition illustrate the changing from summer heating phase with maximum effect of river flow to the autumn cooling phase with a decrease in the river flow. At the beginning of autumn 2007 work was also carried out in Grenfjord from the Norwegian research vessel Haakon-Mosby.

Fig. 4 shows the vertical distribution of temperature and salinity during the summers of 2006 and 2007 in the central part of Grenfjord.

Sounding of Grenfjord water column from 30 July – 6 August was conducted during significant river flow, which was caused by the melting of the snow cover and glaciers, and showed that water temperature changed from 1 to 7 °C and salinity from 0 to 34.88 ‰. The minimum temperature and salinity values correspond to the features of river waters coming from catchment basin terrain. When river water enters the bay it fairly quickly mixes with sea water and within only a few metres from the entrance point shows no fresh water properties. Then, up to 100 metres from the river influx point, the distribution of mixed waters takes place in a thin upper layer of about 30 cm thick. It is only at 400–500 metres that the surface layer with uniform temperature and salinity reaches 0.5 metres thick. This is typical for conditions with almost no wind. However, when the wind is stronger the fresh water surface layer intermixes much more actively with the lower layers and forms a typical thermohaline structure (fig. 5). Temperature and salinity distribution during the survey from 30 July – 6 August (fig. 5 a, b) showed the presence in the upper layer of a water mass (SW) with salinity less than 30 ‰, temperature more than 5 °C and 2–3 metres thick in the southern part of the fjord where the river flow is concentrated. In the northern part, at the exit from the fjord, the halocline goes down to 10–15 metres. Relatively colder water with a minimum temperature of 3.25 °C and salinity in the range of 32–34 ‰ is deeper. The main volume of the fjord from 40 metres to the bottom is taken up by slightly warmer intermediate waters (IW) with salinity 34.0–34.7 ‰ [Svendsen et al., 2002]. In the middle, and also the top part of the bay at the very bottom, are separate spots with features of transformed Atlantic waters (TAW).

The survey of 2–4 September took place in conditions of significantly decreased river flow. At the same time, for a few days before and also during the survey there was a weak wind, almost calm weather. The water temperature in the whole Grenfjord body of water, at this time, changed from 2.49 to 5.77 °C and
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Salinity from 28.1 to 35.25 ‰. Surface water with salinity less than 30 ‰ was only observed at one station on the west coast of the harbour below the River Gren influx (station Br1, see fig. 3).

According to the data from the survey of 2–4 September, compared to previous surveys, changes in the vertical temperature distribution had occurred. The relatively cold layer between 15 and 40 metres had disappeared. The surface water temperature had decreased due to a weakening of heat flows from the atmosphere. Its maximum value was 1 °C less than the maximum value for the 22 August survey. However, the temperature of the whole water column had risen on average by 0.2 °C. At the bottom a powerful layer starting from 100 metres contained transformed Atlantic waters (TAW). The transverse section at the exit to the fjord showed the presence of cold intermediary water with salinity of 34.3–34.5 ‰ and a minimum temperature of 2.49 °C at the level of 90 metres on the fjord’s eastern edge. Further expansion of this intrusion in the fjord’s depths was not observed.

Sounding of the water column in Grenfjord in July 2007 showed that intermediate water (IW) took up most volume, with a temperature more than 1 °C and salinity of 34.0–34.7 ‰ (fig. 4). Above the intermediate water was the surface water (SW), which was warmer and less salty due to the active river flow. The border between them at the time of the first survey was on average at about 20 metres. During the second survey (ten days later) the border had gone below 50 metres. At the same time, the structure of the water mass along the whole length of the harbour remained almost constant (fig 5 g, h). The biggest spatial variation in structure was observed at the top 10 metre layer and can be explained exclusively by the irregularity of the river water inflows along the length of the harbour. In the transverse section the inhomogeneity in the structure of the water mass was somewhat greater. By the western coast the border between surface (SW) and intermediate (IW) waters was 20 metres lower than by the eastern coast. Such a feature of spatial inhomogeneity was clearly seen inside the bay but less clear on the bay exit.

At the beginning of September 2007 the temperature of the whole water column increased on average to 4.4 °C, in addition salinity also increased. Surface waters were under the weak influence of the significantly decreased river flow. Intermediate waters (IW) occupied the layer between 60 and 80 metres. Below this was the transformed Atlantic waters (TAW) and from 100 metres to the harbour bottom was the Atlantic water (AW).

Thus, during the summer season there was typically in the whole body of water the presence of variation thermohaline features in the surface water layer, which were under the influence of a varying river flow, with cold water mass changing to warmer. At the same time local waters (LW), typical for the beginning of summer, changed to intermediary (IW) and transformed Atlantic waters (TAW). By the end of summer these waters in the bottom level could be replaced by Atlantic waters (AW).

Comparison with data from the survey carried out by MMBI during the summers of 2001 and 2002, shows an increase in the average temperature of water in the fjord by a minimum of 1 °C [D.V. Moiseev, V.V. Ionov, 2006]. This shows that there is a strengthening of Atlantic waters entering the fjord carried by the WSC.

Spectral analysis of data from ABS-1 and ABS-2 set up for the whole period 26 July – 7 September 2007

Fig. 4. Vertical distribution of temperature and salinity during the summers of 2006 and 2007 in the central part of Grenfjord
The spectral fluctuation of salinity and water density has weakly expressed peaks, close to the daily fluctuation period. Clearer peaks can be seen at the fluctuations 35 and 73 hours (about 3 days). The maximum peak takes place at 147 hours (slightly more than 6 days).

So, at the same time as clearly marked semidiurnal tides in the bottom layer (0.8H), where the ABC sounder was placed, there can also be seen a weak daily variation in the thermohaline properties of the waters. At the same time there was salinity variation from 6 days, which is shown in the reaction of density variation. These fluctuations take place against the background of growing water temperature and salinity values and are related to the influx in Grenfjord of warmer and saltier Atlantic waters. Temperature change lags behind salinity change by 4 days (fig. 6b).

A possible explanation for this phenomenon is the differential effect (double) diffusion as a result of the meandering WSC. In other words the water mass 4 days previously was to a certain degree separated from the homogenous general mass and then continued moving into contact with water masses with other properties. If we take the average current speed at the bottom layer as being 0.1 m/s (according to data from Norwegian ABS in this region) then the part of the water mass flowing into Grenfjord separates from the general flow on the eastern periphery of the WSC.

The oceanographic research carried out over the summers of 2006 and 2007, especially data from ABS-1, showed the presence in Grenfjord water of a clearly expressed signal from the Western Spitsbergen Current which makes it possible to organise the monitoring of the heat supply on the edges of the Arctic Ocean. The results also made it possible to define more precisely the features of the thermohaline structure of water in Grenfjord and the features of hydrochemical and hydrobiological distribution parameters.
In order to identify the climatic components of the variation of the mentioned parameters it is necessary to continue monitoring the state of Grenfjord, above all by using autonomous buoy stations equipped with instruments for measuring the main parameters of the state of the ocean (temperature, salinity, current direction and speed and depth).

S.M.PRYAMIKOV, O.F.GOLOVANOV, M.V.TRETYAKOV (AARI); F.NILSEN (University Centre Svalbard)

LIST OF REFERENCES


Fig. 6. Temperature and salinity changes according to data from ABS-1 and ABS-2 (thick black line – 25 hour average)


On 21st September at 17:00 Moscow time, in the western part of the Laptev Sea the research drifting station Severny Polys (North Pole) 35 (SP-35) at 81° 33’ N 103° 51’ E was opened. The organization by Roshydromet and AARI of aerological observations, after a long break, on the drifting station was a great achievement.

Sounding of the atmosphere in the Central Arctic Basin had taken place regularly from drifting stations between 1954 and 1991. The first aerological observations were carried out in the Central Arctic region on the drifting station SP-2 led by the famous polar explorer M.Somov from 12 April to 19 October 1950. The aerologists P.Zaichikov, V.Kanaki and V.Blagodarev, who were well known at that time, worked on the station.

From 1954 regular temperature-wind radio sounding began on drifting stations between 00:00 and 12:00 GMT. In certain years they were conducted on two drifting stations.

From the beginning of the program radio sounding on drift ice opened a new era in the wide scale use of aerological data in meteorology for guaranteeing the Northern Sea route for aircraft and shipping and also for research of the thermobaric field in the Central Arctic Basin. In 1930 Pavel Molchanov created the first radiosonde which, at that time, fully satisfied all requirements for investigating the free atmosphere.

Atmosphere sounding began at the drifting stations with the use of the P3-049 comb type radiosonde, invented by Pavel Molchanov. On the drifting stations SP-2–SP-6, observation using an optical theodolite was carried out for every radiosonde in order to determine the wind high up. Reliable rawin observations began in November 1955 when a simplified RP-2 radiotheodolite was set up on SP-4, while on SP-9 a stationary version of the Malachite radiotheodolite was set up. From 1960 the radiotheodolite Malachite was used with the radiosonde R3-49. The A-22 Malachite system was introduced in November 1965 (SP-14) and used until SP-31 was closed (27 July 1991).

After such a long break aerological observations on drifting stations were organised once again. This was preceded by two years work by AARI scientists.

In accordance with decree № 107 of 2 August 2004 from Roshydromet “On the preparing and conducting in 2004 of the high latitude Arctic expedition and the organisation of aerological observations on drifting stations” CAO and OAO UPP Vektor (Ekaterinburg) together resolved problems concerning maintenance
Release of a radiosonde at SP-35. Photo E. Grasser (AWI, Potsdam)

support of aerological sounding. The Russian sounding systems currently used on aerological networks did not satisfy the requirements, taking into account the peculiarities and specifics of using aerological systems on drift ice. The necessary design and program modifications of the Russian RLS MAR-A and Vektor-M were for a number of reasons not completed. As a result it was decided to acquire a sounding system from the Finnish company Vaisala, DigiCORA III MW31 and the radiosonde RS-92 with GPS (Global Positioning System). This was how, within the framework of IPY 2007/2008, Russia organised temperature-wind radio sounding on drifting station SP-35.

This system works on the principle that while in flight the RS-92 carries out uninterrupted measurements and transmits information on temperature, humidity of the surrounding air and atmospheric pressure. Unlike Russian systems, the location of the sounding device is fixed by GPS. The station’s equipment includes: on board unit SPS-311 with a telemetry signal processor; VHF radio, VHF antenna RB31, GPS antenna GA31, GC-ground check set, computer and software. The DigiCORA III sounding system uses the VHF frequency 400–406 MHz to transmit telemetric data. The software makes it possible to exactly link the weather measurements to the real location point and to the actual measurement time.

To determine the position of the RS-92 it is necessary to have a minimum of four low altitude satellites, each of which sends a digital broadband signal on 1575 MHz with a pseudo random code on 1023 MHz. If there are less than four satellites then it is impossible to calculate the wind. Therefore, the number of used satellites is zero.

The sounding system DigiCORA III together with the radiosonde RS-92 provides temperature-wind sounding with the following measurement margins of error:
- air temperature ±0.5 °C;
- air humidity ±5 %;
- atmospheric pressure ±1.5 hPa;
- wind speed ±0.2 m/s.

The MW31 software makes it possible to analyse radiosonde data, to archive and transmit observation results. Before the expedition AARII specialists underwent a training course from 28 May to 1 June 2007 at the Vaisala test base. They were familiarised with the DigiCORA III MW31 equipment, acquired for SP-35, and received a certificate permitting them to work with this system. Before leaving for SP-35 the system was checked at the Voeikovo aerological station with a joint release with the Russian radiosonde MP3-3A.

On 21 September 2007 the drifting station SP-35 started work and from 14 October twice daily sounding began at 00:00 and 12:00 UTC. In order to make it easier to get hydrogen to fill the casing the station was provided with an IV-1 electrolysis unit to produce hydrogen (developed by FGUP Hydrometpostavka). However certain problems with the equipment made it impossible to use an environmentally friendly method of obtaining hydrogen so a high pressure gas-generator AVG-45 began to be used at the station.

In order to release the radiosonde in free flight in the atmosphere the station was equipped with plastic casings (made in China) weighing 400 and 500 g and with a guaranteed height of 21–26 km. However the experienced aerologists S. Semyonov and V. Shevtsov managed to increase the average sounding height by 2–3 km. So in winter (from October to December) the average sounding height was 28 km and reached the level of 10 hPa – 20 %. There were no missed observations.

Doubts concerning the tracking satellites (less than four) fortunately were not realised and all temperature sounding data has wind features.

Sounding data for November established that under the Central Arctic Basin a circumpolar anticyclone had formed. The average pressure at sea level was 1019.0 hPa with east-south-east winds, typical winter
temperature distribution in the troposphere and lower stratosphere (temperature fall from height). In the surface layer to 1.5 km there was observed an ice inversion. The data on ozone distribution is of interest, as together with the radiosonde RS-92 AWI ozonesondes were released. However, final results will be available somewhat later.

Winter restructuring of the thermobaric field in the area of SP-35 reflects the monthly average data for November 2007, which is shown in the table. All the sounding temperature-wind data from the Central Arctic basin is currently important and necessary not only for operational meteorological assistance of aviation, shipping and other sectors of the Russian economy, but also for studying the climate in the period of global warming. The value of the information lies in the fact that there is insufficient aerological atmosphere sounding in the Arctic regions as, out of the previously operating 24 aerological stations, only 8 are currently working.

Researchers from the geography department at the Lomonosov Moscow State University, who participated in the expedition "Arctic-2007" carried out comprehensive studies for the project "Effect of Sea Ice on Atmospheric Carbon Dioxide Content", ESIAC) as part of OASIS IPY 2007/2008. The expedition program included:

1) sampling of the atmosphere, ice sea water in the Arctic Ocean and investigation of its gas content.
2) studying the structure, in particular the porosity, of sea ice to assess its gas permeability;
3) studying the crystal morphology of solid atmospheric precipitation and consequent investigation of its isotopic composition;
4) documentation, during the helicopter flights to the island, of the cryogenic rock disintegration processes in the zones of glacial retreat.

As well as the setting up oceanographic stations in the Arctic Ocean sea water, from different depths, and air samples were taken to study the gas content and measure the CO₂ flow in the atmosphere-sea water system. Samples of 1–1.5 litres of water were taken from different depths from the sampler immediately after the closing of the oceanographic station. Gas, extracted from water, for subsequent research in a gas chromatograph was taken in special glass gas samplers. The gas sampler’s entrance and exit holes were joined by a silicone pipe filled with strong brine. The volume of work that could be done on establishing CO₂ content in the atmosphere and in sea water was significantly greater than had been initially planned. The was because AARI had acquired a gas analyser LI 8100 which is intended to determine the intensity of gas flows into the atmosphere from the subsoil.

On each station, five or six water samples were taken from different depths and from surfaces as well as from under the ice cover. Most samples were taken from the upper 100 metres. To simplify comparative analysis, measurements were conducted on a direct-ion finding deck and atmospheric CO₂ content did not exceed 3 ppm during the whole study. The measurement time was 30 minutes in all cases. CO₂ content, pressure and air temperature, humidity and water vapour content were measured every second. The thermometer’s margin of error was 0.1 °C. Accuracy of the other measurements was 1.5 % from the measured value. A recalculation of CO₂ dry concentration was conducted. The information was

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One would like to believe that the tasks and goals of IPY III will be aimed at improving the work of technical reequipping of the Arctic stations network and also at restarting regular aerological sounding at drifting stations.

I.S. KOVCHIN (SPB FIO RAN),
N.N. KAZAKOVA (RAE AARI)
Changes in CO₂ content during gas exchange of air in the gas analyser chamber with sea water samples. (from the right of the graph data on depth of the water samples and temperature)
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disturbances the ice cover becomes an impermeable membrane. When ice covers the water gas accumulation occurs, especially of gases which are more soluble in water than other main atmospheric gases. After dissolution in water these gases are intensively used in chemical and biological processes. Therefore, one of the main factors determining the variation in CO₂ content in the atmosphere and formation of the greenhouse effect is sea ice covers. Their periodic change in size leads to corresponding changes in ocean and atmosphere gas exchange intensity in polar and mid-latitudes.

Existing explanations of the mechanisms for the appearance of salt and gas accumulations in front of crystallisation of frozen water and their occurrence in ice do not take into account the specific characteristics of the structure of water and growth of ice and, being limited to studied processes, do not always agree with each other. The conducted and planned expedition research, as well as physical and mathematical modelling, makes it possible to develop a unified, consistent development mechanism of these processes based on recent theoretical developments and crystal optical study of sea ice.

During the short helicopter stops on the Islands of the Franz-Josef Land and Severnaya Zemlya archipelagos the territory close to the landing spot was studied to document cryogenic processes in glacial recession zones. The surface deposits were mainly of stone, composed of harsh blocks, gravel and sand of igneous (dioritic) rock and rare small and medium sized pebbles of quartz or quartz field sparry composition.

Weak cryogenic erosion at these places is evidence of a the area having been relatively recently freed from glaciers. The products of cryogenic erosion today serve as sources of wind borne material. The photographs show cryogenic destruction of large blocked material into small parts.

One of the typical features of the development of freeze thaw processes, the presence of underground ice and cryogenic surface changes, encourages the phenomenon of polygonal terrain. Rectangular
polygons, which stretch along the coast line have sides of 20–30 metres. Furrows between polygons are up to 3 metres thick and 1.0 to 1.5 m deep.

On some individual sections clay and cryogenic sorted material can be observed. The soil on these sections is saturated with water. On the horizontal surfaces there are clear signs of cryoturbation and heaving, on the slopes facing the sea there are signs of solifluction. The thickness of seasonal thawing is no less than 50–60 cm.

Samples were taken during solid precipitation for isotopic analysis to study the morphology of the crystal deposits.

All studies were carried out in partnership and with the support of AARI researchers and specialists from other organisations participating in the expedition Arctic-2007.

Preliminary analysis of the results from the integrated IPY 2007/2008 research project allows us to draw the following conclusions:

1) In the Arctic basin the subglacial water is up to 50 metres thick with ice concentration of more than 8 point nonsaturated CO₂ even relative to the summer decrease in CO₂ content in the Arctic and SubArctic atmospheres;

2) in the open water with low ice concentration CO₂ content in the water mixing layer is at equilibrium to CO₂ content in the atmosphere.

3) CO₂ content in large parts of deep water layers was higher than equilibrium with CO₂ content in the atmosphere during the measurement period;

4) the most active development of cryogenic processes can be seen in the immediate vicinity of the glacier front, in parts which were recently freed from ice due to degradation of the ice cover. Here one can see cryogenic erosion and sorting of rock material, polygonal surface forms are created and soil heaving occurs.

5) on parts far from the glacier one can see analogous freeze-thaw processes. However, the shape or the terrain is at a deeper development stage.

In 2008 research is planned of the structure and gas permeability of sea ice, sea water sampling, including subglacial from different depths to determine the variation in CO₂ content depending on ice concentration and on sampling depth. This will make it possible to gain vital information for explaining the effect of sea ice in seasonal and variations over many years of carbon dioxide in the atmosphere and the greenhouse effect. To evaluate cryo metamorphosis intensity of rock material and formation of silt in glacial recession zones, the study of the development of cryogenic processes on islands in the Arctic Ocean will become significant.

V.N. GOLUBEV,
P.B. GREBENNIKOV,
G.A. RZHANITSYN

(Lomonosov Moscow State University)
LAKE VOSTOK – SUBGLACIAL LAKE EXPLORATION

Comparable with the largest European Ladoga Lake and concealed under 4 km of ice masses, Lake Vostok is sharply distinguished by its colossal dimensions from the group of over 145 subglacial water basins presently discovered in Antarctica with the help of radio sounding method. Initiation, development and current regime of this unique water basin are closely connected with aspects of geology, climate and glacierization history of the sixth continent.

Geologically, Lake Vostok represents a rift graben formed during Late Jurassic – Early Cretaceous period as an extension to the Lambert Glacier rift system – Amery Ice Shelf and Prydz Bay. Lake Vostok history as a water basin is not yet definitely established. Theoretically, it has been shown that the lake could emerge in rift-depression stage long before glacierization of Antarctic Continent some 30 mln years ago. However, the majority of researchers are inclined to believe, that the lake appeared as a result of the glacier bottom melting while or soon after the ice sheet was formed on its modern scale (some 15 mln years ago). Due to its enormity (60°280 km, water layer up to 1200 m thick), Lake Vostok lies at the center of the subglacial hydrological system of Antarctic Continent, that largely determines the form and dynamics of the Antarctic ice sheet under conditions of global climate shifts.

Biologically, Lake Vostok represents first of all a unique hydroecosystem that has remained virtually isolated from the terrestrial atmosphere and surface biosphere for millions of years. Tectonic nature of the lake and its prolonged isolation imply possibilities of preserving relict life forms and manifesting previously unknown ways of evolutionary adaptation of microorganisms, studies of which would promote our understanding of life development process on the planet. Extreme conditions of a subglacial water basin, such as high pressure, lack of light, specific water gas composition and extremely low biological content, make it an ideal experimental ground for working out methods and technologies for searching the traces of life on ice-covered planets and moons of the Solar System. Evidently, positive results achieved in researching the microbiota of Lake Vostok would subserve ambitious astrobiological projects within the framework of the proposed expeditions to Mars and Europe, the moon of Jupiter.

Exceptional interest taken by the global scientific community in the research of Lake Vostok and other subglacial systems was fixed in SCAR’s decision to establish its own program of research of Subglacial Antarctic Lake Environments (SALE) and recommendations to set top priority on studies of subglacial

Subglacial Lake Vostok is covered by scientific and logistic activities of RAS (the coastline is given according to the data by PMGEE).
environments for III IPY in Antarctic. At present, the only experimental data on the chemical, gas and biological composition of Lake Vostok water can be obtained from the ice cores extracted from borehole 5G at Russian Vostok Station. The ice borehole is located over the deeper southern section of the lake, where ice is refrozen from lake water. In the course of ongoing drilling operations, 130 m of lake ice core was retrieved up to Vostok Station. The uppermost 70 m of the core contain mineral inclusions that provide unique information on geological aspects of the subglacial environment.

In Russia, combined researches of subglacial Lake Vostok are conducted within the framework of special project under Antarctica Subprogram of the World Ocean Federal Targeted Program (FTP). Substantial part of the researches scheduled for 2007–2009 are immediately connected with implementation of the national IPY Scientific Program. The project involves eight research institutions. Their activities are coordinated by AARI of the Federal Hydrometeorological and Environmental Monitoring Service (Rosgidromet) and cover all the most important technological and scientific aspects of Antarctic subglacial lake research indicated by SALE program.

Development of core drilling means and technologies, as well as methods of environmentally safe penetration of subglacial water basins, is the task fulfilled by experts at Saint-Petersburg State Mining Institute (SPGGI) and AARI in their joint activities. Polar Marine Geological Exploration Expedition (PMGRE) acting as a part of Russian Antarctic Expedition (RAE) conducts remote sensing operations to study Lake Vostok using radar profiling and seismic sounding methods.

Studies of mineral inclusions in the benthic sediments trapped in the lake ice are conducted by experts at Russian Research Institute for Geology and Mineral Resources of the World Ocean (VNII Okeangeologia) and Russian Geological Research Institute (VSEGEI), with gas and isotopic analysis of ice cores conducted by experts with AARI. Winogradsky Institute of Microbiology (INMI) and St. Petersburg Institute of Nuclear Physics (PIAF) of RAS conduct biological studies of ice cores using methods of molecular biology and classic microbiology.

French experts with the Laboratory of Glaciology and Geophysics of the Environment (LGGE) in Grenoble also participate in studies of the ice cores. As their specific contribution, they provide certified ultra clean rooms (Class 1000 and 10), that are necessary for pre-biological filtration of melted ice samples, as well as perform residual impurity control and participate in gas and isotopic analysis of ice cores.

The data obtained in the course of field and laboratory research are then generalized and made correlate in the process of mathematical modelling to describe the ice sheet dynamics (conducted by Kazan State University) and the subglacial lake circulation, as well as its gas and isotope regime (AARI). The data are also used for geological modelling of Lake Vostok origins (VNII Okeangeologia, PMGRE).

In recent years, Russian polar explorers of Lake Vostok have achieved certain outstanding results that already gained international recognition and confirmed the leading position of Russian exploration science as to this unique natural phenomenon. First of all, these achievements include:

1) the world’s deepest ice borehole first penetrating Vostok ice layer to provide access to subglacial environment;
2) geophysical database essential for detailed mapping of the lake coastline and bedrock profile, as well as for determining the thickness of water layer and covering ice sheet;
3) innovative methods and procedures preventing contamination of ice samples with ultra-low microbial concentration;
4) detection of DNA signature of thermophilic bacteria (chemolithoautotrophic meso-thermophile inhabiting earth crust fractures under the lake) in Vostok accretion ice;
5) first estimations of the trapped gas composition implying high concentration of oxygen in the lake water;
6) determining the mineral composition and rock age of Central Antarctica bedrock basing on studies of mineral inclusions in Vostok ice core;
7) developing technologies for environmentally safe penetration of Vostok Lake.

The drilling operations in borehole 5G were resumed in December of 2005 after 8 years of interruption, and were then further continued during the seasonal and wintering periods of RAE 52, with the current borehole depth comprising 3666.5 m. About 90 m remains to be drilled till the contact point of glacier with lake water would be reached. Serious problems for deep drilling are caused due to large crystal structure of the ice and relatively high ice temperature closely approaching the melting point. When applying electromechanical ice core drilling devices, these specific features of the monolithic ice cause slowdown of the drilling process and core hoisting difficulties. As a result, drilling productivity is decreased, whereas the potential incident frequency increases. One such incident occurred in January, 2007, causing breakdown of the load-bearing cable and loss of the total drilling assembly at 3658 m deep. Pull-out of the drilling device together with repair and renewal operations took several months of time. After that, ice core drilling was resumed, reaching 3666.5 m of depth, when in October of 2007 another incident occurred, also resulting in breakdown of cable in the bit lock.

The drilling operations are alternated with geophysical surveying of the borehole and express-analysis of physical and structural characteristics of new ice cores. This enables to exercise operative control of the borehole condition and monitor the variations of ice properties on drawing near the contact with the subglacial water. If there is no indication for a shallower depth of the ice-water interface (estimated glacier depth comprises 3760 ± 15 m), the ice coring with KEMS-132 electromechanical drill will be terminated at about 3720 m. Coring of another 40 m of lake ice will be completed with coreless TBPO-132 electrothermal drill system designed and built at SPSMI especially for subglacial lake penetration.

The technology suggested by SPSMI and AARI for the first penetration of Lake Vostok is both simple and efficient in minimizing the contamination risks for such a unique water basin. The technology proposes to extract some sub-ice water from the borehole by establishing negative-pressure difference between the drilling fluid and lake water. The pressure at the hole base is maintained to be about 5–7 atm. less, than that of lake water, which should fill up the lower 50–70 meters of the hole. After the water is frozen in the hole, it will be sampled by recoring to a level of about 15–20 m above the ice-water interface.

In January of 2008, during the seasonal period of RAE 53, borehole 5G drilling allowed for testing of the most important part elements of TBPO-132 thermal drilling system, such as pressure sensors or feed-through connectors of the thermal bit. The function test showed high working capacity of the equipment when operating under high pressure of the borehole liquid. In the seasonal
period of RAE 54 (2008/2009), it is planned to replace the old broken drilling cable with a new one, as well as to widen the lower section of the borehole and pull the faulted drilling assembly out to the surface. In case the drilling is successfully continued during the wintering period of RAE 54, the first penetration into Lake Vostok may take place in the summer-field season of RAE 55 (2009/2010).

What exactly will be gained by studies of lake water refrozen in the hole, comparing to the results already obtained from studies of the lake ice? The concentration of chemical impurities, gases and microorganisms in the lake water exceeds that of the cored ice by several digits. It is accounted for by expulsion of impurities in the process of sluggish accretion of ice onto the glacier bottom. Subsequently, the accreted ice underwent thousands of years of crystallization, forming large size crystal structures with almost ideal crystal lattice. Extreme clearness of the lake ice accreted at the deepest section of the lake, together with highly uncertain values of the distribution coefficients, considerably degrade informational power of the research and complicate the data interpretation.

Crystallization of water in the hole is an eminently faster process. As calculations show, lake water filling up the hole would get refrozen during 1–30 days depending on the distance between the particular section of the water column and the lake surface. The newly formed ice will be of heterogeneous radial beam structure reflecting the removal of heat through the borehole walls, with highest concentration of impurities located along the borehole axis. At that, volume-average characteristics of ice composition would reflect the composition of refrozen lake water.

Processability of subglacial core-frozen water for biological analysis was experimentally demonstrated by the PNPI RAS experts, who participated in studies of the same kind of core pulled up from a borehole in Greenland.

Now therefore, realization of Lake Vostok penetration project would be helpful in answering a number of key questions posed for subglacial environment explorers, first of the issues being the potential for life existence in subglacial lake water.

Subglacial Lake Vostok studies occupy the cutting edge of global science and attract ever more attention of general public both in Russia and abroad. Therefore, apart from solving fundamental issues of Antarctic geology, paleoclimatology, glaciology and biology, the project delivers an important social mission by exercising positive influence on society development, education and youth upbringing, as well as raising prestige of Russian science and Russian state in general.

First penetration of Lake Vostok should be considered as a logical follow-up and transitional, but at the same time bold and scientifically important step in Russian comprehensive exploration of the unique subglacial water basin. New data, that would be obtained in the course of uninterrupted analysis of lake ice, as well as preparing and conducting the lake penetration, would be used for detailed planning of the next steps in Lake Vostok exploration. What we see ahead is the breath-taking prospect of direct measuring of the main physical, chemical and biological characteristics of the lake water, as well as concentrated sampling and studies of lake water and bottom sediments by deep-submergence survey vehicle, run into the lake on a cable through the borehole in the ice.

V.Ya.LIPENKOV (AARI)

Photo by author
The project "Information Support Geophysical Research during IPY" is conducted by World Data Centers (WDC) for Solar-Terrestrial Physics and Solid Earth Physics, at the RAS Geophysical Centre in accordance with the decision of the Council for programs on fundamental research Department of Earth Science RAS No 14 of 21/03/06 and relates to Direction 5 – "Information systems. Data management" the Russian scientific program in IPY 2007/2008 and is part of the international cluster No 409 (Data and Information Service for Distributed Data Management – IPY DIS).

The WDC system was set up during the preparation and carrying out of the International Geophysical Year (IGY) 1957/58 to archive and distribute data obtained from IGY observation programs. Initially two "universal" World Data Centres were set up, WDC A in the USA and WDC B in the USSR. Their tasks included collection, classification, processing, storage and distribution of the results of IGY geophysical observations, and when IGY had finished, the results of regular observatory observations and large international programs concerning Earth sciences. The USA and the USSR took responsibility for supporting their respective WDCs.

The WDC system turned out to be extremely effective and was constantly expanded. Today there are almost 50 specialised WDCs located in Europe, the USA, China, Japan, India and Australia. WDCs guarantee that a wide circle of scientists and research organisations have unhindered access to planetary geophysics data. An important feature of the WDC system is that it provides data to all users free of charge. Payment is only charged for postage and order preparation.

Russian WDCs collect, classify and store data from the following areas:
- solar-terrestrial physics: geomagnetism (variable field component), ionospheric observations, solar activity, cosmic rays;
- solid earth physics: seismology, gravimetry, geomagnetism (constant field component), heat flow, archeo- and paleomagnetism.

In addition, the WDC has accumulated a mass of associated data. Information on data availability can be found at http://www.wdcb.ru. In the 2007/08 IPY program World centres occupy an important position in the creation of systems of knowledge and providing long term data storage on the Earth’s Polar Regions.

The aim and task of the project is to set up on the Russian WDC for solar-terrestrial physics and solid earth physics server a dedicated IPY 2007/08 website. This will provide information on the IPY program, on-line Arctic and Antarctic geophysics data which has accumulated in the WDC to date;
- transmit data from the WDC in traditional formats (tables, publications, analog recordings etc.) digitally;

The subject of research is data obtained from observations, measurements and research at different observatories and stations carried out during expeditions, experiments and other work in the Earth’s Polar Regions, the Arctic and Antarctic.

In 2006 the first version of the 2007/08 IPY website was created:
http://www.wdcb.ru/WDCB/IPY/IPY.ru.html

In 2007 the Russian version was redesigned and an English version set up:
http://www.wdcb.ru/WDCB/IPY/IPY.html

Geomagnetic observation results from drifting stations SP-5-8, 10, 12, 13 were transferred from table to electronic format as well as average hourly and minute values for components of the geomagnetic field at the chain of Russian polar observatories and analogous magnetograms. The catalogue of earthquakes in the Arctic basin from 1965–2001, according to data from the annuals Earthquakes in the USSR and Earthquakes in Northern Eurasia, was transferred into electronic format. The results of ionospheric observations (parameter foF2) at the drifting station SP-6 from 1958–1959 were transferred from table to electronic format. All of the listed data are available on-line on the IPY 2007/08 website.

Four information bulletins have been prepared for publication, containing information about IPY 2007/08 and about data presented on the specially set up WDC website. The latest issue listed the organisations and types of data these organisations intend to obtain during IPY and give them access to the wide scientific community. This information was prepared on the basis of answers to questions listed in Information Bulletin No 3, which asked organisations to send us their agreement on participating in the project and list the types of data which can be available in the WDC. The website has virtual access to geophysical data on the Arctic and Antarctic presented on other websites. On the WDC home page, which has information on the IPY 2007/08 program, there are links to:
- official sites of organisations connected to IPY program work;
- providing virtual access to geophysical data on the Arctic and Antarctic presented on other websites.
- to other websites which have general information on the Arctic and Antarctic and digital data on a number of geophysical subjects.
The website presents the results of geophysical observations in the Arctic and Antarctic in the following categories: geomagnetic, ionospheric, seismological, gravimetric data, measurement results, heat flow and on volcanoes. There is also interesting information on the history of exploration and research of the Arctic and Antarctic.

On the page which deals with access to different types of geomagnetic data obtained for the Arctic region, there is a map of the North Polar Region which shows the location of the Russian geomagnetic observatories and Severn Polus drifting stations.

The website will be updated with data from Arctic and Antarctic observations from the WDC obtained during the IPY program. The website will provide information on newly available data as well as information on how data from new geophysical stations, organised for IPY, and materials and results from specific expeditions and experiments can be obtained. The website will be more accessible and convenient for users. It will have a single system, enabling the user to obtain information on the availability of research results, to select data according to different criteria and to conduct integrated analysis of the data. This will enable scientists, when analysing and generalising IPY 2007/08 program research results, to use more complete and longer time scale observations, including data prior to 2007/08.

The new website will be useful not only for participants of the fundamental research program No 14 Department of Earth Science RAS "The History of the Formation of the Arctic Ocean Basin and the Regime of Modern Natural Processes in the Arctic", but also to all IPY 2007/08 program participants.

E.P. KHARIN, N.A. SERGEEVA, A.G. RODNIKOV, L.P. ZABARINSKAYA, T.A. KRYLOVA, I.P. SHESTOPALOV (GC RAS)
E-mail: kharin@wdcb.ru

Appearance of the home page of the IPY 2007/2008 website created in WDC for STP and SEP
INTERNATIONAL COOPERATION

INTERNATIONAL FORUM ON STUDY AND CONSERVATION OF ARCTIC FAUNA

International Forum on study and conservation of Arctic fauna has been held in August, 8–13, 2007.

Forum objectives:
– summarizing of international collaboration on conservation and use of Arctic fauna;
– exchange of results and experience of research and nature protection activities;
– intensification of integration processes on restoration, protection and use of Arctic biodiversity, conservation of traditional and alternative nature use.

Organizers:
– Administration of the Republic of Sakha (Yakutia) – M.K.Ammosov Yakut State University
– the Yakut Research Centre of the Siberian branch of RAS – the Republic of Sakha (Yakutia) Academy of Sciences.

Organizing committee:
A.I. Stepanov – Deputy Head of Administration of the Republic of Sakha (Yakutia);
A.V. Migalkin – Head of Department for Peoples and Federative Relations of the Republic of Sakha (Yakutia);
V.A. Grigoryev – Minister of Nature Protection of the Republic of Sakha (Yakutia);
A.N. Alekseev – Rector of M.K.Ammosov Yakut State University;
F.P. Pestryakov – Head of Department for Press, Television and Radio Broadcasting of the Republic of Sakha (Yakutia);
M.P. Borisova – Deputy Minister of Finance of the Republic of Sakha (Yakutia);
V.I. Kondratyev – Deputy Minister of Economical Development of the Republic of Sakha (Yakutia);
N.G. Solomonov – Counselor of RAS, corr. member of RAS;
A.A. Alekseev – Docent of M.K.Ammosov Yakut State University, the Russian Federation member of Executive Committee of International Society for Study of Arctic Hoofed Mammals;
N.I. Germogenov – Vice-head of Institute of Cryolithozone Biology of SB RAS, Director of Yakut Coordination Group of the UNEF/GEF Project “Sterkh”;
M.P. Neustroev – Director of Yakut RI of Agriculture of RAAS.

Scientists and experts in the area of nature protection from 14 countries have participated in the Forum.

In frames of the Forum the following events were carried out:
– XII International Scientific Conference on Arctic Hoofed Mammals;
– III International Conference on Migrating Birds of the North Pacific Region.

Programme of XII International Scientific Conference on Arctic Hoofed Mammals

13 presentations were made on Plenary meeting. There were 4 Sections according to the conference Programme:
1. Morphology, ecology and use of hoofed mammals (28 presentations);
2. Feeding stuff and pasture resources (4 presentations);
3. Veterinary, diseases, parasites and biotechnologies (11 presentations);
4. Socio-economic, legal and moral and ethical problems (4 presentations).

According to the Programme 7 sections and 5 round tables were held:

Sections:
1. Fauna and bird population.
2. Bird migrations.
5. Bird diseases and parasites.
6. Ornithological resources.
7. Wetlands, key ornithological territories and special protected habitats of rare cranes of the North-East Asia.

Round tables:
1. Discussion of results implementation of the decision of the Vermont meetings on migrating birds of the Asia-Pacific Region.
INTERNATIONAL COOPERATION

2. Priorities of implementation of the Eastern component of the UNDP and GEF Project “Improvement of a network of conserved wetlands’ having key importance for Asiatic white crane and other migrating near-water birds of Asia”.

3. Problems of integration of research and nature protection bodies’ efforts on conservation and use of migrating birds resources and their habitats in the area.


5. Issues of preparation of the next Conference on migrating birds of the Asia-Pacific Region.

On the final Plenary meeting of the Forum resolutions were adopted in frames of both conferences.

**XII International Scientific Conference on Arctic Hoofed Mammals**

A necessity to adopt the Russian Federation law “On deer breeding” and Programme of deer breeding development was recognized and the following proposals were made:

- to create an All-Russia Coordination Centre for Rational Use of Wild Reindeer Resources under the Administration of the Republic of Sakha (Yakutia);
- to fund the accounting works of wild reindeer populations in Taimyr, the North of Yakutia and Chukotka;
- to strengthen the control measures on animals take out and tighten the responsibility for breaking the hunting rules;
- to carry out geobotanical research on determination of the deer pastures state and their feeding capacity;
- to create a unique information system on wild reindeer and widen bioclimatic researches taking into account global warming impact on ecosystem state.

Forum recommends the Department of Veterinary of Ministry of Agriculture and Ministry of Nature Protection of the Republic of Sakha (Yakutia) to set up an epizootic monitoring of infectious diseases and to develop a system of veterinary-sanitary measures on liquidation of infectious diseases of birds and farm livestock.

**III International Conference on Migrating Birds of the North-Pacific Region**

The following was discussed: results obtained for migrating birds in researches of the Yakutsk, Novosibirsk, Baikal and Kamchatka ornithologists; coordinated actions of Russia, Kazakhstan, Iran and China on improvement of the network of protected wetlands having key importance for Asiatic white crane and other migrating near-water birds in frames of the UNEP/GEF projects, ECORA and others.

Forum recommends:

- to restore the effective protection of Federal wildlife reserves – in areas of Asiatic white crane and other rare and endangered birds habitats in the first place;
- to make a positive conclusion on the use of satellite monitoring technology;
- to find funds to ensure effective execution of protective functions of the Special Protected Areas "Ktalyk", "Kypsky", "Koluma-Chappanda", "Chabda";
- to provide ecological assistance of the new wave of the Yakut territory exploration due to approval of the Republic complex development scheme of productive power, transport and power industry.

Forum considers inadmissible to extirpate various species of birds and destroy wetlands as measures against bird flue.

V.V.MIKHAIOV (St. Petersburg Institute of Informatics and Automatics, RAS),
L.A.KOLPASCHIKOV (RI of Agriculture of the Far North, RAAS)

Photos by M.G.Gavrilo (AARI)
This article continues the account of Finland’s participation in the IPY programmes. In order to complete the International Geophysical Year programme research, Finland in cooperation with Sweden and Switzerland planned to organize a joint scientific research station Kinnevik in Murkisonfjord in the north-west of the Spitsbergen archipelago. The responsibilities that Finland accepted included shipping a party of the equipment for the new station. The task was assigned to the Aranda, a ship belonging to the Finnish Institute of Marine Research.

The Finnish Institute of Marine Research (Merentutkimuslaitos) founded in 1918 is currently one of internationally recognized research centres studying the Baltic Sea. In addition, the Institute conducts research in other regions including the Polar region. The Institute possesses a special vessel geared for conducting oceanographic work. Out of the four vessels which belonged to the Institute throughout its history, three were named Aranda.

The first Aranda, which sailed in the 1930s, was transferred to the Soviet Union in 1945 as a part of post-war reparations. The second Aranda, which features further in this article, was built in 1953 and stated on its first research voyage the following summer. The ship, 46-meter long and 10.5 meter-wide with the displacement of 906 tonnes, was built in the Velmet docks in Finland. She was equipped with three diesel-electric engines. Along with stern propellers the vessel was also equipped with a bow propeller, which allowed for more maneuvering ability. Aranda was geared for ice navigation and could break ice of up to 30 cm thick. Her crew included 28 members in 1957.

Aranda was to depart from Helsinki on June 1, 1957 to start work on the International Geophysical Year programme, but due to the liquid compass breakdown the departure was delayed until 6 a.m. on June 3. On the course to Spitsbergen the crew was to conduct research in marine physics, chemistry, biology and geology.

The programme of the voyage included gravimetric observations. For this purpose a new gravimeter capable of registering even the smallest fluctuations in gravity had been acquired in the USA. Such gravimeters were used mainly in ore and oil reservoir exploration.

On June 8 Aranda approached the Aland Islands. During several days the ship remained in the Gulf of Bothnia conducting hydrological observations, as well as taking plankton samples and coring. Liquid compass repairs were also continued in Marienhamn. On June 16 Aranda left the Alands and on the same day she arrived in Stockholm, where part of the expedition equipment was brought on board. Construction materials for the polar station, tanks with fuel, food supplies, equipment and even a tractor were waiting to be loaded in another Swedish port, Kalmar, where Aranda arrived on June 20.

Having circumnavigated the Scandinavian peninsula, Aranda progressed along the Norwegian coastline and put in at several ports. On June 29 the vessel docked in Vardo, the most remote eastern port in Norway. For this small town where the majority of the population is occupied in the fishing industry the arrival of Aranda was an extraordinary event: she was the first non-fishing vessel to arrive in the port since the end of World War II, and many people gathered to welcome her.

On July 1 Aranda left Vardo at 8 a.m. to continue on her course, and the second stage of the International Geophysical Year research began. It involved research in the eastern parts of the Barents Sea, and observations had to be conducted on a twenty-four hour basis, so that the crew members took part in conducting them alongside with the research team.

On June 6 Aranda replenished the food and fuel supplies in Hammerfest, and then headed for Spitsbergen. On July 11 she circumvented the Bear Island, and on July 13 Aranda arrived in Longyear on the western coast of Spitsbergen, where 17 members of the polar station staff lead by chief Lilkwist boarded the ship. On July 15 Aranda approached the Kinnvik station. Discharging was impeded by a severe wind, so all the equipment for the polar station was discharged by July 17, and the following day the ship set off on the return journey. With practicality so common for those times Aranda put in at Spitsbergen on July 22 to pick up a load of coal to be delivered to Finland.

After a brief port call in Copenhagen the ship docked in Helsinki on August 6.

We used recollections of Ilpo Hahtela, who served as a cabin boy on Aranda at the time of the expedition. Hahtela describes the events and the relationships between crew members with good humour, although
they were far from ideal. According to Haahtela, on the first night of the journey he was awakened by the noise caused by a fight between other sailors. It was also interesting to note that 50 years later the author retained the most vivid memory the port call in Copenhagen: "... people were drinking beer in restaurants and cafes. You could buy alcohol in shops without any problem..." The young man’s surprise is perfectly understandable: he was raised in the times of the famous Finnish prohibition. We, on the other hand, were most surprised by a different piece of reminiscence: the cabin boy had his own private cabin on Aranda!

It has been 50 years since Aranda’s journey to Spitsbergen, but the old ship is still in service: she was renamed Katarina and became a training vessel at the marine college in Kotka. In 1991 the Finnish Institute of Marine Research (www.fimr.fi) acquired a modern ice reinforced vessel which was also named Aranda according to the tradition.

The Sodankyla geophysical observatory continues its operations today, and information regarding its activities can be found on its site www.sgo.fi.

In 1988 Finland opened FINNARP, its own Antarctic programme. Then the Aboa station was opened on Queen Maud Land, and the first wintering there took place in 1989–1990. Aranda takes part in the FINNARP programme, conducting research operations, as well as carrying out transportation missions.


This year, upholding the traditions of an IPY-participation country, Finland initiated the implementation of the IPY Programme 2007–2008, both in the Arctic and in Antarctica. Details on the current Finnish research can be found on www.ipy-finland.fi.

We would like to thank Jan-Erik Bruun and Leena Parkkonen, the Finnish Institute of Marine Research staff members who provided materials for this article.

A. ANDREEV, M. DUKALSKAYA
(Russian State Museum of Arctic and Antarctica)

Dear colleagues!

If you have information about IPY 2007/08 events in your organisations and regions, you can present them here in a bulletin of IPY News 2007/08.

Send texts with photographs and diagrams to 199397, St. Petersburg, 38 Bering Street, AARI, tel./fax: (812)352–2735, e-mail: siac@aari.nw.ru.

Participate in IPYs chronicles.


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