Proceedings of a Workshop on Facilitating U.S. – Russian Environmental Change Research in the Russian Arctic

11-16 June 2005, St. Thomas, U.S. Virgin Islands

Sponsored by the Project Management Office for the Russian-American Initiative for Land-Shelf Environments (RAISE)

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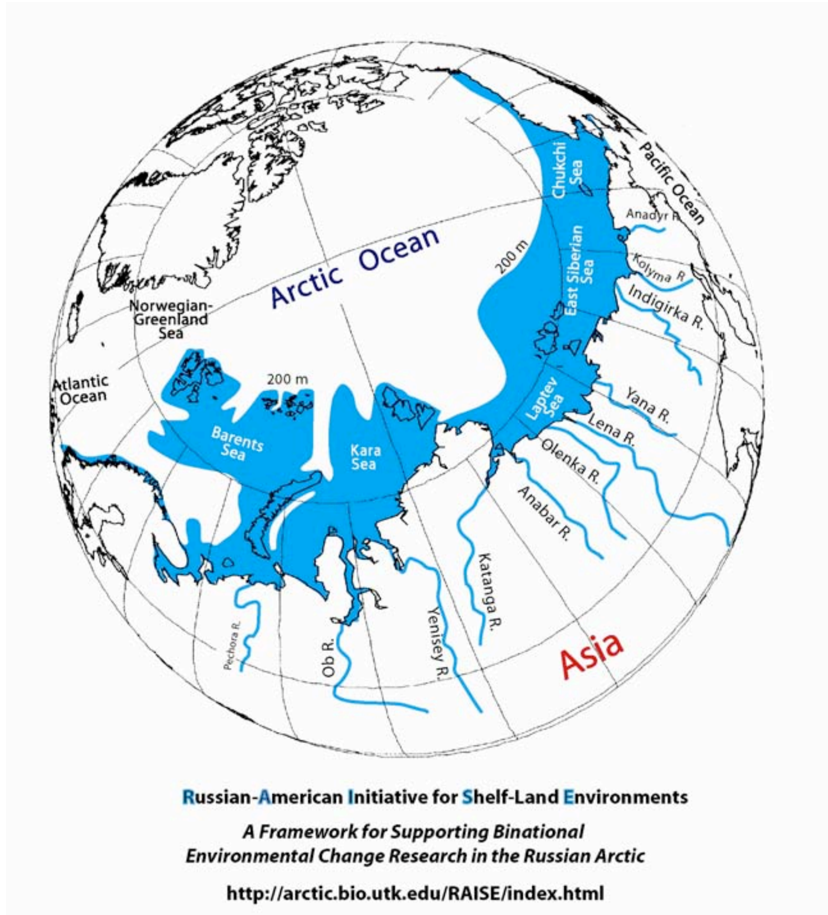

Summary

An international workshop on facilitating U.S. – Russian joint collaborative research in the Russian Arctic was held on the island of St. Thomas, U.S. Virgin Islands, 11-16 June 2005. One goal was to document successful models, mechanisms and methods for promoting joint research of benefit to both countries, with a particular focus on the growing number of research results providing evidence of widespread, systemic environmental change in the Arctic that are likely the result of global climate warming. Specific challenges and hindrances that tend to preclude comprehensive joint studies of the Arctic System by U.S. and Russian scientists working together were also identified. Finally, recommendations were made to improve the capability of scientists to address critical research questions on environmental change in the Arctic that cannot be addressed without a more concerted effort over a broader geographical area. This workshop report represents the overall findings of an expert group of both U.S. and Russian scientists, from Ph.D. candidates to senior scientists, with many cumulative decades of field research experience in the Arctic, including the territories and seas of the Russian Federation. U.S. scientific agency personnel and representatives of the Russian Academy of Sciences also participated and funding support for the workshop was provided through U.S. National Science Foundation to the Russian-American Initiative for Shelf-Land Environments Science Management Office, located at the University of Tennessee. Proceedings of the workshop represent the opinions of the individuals attending the workshop and not those of the National Science Foundation, or any other U.S. or Russian agency or entity.

Why the Arctic?

It is widely recognized that widespread environmental change is underway in the Arctic that results from climate warming, including sea ice retreat, vegetation and biological community changes, thawing permafrost, increasing runoff and drying surface soils. It is also widely understood that these and other changes are likely to have both regional and global consequences for the future functioning of the earth climate system.

Why the Russian Arctic?

Despite the wide degree of public attention that is being provided to arctic climate change through international efforts such as the Arctic Climate Impact Assessment, research investments to observe and assess these changes, and to predict future impacts have not been geographically distributed in an even way. By almost any standard, the Russian Arctic is grossly understudied, and much of our current understanding of the evolving changes in the Arctic System may be in fact unrepresentative because it is based on field data collected outside of Russia. This is significant because by almost any Arctic definition, Russia generally occupies a far larger portion of the Arctic than does any other nation. For example, 60-70% of arctic land area is in Russia, the majority of river discharge to the Arctic Ocean comes from Russia, over 80% of the Arctic's human population lives in Russia, and most of the

Arctic Ocean's expansive shelf is in Russian territory (Fig. 1). Russia's vast boreal forests, peatlands, tundra, and shelf contain an enormous reservoir of stored carbon that represents both a source and sink of greenhouse gases, including carbon dioxide and methane. Thus, from the standpoint of the land or continental shelf surface area, river discharge volume, watershed area, human population size or most other aspects of the Arctic, most of it is found within Russia or its territorial waters. Given this reality, it is difficult to imagine that we could ever attain a comprehensive understanding of the Arctic without extensive research in the Russian Arctic. The importance of the Russian Arctic for assessing environmental changes in the Arctic System was assessed by one of the workshop's working groups, which is provided as a more detailed summary in the following section of the proceedings, "Importance of Russia to Arctic and Global Processes."

Our relatively limited understanding of global change in the Russian Arctic is a consequence of a significant decline in scientific research support following the demise of the Soviet Union, related economic dislocations, as well as the enormous landscape scale of this region, which is poorly connected with global transportation and communication systems. The importance of international research partners to increase knowledge of environmental change and processes in the Russian Arctic has long been recognized, both within and outside Russia. For example, the International Arctic Science Committee, a non-governmental research coordination body now based in Stockholm, has had a long-term working international working group, the International Science Initiative in the Russian Arctic (ISIRA) that share information on challenges and successes of foreign researchers working in the Russian North.

In the United States, as well as in many other countries, there was recognition of the opportunity presented by the end of the Cold War to improve environmental observation capabilities and collaborative research in the Russian Arctic with Russian scientists. The Russian American Initiative for Land-Shelf Environments (RAISE), a project supported by both the U.S. National Science Foundation, and the Russian Foundation for Basic Research, was a direct outgrowth of this opportunity and the bi-national recognition that studies of the Russian Arctic were critical to understanding the Arctic system and its relationship to global climate. The U.S. national investment in arctic research, including infrastructure and logistical support, has grown significantly over the past decade. According to the Interagency Arctic Research Policy Committee, FY 2005 spending by all federal agencies on arctic research is estimated to have reached $352 million. This represents a doubling of federal research support in the decade since FY 1995. Much of this new funding has been targeted through the National Science Foundation (NSF), which has become by far the largest agency supporter of U.S. arctic research.

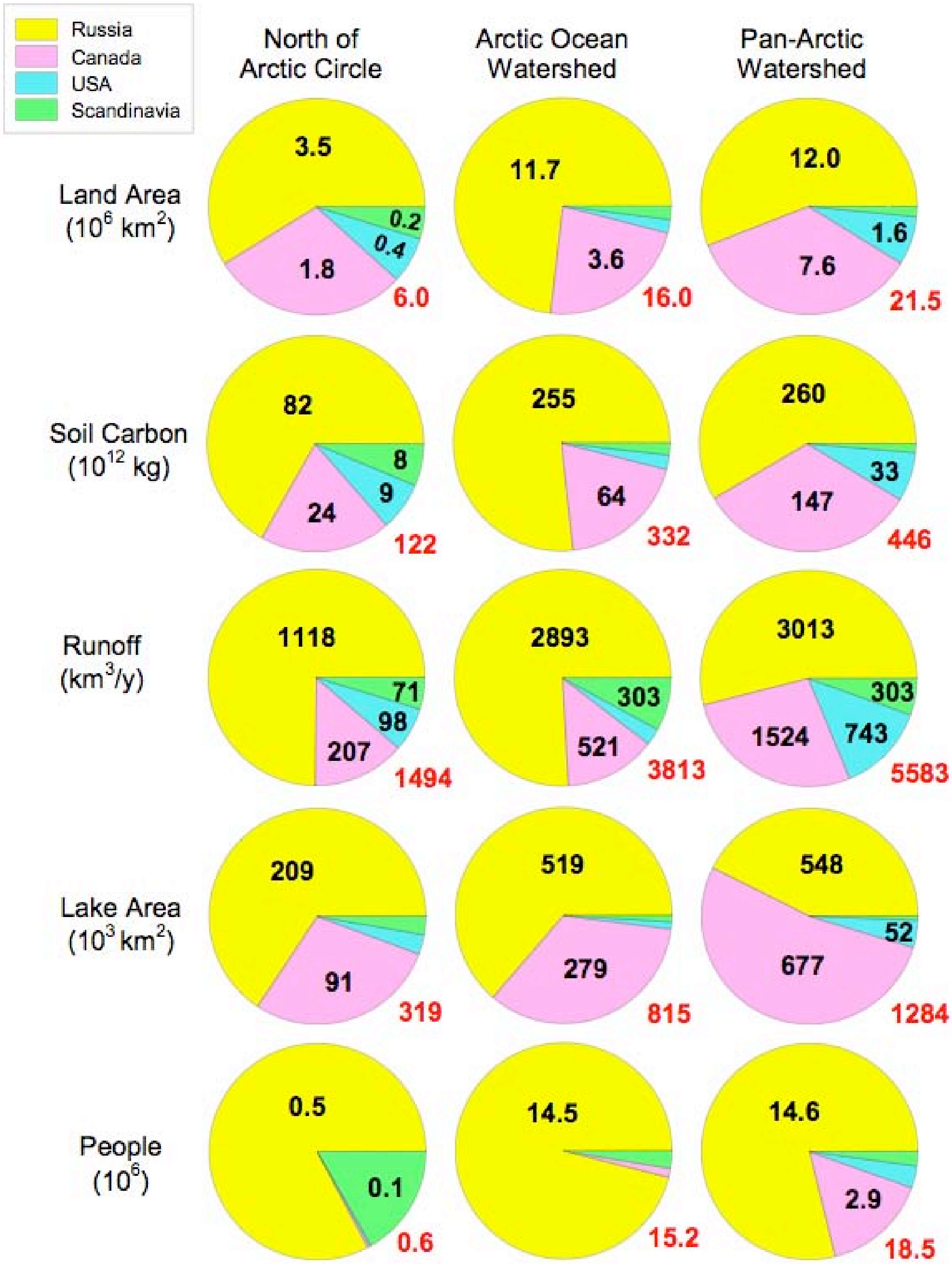

Fig. 1 (courtesy of R.M. Holmes) Russia is the “dominant player” when using diverse measures of high latitude biogeophysical and human systems over several regional expressions of the Arctic. North of the Arctic Circle refers to the region north of 66° 33’ N, the Arctic Ocean Watershed represents the land area whose river systems feed directly into the Arctic Ocean, and the Pan-Arctic Watershed is a larger hydrologically defined region including all of the Arctic Ocean Watershed, most of Alaska, Hudson Bay and James Bay, the Canadian Arctic Archipelago, Ungava Bay, Greenland, Iceland, and the Norwegian Sea coastline of Norway.

Despite its significance, global change research in the vast portion of the Arctic occupied by the Russian Federation and its territorial seas has received surprisingly little attention from U.S. researchers. Analysis of the NSF award database (http://www.fastlane.nsf.gov) indicates that since the end of the Soviet era in 1992, total annual funding for new projects with significant research fieldwork or collaborations in the Russian Arctic has never exceeded $4 million (Fig. 2a), representing at most a small fraction of NSF's annual arctic research expenditures. The actual number of U.S. awards made by NSF also appears to be declining (Fig. 2b), and Russian support of its own research programs remain very low (Dezhina and Graham, 2005) and is insufficient to meet global needs for understanding environmental change at high latitudes.

Importance of Russia to Arctic and Global Processes

Contributors: Ken Dunton, Max Holmes, Richard Lammers, Igor Melnikov, Andrey Proshutinsky, Nicolai Romanovskiy, Igor Semiletov. Laurence Smith

Overview

A comprehensive knowledge of the physical and biogeochemical processes is critical to our understanding of the arctic ecosystem. Over 60 to 80% of the Arctic lies within Russia, a majority of the freshwater input to the Arctic Ocean originates from Russian watersheds, and over 80% of the panarctic population resides in Russia. Its vast boreal forests and peatlands represent an enormous reservoir of stored carbon that represents both a source and sink of greenhouse gases, including methane and carbon dioxide, and with important consequences for changes in albedo. Coincident with the massive contribution of carbon from terrestrial sources, a large reservoir of organic-C is stored on Russian arctic shelves. The widest and shallowest shelf in the Arctic Ocean lies between the East-Siberian and Laptev Seas, making this area and important focus in the calculation of global carbon budgets. Uncertainty with respect to the contribution of rivers and coastal erosion along the nearshore zone of the Russian arctic makes this region a key priority for future research on climatology and biogeochemical cycling. Finally, the linkage between circulation and the advection of reduced carbon that fuels biological processes, particularly on the shelf, is critical to secondary production that supports the indigenous human populations across the circumpolar arctic.

Rivers

The Arctic Ocean is the recipient of three of the world's 10 largest drainage basins. These massive river systems, the Ob, Yenisey, and Lena, along with the Severnaya-Dvina, Pechora, and Kolyma transfer some 1800 km^3 of freshwater each year from the Eurasian continent to the northern seas. By area the 11.7 million km^2 of Russia's portion of the Arctic Ocean land surface drainage represents a significant 65% of the land area, which contributes more than 60% of the riverine freshwater to the Arctic Ocean. Recent synthesis work by Russian and U.S. scientists using Russian data archives has shown large increases in Russian river discharge over the last 70 years of 2 km^3/yr. These increases are related to global warming, through changes in the global

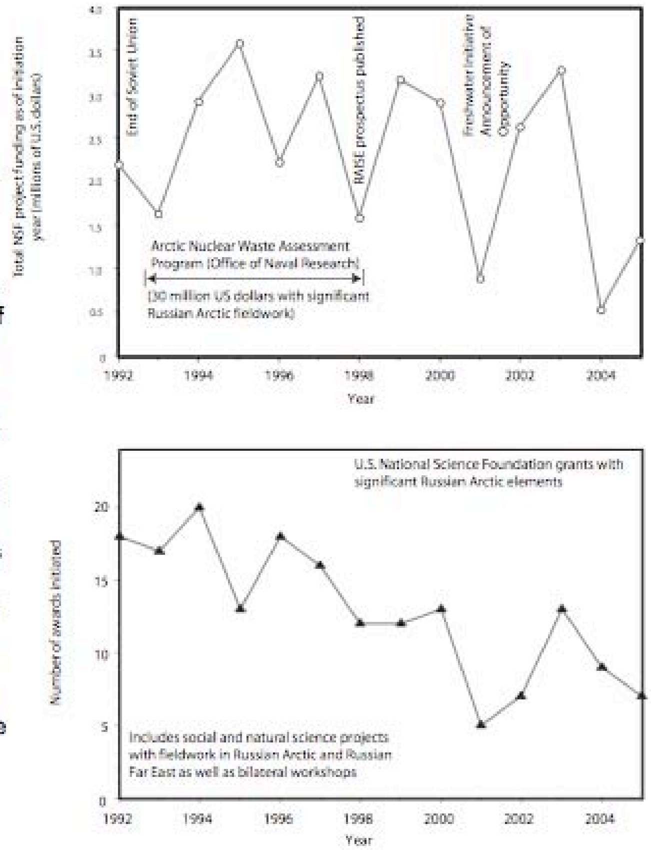

Fig. 2 (analysis by L.W. Cooper). Total U.S. National Science Foundation project funding for projects with significant U.S. – Russian collaborations, as of the year of project initiation. b. Number of NSF projects with significant U.S. – Russian collaborations, as of the year of project initiation. Total funding and number of projects were identified by a search of the NSF award data base from 1992-2005, for the term "Russia" and/or "Russian arctic" appearing anywhere within the project summary or title of all NSF awards. Project summaries of approximately 500 NSF awards were evaluated and the following criteria were used to judge whether the project involved significant U.S. – Russian collaborative work in the Russian Arctic: Both social and natural science projects were included. Geographical boundaries were flexible, including fieldwork in Kamchatka, Siberia, Sakhalin Island and the Kuriles. Work using Russian laboratory facilities outside the Arctic, mathematical studies, and social science investigations in major Russian population centers outside the Arctic (e.g. Moscow and St. Petersburg) were not included. Workshop awards were only included if they primarily involved U.S. and Russian participants and were focused on arctic research problems. Some efforts indirectly funded by the NSF, such as block funding of the International Arctic Research Center at the University of Alaska Fairbanks are not included, but some recently funded projects that are included have broadly pan-Arctic sampling efforts, meaning that some fieldwork outside of Russia is reflected in the award funding totals. Dates of an announcement of opportunity that supported research on Russian rivers, the publication date of the RAISE prospectus that encouraged U.S. – Russian research collaborations in the Arctic, and the time line of the 1990's ANWAP program that provided for significant research collaborations in the Russian Arctic are provided for perspective.

hydrologic cycle leading to increased precipitation in the Arctic as well as local impacts of warming such as influences on permafrost. Much current research is directed at improving our understanding of these substantial changes to the arctic hydrologic cycle.

Population

Humans play a vital and often dominant role in the natural processes occurring at large spatial scales. We see this via indirect effects (e.g. atmospheric trace gases) as well as direct effects (e.g. land cover/land use change) on the hydro-ecosystem. The importance of these changes is not only in affecting the system itself, but also in our ability to monitor the system for natural change. This is particularly the case with the river systems in which the construction of dams, reservoirs, and diversions limit our ability to separate ongoing natural changes from even the direct human impacts. All the large Russian rivers feeding the Arctic Ocean have human constructed impoundments large enough to change the river discharge both seasonally and annually and these dams are significant points in the river systems in which sediment from upstream is trapped and prevented from reaching the continental shelf.

In terms of population, Russia contains 83, 96, and 79% of the population north of the Arctic Circle, within the Arctic Ocean watershed, and within the Pan-Arctic watershed respectively. This population is distributed primarily within the European part of Russia and along the principal waterways of the large, navigable rivers of Siberia, many of which are connected by the trans-Siberian railway. There are also diverse indigenous communities throughout the Eurasian Arctic. Given polar amplification of warming, and the sensitivity of the cryosphere, and their reliance on substance lifestyles, these people will be most directly impacted by climate disruption.

Trace gases and planetary albedo

Massive quantities of carbon dioxide and methane are both released and absorbed by Russia's vast boreal forests, tundra soils and wetlands, exerting a global control on the concentrations of these important greenhouse gases in the atmosphere. Russia contains the world's most extensive high-latitude peatlands, which for millennia have absorbed large quantities of atmospheric carbon and stored it as a gradually accumulating mantle of dead plant matter. The likely response of peatlands to a warming Arctic climate remains a major unanswered question with global implications, as their desiccation and aerobic decay could potentially return large quantities of carbon dioxide to the atmosphere. Under present cool, wet conditions, peatlands are generally a slight sink of atmospheric CO_2 but release copious quantities of methane, a by-product of anaerobic microbial decomposition processes. Elsewhere in Russia, thawing permafrost has enhanced methane release from previously frozen carbon-rich soils and near-shore environments. Recent discovery of methane seeps along Russia's enormous coastal shelf, most likely caused by destabilization of offshore methane hydrate deposits by rising sea levels and/or thawing of marine permafrost, point to a potentially important new source of atmospheric methane. The many hundreds of thousands of Siberian rivers, lakes and wetlands, particularly in permafrost regions, are currently potent sources of both carbon dioxide and methane. Rivers also transport large quantities of dissolved organic carbon leached from surrounding peatlands and organic-rich soils, most of which is delivered to the Arctic Ocean where it is rapidly mineralized and returned to the atmosphere.

Russia's vast boreal forest exerts an important influence on the global climate system both as a major sink of atmospheric carbon (stored as tree biomass) and through albedo contrasts with tundra and snow-covered surfaces. In general, northward migration of the boreal forest is expected to decrease planetary albedo, owing to its darker reflectance relative to snow-covered surfaces and also the "shadowing" effect of trees on surrounding snow-covered surfaces. Accelerating deforestation of the boreal forest's southern range (particularly in the Far East), as well as its anticipated northward migration and increased fire frequency (in response to continued climate warming) represent major current and anticipated changes to this important ecosystem.

Changing permafrost and carbon

The continental shelves occupy about 36% of the Arctic oceanic area. The widest and shallowest continental shelf in the Arctic Ocean lies beneath the East-Siberian and Laptev seas. The amount of terrestrial organic carbon stored in the wide circum-Arctic shelf and slope areas is certainly of importance for calculation of organic carbon budgets on a global scale, with a significant portion of organic carbon withdraw occurring over the East Siberian shelf. The enormous Russian Arctic coastal zone thus plays an undoubtedly significant role in the transport, accumulation, transformation, and seaward export of carbon that has important implications for the global carbon cycle.

Beringia was never covered by ice sheet. It is the one large area (about 3 million km^2) in the arctic region where terrestrial carbon accumulation existed over the Pleistocene. A unique feature of the northeastern Russian Arctic (which represents the major portion of Beringia) is an ice-complex, which consists of a frozen soil enriched by organic material and ground ice (up to 90% by volume). Almost 500 Gt of old carbon was buried there (Zimov et al., 2006). During the Holocene, the ice complex was subjected by thaw lake thermokarst. A huge amount of organic material is subject to biogeochemical cycling throughout the lake taliks and has played a role in their development. The ice-complex storage archived environmental changes throughout Pleistocene in both eastern Siberia and Alaska. During the last transgression a huge amount of terrestrial carbon was mobilized from permafrost and relocated from the land due to coastal erosion. Moreover, submarine remains of ice-complex deposits are degraded through seafloor thermal erosion. Processes of coastal and seafloor erosion are major drivers for terrestrial carbon transport onto the shelf and Arctic Ocean basin.

Permafrost extends over the entire shelf and plays an important role in gas hydrate formation and their stabilization. Permafrost deposits accumulate huge amounts of methane onshore (about 10,000 Gt; Semiletov et al., 1996). Subsea gas hydrates accumulate about 6,000Gt of methane (Makagon, 1984) and work also as a barrier for release of methane into the atmosphere. Major "windows" for methane release from continental shelves can be *faults and brakes* in rift zones where open taliks may be formed because of anomalous geothermal fluxes (Romanovkii et al., 2005; Romanovskii and Hubberten, 2001). Recent findings of methane spots over the East-Siberian shelf may indicate decay of subsea hydrates with consequent methane release into the atmosphere (Shakhova et al., 2005). Coincident oxidation of eroded carbon produces atmospheric emissions of carbon dioxide, another greenhouse gas. Crude evaluation show that the conversion of a small amount of old carbon stored in permafrost into the methane (anaerobic environment) and carbon dioxide (aerobic environment) may increase the atmospheric burden of both major greenhouse gases significantly, whereas release of less than 0.1% of methane buried in shelf hydrates may double current methane atmospheric concentration (Semiletov et al., 2004).

Controversy surrounds the role of the river output and coastal erosion in land-shelf transport of terrestrial carbon in the Arctic and their role in the Arctic Ocean's biogeochemistry and sedimentation (Romankevich and Vetrov, 2001; Stein and Macdonald, 2003). Another complexity is that organic carbon eroded from receding shorelines is more biodegradable (Guo et al., 2004) than riverine dissolved organic (Dittmar and Kattner, 2003).

Coastal erosion

In the last decade concern about coastal erosion has become pervasive in many human communities along the Arctic coastlines. Erosion has impacted modern and ancient settlements to an extent not previously recorded. As village population and infrastructure increases, shoreline erosion becomes a geologic hazard requiring effective long-range monitoring and planning. Many scientists and engineers expect the effects of global warming and sea level rise to be profound and costly along the Arctic Ocean coasts. Coastal erosion may also be viewed as a cyclic affect of storms generated by hemispheric teleconnections such as the El Nino Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO)/ Arctic Oscillation (AO).

Importance of Russian Arctic for the freshwater and heat budgets

The Arctic Ocean is an important component of the global climate system. Processes regulating freshwater fluxes in the Arctic Ocean impact the rate of deep- and bottom-water formation in the convective regions of the high North Atlantic and influence the global ocean circulation. As well, transport and release of oceanic heat influence the extent and thickness of arctic sea ice, in turn affecting albedo and the insulation of the winter atmosphere. These effects are highlighted by global climate modeling studies that consistently show the Arctic to be one of the most sensitive regions to climate change.

In order to understand these processes, the Arctic Ocean, atmosphere, sea ice, and land must be considered together as a unique climate system covering high latitudes of the Northern Hemisphere. Many of these mechanisms are regulated by processes originating in the Russian sector of the Arctic Ocean (continental slope and continental shelf). These processes are:

- Accumulation and release of fresh water and heat during seasonal cycle over the shelf areas. This also includes processes of sea ice production and salt redistribution during freezing/melting cycle;

- Transport of fresh water, heat, chemical and biological properties, sediments from the shelf via continental slope to the deep basin and to the North Atlantic (shelf-basin exchange)

There are several important features of the shelves in the Russian sector of the Arctic Ocean, which manifest processes described above. They are:

- Vast land-fast ice which protects shallowest shelf from direct wind action during at least 7 months in the seasonal cycle; nature of the fast ice dynamics and thermodynamics, its freeze-up and decay dates are important scientific questions needed to be resolved.
- The Great Siberian Polynya, also termed the Transarctic Flaw Polynya, which is a result of heat exchange between the ocean and atmosphere along continental slope due to joint action of wind and tides providing increased vertical mixing and heat release from warm Atlantic waters to the bottom of sea ice and atmosphere;
- Coastal currents and local circulations influencing fresh water and heat transports

This natural climate system does not have territorial boundaries and must be studied simultaneously in all regions and with more or less the same temporal and spatial resolution. In this context, vast regions of the Russian Arctic remain under-sampled, especially during last 20 years. There are several causes for this, but economical difficulties are foremost in leading to the reduction of the Russian observational network in the Arctic.

Circumpolar biological processes

Recent global warming in the Arctic Ocean predicts shifting of ice-edge to the north, decreasing of sea ice thickness and surface, increasing of ice-open areas. This scenario suggests changes in the biodiversity, biological productivity and duration of vegetation period in the Arctic seas. However, at present the evidence of impacts of global change on the sea ice ecosystem is sparse or uncertain, though there are fragmentary indications of recent changes in the Arctic Ocean, in general, and in the Russian Arctic, in particular. Assessment of the recent sea ice ecosystem dynamic and modeling its potential changes will allow estimating and forecasting potential changes within the sea ice-upper water system and consequent effects on higher trophic levels including birds, marine mammals and benthic organisms.

Linked Biological and Physical Processes on the Continental Shelf

The influence of northward flowing Anadyr water on phytoplankton production and benthic biomass in the northern Chukchi Sea has now been well documented (Dunton et al., 2005). Unfortunately, our data in the western (Russian) Chukchi Sea is extremely limited, and it as been difficult to sort our the relative importance of southeastward flowing water from the East Siberian Sea relative to the northward flowing Anadyr water. Finally, if shifts in epibenthic community composition were to occur in reaction to changes in global climate, the associated changes in carbon mineralization are likely to have significant consequences for arctic shelf systems. For example, on the Chukchi shelf (east of the dateline), maximum biomass of ophiuroids recorded was 30% higher than on any other arctic shelf (Ambrose et al, 2001). Stable isotope data from sediments collected in the East Siberian Sea suggest that the eastern area is influenced by Pacific-derived water. If so, how is the presence of this high nutrient core of the reflected in the epibenthic community structure and food web structure of this region? It is likely that the benthic community on the Siberian Chukchi shelf is sustained by the high nutrient regime of the Bering Sea Anadyr (BSAW) water, but there may be considerable temporal variation that reflects variation in global climate.

It is known that the ESCC is a wind-forced low salinity current flowing eastward from the East Siberian Sea and carrying Siberian river outflows (Weingartner et al., 1999). At the northern coast of the Chukotka Peninsula, the ESCC is deflected offshore and mixes with northwards-flowing BSAW. The intensity of the ESCC varies greatly and can be hardly noticeable in some years and very strong in others. Productivity patterns under ESSC influence deposition of the benthos and are likely to be very different from those under the influence of BSAW. Stable carbon isotope signatures of ESSC are depleted compared to the heavy signals found in the SBAW (Dunton et al., 1989) and can be used as trophic tracers. This is important in the context of global climate change since different water masses are likely to respond differently in response to the seasonality and magnitude of flow through the Bering Strait and southeastward from the East Siberian Sea.

Major impediments to bilateral research

Contributors: Julie Brigham-Grette, Karen Frey, Eugene Karabanov, Tom Quinn, Jackie Grebmeier, Tatiana Filatova

A specific working group during the workshop was charged with identifying some of the major impediments to successful bilateral research projects in the Russian Arctic. One of the key challenges are permits required to facilitate scientific research, including those that provide access to Exclusive Economic Zones, facilitate equipment importation, and sample export. Many regulations have changed over time, so there is a perception that regulations are moving targets and cannot be reasonably predicted each time a field research program is initiated. There are also more systemic, general problems. In Russia, there are very few young scientists being trained who are able to work full-time on scientific problems. This working group noted that smaller projects with lower profiles tend to face fewer challenges and can often accomplish practical objectives. However, the organization required for ship-based marine research means that this is a major reason why truly bilateral sea-going research is so rare. This working group did not want to provide an exhaustive list of all problems that have arisen, but to communicate an appreciation of the scope of the challenge for Russians and U.S. scientists to cooperate in accomplishing work in the Russian Arctic. For balance, the current-day difficulties and complexities in obtaining visas for foreigners in the United States needs to be kept in mind. It is also worth pointing out that U.S. government agencies and local entities in the North American Arctic also exert their national and local interests, and scientists should expect that some regulation is normal and within reason wherever field research is required in the Arctic.

Some of the challenges for undertaking bilateral research in the Russian Arctic that were most prominently mentioned and discussed included: 1. The lengthy process for registration in each city; 2. Unpredictable import fees imposed on field equipment by Russia customs; 3. The inability to export expensive equipment back to US; 4. Unreliable transport vehicles and systems; 5. Rules/regulations for work often seem chaotic and are changed without notice; 5. Scientists are often at the mercy of individual customs officers and local officials who are free to interpret regulations; 6. Unpredictability of field work due to local conditions; 7. The scope and unpredictable scale of import taxes, in some cases that could be reasonably interpreted to be bribes; 8. Apparent insensitivities on the part of the Russian consulates in the United States, which can be unwilling to specifically list all Russian cities to be visited on a Russian visa, creating potential problems later in Russia. Experience indicates that no more than five cities are often listed on visas. 9. The perception that foreign scientists in Russia engaged in environmental change research are threats to Russian national security.

What is needed [Things that (can) work or help]

Contributors: Kathy Crane, Steve Kohl, Boris Levin, Aleksey Ostrovskiy, Natalia Shakhova, Marianna Voevodskaya, Alexey Voinov, Katey Walter, Doug Williams

Another working group during the workshop focused on practical steps that should be taken to improve capabilities for bilateral work. For example, the exchange of students between the U.S. and Russia who will work together in field schools in both countries provides practical opportunities for developing working relationships between U.S. and Russian scientists. The Alaska Volcano Observatory (http://www.avo.alaska.edu/) has been a good model for scientific exchange through field schools that they have undertaken.

The Otto Schmidt Laboratory (http://www.otto.nw.ru/) supported by Germany is also often cited as a good model for improving research infrastructure that ought to be emulated by other countries, including the U.S. In part using this model, the University of Alaska Fairbanks signed a cooperative agreement with the Far Eastern Branch of the Russian Academy of Sciences in 2001 to establish a Vitus Bering Laboratory in Vladivostok at the Pacific Oceanological Institute, but unfortunately there has been limited concrete progress. This working group suggested that perhaps starting with a smaller scope and scale might be at least as effective. For example, the Cherskiy Field Station on the Kolyma River (http://www.faculty.uaf.edu/fffsc/station.html) might be good place for such a laboratory given a history of providing a base for U.S. researchers, comparatively good laboratory capabilities, and an entrepreneurial laboratory director.

This working group also strongly endorsed agency involvement and higher-level agreements, but recognized that Personal relationships between scientists crucial in many respects and that involvement of scientists experienced and savvy in both U.S. and Russian cultures was a distinct advantage. Private entrepreneurial entities and/or independent facilitators such as the U.S. Civilian Research and Development Foundation (www.crdf.org) VECO Polar Resources (www.vecopolar.com), the Russian Polar Foundation, the Far Eastern Shipping Company, Ecoshelf (http://ecoshelf.net/english/company.html) and Group Alliance also can play key roles in facilitating bilateral scientific work.

Higher-level improvements would include more seamless transportation between U.S. and Russia, including more official ports of entry in both countries and a reduction of logistical difficulties in traveling between U.S. and outlying portions of Russia. The cooperative science and technology agreements between the U.S. and Norway were also cited as examples of the kinds of high-level agreements that are needed, including arrangements for improving logistics such as exist for bilateral U.S. – Norwegian research through the University Centre in Svalbard and the Norsk Polar Institut. World Bank – UN global environmental funds could also be potentially of use in development of scientific infrastructure.

Commonly Identified Themes

All of the working groups had a consensus on certain shared themes regarding challenges and practical solutions:

1. Need for Russian collaborators, preferably established, knowledgeable, pro-active scientists working through established institutes. The National Science Foundation's logistics coordinator, VECO Polar Resources, has gained significant on-the-ground experience within Russia so that many potential Russian collaborators can be enlisted for assisting foreign scientists. The International Arctic Science Committee (www.iasc.se), through its Russian Arctic working group, ISIRA, also annually attempts to identify and provide contact information for all Russian and international collaborators cooperating in bilateral and multinational research in the Russian Arctic. This contact information is an important resource for U.S. and other foreign scientists developing contacts in Russia for potential field research opportunities.

2. Import/export of equipment, and export of samples continue to often be troublesome challenges. There are however import means that need to be better publicized such as CRDF and also government-to-government agreements. One specific example is a government-to-government agreement between the United States and Russia signed in 1992 and still in force that specifically exempts from duties and taxation, grants and commodities from U.S. agencies including the National Science Foundation, the Department of Energy and the National Academy of Sciences (Appendix I). By and large, many U.S. agency managers are unaware of these agreements, but they could assist scientists by providing

documentation that funds or equipment involved in transfers are provided by a specific tax-exempt U.S. agency.

3. Workshop participants concluded that it would be helpful if U.S. entities such as the Arctic Research Commission and the Polar Research Board of the National Academy of Sciences would take a more active role in improving the prospects for bilateral research in the Russian Arctic, while working with long-standing organizations such as the CRDF. The possibility of a National Academy study committee, with Russian agencies and scientists participating, was also suggested as a positive mechanism to formally identify challenges and solutions that are needed to improve U.S. and Russian scientific cooperation in the Arctic. Finally, many U.S. participants recognized that more effective contact with U.S. congressional representatives and staff by scientists about bilateral arctic research issues is needed. A key objective should be to better educate higher levels of the U.S. government as to the scientific needs for improved bilateral arctic and global environmental change research across national boundaries in the Arctic.

4. U.S. scientists need a better “road map” for success in Russian field research because the current lack of information is a significant impediment; Russian collaborators could assist by obtaining policies in writing. Russian institutes can help in some instances, as well as more government-to-government agreements such as between U.S. organizations and the Russian Academy of Sciences and ROShydromet, with clear means of communication when local problems arise. Higher-level agreements with the Ministry of Science and Technology, and Russian Navy interests and the highest levels of the U.S. government are probably required to enable routine sampling across the U.S. – Russian EEZ and territorial boundaries for biogeochemical processes that are critical for assessing arctic environmental change. Use of Russian-flag ships is clearly an advantage for marine sampling in the Russian EEZ, but the specific reasons for rejection of scientific sampling clearance requests are not otherwise often clear. NOAA’s RUSALCA program that has facilitated a modest marine sampling program in both U.S. and Russian waters over the past several years, is one of the few recent success stories for bilateral arctic marine research. The efforts of its agency personnel in negotiating agreements with Russian institutions to facilitate this shipboard research should be emulated by a larger cross-section of U.S. research funding agencies.

5. Russian scientists also need a “road map” for access to the US-visas. These travel documents are becoming harder for Russian scientists to obtain and U.S. scientists need to assist by writing tighter letters of support (e.g. where, when, who are collaborators). As an example of advice that can be provided, the US Fish and Wildlife Service (USFWS) International Programs Office prepares Russians for U.S. consular interviews by providing written guidelines. This “Advice for Russians to Prepare for US Interviews”, includes questions to expect such as why the scientist is going to the U.S., who are the hosts, what evidence is needed to demonstrate credible evidence to support the expertise of the U.S. visitor, and the need for Russian scientists to make it clear their intentions are for a temporary visit.

6. Concerns about "rule change" issues in both US and Russia, and how to keep up-to-date information on procedures, permits available for scientists planning field research in the Arctic or exchange visits. Clearance requests are more likely to positively approved if the participating Russian institute is directly involved. Certain long-established organizations, such as the Arctic and Antarctic Institute have experience in navigating the clearance process on behalf of foreign scientists, and their administrative structure includes an office supporting international collaborations. Another variation on this challenge are decisions and/or permitting at the local level in remote areas of Russia that can prevent field research from going forward.

7. The lack of new, emerging young scientists, particularly in Russia is a key problem that is preventing the growth of cooperative research in the Arctic. Essentially, with the new economic realities, students and junior laboratory staff in Russia need multiple jobs; coupled with a lack of access to current books, journals, opportunities to attend conferences, go on expeditions or undertake experiments, scientific research continues to contract. The next generation is important for Russia as well as other countries and modest mechanisms to assist, such as 3-month service visits to the U.S. for young Russian scientists (USFWS) are good models. Ultimately, the workshop participants recognized that equivalent bilateral financial support is needed and this is many years away.

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Abstracts of Presentations Made at Meeting

The Nature and Conditions of Bilateral and Multinational Quaternary Studies of Past Climate Change in the NE Russian Arctic

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Joint field studies of the surficial geology and paleoclimate history of the Chukotka region have been carried out with scientists of the Northeast Interdisciplinary Scientific Research Institute (NEISRI) since 1991. Field campaigns in 1991, 1992, and 1993 were initially reciprocal ventures with time spent in Chukotka financed and arranged by the Russians and time spent in Alaska financed by grants from NSF-OPP and arranged by myself as the PI. In 1994, as economic conditions changed in the Former Soviet Union, proposals submitted to NSF for field work in 1995 and 1996 included all of the science and logistics costs for work inside Russia. In return, NEISRI colleagues made arrangements for letters of invitation, logistical contracts (e.g., boat and helicopter hires) and all necessary permits from Moscow, Anadyr and Magadan. A key person assisting us at the time (and Pat Anderson, University of Washington, on her separate projects) in Moscow was Vladimir Davyadov, international science facilitator within the Russian Academy of Sciences. Without a doubt, small low-profile projects have always been easier to plan than large high-profile projects.

Permits requested in 1996 for fieldwork at Lake El'gygytgyn were problematic in Anadyr and not granted as a US/Russian project until a month before our departure in 1998. Since that time, permitting for this project has become more complex due to 1) increasingly demanding logistics and 2) the trilateral imbalance between well established Russian/German science agreements and the total lack of US/Russian science agreements. Euphemistically, the legs of this stool are not all the same length!

The field program in summer, 2000, was largely financed by the U.S. side but permits were acquired as if the project were a German/Russian project. Starting early in 1999, a series of documents were distributed to Russian authorities to ensure access to the Lake. First, a cooperative agreement was signed by administrators at each of the major institutions (UMass, UAF, NEISRI, AWI, and GFZ) requesting scientific access and the establishment of a major research program from 2000-2006. This document was forwarded to the Russian Ministry for Science and Technology in Moscow. By October of 1999, a formal scientific agreement for bilateral research at El'gygytgyn was finalized between Ministries of the Russian and German governments. Despite a long Russian/German tradition for bilateral-only projects, both parties accepted in good faith the fact that this bilateral agreement included Americans. This had a number of repercussions, for example, all US equipment and field gear be shipped under AWI labeling for Russian customs clearance. This arrangement was something that worked and seemed simple.

In addition to general science agreements, permits of various types were required from government authorities in Moscow, Magadan, Anadyr and Pevek in advance of our field effort. Our Russian science colleagues made arrangements for permits. The permits included:

Nature of Permit	Issuing Agency
Permission to visit Lake El'gygytgyn	Govt. of Chukotka, Anadyr
License for Geologic work	Geological Commission of Chukotka, Anadyr, with the signature of the Anadyr Govt.
Permission for Temporary Import of Equipment to Russia	Russian Ministry of Industry and Science, Moscow,
Permission for Temporary Import of Equipment to Russia	Moscow Border Guard Headquarters
Permission for Temporary Import of Equipment to Russia	Federal Service of Security ("KGB"), Moscow
Permission for Temporary Import of Equipment to Russia	General Headquarters of the Russian Military, Moscow
Permission to import satellite phones, walkie-talkies	Russian Communications Commission, Magadan
Permission to import Science equipment to Magadan and Chukotka	Russian Communications Commission, Magadan
Permission to import GPS equipment	Russian Communications Commission, and Central Cartography Office, both Moscow
License for export of Clay	Foreign Trade Office, Magadan
License for export of Igneous Rocks	Foreign Trade Office, Magadan
License for export of water	Foreign Trade Office, Magadan

Similar sets of permits were required for a larger, more involved expedition in 2003, however this expedition was financed by the German Ministry and most of the permitting was handled by AARI – St. Petersburg with help from NEISRI.

Escalating plans for deep drilling at Lake El'gygytgyn under the International Continental Drilling Program (ICDP) will require a more sophisticated approach to working out agreements with a number of Russian government agencies, as well as the Russian Academy of Sciences (parent organization for NEISRI) and Roshydroment (parent organization for AARI). While the US and Germany are long-standing members of the ICDP, Russia has never joined.

For nearly 10 years a bilateral science agreement for shared research has existed between the Ministry for Industry, Research and Technology of the Russian Federation and the German Federal Ministry for Education and Research (BMBF). This protocol, titled, *Agreement on Collaboration in the Fields of Marine and Polar Research*, has supported annual meetings, at which time the projects and interests of both sides are discussed, listed, and agreed upon. German/Russian bilateral discussions are currently underway for future projects, including Lake El'gygytgyn.

On the US side, NSF and NOAA have agreed in principle, to allow the Lake El'gygytgyn Drilling program to fall under the diplomatic umbrella of an existing MOU between the RAS and NOAA (National Oceanographic and Atmospheric Administration). This document was signed in December 2003 by Vice-Admiral Lautenbacher (NOAA) and Vice-President Lavyerov (RAS) and embraces themes of “Arctic Climate change” including NSF related science. It is the only agreement we have.

In the coming months, our science team will continue to seek ways to facilitate the complex yet desirable path toward drilling at Lake El’gygytgyn in order that scientists from each of the interested countries share the exciting science to evolve from this project. Our goal is to collect the longest most unprecedented record of climate change in the terrestrial arctic, ~3.6 Million years, for comparison with lower latitude marine and terrestrial archives of hemispheric and global climate evolution. Coring objectives include replicate cores of 630 m length to retrieve a continuous paleoclimate record from the deepest part of the lake and into the underlying impact breccias and bedrock. Studies of the impact rock offers the planetary community with the opportunity to study a well preserved crater uniquely found in igneous rocks like those on Mars. One additional core to ca. 200 m into permafrost from the adjacent catchment will allow us to test ideas about arctic permafrost history and sediment supply to the lake since the time of impact.

A Short History of RAISE, Land-Shelf Interactions and Transitions for Arctic System Science

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The Russian-American Initiative for Land-Shelf Environments (RAISE) was envisioned as research framework to address important scientific problems relating to global change that were most appropriate to address in the large portion of the Arctic in Russian territory. In many respects this research "umbrella" has been an extremely successful bi-national effort over the past decade. Results have been published in high-impact journals such as Nature and Science, as well as important specialist journals. Many of the important scientific questions that were identified in science planning for RAISE, such as the influence of freshwater from Russian rivers upon stratification in the Arctic, and ultimately thermohaline circulation, continue to be important priorities for arctic research programs such as the Study of the Arctic Change (SEARCH) and International Polar Year planning. Yet even these evolving arctic system research opportunities that are based upon a decade of sustained growth in arctic research and knowledge are not likely to fully succeed without recognizing and overcoming the current limitations of bi-national frameworks such as RAISE.

RAISE is based upon cooperative support from the U.S. National Science Foundation (NSF) and the Russian Foundation for Basic Research (RFBR), but the RFBR, while developed by the Russian government following the NSF model, does not play as key a role in supporting Russian scientists, who have traditionally used Russian Academy of Science channels that remain woefully under-funded 15 years following the dissolution of the Soviet Union. A larger challenge however is the scarcity of high-level cooperative agreements between Russia and the U.S. to support joint research in the Arctic, and the difficulty of coordinating research that needs simultaneous financial support from both Russian and U.S. agencies that operate under independent and vastly different fiscal realities. In some areas, such as wildlife conservation, international treaty obligations have compelled both countries to work continuously and productively over many years regardless of international relations, openness, and variations in regional power centers and nationalism. In other cases, such as establishment of tsunami warning systems that incorporate international cooperation across the Aleutians and Kamchatka, it is clearly in the interests of all countries to collectively cooperate. Despite the growing attention being given to the costs and dangers of Arctic climate change, we have failed so far to reach the threshold of public awareness that would break down the barriers to fully cooperative research in the Russian Arctic, which must be overcome if the Arctic is to be understood as a cohesive system.

Individual RAISE projects have succeeded scientifically because of specific, often Herculean efforts of the scientists involved, including émigrés who know how to communicate and operate in both countries, scientists who have developed personal friendships across national boundaries and through risk-taking by all involved. The presence of the RAISE framework has probably helped, but not in the same way as would international treaty obligations or sustained public awareness of arctic climate change as a critical and immediate societal problem. I see our task in this workshop as using our knowledge of the complexities of U.S. – Russian arctic research as a starting point to elevate awareness of critical research needs to a level where they will succeed regardless of the physical, social and political challenges inherent in conducting scientific research across international boundaries around the Arctic rim.

Navigating Through Global Political Change: When There is a Will There is a Way

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Oceanographic researchers at academic institutions in the United States are used to wielding large powers when it comes to negotiating for ship time, mobilizing science teams and agenda, and driving the "science that is funded" from a bottom-up direction. Most other countries do not operate in this fashion, and science in these realms tends to be directed by science priorities determined by government agencies. Thus international scientific programs demand a significant amount of compromise and adaptation between groups of different nations. Therefore, guidance from government agencies is needed to smooth the transition between the interests of individual scientists and universities in the United States and the agencies and governments of other countries.

In the 1990's political chaos broke through the formerly structured science community of the Soviet Union. Rules disappeared and governing bodies were abolished, opening up the door for and in many cases necessitating the rise of scientific entrepreneurship in the former Soviet Union. During this decade, the tried and true methods of government to government collaboration and negotiation disappeared, and one to one type of financial exchange and collaboration ensued.

There were many cases that developed, especially between remote regions of Russia and the U.S. where equipment was moved into Russia, data was taken out, local officials were paid off, and American scientists outbid one another for information and collaboration. Those of us who worked with science coordinators from many countries attempted to put some controls on this free-for all exchange, at least so we were not being faced with escalating price wars and competition for funding scientists.

One of the consequences of the results of these 15 years, led to the belief that if American scientists wished to work with Russian Scientists, he/she should pay entirely for his/her Russian colleague.

However these times are changing. Organizing programs between Russia and the United States can no longer proceed without following the rules of law, stipulated by the federal governments of both the Russian Federation and the United States.

There is quite a lot of government-agency turbulence remaining in the Russian Federation, (as is there turbulence in the agencies of the United States). However, it is necessary during this next decade, to proceed with international mechanisms that have already brought all the agencies "on board" in a positive manner, meaning the results will be good for the mutual security of the both the Russian Federation and the United States of America.

For this reason, NOAA spent many years to reinvigorate the Russian-American oceanographic working relationship through the crafting of a Memorandum of Understanding with the Russian Academy of Sciences. The memorandum sits under the umbrella bilateral agreement of science and technology.

U.S. University to Russian University Memoranda of Understandings may coexist, but the government to government umbrellas are absolutely required to enable smooth collaboration between our countries.

In addition, NOAA makes full use of private-public -partnership programs within Russia to expedite communication and coordination between the various Russian Agencies, including (but not only) the Department of Defense and the Ministry of Science.

Community Structure in Western Arctic Coastal Food Webs

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In addition to community species composition, benthic food web structure is a sensitive indicator of changes in primary productivity of the arctic shelf system due to climatic changes. At high latitudes, food resources are more likely to restrain growth and survival of benthic organisms than low temperature (Clarke 1998). The arctic benthos receives food from the overlying ice-associated and pelagic systems through the flux of sinking material from the euphotic zone (Grebmeier et al. 1989, Grebmeier and Cooper *in press*). This food input occurs in form of dead phytoplankton, fecal pellets, zooplankton carcasses, molts and marine snow. Food composition and the high seasonality of food availability drive the selection for highly adapted and specialized trophic pathways and feeding types (Iken et al. 2001). Changes in quantity, quality and timing of food supplied to the arctic benthic shelf community, as a result of changes in pelagic processes in response to climatic variation, will cause shifts in benthic food web structure. Consequently, an understanding of trophic interactions is absolutely critical to tracking large scale changes in shelf ecosystems.

In this sense, it is becoming increasingly obvious that epibenthic megafauna cannot be disregarded if we are to understand ecosystem functioning and carbon cycling in the productive systems of the Gulf of Anadyr, the northern Bering Sea and the Chukchi Sea. The influence of northward flowing Anadyr water on phytoplankton production and benthic biomass in the northern Chukchi Sea has now been well documented (Dunton et al, 2005). Unfortunately, our data in the western (Russian) Chukchi Sea is extremely limited, and it has been difficult to sort out the relative importance of southeastward flowing water from the East Siberian Sea relative to the northward flowing Anaydr water. Finally, if shifts in epibenthic community composition were to occur in reaction to changes in global climate, the associated changes in carbon mineralization are likely to have significant consequences for arctic shelf systems. It is imperative that we understand epibenthic community structure (in addition to the infauna), in the high productivity systems of the Bering and Chukchi shelves, and especially in the hitherto under-explored western Chukchi region. For example, on the Chukchi shelf (east of the date line), maximum biomass of ophiuroids recorded was 30% higher than on any other arctic shelf (Ambrose et al. 2001).

Epibenthic megafauna is an important component of arctic shelf communities in terms of abundance, biomass and remineralization processes (Piepenburg and V. Juterzenka 1994, Piepenburg and Schmid 1996a, b, Bluhm et al. 1998, Starmans et al. 1999, Ambrose et al. 2001). There exists a conspicuous geographical gap in epifauna data in the western (Russian) Chukchi/northern Bering Sea. On the Eurasian shelves, the epifauna has been extensively studies using photographic surveys (Barents, Laptev, Greenland Sea shelves) and accounts for an average 25% of the overall benthic community respiration (Piepenburg et al. 1995, Piepenburg and Schmid 1996a, b, Piepenburg et al. 2001). At most locations studied, ophiuroids dominated the epifauna with up to several hundred individuals m^{-2} (Meyer and Piepenburg 1996, Piepenburg and Schmid 1996a, b, Piepenburg et al. 1005, 1006, 1007, Starmans et al. 1999, Piepenburg 2000, Sejr et al. 2000). Other conspicuous epibenthic faunal elements included sea urchins in the Barents Sea (Bluhm et al. 1998), sponges, anthozoans and polychaetes on the NE Greenland Sea shelf (Starmans et al. 1999) and sea cucumbers and bivalve mollusks in the Laptev Sea (Piepenburg and Schmid 1997).

Thus, it is within our best interest to investigate how far the influence of the high nutrient Anaydr water mass reaches in the western Chukchi. Political constraints have so far often prevented extensive collaborative studies on the Siberian Chukchi shelf (Grebmeier 1993, Grebmeier and Cooper *in press*). However, if valid baseline data of Arctic Ocean ecosystem functioning is collected to serve in monitoring and assessing global climate change effects, it is imperative to obtain continuous, large-scale information on the entire Chukchi shelf system.

- How does the high nutrient core of the Anadyr water disperse along east-west and north-south transects across the Bering Strait and the Chukchi Sea (Fig. 1), and how is that reflected in the epibenthic community structure and food web structure?

- To what extent is the benthic community on the Siberian Chukchi shelf sustained by the high nutrient regime of the Bering Sea Anadyr water (BSAW), and to what extent is it under the influence of the eastwards flowing East Siberian Coastal Current (ESCC)?

The ESCC is a wind-forced low salinity current flowing eastwards from the East Siberian Sea and carrying Siberian river outflows (Weingartner and Danielson 1999). At the northern coast of the Chukotka Peninsula, the ESCC is deflected offshore and mixes with northwards-flowing BSAW. The intensity of the ESCC varies greatly and can be hardly noticeable in some years and very strong in others. Productivity patterns under ESSC influence deposition to the benthos and are likely to be very different from those under the influence of BSAW. Stable carbon isotope signatures of ESSC are depleted compared to the heavy signals found in the BSAW (Dunton et al. 1989), and can be used as trophic tracers. Our investigations of epibenthic community composition and benthic food web structure using stable isotope analysis has already yielded some fascinating results with respect to trophic linkages in adjacent arctic marginal seas. However, the dataset is compromised by the absence of information from the western Chukchi which can help us identify regions influenced by varying water mass types. This is important in the context of global climate change since different water masses are likely to respond differently in response to the seasonality and magnitude of flow through the Bering Strait and southeastward from the East Siberian Sea.

Field-based research in West Siberia 1999–2001: Logistics and lessons learned

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Three field campaigns to West Siberia were conducted from mid-July to late August of 1999, 2000, and 2001 in order to investigate aspects of Holocene peatland dynamics and modern stream biogeochemistry throughout the region. To geographically maximize the area sampled, field sites only slightly overlapped between field seasons (covering ~61–64°N in 1999, ~64–68°N in 2000, and ~55–61°N in 2001 – spanning nearly one million square kilometers in total). During each of the field campaigns, we were joined by several Russian colleagues from the Institute of Geography, Russian Academy of Sciences in Moscow, who were critical to the logistical aspects of the fieldwork. These Russian colleagues first met us at the Sheremetyevo-Moscow airport and acted as negotiators and translators with customs officials. Significant import taxes were required at customs for the most conspicuous field equipment (e.g., peat corer and motor). We then entered West Siberia on domestic Aeroflot flights and further traveled to field sites using hired drivers (both local and Moscow-based) and their personal vehicles (vans, trucks, or buses), utilizing the extensive road network that is primarily in place to support the regional oil and natural gas industry. We were commonly stopped at checkpoints along roads, during which we ensured GPS units and field notebooks were hidden from view of the authorities. Less frequently, we were able to hire rides on tracked armored personnel carriers (owned by local oil companies), which allowed us to enter the wet interior of peatlands where roads do not exist.

During each field season, we chose 2–3 cities to use as "hubs" (e.g., Noyabr'sk, Surgut, Novosibirsk, Novy Urengoi, Tomsk, some with populations of ~100,000 or more) to which we returned each night after field work (and several hundred kilometers of driving on some days) to sleep in motels. Despite having permits and visas, Americans and Russians both were required to register with the local Federal Security Bureau (FSB) in each city we stayed. In many cases, these registrations escalated to several days of our Russian colleagues trying to prove that our paperwork was in order and we were indeed legally permitted to be in the area. These long negotiations (typically more common in the more northern, less populated cities) unfortunately hindered the progress of our fieldwork and detained the Americans in motel rooms for several days at a time. Conflicts with FSB officials in some cities were highly problematic and could not be resolved (e.g., in the year 2000, authorities in Novy Urengoi forced the Americans to leave the country five weeks prematurely because of a "loophole" in our visas). These experiences are indicative of our vulnerability to the unpredictable "whim" of the individual FSB official.

Some of our collected field data were simply recorded in field books and easily transported back to the U.S. (e.g., GPS points, land cover observations, peat depths). However, large volumes of peat and water samples were also transported back to the U.S. Water was collected and stored in small 30–60 mL bottles, placed in checked baggage, and apparently inconspicuous enough to bypass customs authorities without notice (hence, no paperwork was presented at customs for the water samples). Peat samples were much more voluminous and were transported back to the U.S. at a later time by our Russian colleagues. Owing to our unpredictable fieldwork experiences in West Siberia, long-term planning was difficult and we learned to plan one day at a time. In retrospect, we were fortunate with our field seasons. Given that permissions for our samples to leave the country were only “petitions” to Russian customs and ultimately at the discretion of the customs officer, it may have been sheer luck that we were able to transport every single field sample safely back to the U.S.

Russian-US Collaboration in Oceanographic Research in the Western Arctic Ocean

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From the 1970s to middle 1990s oceanographic studies in the Bering, Chukchi and East Siberian Seas were undertaken successfully through the joint US-Russian Program "BERPAC" (A Program for Long-Term Ecological Research of Ecosystems of the Bering and Chukchi Seas and the Pacific Ocean) under the U.S.-Russia Environmental Agreement, Area V, Project 02.05-91, Ecology and Dynamics of Arctic Marine Ecosystems. Cruises in the Bering Sea occurred in 1977 and 1984, and expanded into the Chukchi Sea in 1988 and 1993 and into the East Siberian Sea in 1993. Collaborative efforts included Russian colleagues within BERPAC via the Institute of Global Change of the Russian Academy of Sciences and the Russian State Committee on and US scientists involved in various US-funded science projects.

Overall, BERPAC was a very successful collaboration, originally with both countries providing national support for the ship and scientists, but this eventually changed with the fall of the Soviet Union and subsequent economic hardship. In 1993 there were difficulties for Russian water access for the collaborative BERPAC cruise in spite of a previously agreed free access by both US and Russian officials to each nations territorial waters before the summer joint cruise began. Just before the RV *Okean*, a research ship chartered out of Vladivostok, was to transit north through Bering Strait with research personnel onboard, access for sampling in Russian water was temporarily denied due to military exercises nearly 500 miles from the study site. It was only after phone calls between BERPAC leadership in Washington, DC and corresponding officials in Moscow, Russia was the ship allowed to work in the western Chukchi Sea, but only for water collections, not sediments. This latter decision by the Russian government appears to have been both a national security issue and one related to petroleum resource development in the region due to sediment sampling plans on the cruise.

In 1995 the US Office of Naval Research supported a BERPAC cruise to the western Chukchi and East Siberian seas as part of the ANWAP (Arctic Nuclear Waste Assessment Program). This last joint Russian-US BERPAC cruise was fully supported by US funds in coordination with the Pacific Oceanographic Institute in Vladivostok, Russia, and extended the BERPAC coverage from the mouth of the Kolyma River in the East Siberian Sea to Bering Strait in the Chukchi Sea. This program was notable in that it was a 2-ship operation, using the US research ship RV *Alpha Helix* as the science platform and the Russian icebreaker MV *Moskvitin* out of Vladivostok as the lead vessel in ice. The study focused on oceanic processes to assess contaminant levels within the Siberian Coastal Current that flows eastward towards the Alaska mainland as well as in offshore waters in both seas. This US program supported the logistical costs for both ships, permits, and airplane flights for our Russian colleagues to the join the cruise. Individual Russian institutions covered the salary and analytical costs for our Russian colleagues. The support of both Russian scientists and both ships led to a completely successful scientific cruise. However, the continued difficulty of obtaining foreign access to Russian waters, the increasing cost for

Russian ship platforms, and the increasing US dollar costs for bilateral oceanographic science has limited support for the US-Russian BERPAC program, and overall work in Russian territorial waters.

However, in 2004 the Arctic Program of the US National Oceanographic and Atmospheric Administration (NOAA) and the Russian Academy of Sciences succeeded in negotiating access and Russian ship support to initiate a joint US-Russian program into the northern Bering and Chukchi seas as part of the program RUSALCA (Russian American Long-term Census of the Arctic). For the first time scientists were able to deploy joint physical moorings in the western side of Bering Strait, thus allowing coincident measurements of Bering Strait along with the ONR- supported moorings in the eastern channel of Bering Strait as part of the Shelf-Basin Interactions (SBI) project. In addition, this program allowed oceanographic ship sampling (water and benthos) in the deep Bering Sea, Bering and Chukchi seas, and in Herald Valley in the northwestern Chukchi Sea, a key outlet for the nutrient-rich Bering Sea Anadyr water transiting northward to the Arctic Ocean. A key aspect of this success was direct negotiations by a US funding agency with both government officials and private entities in Russia.

The success and failures of the US-Russian oceanographic collaboration from the 1970s to the presented have resulted from a combination of scientific and political events in both the US and Russia. Before the fall of the Soviet Union periodic oceanographic sampling occurred under the joint US-Russian bilateral agreement of 1972 umbrella, with individual country support resulting from these agreements. The Soviet side brought the ship and Russian specialists and the US brought new technology and specialists to the table. By the late 1980s the changing political climate and openness to the west enabled free access to waters of both countries, with sampling in both water column and sediment realms. However, with the fall of the Soviet Union and internal politics in Russia, there were more limitations on scientific access, along with a need for more financial support for logistics by the US side for Russian ship rental and science support. In addition, there was a deterioration of cooperation internally in Russia, such that decisions made in Moscow were not necessarily embraced by the Russian military or local governments, the latter entities seeking more autonomy from the centralized Russian government. As such, signed agreements in Moscow by Russian and US lead officials were subsequently questioned by Russian military and perhaps economic leaders. The fact that 72 hrs after the rejection of access into Russian waters beyond Bering Strait during the summer 1993 access was then allowed “for water only”, indicated more an economic, resource based decision than military or scientific decision. Interestingly, our success in both water and sediment sampling in the exact same area in 1995 resulted from a combination of bilateral agreements, financial support for both US/Russian ship use and US/Russian participants, and a smaller “footprint” on the planning scene. All paperwork and permits were approved before the cruise and the science plan was completed according to these agreements. The success of the 2004 RUSALCA program via US leasing a Russian ship and individual nation support of science projects, appears a viable and positive direction for future bilaterial oceanographic research in the Arctic.

This presentation will discuss aspects of US-Russian oceanographic collaboration in the western Arctic through scientific achievements and joint efforts of government officials and scientific participants.

The Arctic System and Global Change: Why Bother with Russia?

Max Holmes[1] and Richard Lammers[2]

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There is a growing awareness of the critical importance of human-forced climate change and of the key role the Arctic plays in the global climate system. This realization has greatly increased the importance and exposure of arctic research over the past two decades and has led to significant increases in research funding. But while the "Arctic System" knows no national boundaries, the strongly asymmetrical distribution of research funding does. One objective of this presentation will be to ask a couple of basic questions, such as *Where is the Arctic?*, and then to consider where US-funded arctic research is being conducted. We will see that, though the Arctic is a big place and most of it is in Russia, the bulk of U.S.-funded research is being done in the relatively small slice of the Arctic that belongs to the United States.

It is our belief that the RAISE community of scientists should take the lead in articulating the importance of studying the entire Arctic System, irrespective of national boundaries. As this conference will acknowledge, yes, there are substantial challenges to doing research in the Russian Arctic (including visa issues, shifting regulatory structures, transportation, and language difficulties), but it is possible to overcome these challenges and conduct successful projects throughout the Russian Arctic. The bottom line is that if we are ever to really understand the role of the Arctic in the Earth System, we will have to look very closely at the Russian Arctic. This will require close partnerships between scientists in Russia and the United States. The RAISE community is well poised to lead this effort. It is also our belief that the RAISE committee should live on as an entity and continue to make these important points, even if future funding for our management office cannot be found. Our tasks are too important to let RAISE die a quiet death.

U.S. Fish And Wildlife Service Arctic Research Programs With Russia Under The U.S.-Russia Environmental Agreement

Steven G. Kohl

Division of International Conservation, U.S. Fish and Wildlife Service

Begun in 1972, FWS-sponsored collaboration in the Arctic with the Soviet Union (since 1992, Russia) has continued uninterrupted to the present day. The geographic range of activities encompasses the Chukchi Sea, Alaska, Chukotka, Kamchatka, and the Bering Sea north of and including the Aleutian and Commander Islands. Bilateral research in Arctic areas falls under five subject headings:

MARINE MAMMALS: Shipboard/aerial surveys and satellite tagging of walrus and polar bears; Steller sea lion and sea otter studies to determine reasons for declines in abundance; bowhead and gray whale migration studies; monitoring of subsistence harvest of walrus, fur seals and other pinnipeds; administration of U.S.-Russia Agreement on Conservation of the Alaska-Chukotka Polar Bear Population (signed 2000).

MIGRATORY BIRDS: Aerial surveys of waterfowl in Alaska and Chukotka; nesting, feeding and summer/winter studies of geese and eider ducks; reintroduction of Aleutian Canada goose into its former range in Russian Kuril Islands; field studies of sea birds and shorebirds; creation and continuous updating of U.S.-Russia Seabird Colony Catalogue database; comparative ecology of Steller's sea eagles, peregrine falcons and other raptors.

OCEANOGRAPHIC RESEARCH: conduct periodic shipboard assessments of the ecological health of the Bering and Chukchi Seas; measure STD and other physical oceanography components; identify bioindicators of marine pollution, assimilative capacity, effects of human-caused disturbances and emerging trends.

REFUGES/RESERVES: comparative ecological studies of Alaska Maritime National Wildlife Refuge and Commander Island Nature Reserve; work on education/public outreach; study impact of invasive species; eradicate rats from specific islands; study seabird colonies found on these protected areas.

FISHERIES: research on sockeye, pink, chum and coho salmon in Alaska, Kamchatka and Magadan regions; study effect of hatchery-produced fish on wild populations; fish disease and nutrition; improve stream conditions to promote higher spawning returns.

Principal participants include federal and state agencies, University of Alaska, Alaska Sealife Center, Chukotka Fisheries Agency, Russian Academy of Sciences, Native corporations and NGOs (e.g., Northern Forum, Audubon Alaska). Annual funding of approximately $750,000 comes from FWS and other sources, and is a limiting factor on what can be accomplished in a region where research costs are high. Long-term American-Russian working relationships, in some cases going back 30 years, are an important component of the program's success.

Russian-American Cooperation in Hydrological Research at the University of New Hampshire

Richard Lammers
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Water Systems Analysis Group, University of New Hampshire, Durham, NH, USA

We present a case study of an ongoing scientific relationship between the Water Systems Analysis Group at the University of New Hampshire (UNH) and our colleagues affiliated with the State Hydrological Institute (SHI) and the Arctic and Antarctic Research Institute (AARI) both in St. Petersburg Russia. The focus is on the logistics of both 1) the academic/scientific research and 2) the administrative/human resources kind.

The logistics surrounding the academic/scientific research will look at our abilities to obtain data in order to address our research questions surrounding pan-arctic hydrological budgets. Topics include:

- Historical time series of river discharge and
- Near-real-time hydrological data.

Factors affecting our ability to obtain comprehensive time series of river discharge involve restrictions in Russian internal data flows creating still existing "data holes" and the spatial domain changing from being primarily intra-national to one that is more international in the early 1990s.

In many ways the story of UNH collaboration revolves, and has evolved, around one person who has remained at the center of this collaboration for seven years. This Russian researcher began his involvement in the USA with the Marine Biological Laboratory in an NSF funded collaborative grant with UNH as an outside contractor facilitating the Russian relationship. He is now employed full time at the University as a research scientist. The presentation will also focus on the logistics of this international scientific relationship as well as the career path taken by the researcher. Several issues will be examined related both to the history of our ongoing collaboration and to those best classified in the realm of mundane and job-related:

- Visas,
- Financial constraints,
- International research,
- Language barriers, and other
- Institutional problems.

We gather our information by conducting short interviews with key stakeholders such as project Principal Investigators, department administrative personnel, and university-wide advisors for international employees. We find that although the process is sometimes very time consuming and exhausting the scientific rewards are great.

Long-Term Outlook for the Future U.S.-Russian Cooperation

Boris Levin

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Last global geophysical catastrophe of the 26 December 2004 tsunami that devastated several countries in the Indian Ocean region and claimed nearly 300,000 lives has clearly called the attention of the international community and cooperation in the area of tsunami warning. Other directions of the scientific collaboration are very important too.

I would like to remind that the Northern Caribbean and the U.S. Virgin Islands, particularly, have sufficiently large risk of tsunami (see EOS, 2005, Vol.86, No.12). The 1867 Puerto Rico earthquake (M=7.5) unleashed a tsunami with runup heights ranging from 2.4 to 12.1 m in the U.S. Virgin Islands. Harbor was damaged, but only 17 lives were lost due to tsunami. In 1918, a magnitude 7.3 earthquake in the Mona Passage between Hispaniola and Puerto Rico produced tsunami with 6-m-heigh runup on the western coast of Puerto Rico. Of the 116 fatalities from the earthquake, 40 were caused by the tsunami. The most recent destructive tsunami (~1800 deaths) in the northern Caribbean occurred in 1946 and was triggered by a magnitude 8.1 earthquake off the northeast coast of the Dominican Republic.

International cooperation in the area of tsunami research and tsunami warning system has great experience. Russian scientists and specialists and, in particularly, scientists from the Institute of Marine Geology and Geophysics (IMGG) Far East Branch of the Russian Academy of Sciences as well as officers of Sakhalin Tsunami Center collaborate with several Universities of the USA. Universities in Fairbanks, Seattle, Los Angeles, Honolulu are real collaborators of Russian scientists. Alaska Tsunami Warning Center (ATWC, Palmer, Alaska) and Pacific Tsunami Warning Center (PTWC, Honolulu, Hawaii) as well as International Tsunami Information Center NOAA (ITIC, Honolulu, Hawaii) have constant contacts with Russian colleagues. This collaboration may be improved in future.

The involving of students and young scientists in joint projects is important for the successful international cooperation. Academy Institutes at Sakhalin and at Kamchatka have good results in joint field schools, conferences, expeditions, and projects with University of Alaska, Fairbanks and Alaska Volcanology Laboratory (AVO). Hokkaido University of Sapporo is involved in this cooperation too. Institute of Marine Geology and Geophysics at Sakhalin is finishing the creation of permanent geophysical station at the Kunashir Island (Southern Kuril Islands), where groups of foreign students with supervisors can carry out observations, field survey of volcanoes, study of geophysical processes. Permafrost phenomena, which are observed at the Northern Sakhalin, can be studied together with Russian geologists in field expedition and at the permanent stations.

Seismologists of Sakhalin, Kamchatka and Magadan region have long-standing contacts with American scientists. At last time, seismologists of the Sakhalin Academy Institute fulfil contract for the Exxon Company Ltd. Several PhD students and students from Universities of Yuzhno-Sakhalinsk, Moscow, Novosibirsk and Vladivostok were involved in this contract.

In these times, field observations with seismological network devices from the USA and other works with GPS instruments, foreign gauges, and receivers demand special permission from state technical commission. Our Institute - IMGG FEB RAS has some experience in this.

Sea Ice Biology in Recent Environmental Changes in the Arctic

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In general, the Arctic Ocean is a critical area for the flux of water and ice that modulate global climate. A unique feature of the Russian Arctic Seas, in particular, is its vast watershed. Draining freshwater from continent to the shore has significant impacts across the coastal zone onto adjacent shelf water. New knowledge is needed of the interaction between terrestrial, shelf, and sea ice environments in the Russian Arctic Seas to understand the role and response of the Arctic to global change.

The primary goal of our 2-years long research, founded by CRDF (U.S. Civilian Research and Development Foundation), was to study the dynamic of biological processes in the coastal sea ice zone. Objectives of our research were focused on monitoring of the sea ice's biological processes at all stages of the sea ice development. Field sampling was conducted in two different coastal systems in Kandalaksha Bay of the White Sea: (1) the sea-ice area without river water influence (winter 2002), and (2) the sea-ice area with river water impact (winters 2003 and 2004). Sea ice cores and water samples were collected monthly along transects from a coastal line to the middle of the bay at 3-6 fixed stations. Salinity, temperature, nutrients, organic carbon and chlorophyll a as well as species composition in all samples were measured. In our research we used a hydrophysical sensor, especially designed for our project, for measurements of 5 oceanographycal parameters (temperature, salinity, pH, oxygen and PAR) within the water-ice interface (indications every 20 min with computer storage of the raw data). Using this sensor it was possible to carry out measurements over the winter on formation of a brackish-water layer of 50-60 cm thick with salinity 2-3‰. This layer was formed in early February and persisted up to the melting period in late April. In spring 2003, we observed the development of the brackish-water algae *Ulothrix implexa*, - the same species, which we also observed in the Canada Basin of the Arctic Ocean during our collaborative research at the NSF founded SHEBA experiment in 1997-1998. Using SCUBA diving, we made digital photos and video of these algae aggregations beneath the ice. Thus, practically for the first time in this region, we have obtained three continuous winter data sets, and discovered and described a three-dimension system (sea ice-brackish layer-sea water), which formed in winter in Arctic coastal zone influenced by river water input. The project's results were presented at several international meetings (including AGU in 2003) and published in peer-reviewed journals. Some of the results were discussed on Russian TV ("Polar Circle") (http://www.rambler-tv.ru). Our collaborative research was under umbrella of program RAISE (Russian-American Initiative in Shelf-Land Environment in the Arctic), which is a component of the NSF program in Arctic System Science, focused on studying of the Arctic System. We expect that our project's results will provide a base for future research of land-ice-ocean processes in the context of the upcoming International Polar Year, 2007-2008.

The RUSALCA Project: a successful example of a public-private partnership approach for Russian - American cooperation in the Arctic.

Dr. Aleksey A. Ostrovskiy

(Assistant to the Vice-President of the Russian Academy of Sciences, Director of International Programs)

For any bureaucracy, making decisions on new initiatives involves risk, especially when the decision results in a change of the system. This is why bureaucracies are usually not responsive to new challenges. Bureaucracies are designed to take care of the general public interests of society, yet making changes in the government always requires time and internal discussion. Because no one knows for sure where one or another decision will lead, bureaucracies generally find it much safer to say "no" to a change. Often the "no change" decision protects society from selfish or unreasonable motives. In this case a bureaucracy is quite useful as it acts like a pendulum damper for the society's oscillations.

But very often bureaucracies do damage society's progress by pressing on the brakes to change. The private sector as a rule is more active and efficient, but only in a profit orientated way. Traditionally, society benefits from the taxation of the private sector, but they can benefit one another by working together for mutual goals. This collaboration is called a Public-Private-Partnership, (P3). The P3 tools are used in different countries and different areas to overcome the inefficiencies of government. Sometimes the results are excellent and sometimes the P3 approach is criticized if too much emphasis is placed on the private interest's success. This P3 entity can be good or bad from different points of view depending on the public/private ratio and the methods of checks and balances. Balance and optimized use are important criteria to consider. The following is an example of a P3 approach in Arctic Russian-American collaboration.

Foreign scientific cooperation with Russia in the 1990s was almost without government regulation. The decade provided new opportunities and pitfalls for scientists. It was both a time of new freedom from bureaucracy and rapid financial decay created by the collapsed Soviet economy which plunged the Russian scientific institutions into poverty. Foreigners were able to access unique data and much of the endangered information was saved, preserved and reinterpreted fostered by an infusion of funding from organizations outside of Russia. During this decade, people often used the opportunities created by government chaos for their own personal benefits. Many non-Russian foreign scientists used this situation in Russia to boost their careers with minimum cost and effort, by paying small amounts to obtain enormous quantities of formerly classified data as well as non-expensive scientific workforce (acceptable from a free market point of view, but not always ethical). There were also many Russian scientists who felt abandoned by their government and as a consequence sold data for "nothing" without taking into account the public interests of the Russian society. This was an adventurous-pirate-type decade for Russian science.

After 2000 Russian government changed the situation in the area of international cooperation. Yet not everybody in Russia or America has realized the changes that have occurred. Some scientists and organizations believe that they are still living in the "good old days" when customs and paperwork could be avoided, financial transfers could be masked and permissions for data exchange were unnecessary. In today's world, government regulations determining the fate of international scientific cooperation have been recently introduced (not necessarily for the worse). These regulations provide more guidance and more stability to the scientific collaboration process. Long-term plans for international cooperation have recently become possible, but in reality the process to succeed with these plans is still difficult to achieve. One of the first successful new collaborative projects between Russia and the U.S. is the RUSALCA (Russian-American Long-term Census of the Arctic) Project.

The principal partners in the RUSALCA project are the National Oceanic and Atmospheric Administration (NOAA), the Russian Academy of Sciences (RAS) and Group Alliance. In 2002, many bureaucratic "experiments" where undertaken by NOAA and the RAS to develop collaborative Russian and American science in the Arctic. The first attempts followed the established pathways through the Department of State and the Russian Foreign Ministry. One goal was to carry out collaboration through a World Oceans bilateral agreement between the U.S. and Russia. However, during the 1990s this agreement lapsed and was not easy to resurrect. Interested parties representing Russian and American agencies met in Hawaii in February, 2002 to discuss the re-creation of a World Oceans agreement. But as usual there was little follow through. The second attempt was to develop the Arctic project under the still existing Russian-American Intergovernmental Science and Technology Agreement and to work directly with the Russian Ministry of Science and the Russian Academy of Sciences. After many discussions and with the support of the Embassy of the Russian Federation in Washington DC, it became clear that it was the Russian Academy of Sciences that was willing to form a partnership with NOAA to develop a Memorandum of Understanding on World Ocean and Polar Region Studies. It also became clear that to enable the MOU and to activate the necessary Russian agencies involvement, Russia and the U.S. would have to engage the private sector within Russia to adequately connect the government officials with one another. During the summer of 2003, the Arctic Research Office of NOAA under Dr. John Calder and Dr. Kathleen Crane set up a cooperative agreement with the private Russian company Group "Alliance". This private company had a workforce with appropriate oceanographic, business and government relations skills. It was to serve as NOAA's cooperative partner and as the development and management arm of the RUSALCA program within Russia. On the Russian side the project was headed by the President of Group "Alliance" Dr. Vitaly Keondjian while Dr. Michael Zhdanov managed the project on daily basis. The decision by the Arctic Research Office of NOAA to move in this direction could have been considered very risky, taking into account the fact that the business climate in Russia is fairly young. However, in this case the risk paid off because the parties concerned were able to move ahead into crafting new alliances between the U.S. and Russia.

Group "Alliance" provided all necessary support for the Project and navigated NOAA through the complicated Russian bureaucratic environment. These efforts led to the successful 2003 Memorandum of Understanding for World Ocean and Polar Regions Studies between NOAA and the Russian Academy of Sciences. It was signed by Administrator of NOAA Vice Admiral Conrad C. Lautenbacher and Vice President of the Russian Academy of Sciences Academician Nikolai P. Laverov. In the summer of 2004 the first expedition under the auspices of the MOU took place. Guidance and leadership was provided by NOAA, the Russian Academy of Sciences, the Russian Navy, Roshydromet and many other agencies and academic institutions. The major goals of the investigation were to check the pulse of the biological, geological, chemical and physical oceanographic environment in the Bering Strait and the Chukchi Sea of the Arctic Ocean.

Because of the success of the first year of the RUSALCA project it may now be an opportune time to use the private-public partnership approach for other collaborative U.S.-Russian programs. This approach could be very helpful in many different areas and at different stages of many international cooperation projects. At the present time it is probably the most reliable way to successfully operate with Russia. The Russian Federation is very sensitive to any foreign work on its territory. However the recent achievements mentioned above lend some optimism about growth in the area of international collaboration.

Investigations of sea level rise and freshwater budget of the Arctic Ocean in collaboration with the Russian and Canadian Scientists

Andrey Proshutinsky

Woods Hole Oceanographic Institution

The results of two collaborative (USA-Russia-Canada) and one multi-national NSF-funded projects which major missions were recently accomplished or are still ongoing at the Woods Hole Oceanographic Institution (WHOI) will be presented. The project "Investigation of sea level rise in the Arctic Ocean" (http://www.whoi.edu/science/PO/arcticsealevel/), included the collection, processing, preparation for publication and release of previously classified and not available for the international oceanographic community monthly relative sea level data for 71 coastal tide gauge stations in the Kara, Laptev, East Siberian, and Chukchi Seas for the time period of 1950-present. These data are now freely available at PMSL, NOAA, and WHOI archives and web sites. The USA project team included scientists from WHOI and University of Alaska Fairbanks (UAF), the Canadian team was represented by scientists from Toronto University, and the Russian team originated from the Arctic and Antarctic Research Institute (AARI). This collaborative effort allowed participants to analyze causes and rate of sea level rise in the Arctic Ocean combining the observational data from Russian tide gauges, the experience and knowledge of sea level regime of AARI scientists, and the analytical and modeling capabilities of the USA and Canadian sea level experts.

Another example of USA-Russia-Canada collaboration is the project "Beaufort Gyre freshwater experiment: Study of fresh water accumulation and release mechanism and a role of fresh water in Arctic climate variability" (http://www.whoi.edu/beaufortgyre). This project brought together experts from WHOI, Institute of Ocean Science (IOS), British Columbia, Canada, and from AARI. AARI scientists contributed historical analyses of classified hydrographic data and provided gridded T-S fields averaged for the natural periods of Arctic variability (cyclonic and anti-cyclonic regimes of the Arctic Ocean circulation). WHOI and IOS conducted measurements of the Beaufort Gyre freshwater and heat content during cruises on Canadian icebreaker in 2003 and 2004. This project will be finished in 2005 but several important scientific results showing significant changes in the freshwater budget of the Arctic Ocean relatively to climatology have been already identified.

The international "Arctic Ocean Model Intercomparison Project" (AOMIP) is a truly multinational effort (http://fish.cims.nyu.edu/project_aomip/overview.html). This project has been focused on the investigation of different aspects of the ocean and sea ice changes from 1948 to the present. Among the major themes of AOMIP are investigations of the origin and variability of Atlantic Water circulation, mechanisms of accumulation and release of fresh water, causes of sea level rise, and the role of tides in the shaping of climate. Several hypotheses based on synthesis and integration of model results with observations, and major directions for modeling studies during the International Polar Year (IPY) 2007-2008 will be discussed.
In later discussion, major aspects of project organizational work including proposal preparation, project coordination, reporting procedures and resolving problems associated with financing will be offered based on experience gathered since 1997.

Workshop for Facilitating U.S. and Russian Research Collaborations
11-16 June 2005

Tom Quinn

VECO Polar Resources

VECO Polar Resources (VPR) began providing logistical support for research programs funded by Office of Polar Programs (OPP) in 1999. A growing scientific interest in the Russian Arctic has permitted us to assist several multi-year projects in Siberia and at the North Pole. While logistical support in the Russian Arctic has a well-deserved reputation for being problematic, it is possible to achieve your research goals through collaboration, planning, patience, and a bit of luck.

The following items may serve as a baseline for planning a successful field program in the Russian Arctic.

- **Identify and establish relationships with Russian colleagues who have a stake in the research and the data.**
- **Start planning logistics early, preferably in the proposal stage.**
- **If the project is large or complex, investigate Russian companies that may be able to assist. *i.e.,* CPPI-S, Polar Foundation, POLUS.**
- **Conduct a risk assessment and identify options to reduce or minimize risk.**
- **Clearly define the roles and responsibilities of each key player.**
- **Purchase materials, chemicals, and communications gear in Russia.**
- **Meticulously document materials to be imported/exported from Russia.**
- **Establish a reliable method to transfer funds.**
- **Maintain an open dialog between the researcher, collaborator, and support personnel when developing the project plan.**
- **Acquire permissions and move cargo/materials early in the process.**
- **Plan for medical emergencies and utilize telemedicine.**
- **Anticipate and be prepared for minor setbacks or changes.**
- **Maintain contacts, share data, and recognize Russian collaborators in publications after the project is completed.**

New results of Eastern Siberian Arctic Shelf investigation.

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The research programme "Laptev sea System" within the framework of joint Russian–German cooperation has been held from the beginning of 1990. These studies were significantly expanded by the cooperation with American scientists Vladimir Romanovsky & Tom Osterkamp, research work was supported by grant NSF # OOP 99 86 826.

Authors received a number of absolutely new representations about Arctic Shelf of Eastern Siberia.

1. It was established that offshore relic permafrost is presented on the whole territory of Arctic shelf of Eastern Siberia. The continuous ice-bearing permafrost is distributed up to modern depths of the sea about 50 m; permafrost is discontinuous on the greater depths up to an edge of a continental slope. On the major part of the arctic shelf offshore relic permafrost is presented by ice-bearing permafrost in freezing-thawing diapason of temperatures of fine-grained or/and saline deposits. Sea water temperature predominantly is negative. In this environmental conditions degradation of relic permafrost takes place mainly from the permafrost lower boundary under the geothermal heat flux ($\mathbf{q_{gt}}$) influence.
2. Gas hydrate stability zone – (GHSZ) is spread on the whole Arctic lowlands and shelf.
3. GHSZ and ice- bearing permafrost prevent gas emission from sub-permafrost collectors.
4. Due to the high geothermal heat flux values "pocket like" ore "anticline" structures are formed in rift zones of the internal part of the shelf . Thicknesses of permafrost and GHSZ are essentially reduced in such structures and can serve as "traps" for greenhouse gases and their hydrates. Along the rift structures axes open "endogenic" taliks are formed in an external part of the Arctic shelf under influence of geothermal heat flux during the periods of sea transgressions, emission of sub-permafrost gases can be take place through them. Local gas emission occurs also in the shallow part of the sea along the individual faults with $\mathbf{q_{gt}}$ 150 mW/m^2 and higher values (personal communication of Igor Semiletov).
5. During the sea regressions syncryogenic continental depositions with high ice content have been deposited on the lowland of the shelf. The poly-facial Ice Complex (IC) containing up to 90 % of fresh ice and a plenty of poorly decayed fossils was generated during the last regression period.
6. The majority of taliks under the thermokarst lakes are not open. After sea transgression they turned into closed subsea taliks.
7. Submerging of the thawed and frozen deposits of the thermokarst lakes and thermokarst depression- alases by the sea water, thawing of the deposits under the sea influence and so on, lead to changes of the deposit' s structure, the organic maintenance and salinity, that in a complex present the material expression of not studied part of «Sea-Land Interaction» processes of the Arctic regions.

Cooperative Russia-US studies in the Pacific sector of the Arctic: 10 years experience

Igor P.Semiletov

International Arctic Research Center, University Alaska Fairbanks & Pacific Oceanological Institute, Far-Eastern Branch of Russian Academy of Sciences;

Critical Contrasts in the Pacific sector of the Arctic

A major constraint on our ability to understand linkages between the Arctic Ocean and the global climate system is the scarcity of observational data in the marginal seas where major fresh water input and terrestrial CNP fluxes exist. A transect of the eastern Laptev and East-Siberian seas corresponds to a number of geographically critical contrasts in the Pacific sector of the Arctic. This area remains largely understudied and provides an excellent natural laboratory in which to use our approach to make progress towards an improved understanding of the interactions across the atmosphere-land-ocean system, and the impacts of those interactions on freshwater dynamics and biogeochemistry. The fate and transport processes of terrestrial organic carbon across the Arctic land/ocean margin are largely unknown especially in the East-Siberian, Laptev, and Chukchi Seas, and the Russian part of the Bering Sea, they are critical to our understanding of environmental change on a time scale of human concern.. The specific role of the Pacific derived/halocline waters in climate change has yet to be elucidated. Whether there is a signal of old terrestrial organic carbon input due to recent environmental and climate changes in the Arctic region is still not clear (Semiletov, 1999; Stein and Macdonald, 2003; Benner et al., 2004; Guo et al., 2004; Vetrov and Romankevich, 2004; Frey and Smith, 2005; Semiletov et al., 2005).

Paradox in Planning and Badly Coordinated International Studies

Observational studies over the Alaskan and Canadian Beaufort shelf are well established with near 70 existing moorings and data are available from a few hundred moorings that have previously been deployed. This area is much more intensively studied than the Russian EEZ of the Bering, Chukchi, and East-Siberian seas, where no mooring observations or well-coordinated international studies have been established. Thus, at present it is impossible to evaluate the Pacific effects on the Arctic Ocean, and vice versa

The U.S. National Academy calls for Sea Change in Ocean Efforts.

U.S. National Academy has called for sea change in ocean efforts. A National Academy of Sciences (Mason, 2003) committee has reported that the United States isn't doing enough to explore the oceans and needs to develop an interagency approach to such exploration. An academy panel also related that a better understanding of the oceans requires a major coordinated, international effort to investigate unexplored regions such as the Arctic and Southern oceans. The panel concluded, in a report released on November 4, 2003, that the best way to get such an effort under way is for the United States to take the lead, with the hope that other countries will follow suit.

Logistic Justification with focus on permission issue.

Author has unique experience organizing and facilitating Russia based (1990-2000), and later Russia- U.S. based (2001-2005) studies in the Russian Arctic seas (http://www.iarc.uaf.edu/east_siberian_cruise.html). In total author organized and accomplished successfully 17 land-shelf expeditions in the Siberian Arctic and Alaskan Arctic. From 1995 to 2002 author served for International Arctic Science Committee (IASC) as Director of Russian *Bering Sea Impact Study* (BESIS) office to manage joint US-Russia studies in framework of the BESIS/IASC Regional project led by Gunter Weller. In 2001 I was invited by International Arctic Research Center (IARC)/University Alaska Fairbanks (UAF) to develop cooperative studies betweenUAF and Far-Eastern Branch, Russian Academy of Sciences (FEBRAS). Since 2001 author organized three Russia-US full-size oceanographic summer expeditions in the East-Siberian and Laptev seas (2003, 2004, 2005/underway), and one winter expedition in the Laptev Sea (2002). For instance, in May 2003, IARC through the Pacific Oceanological Institute (POI), FEBRAS, received permission, which was issued by the Russian Ministry of Industry, Science and Technology, for a joint Russia-U.S. cruise in the most poorly explored area of the Siberian shelf seas: the East-Siberian Sea. The cruise set sail from Tiksi in the Laptev Sea in September 2003. The National Science Foundation (NSF) provided funds for equipment and U.S. participation in this cruise through an NSF-Office of Polar Programs (OPP) project (OPP-0342837) that is complementary to the NSF CHAMP/SEARCH project (OPP-0230455). From the Russian side, support for the cruises was obtained by awarded different Russian grants from Headquarters of Russian Academy of Sciences, FEBRAS and Russian Foundation for Basic Research (RFBR). Personal support from academician Sergienko, President of FEBRAS, academician Gueorgui Golitsyn, Director of Institute of Atmospheric Physics RAS, play an extremely important role in the projects accomplishment. Permissions for joint Russia-US cruises 2004 and 2005 (which is now underway) were also obtained from the Russian Ministry of Industry, Science and Technology on time. Charter of the oceanographic vessel from 2003 to 2005 is arranged through a Cooperative Agreement between IARC/UAF, POI-FEBRAS, and Tiksi Hydrobase (the former Northern Sea Route Hydrographic Service), Russian Federation Ministry of Transportation. Our success may be easily explained by cooperation with right persons from the FEBRAS, which was created many decades ago by Russian (Former Soviet Union) Government and RAS Headquarters to lead regional marine and land-based studies. FEBRAS is working closely with the Pacific Fleet Headquarters, which is a critical Federal body to obtain permission. Also cooperation with Moscow RAS Headquarters made our position much stronger. Thus my 10years record of cooperative studies shows that it is possible to conduct bi-national projects dealing directly with Russian regions.

To obtain permission on time, avoid weak-organized studies, missing opportunities, overpayments, and work more effectively towards joint mutual long-term observations in the Siberian Arctic seas <u>author recommends</u>:

1) to establish cooperative studies only with Russian institutions which are eligible (licensed) to organize and provide international marine studies on the Russian Shelf Seas;
2) to identify key persons from .licensed institutions; major criteria should be: experience in organization and accomplishment of international marine field studies, adequate professional experience in the Arctic exploration, fluent English, good connection with Moscow and Navy officials;

3) additional requirement for choosing of right key person should be record of grants obtained from different domestic and/or international organistaions and foundations; expertise of chosen person should be also confirmed by publications in refereed journals;
4) to work primarily with regional licensed institutions, because they have relevant research vessels with minimal costs, they know local environment and right people at the regional level to organize the joint study by most proper way;
5) to invite in the cruise leading research scientist not only from chosen regional institution but also from other interested Russian institutions; that make the cruise more convenient to be supported from Ministry of Science (permission) and funding agencies (RFBR and others);
6) to obligate the key person from Russian partner-institution to apply for support from the RFBR (field awards); which is very sufficient and prominent support;
7) avoid cooperation with profit companies which can not be eligible to obtain the permission (ask their marine/license obtained at federal level); they are working as the "third" body which makes a profit from US taxpayers money because; they must come to the eligible (licensed) institutions and make a subcontract ; finally US institution pay 200-300% (may be more) of real expenses which may be paid directly to the right licensed institution (necessary condition: right local key person);

Dissolved Methane Studies In The East-Siberian And Laptev Seas: Scientific And Logistic Issues

Natalia Shakhova

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There exists very limited knowledge about sub-sea permafrost distribution and the permafrost thermal regime in the Pacific sector of the Arctic shelf, especially within the East Siberian, Chukchi, and Northern Bering seas. It was previously assumed that there is no permafrost in the Northern Bering and most of the Chukchi seas. However, recent studies (unpublished results of the RV "Nikolai Kolomeitsev" cruise in 2000) indicate a possibility that sub-sea permafrost exists in this poorly explored region (Iossupov et al., 2005). Sub-sea permafrost degradation can have a significant effect on sea-bottom heat flux and could lead to release of an enormous amount of methane from gas hydrate deposits (Romanovskii and Huberten, 2001; Kennett et al., 2002; Semiletov et al., 2004). Then studying the role of sub-sea permafrost dynamics in the thermal balance of the bottom sediment- sea water system and in greenhouse gases release (primarily methane) needs well-coordinated international efforts.

Our Russia-US based methane (and carbon dioxide) studies were done in framework of the First and Second Russia-US expeditions onboard IVAN KIREEV in the East-Siberian and Laptev seas. First time distribution of dissolved methane was studied in this area which is most affected by Global Warming. Joining our previous land based methane studies (Semiletov et al., 2004) with recent marine based results (Shakhova et al., 2005ab) we may hypothesized that during global warming the North is a significant source of methane into the atmosphere. We suggest that during the Holocene and previous "warm" stages, the formation and evolution of thaw lakes and disturbance of gas hydrates are the best candidates. Projections (ACIA, 2004) shows that in the end of this century almost half of permafrost in the East-Siberian and Laptev seas' basins will be thawed. Then a huge amount of old organic carbon (up to hundreds of Pg OC) will be mobilized into the modern biogeochemical cycles with methane as major end product. Then warming-thawing permafrost-methane release-greenhouse warming feedback may be become as an important and poor explored yet climate forcing.

Logistic issues: Our experience working in the Russian Economic Enterprise Zone (EEZ) will help when planning future U.S. studies in this area. Our ongoing project is a good start towards the goal of establishing mutual twenty first century cooperation between the U.S. and Russia in the Pacific sector of the Arctic Ocean, which falls mostly in the Russian EEZ. Working directly with regional and local ship owners we are able to establish long-term and low cost studies in coastal zone of the Laptev and East-Siberian seas where we have 15 years succeeds record. Working directly with many profit and non-profit, governmental and private organizations in Russia (Vladivostok, Moscow, Tiksi, Sankt-Petersburg) we recommend to work directly with licensed Russian institutions, not with profit organizations. For instance, our experience working with profit organizations in Russia demonstrate that profit organization may become as slave driver and explore high-qualified scientist with lowest labor rates, because major part of the funds invested for science (in our case: field studies) are going to be used for company profits.

The same with a rent-a-vessel: cooperation with Russian licensed institutions via profit organizations may increase expenses up to 2-3 times and more. Meantime, profit organizations are not eligible to conduct any marine studies in the Russian shelf seas. That may cause a negative consequences from Russian scientific community and officials. Note also, that working via "third body" decrease real income for Russian partners about 18%, because of increased federal tax on salary money issued by non-profit organizations.

Field-based Research in West Siberia 1999-2001: Procedures for Obtaining Permits for International Scientists

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Our RAISE field activities took place from 1998-2000 in the West Siberian Lowland, Russian. At that time, the procedure for foreign scientists to obtain research permits Moscow could follow two tracks, as follows:

1. U.S. scientists are considered "guests"

(1) Russian colleagues prepare application to obtain permission for U.S. scientists to visit, signed by Director of Institute (Kotlyakov)

(2) Director sends application to Department of Foreign Relations (Upravlenie Vneshnikh Snosheni), Russian Academy of Sciences.1 Department of Foreign Relations then submits Visa application to Russian Foreign Ministry, who sends approval to U.S. Russian Consulate

Note that this procedues does not provide permission for U.S. scientists to do field work, only to stay in towns. It also does not circumvent the problems of "closed" towns, which we did encounter particular in northern regions.

2. U.S. scientists considered "joint collaborators"

(1) Russian colleagues prepare application to obtain permission for U.S. scientists to conduct joint field work, signed by Director of Institute (Kotlyakov)

(2) Director sends application to Department of Foreign Relations

(3) Department of Foreign Relations prepares additional paperwork, to be signed by Vice President of the Academy.

(4) Copies of the signed paperwork are submitted to FSB (Federal Security Bureau) and Russian General Staff (Generalny Shtab). FSB takes ~3 months. If work is to take place in a "Boundary Area" (e.g. Yamburg), copy must be sent to Headquarters of Russian Boundary Service (Federalnaya Pogranichnaya Sluzhba). This step is usually required for Arctic coastal work. All signed copies are returned to the Department of Foreign Relations. For Arctic Boundary areas, additional permission is required from Arctic Staff of the Russian Boundary Service (Murmansk). This level of permission may be arranged at the Institute level.

(5) Signed originals are returned to the Director of the Institute and field crew.

(6) Department of Foreign Relations sends approved Visa application to Russian Foreign Ministry.

The latter represented a return to Soviet-era procedure, however we found that approval was generally not too difficult to obtain, provided our Russian colleagues were persistent.

Samples

There are two ministries that issue permissions for samples:

1. Ministry of culture (required for certain flora and fauna samples, including bones)

2. Ministry of Mineral Resources. All permissions are signed by 1st Deputy Minister. There are two procedures:

   (a) For mineral resources (rocks, peat): Paperwork must be prepared by Department Litsenzirovaniya (Department of "Exported Mineral Resources"), stating that the samples have no economic value.

   (b) For water samples (and others not considered mineral resources, e.g. wood): Paperwork must be prepared by the Department of Foreign Relations (not to be confused with Upravlenie Vneshnikh Snosheni). Previous to May 2000 this was done by the Ministry of Ecology.

The paperwork provided from this process does not represent "permission," but rather a "petition" to Russian customs. Ultimately, it is the decision of the customs officer whether to accept the petition or not.

Wish list:

(1) A way to import and return equipment for field work without paying undetermined fees?

(2) Establish an agreement or special type of permission facilitating the export of samples?

Facilitating Collaborative Scientific and Technical Research in the Arctic Sciences and Geosciences

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The U.S. Civilian Research and Development Foundation (CRDF) is a private, nonprofit, grant-making organization created in 1995 by the U.S. Government (National Science Foundation).

The CRDF promotes international scientific and technical collaboration, primarily between the United States and Eurasia, through grants, technical resources, and training. The Foundation's goals are to support exceptional research projects that offer scientists and engineers alternatives to emigration and strengthen the scientific and technological infrastructure of their home countries; advance the transition of foreign weapons scientists to civilian work by funding collaborative non-weapons research and development projects; help move applied research to the marketplace and bring economic benefits both to the U.S. and the countries with which the CRDF works; and strengthen research and education in universities abroad.

Three CRDF programs provide support to U.S. and Russian scientists engaged in collaborative Arctic and geosciences-related research. First, under a contract with the National Science Foundation, CRDF provides an office and personnel in Moscow to assist Office of Polar Programs (OPP) and Geosciences Directorate (GEO) grantees and collaborators with programmatic activities, including identifying and communicating with individual and institutional partners, navigating government agencies, facilitating travel and visas, and providing on-site office support to visiting U.S. travelers. Second, the CRDF Cooperative Grants Program allows US-Russian collaborators in Arctic sciences and geosciences to apply for two-year R&D grants averaging approximately $65,000. Third, the CRDF Grant Assistance Program (GAP) enables U.S. government agencies, universities, and other organizations to utilize CRDF's financial and administrative infrastructure to transfer payments, purchase and deliver equipment and supplies, and carry out other project management services to collaborators in Russia and elsewhere in Eurasia.

Studying Human and Ecological Dynamics in the Kola Peninsula

A. Voinov

University of Vermont

A US-Russian research effort is conducted in the Kola Peninsula to increase understanding of the role of human dynamics on ecosystem functions and explore development strategies to enhance ecosystem health, ecological sustainability and economic diversity. The project is focused on the Imandra Lake watershed.

More specifically, four research questions are examined:

1. What effects has decreased industrial and human activity had on the ecological health or resilience of the watershed?
2. What future models of economic and social development in the region can increase economic productivity while not degrading the health of the watershed?
3. How can integrated modeling be used as a consensus-building tool for making decisions about further economic and social development of the region?
4. What are the possible scenarios for future development of the region under changing global conditions, such as global warming?

We are developing site-specific databases and models for the Imandra Lake, and its watershed. The stakeholder workshops and the data collected feed into a modeling process that is based on the Landscape Modeling Framework (LMF), which provides the capability to model watersheds as spatially explicit, integrated, ecological economic systems. Most important is not a unique model implementation that is developed, but rather an ongoing process of integrated assessment. This participatory modeling approach starts from a series of workshops when stakeholders take part in defining the goals of the studies, in understanding the system structure, in reviewing the available data sources, and in prioritizing the monitoring programs. By involving the stakeholders in the modeling process, we increase their awareness, and contribute to consensus-building on economic development, resource management, and strategic planning issues.

The major problems encountered so far are as follows:

- Lack of funding on both US and Russian sides (what's new?)
- Language barriers
- Communication barriers
- Organizational barriers
- Different expectations and attitudes
- Bureucratic roadblocks (no clear mechanisms for transfer of funds)

However the main problem is certainly the lack of internal support for Russian science that results in fast degradation of the world class schools and research centers. The declining levels of support for science in the USA certainly does not help as well.

A Measurement Program At The Northeast Science Station In Cherskii, Siberia To Assess Disturbance-Driven Changes In Arctic Carbon Fluxes (RAISE).

Katey Walter

University of Alaska, Fairbanks

The RAISE program set an important precedent whereby U.S. and Russian scientific research collaborations occurred with the active involvement of Russian scientists in planning and guiding the science. At a time when Russian politics are transitioning to a new stage, NSF should maintain this precedent of active collaboration at the level of U.S. scientists with Russian scientists, rather than between institutes and academies.

The objectives of Northeast Siberian carbon flux study were two-fold: 1) to study critical biogeochemical fluxes (C, nutrients, H_2O) between terrestrial ecosystems and the atmosphere and to the ocean; and 2) to increase the capacity for Russian science to conduct Arctic research.

This project was strategically based at the Northeast Science Station in Cherskii, Russia (69∞N, 161∞E) in order to study a unique, large (10^6 km^2), and ecologically important area with regards to global climate change. The icy-permafrost loess soils in North Siberia that developed during the Pleistocene, called *yedoma*, contain 4.5 Gt of C, a pool size equal to that of the terrestrial biosphere. Yedoma is susceptible to mineralization to greenhouse gases (CO_2, CH_4) and transfer to the atmosphere and ocean.

The Northeast Science Station has a tradition of exciting research contributing to theory and interest in global change. The following attributes of the station were key to the success of our project:

- Pre-established working relationship between director, Sergei Zimov, and U.S. PI, Terry Chapin
- Year-round operation and staff at station for continuous measurements
- On-site facilities for data collection, laboratory analysis (data not dependent on sample export to USA).
- VECO coordination of equipment and sample transport and border customs
- Russian-speaking American scientists
- Flexibility and resourcefulness of station users for unexpected circumstances
- Opportunities for undergraduate and graduate student participation and collaboration with Russian scientists and other international research teams.

The results included:

- Co-authored (by Russians and Americans) publications
- Growth of the Northeast Science Station's capacity to continue a long-term monitoring of global change: marked improvements in laboratory facilities, personnel, field equipment, computers, small aircraft, and establishment of infrastructure for long-term monitoring in the region.
- The birth of interest in an array of young U.S. and Russian scientists committed to future research in the Russian Arctic.

The NSF now has a great opportunity to continue the precedent for U.S- Russian scientific collaboration in the Russian Arctic set by RAISE. Research in Russia will benefit from a commitment to maintaining a small number of science stations set in extensive areas of Russia that differ from North America (yedoma, Ob Peatlands, dark taiga), with the purpose of long-term monitoring of global change.

Joint Russian-American Scientific and Educational Adventures in Siberia and the Russian Arctic, 1989-2005

Douglas F. Williams and Evgeny B. Karabanov*

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Over the past sixteen years, the authors have collaborated on a variety of scientific and educational endeavors that span the transformation of the Soviet Union to the market economy of the Russian Federation. Our partnership has involved a complex mixture of scientists of the Russian Academy (Moscow, Siberian and Far Eastern Branches), faculty and students of universities in Irkutsk, Moscow and Novosibirsk, faculty and students of a dozen universities across the USA, scientists of the USGS, and scientists and faculty of Japan and Germany. Our collaborations include the multinational Lake Baikal Drilling Project (BDP) and pre-drilling coring-geophysical cruises with the USGS. BDP received the highest international endorsements as a critical Geoscience project from the Gore-Chernomerdyn Commission, the PAGES Pole-Equator-Pole network, the Baikal International Research Center (BICER), and paved the way for a global effort being led by ICDP and DOSECC to obtain long paleoclimate records from lake systems.

In parallel with BDP, we created a three-year university-based study of the carbon cycle of Lake Baikal and of the environmental health of the Angara River from Irkutsk to Bratsk as part of the Baikal Undergraduate Research Group (BURG) and RESET, the Russian-American Environmental Science and Education Training effort. From BDP, with the headwaters of the mighty Lena River just 10 km from the shores of Lake Baikal, we redirected our partnership into a three-year study funded by the NSF Freshwater Initiative to determine the history of Lena River discharge into the Laptev Sea of the Russian Arctic. In 2003, with a team of American-Russian students at the core, we conducted a month-long, 2500 km hydrographic-hydrochemical-coring expedition down the Lena River from Ust-Kyt to the Lena Delta and Bukovskoya Bay. Three weeks later a small part of our team participated in a hydrograhic-hydrophysical expedition in the Laptev and East Siberian Seas led by Igor Semiletov.

In many cases, funding and opportunities made possible by our partnership have impacted the directions of institutes and been virtual lifelines for many Russian scientists. In the tumultuous geopolitical environment of the times, as far as humanly possible, we conducted our collaborations with a healthy spirit of respect and a firm commitment to mutual benefit for all parties. Throughout our sixteen years of joint Russian-American work together, only in two cases did we meet outright dishonesty and disregard for professional integrity and interestingly, the first instance occurred in our very initial work together in Lake Baikal, and the second, sadly, just recently in our work in the Russian Arctic. Overall, however, American scientists and students have gained unparalleled opportunities to work side-by-side in some of the most spectacular environments and with some of the most genuine people that Russia has to offer.

Likewise, the Russian side have had opportunities to access new ideas and equipment, including in some cases chances to do further study at US institutions.

Provisional Recommendations We will elaborate on these and other ideas during our presentation but in summary, joint research in the Russian Arctic needs better mechanisms for a) logistical support to remote areas, including permission to conduct field work and sampling, b) stable long-term funding, and c) assistance dealing with the ever-changing customs regulations in Russia and visa regulations in the US.

Appendix I. Scanned copy of agreement for tax-free transfer of equipment and commodities from U.S. agencies to Russia

AGREEMENT BETWEEN
THE GOVERNMENT OF THE UNITED STATES OF AMERICA
AND
THE GOVERNMENT OF THE RUSSIAN FEDERATION
REGARDING COOPERATION TO FACILITATE
THE PROVISION OF ASSISTANCE

The Government of the United States of America and the Government of the Russian Federation (hereinafter referred to as the "Parties"):

Being guided by a mutual desire to cooperate in facilitating the provision of humanitarian and technical assistance in support of market economic and democratic reform to benefit the people of the Russian Federation*

Recognising that the Government of the Russian Federation appreciates the humanitarian and technical assistance and notes the important positive role that non-governmental organisations of the United States of America can play in providing such assistance*

Recognising that full cooperation between the Parties will be aimed at the effective use of such assistance*

Have agreed as follows:

ARTICLE I
TAXES AND OTHER CHARGES

utilized in connection with United States assistance programs may be imported into, exported from, or used in the Russian Federation free from any tariffs, dues, customs duties, import taxes, and other similar taxes or charges imposed by the Russian Federation, or any subdivision thereof.

(b) Any United States Government or United States private organisation that has responsibility for implementing United States assistance programs, and any personnel of such private organisation who are not nationals of or ordinarily resident in the Russian Federation and that are present in the Russian Federation in connection with such programs, shall be exempt from (1) any income, social security or other taxes imposed by the Russian Federation, or any subdivision thereof, regarding income received in connection with the implementation of United States assistance programs, and (2) the payment of any tariffs, dues, customs duties, import taxes, and other similar taxes or charges upon personal or household goods imported into, exported from, or used in the Russian Federation for the personal use of such personnel or members of their families.

(c) The access and movement of aircraft and vessels operated by or for the Government of the United States of America in connection with United States assistance programs in the Russian Federation shall be free of landing fees, navigation charges, port charges, tolls and similar charges by the Russian Federation, or any subdivision thereof.

ARTICLE II
STATUS OF PERSONNEL

Personnel of the United States Government present in the Russian Federation in connection with United States assistance programs shall be accorded status equivalent to that accorded administrative and technical staff personnel under the Vienna Convention on Diplomatic Relations of April 18, 1961. Nothing in this Agreement shall be construed to derogate from the privileges and immunities to which personnel are otherwise

ARTICLE III
INSPECTION AND AUDIT

Upon reasonable request, representatives of the Government of the United States of America may examine the utilisation of any commodities, supplies, other property, or services provided under United States assistance programs at sites of thei location or use and may inspect or audit any and all records or other documentation in connection with the assistance during th period in which the United States provides assistance to the Rus sian Federation and for three years thereafter.

ARTICLE IV
USE OF ASSISTANCE

Any commodities, supplies, or other property provided unde United States assistance programs will be used for agreed upo purposes. If use of any commodities, supplies or other propert occurs for purposes other than those agreed upon under suc programs, which could reasonably have been prevented b appropriate action of the Government of the Russian Federation the Government of the Russian Federation upon request shal refund in United States dollars to the Government of the Unite States of America the amount originally disbursed for suc commodities, supplies, or other property. The Government of th United States of America may, in its discretion, make availabl the amount refunded to finance other costs of the assistanc activity involved.

ARTICLE V
OTHER AGREEMENTS

The Parties recognize that further arrangements o agreements may be necessary or desirable with respect t particular United States assistance activities. In case of an

ARTICLE VI
ENTRY INTO FORCE, AMENDMENTS AND DURATION

(a) This Agreement shall enter into force upon signature by both Parties. This Agreement may be amended, which amendment shall enter into force upon signature by both Parties.

(b) This Agreement shall remain in force for 90 days after the receipt by either Party of written notification of the intention of the other to terminate it. In such event, the provisions of this Agreement shall continue to apply with respect to assistance furnished before the date of termination of this Agreement.

DONE at Moscow, this 4 day of April, 1992.

FOR THE GOVERNMENT OF
THE UNITED STATES OF AMERICA

FOR THE GOVERNMENT
THE RUSSIAN FEDERATION

МИНИСТЕРСТВО ФИНАНСОВ РОССИЙСКОЙ ФЕДЕРАЦИ

ЗАМЕСТИТЕЛЬ МИНИСТРА

103097, Москва, ул. Ильинка, 9
телетайп: 112008
телефакс: 925-08-89

20.12.2000 № 04-06-02/45

На №

His Excellency
Mr. James F. Collins,

Ambassador of the
United States of America

Your Excellency!

With respect to your request concerning tax exemption of income American citizens and third country nationals engaged in the provision of U government-funded assistance to Russia we inform you as follows.

The Foreign Ministry of the Russian Federation informed the Ministry Taxation of the Russian Federation that the April 1992 US-Russia Agreement technical assistance is still in force since none of the parties expressed an intent to terminate it.

Therefore the income of individuals implementing United St government-funded technical assistance can be tax exempted under condition your Embassy or any other US-government body provide the Ministry of Taxa of the Russian Federation with a list of such individuals. In this case the Mini of Taxation may instruct its local offices (tax divisions) to provide tax exempti for all the persons participating in the US government technical assista programs in Russia.

Now we are in the process of according with the Ministry of Taxation a draft form of application for tax exemption for such individuals. As soon as it is ready we shall send it to the US Embassy for your information. We do not expect any delays in the process of according.

Sincerely,

First Deputy Minister of Finance
of the Russian Federation

Sergey D. Shatalov

Commodity

(1) A physical good typically produced in agriculture or mining, usually standardized or subject to grading or other classification, that can be the object of commercial transactions. The expansion of the legal definition of commodity in recent years leads many managers, analysts and traders to refer to these as physical commodities. (2) Any economic good. (3) Any index, rate, security or physical commodity that is or could be the underlying instrument or price determinant of a futures contract or other instrument regulated by the Commodity Futures Trading Commission (CFTC).

source: International Financial Risk Institute, Switzerland

Appendix II. Attendees at Workshop

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