

**HARC Synthesis Workshop  
5 October 2007**

**List of Invited Projects (Tentative)**

<b>International Polar Year Awards</b>				
<b>Award Number</b>	<b>Title</b>	<b>NSF Organization</b>	<b>PI</b>	<b>Contact</b>
0632346	ELOKA: Exchange of Local Observations and Knowledge of the Arctic	ARC/AON Implementation	Gearheard, Shari (UC Boulder).	<a href="mailto:sharig@qiniq.com">sharig@qiniq.com</a>
<p>This project addresses a gap in data management for Arctic research - the urgent need for effective and appropriate means of recording, storing, and managing data and information being collected in Arctic communities. Local and traditional knowledge (LTK) research and community-based monitoring efforts are on the rise, but to date there has been very little done to coordinate these projects or the information they have collected. The Exchange for Local Observations and Knowledge of the Arctic (ELOKA) seeks to fill this gap by supporting community-based research with accessible and useable data management that can allow findings to be shared more broadly, while still keeping control of data in local hands. Specifically, ELOKA proposes to provide data management and user support to facilitate the collection, preservation, exchange, and use of local observations and knowledge of the Arctic. To build ELOKA, researchers, community organizations, data management specialists, web specialists, and Arctic residents will work together. ELOKA will be developed in collaboration with four pilot projects representing different regions and cultures, different priorities and goals, different topics and locations of study, and different types of data. All of the pilot projects share a focus on community-based research in the North and a common interest and need for data management and networking capability. Working closely with these projects and using their expertise, experiences, and data, we will build the core of ELOKA which includes: (a) a secure place for existing and future LTK and community-based projects to store their data in a way that is searchable and accessible to a diverse community of users while assuring protection of sensitive data; (b) a portal to finding data, information, and resources about Arctic LTK and community-based projects; and (c) developing best practices and standards in data stewardship for community-based observations.</p>				
<b>Award Number</b>	<b>Title</b>	<b>NSF Organization</b>	<b>PI</b>	<b>Contact</b>
0638408	IPY Collaborative Research: Is the Arctic Human Environment Moving to a New State	OPP/Arctic Sciences AON Implementation	Kruse, Jack (UA Anchorage)	<a href="mailto:afjak@uaa.alaska.edu">afjak@uaa.alaska.edu</a>
<p>This project is part of the Arctic Observation Network, initiated as part of the International Polar Year, and will implement phase one human dimension priorities of the Study of Arctic Environmental Change (SEARCH) program. These priorities are directed toward the goal of identifying knowledge that will help people respond to environmental change. The priorities include: (1) developing an integrated pan-Arctic human dimension observation system based on existing data; (2) developing stakeholder networks to identify relevant observations and predictions, and to help understand the dynamics of the Arctic system; and, (3) develop and apply models to a pan-Arctic database to advance our understanding of environmental change and to identify data gaps that could be filled in a Phase Two human-dimensions observation system. The project will focus on four arenas likely to involve climate-human interactions: marine mammal hunting; oil, gas, and mineral development; tourism; and fisheries. A fifth project focus is on indicators of social outcomes of human interactions with environmental change. As part of the Arctic Observation Network, the project will be designed to foster integrated analysis across the physical, natural, and social sciences.</p>				

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0638413	IPY Collaborative Research: Is the Arctic Human Environment Moving to a New State	OPP/Arctic Sciences (Arctic Social Sciences)	Hamilton, Lawrence (U New Hampshire)	<a href="mailto:lawrence.hamilton@unh.edu">lawrence.hamilton@unh.edu</a>
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0634079	International Polar Year Collaborative Project: Bering Sea Sub-Network: International Community-Based Observation Alliance for Arctic Observing Network (BSSN)	ARC/AON Implementation	Gofman, Victoria (Aleut International Association)	<a href="mailto:victoriag@alaska.net">victoriag@alaska.net</a>
<p>Indigenous peoples around the economically important Bering Sea region are launching a project that will monitor environmental changes in the region. The project will involve Native organizations in western Alaska and in the Russian northeast. The Bering Sea, one of the most productive seas in the world, which includes globally important habitats for many biological resources, is now undergoing far-reaching environmental changes including climate change that alarm scientists, coastal residents and others from around the world. The region is of vital economic importance to both the US and Russia. The health, economic well-being, and ways of life of indigenous and non-indigenous peoples in the region are connected to the Bering Sea and its natural resources. The socioeconomic development of coastal villages along the Bering Sea, on both the Russian and United States sides, is dependent on maintaining ecologically sustainable conditions in the region. "This monitoring project is critical to the future of the region and of the peoples who live there," says Michael Zacharof, the president of the Aleut International Association, which is leading the project. "People in our communities notice even the slightest changes in nature but they do not have resources and tools to document them properly and to conduct research. In the Native communities, there are no "field seasons". We are in the field all year around and we think it is necessary to bring research, monitoring and observation capabilities to the local communities. By involving the people who live there, we can do this cost-effectively." The Bering Sea Sub-Network: International Community-Based Environmental Observation Alliance for Arctic Observing Network (BSSN), endorsed by IPY Joint Committee, will involve six local indigenous communities, three each in the U.S. and Russia, to monitor and share the changes they observe. Changes could include the shift of southern species north, changes in distribution and abundance of fish and other temperature-sensitive species, changes in ice patterns, and weather observations. Observations will be collected using surveying methods across the network based on standard protocols. BSSN will address the questions of: 1) historical and present distribution and properties of economic and subsistence important species as derived from collective indigenous and traditional knowledge; 2) types of major variables and indicators that could be correlated with western science to develop predictable models based on indigenous and traditional knowledge; and 3) spatial and temporal convergence and divergence of community-derived and western science data. This project will assess large scale environmental changes in the Arctic by</p>				

looking at both the physical and human dimensions of change and its impact. Success of this project will leave a legacy not only for IPY but also for a broad community of arctic residents striving to organize an observing system that is a valid partner in pan-arctic observations.

#### Synthesis of Arctic System Science (SASS1)

Award Number	Title	NSF Organization	PI	Contact
0531354	Humans & Hydrology at High Latitudes	OPP/ARCSS	Lammers, Richard (U New Hampshire )	<a href="mailto:richard.lammers@unh.edu">richard.lammers@unh.edu</a>

Data for the dynamics, uses and values of freshwater in the Arctic are rapidly accumulating. However, it is currently unknown which regions of the pan-Arctic are most vulnerable to future changes. In order to begin to address the future change to freshwater availability on a pan-arctic scale, this team will use a system of arctic typologies to enable the integration of biophysical data with socio-cultural data produced regionally, such as demographics and water values. They will use mature data sets to study the strategic transformations of the high latitude water cycle. Recent studies suggest that climate change will have a significant impact on arctic hydrology. Changes in the hydrologic cycle will affect both the presence of surface water and the thermal balance in soil. While preliminary evidence suggests a changing climate will have a significant impact on the hydrologic cycle in arctic regions, very little evidence is available to predict how the quantity of freshwater used by people is likely to change. Even less is understood about how hydrologic changes will affect the sustainability and culture of arctic residents. The overall objective of this research is to use a wide array of existing data sets in a synthesis effort to describe the vital role of freshwater in the lives of people in the pan-Arctic, how it has changed in the recent past, and how it is likely to change in the future. The group will use a model to predict climate-induced changes in the hydrologic cycle and the resultant water stress on people at these high latitudes. Water-related stress will involve all of the key agents of change: climate change, land use/cover change, and water management by humans. They seek to address water stress in the pan-Arctic by testing hypotheses related to the 1) dominant types of hydrologic change at local, regional and continental scales, 2) the interplay between humans and hydrology over the pan-Arctic, and 3) future prognostication of the high latitude water cycle under changing climate and populations. An important component of this research is an attempt to bridge the gap between large, continental scale processes with those processes acting at local scales.

0531148	Humans & Hydrology at High Latitudes	OPP/ARCSS	White, Daniel (UA Fairbanks)	<a href="mailto:ffdmw@uaf.edu">ffdmw@uaf.edu</a>
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humans and hydrology over the pan-Arctic, and 3) future prognostication of the high latitude water cycle under changing climate and populations. An important component of this research is an attempt to bridge the gap between large, continental scale processes with those processes acting at local scales.

<b>Award Number</b>	<b>Title</b>	<b>NSF Organization</b>	<b>PI</b>	<b>Contact</b>
0531200	Heterogeneity and Resilience of Human-Rangifer Systems: A Circumpolar Social-Ecological Synthesis	OPP/ARCSS	Kofinas, Gary (UA Fairbanks)	<a href="mailto:gary.kofinas@uaf.edu">gary.kofinas@uaf.edu</a>

The Human-Rangifer System is defined at the regional scale as the set of ecological-social processes underlying the human use of Rangifer. These processes include bio-physical interactions, socio-economic dynamics, the role of social institutions and organizations in shaping human adaptation. Resilience in these systems is the amount of disturbance to individual or multiple components that can be accommodated without change to alternative domains. The overarching goal of this project is to improve understanding of the relative resilience and adaptability of regional Human-Rangifer Systems to forces of global change, and to derive generalized propositions about their functional properties as critical aspects of the Arctic System. This study of resilience goes beyond the regional analyses of Human-Rangifer Systems considered in past studies, to address the heterogeneity present in the drivers and responses found across the circumpolar North. This circum-arctic synthesis undertakes a comparative retrospective analysis of six regional case studies in North America and Russia. The project develops a conceptual framework for measuring and assessing resilience in three components of the Human-Rangifer System: ecological processes, socio-economic processes, and institutional processes. In addition, simple synthesis models will be developed and simulated to examine resilience in each subcomponent process interactions, as well as in the coupled social-ecological system. This project is the first to provide a comprehensive synthesis of heterogeneity and resilience of Human-Rangifer Systems, and the first such project to predict means of accommodating changes in drivers and enhancing resilience of Human-Rangifer systems in the circumpolar North.

#### **Synthesis of Arctic System Science (SASS II)**

<b>Award Number</b>	<b>Title</b>	<b>NSF Organization</b>	<b>PI</b>	<b>Contact</b>
0629338	Synthesis of Sea Ice, Climate, and Human Systems in the Arctic & Subarctic	OPP/ARCSS	Ogilvie, Astrid (UColorado)	<a href="mailto:astrid.ogilvie@colorado.edu">astrid.ogilvie@colorado.edu</a>

The SYNICE project seeks to improve the understanding of pan-Arctic and North Atlantic climate and human systems through the integration and syntheses of several sea-ice data sets together with information from the physical and social sciences. The project is analyzing data from the past 1000 years, with major emphasis on the period c. AD 1800 to the present. Five major locations/sea-ice data sets are being considered: i) The sea-ice record from Iceland; ii) The sea-ice record from the Barents Sea area; iii) The record of historical ice conditions around Newfoundland and on the Grand Banks, and in the Gulf of St. Lawrence and the Scotian Shelf; iv) The Odden region of the central Greenland Sea; v) A climate and sea-ice record based on Moravian missionary accounts from Nain, Labrador. Two other components will investigate local knowledge of sea-ice and other climate changes, specifically in Iceland and Labrador/Nunatsiavut. Deliverables include: i) Development of a new 150-year central Greenland Sea ice-atmosphere dataset; ii) Analysis and modeling of the relationship between ice extent and production in the Central Greenland Sea and the occurrence of deep convection; iii) An interpretation of how Greenland Sea convection has varied over the past 150 years, together with implications of this for the development of ocean changes and marine climate in the Nordic Seas during this period; iv) A homogeneous and reliable long-term sea-ice record for Iceland; v) A synthesis of the sea-ice records with circulation data in order to gain insights into past, present and future natural climate variability of pan-

Arctic systems; and vi) a study of the social impacts of changing Arctic and Subarctic environments.				
<b>Study of North Alaskan Coastal Systems (SNACS)</b>				
<b>Award Number</b>	<b>Title</b>	<b>NSF Organization</b>	<b>PI</b>	<b>Contact</b>
	Environmental Variability, Bowhead Whale Distributions, and Inupiat Subsistence Whaling— Whaling Linkages and Resilience of an Alaskan Coastal System	OPP/ARCSS	Ashjian, Carin (Woods Hole)	<a href="mailto:cashjian@whoi.edu">cashjian@whoi.edu</a>
<p>The coupling between atmosphere, sea ice, ocean, bowhead whales, and subsistence whaling by the Native human populations is fundamental to the physical-biological-human systems of the Northern Alaska Coast. Whale migration routes and habitat use are determined by zooplankton aggregations, which are driven by oceanographic conditions, which depend on the climatic regime. Successful hunting depends on interactions between environmental and societal factors that vary each year and are driven by forces originating outside the system. This complex suite of environment-whale-human factors comprises a system that is vulnerable both to global climate and human generated change. This proposal seeks to identify and understand the complex linkages, mechanisms, and interactions within and between the atmosphere, ocean, and human components of this system. The response and resilience of these components and the system as a whole to variable forcing by external environmental change will also be investigated. The work is highly interdisciplinary and focuses on the linked ocean-human systems of coastal Alaska, concentrating specifically near Barrow, Alaska. Four distinct yet highly interrelated approaches to understanding the system are used: 1) Biological and physical ocean modeling to identify mechanisms of frontal and eddy formation and plankton aggregation, to describe the effects of environmental forcing from outside on the local ocean, and to understand longer term, past and future variability in outside forcing on whaling success, 2) High resolution field sampling to demonstrate presence of physical features and associated biological concentrations and to validate modeling, 3) Assessment of the resilience and vulnerability of the subsistence hunting economy and culture in Barrow, and 4) Retrospective analysis synthesizing modeled ocean and climate conditions with available information on whale location, feeding, and harvest success to assess the resilience and vulnerability of the whale-ocean-human system to environmental change. Intrinsic Merit: On the local scale, the results of the research will provide a greater understanding of the factors influencing a natural resource, demonstrating linkages between discovery and application to policy issues of bowhead whale management. The social structure and fabric of the Inupiat communities are intimately linked to the whaling tradition and are particularly vulnerable to both environmental change and human-generated pressures. On the broader scale, the research will address how multiple physical, biological, and human factors are linked in a complex natural system that may be critically affected by environmental variability. Biogeochemical and physical manifestations of climate change in this region (e.g., ice reduction, changes in marine mammal migration and ecosystem structure) will have consequences for local human linkages to the Arctic ecosystem by influencing hunting success, ease of travel, and the relative importance of subsistence and cash economies and are representative of those of the broader Arctic with important impacts on global carbon cycling. All these topics are highly relevant to the Study of Environmental Arctic Change (SEARCH) program. This project is cutting-edge in that it assimilates research of multiple disciplines from oceanography to social science to address questions that can only successfully be answered using this multi-faceted, integrative approach. Broader Impacts: The locally relevant science proposed for this project is of significant interest to the Barrow community and neighboring villages, to policy makers at the IWC, NOAA, and MMS, and to the broader public. The interdisciplinary collaborative partnership between academic researchers and staff at a federal agency and at a regional wildlife management agency is an investment in human and social capital that enhances</p>				

the broader research infrastructure. Climate variability and its effects on access to and mobility within the Arctic Ocean have broader impacts for global and local commerce and national security. The proposed high school internship program involves the participation of native people who are often underrepresented in the fields of science and technology. Broader involvement of high school students and teachers through the ARMADA program will communicate to the scientists of the next generation understanding of field research, of the Arctic Ocean ecosystem, and of the importance of climate variability to this ecosystem.