

Arctic Observing Network (AON) Project Abstracts
Total of 32 projects
As of March 2008

The AON projects are categorized by the SEARCH Implementation Plan categories: Human Dimensions, Atmosphere, Ocean and Sea Ice, Hydrology/Cryosphere, Terrestrial Ecosystems, and Data Management and Coordination.

Summary table of AON projects receiving funding from the National Science Foundation.

* Collaborative Projects
 ◇ Funded by IPY AON

Principal Investigator(s)		Project Title	NSF Award Number
Human Dimensions			
1	John Kruse Lawrence Hamilton	Is the Arctic Human Environment Moving to a New State? * ◇	0638408 0638413
Atmosphere			
2	Roger Bales	Core Atmospheric Measurements at Summit, Greenland Environmental Observatory	0336450
3	Richard Collins	IPY: Pan-Arctic Studies of the Coupled Tropospheric, Stratospheric, and Mesospheric Circulation ◇	0632387
4	Edwin Eloranta	Development of Data Products for the University of Wisconsin High Spectral Resolution Lidar ◇	0612452
5	Von Walden Matthew Shupe	Collaborative Research: IPY: Cloud Properties Across the Arctic Basin from Surface and Satellite Measurements - An Existing Arctic Observing Network * ◇	0632177 0632187
6	Germar Bernhard	Ultraviolet and Visible Radiation at Barrow, Alaska: Climatology and Influencing Factors on the Basis of Version 2 National Science Foundation Network Data *	Not available on NSF FastLane

Ocean and Sea Ice			
7	Hajo Eicken Donald Perovich	IPY: Collaborative Research on the State of the Arctic Sea Ice Cover: An Integrated Seasonal Ice Zone Observing Network (SIZONET) * ◇	0632398 0632130
8	Jacqueline Richter-Menge	Ice Mass Balance Buoy Network: Coordination with DAMOCLES ◇	0612391
9	John Toole	IPY: Towards an Arctic Observing Network: An Array of Ice-Tethered Profilers to Sample the Upper Ocean Water Properties During the International Polar Year ◇	0631951
10	John Toole	Design and Initialization of an Ice-Tethered Array Contributing to the Arctic Observing Network	0519899
11	Timothy Stanton	Ocean-Ice Interaction Measurements Using Autonomous Ocean Flux Buoys in the Arctic Observing System	0520328
12	Timothy Stanton	Toward Developing an Arctic Observing Network. An Array of Surface Buoys to Sample Turbulent Ocean Heat and Salt Fluxes During the IPY ◇	0632041
13	William Simpson Patricia Matrai Paul Shepson Donald Perovich	The Collaborative O-Buoy Project: Deployment of a Network of Arctic Ocean Chemical Sensors for the IPY and Beyond *	0612457 0612331 0612047 0611992
14	Ignatius Rigor	Coordination, Data Management, and Enhancement of the International Arctic Buoy Programme (IABP)	0520287
15	Robert Collier James Morison Miles McPhee	Collaborative Research: North Pole Station: A Distribution Long-Term Environmental Observation*	0352984 0352754 0352687
16	James Morison Christopher Guay Robert Collier Miles McPhee Andrey Proshutinsky	IPY: Collaborative Research: Aerial Hydrographic Surveys for IPY and Beyond: Tracking Change and Understanding Seasonal Variability *	0634226 0634167 0634122 0634097 0633979
17	Peter Schlosser Michael Steele Ronald Kwok	Collaborative Research: A Modular Approach to Building an Arctic Observing system for the IPY and Beyond in the Switchyard Region of the Arctic Ocean * ◇	0633878 0633885 0633343

Ocean and Sea Ice Continued			
18	Andrey Proshutinsky	The Beaufort Gyre System: The Flywheel of the Arctic	0424864
19	Mary-Louise Timmermans	Observing the Dynamics of the Deepest Waters in the Arctic Ocean ◊	0632201
20	Craig Lee	An Innovative Observational Network for Critical Arctic Gateways: Understanding Exchanges through Davis and Fram Straits ◊	0632231
21	Rebecca Woodgate	Comparison of Water Properties and Flows in the U.S. and Russian Channels of the Bering Strait - 2005 to 2006	0528632
22	Rebecca Woodgate Thomas Weingartner	IPY: Collaborative Research: The Pacific Gateway to the Arctic-Quantifying and Understanding Bering Strait Oceanic Fluxes * ◊	0631713 0631713
23	Victoria Gofman	Bering Sea Sub-Network: International Community-Based Observation Alliance for Arctic Observing Network	0634079
Hydrology/Cryosphere			
24	Vladimir Romanovsky	Thermal State of Permafrost (TSP): The U.S. Contribution to the International Permafrost Observation Network	0520578
25	Vladimir Romanovsky	IPY: Development of a Network of Permafrost Observatories in North America and Russia: The US Contribution to the International Polar Year ◊	0632400
26	Matthew Sturm Glen Liston Douglas Kane	IPY: Collaborative Research: A Prototype Network for Measuring Arctic Winter Precipitation and Snow Cover (Snow-Net) * ◊	0632131 0632133 0632160
27	Douglas Kane	Long-term Measurements and Observations for the International Arctic Research Community on the Kuparuk River Basin, Alaska	0335941
28	Robert Max Holmes Peter Raymond	Arctic Great Rivers Observatory (Arctic-GRO)	Not available on NSF Fastlane
29	W.Tad Pfeffer	Columbia Glacier Project	Not available on NSF Fastlane

Terrestrial Ecosystems			
30	Julia Klein Jeffrey Welker Robert Hollister Steven Oberbauer	IPY: Collaborative Research: Study of Arctic Ecosystem Changes in the IPY using the International Tundra Experiment ◇	0632144 0632184 0632263 0632277
31	Gaius Shaver Marion Bret-Harte	IPY: Collaborative Research on Carbon, Water, and Energy Balance of the Arctic Landscape at Flagship Observatories and in a PanArctic Network ◇	0632139 0632264
32	Craig Tweedie	Development and Implementation of the Terrestrial Circumarctic Environmental Observations Network (CEON)	0622406
Data Management and Coordination			
33	Shari Gearheard	IPY: Exchange for Local Observations and Knowledge in the Arctic (ELOKA) ◇	0632345
34	Roger Barry James Moore	Collaborative Research, IPY: A Cooperative Arctic Data and Information Service (CADIS) ◇	0632296 0632313

Human Dimensions

1) Is the Arctic Human Environment Moving to a New State? *◇

#0638408

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Awarded Amount to Date:
\$468,404.00

#0638413:

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Awarded Amount to Date:
\$84,051.00

Program Manager: Anna Kerttula de Echave
Start Date: April 1, 2007
Expires: March 31, 2008 (Estimated)

Home Page:

<http://www.iser.uaa.alaska.edu/projects/search-hd/index.htm>

Project Description:

<http://www.iser.uaa.alaska.edu/projects/search-hd/database.htm>

ArcticRIMS Data Explorer:

http://rims.unh.edu/data/basin.cgi?basin=sea_0000&category=0&subject=0

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Kruse/>

Abstract: 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.

Atmosphere

2) Core Atmospheric Measurements at Summit, Greenland Environmental Observatory

#0336450

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Awarded Amount to Date:

\$750,107.00

Program Manager: Simon Stephenson

Start Date: September 15, 2003

Expires: August 31, 2007 (Estimated)

Home page:

<http://niflheim.nilu.no/summit>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/McConnell/>

Abstract: This 5-year project supports continuing and expanding the collection of long-term measurements of the Arctic atmosphere, snow and other Earth system components at the Summit Greenland Environmental Observatory (GEOSummit), located at an elevation of 3100 m on the Greenland ice sheet. A core suite of measurements has been collected at GEOSummit since 1993 and this project provides for the continued operation of GEOSummit as long-term site for year-round disciplinary and interdisciplinary measurements and research. The location provides a compliment to lower-elevation sites and a Northern Hemisphere analog to South Pole station. Measurements include baseline meteorology, radiation, tropospheric chemistry, snow properties and snow chemistry, some measurements in cooperation with NOAA-CMDL and measurements initiated by individual investigators. Measurements are aligned with the objectives of the World Meteorological Organization's Global Atmospheric Watch (GAW) program. The atmospheric gas-phase and aerosol species being studied are all either sensitive indicators of anthropogenic impacts on regional and global atmospheric change, or are important chemically coupled species whose concentrations may be strongly influenced by changes in the Arctic, including changes in snow/ice surface temperatures, ice/snow cover, and atmospheric circulation. Related chemical measurements in the snow provide the needed link to investigate feedbacks between Arctic climate change, air-snow exchange, and atmospheric composition. Recent evidence indicates that important atmospheric chemical constituents undergo temperature-dependent exchange with ice/snow, and that some species are photochemically transformed and/or produced within the sunlit surface snowpack. Understanding arctic environmental change requires a quantitative understanding of the environmental controls (e.g., temperature, radiation, humidity, ozone concentration) on air-snow feedbacks, as well as the impact of these processes on the entire

Arctic atmosphere. Because changes in Arctic atmospheric circulation are cyclic over 4-5 year or longer times, long-duration measurements are needed to understand circulation and to place observed changes in a long-term perspective. Data and results will be shared via the National Snow and Ice Data Center data archive.

3) IPY: Pan-Arctic Studies of the Coupled Tropospheric, Stratospheric, and Mesospheric Circulation ♦

#0632387

Principal Investigator:

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Awarded Amount to Date:

\$270,307.00

Program Manager: Janet M. Intrieri

Start Date: March 15, 2007

Expires: February 29, 2008 (Estimated)

Home Page:

<http://www.gi.alaska.edu/splidar/>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Collins/>

Abstract: This proposal sets forth a three-year plan to study the circulation of the Arctic atmosphere during the upcoming IPY. Specifically, this is an observational study that combines satellite measurements, lidar measurements, and meteorological soundings and analyses to study the troposphere, stratosphere, and mesosphere. The study is an international collaboration between investigators at six institutions in Canada, Germany, Japan and the United States. The satellite observations yield global synoptic-scale temperature measurements of the mesosphere and upper stratosphere while the meteorological soundings and analyses provide global synoptic-scale measurements of the troposphere and lower stratosphere. An international network of four Rayleigh lidars located in observatories at Andoya, Norway (69N, 16E), Chatanika, Alaska (65N, 147W), Eureka, Nunavut (80N, 86W), and Kangarlussuaq, Greenland (67N, 51W), will provide a chain of high-resolution temperature measurements from the eastern Arctic to the western Arctic. The lidars will yield high-resolution measurements of the structure and circulation of the Arctic stratospheric vortex, the Aleutian anticyclone, the stratospheric surf-zone, planetary waves, tides, and gravity waves that are corroborated by the synoptic-scale satellite and meteorological observations. The proposed activity will provide a comprehensive analysis of the circulation of the Arctic atmosphere that will directly address the following specific studies; the structure, evolution, and variability of polar vortices and anticyclones, coupling and feedbacks between waves and large-scale circulation, links between the middle and lower atmosphere, atmospheric teleconnections, and modes of variability. This study will provide data and analyses in support of studies of ozone depletion, stratospheric climate, climate oscillations in the Arctic, and long-range horizontal and vertical transport in the Arctic. The

proposed activity will support education and training of students in science and engineering. The activity will jointly draw on and contribute to research infrastructure in the Arctic, enhance international collaborations, and promote collaboration among observers, modelers and theorists. The research results will be integrated into the University of Alaska and University of Colorado IPY Education and Outreach programs and disseminated through a variety of professional, educational, and outreach programs.

A. PROJECT SUMMARY

This proposal sets forth a three-year plan to extend our understanding of the circulation of the Arctic atmosphere during the upcoming Fourth International Polar Year. Specifically, an observational study that combines satellite measurements, lidar measurements, and meteorological soundings and analyses to study the troposphere, stratosphere, and mesosphere will be conducted. The study is an international collaboration between investigators at six institutions in Canada, Germany, Japan and the United States. The satellite observations yield global synoptic-scale temperature measurements of the mesosphere and upper stratosphere while the meteorological soundings and analyses provide global synoptic-scale measurements of the troposphere and lower stratosphere. An international network of four Rayleigh lidars located in observatories at Andoya, Norway (69°N, 16°E), Chatanika, Alaska (65°N, 147°W), Eureka, Nunavut (80°N, 86°W), and Kangarlussuaq, Greenland (67°N, 51°W), provide a chain of high-resolution temperature measurements from the eastern Arctic to the western Arctic. The lidars will yield high-resolution measurements of the structure and circulation of the Arctic stratospheric vortex, the Aleutian anticyclone, the stratospheric surf-zone, planetary waves, tides, and gravity waves that are corroborated by the synoptic-scale satellite and meteorological observations.

Intellectual Merit: The proposed activity will provide a comprehensive analysis of the circulation of the Arctic atmosphere that will directly address the following specific studies; the structure, evolution, and variability of polar vortices and anticyclones, coupling and feedbacks between waves and large-scale circulation, links between the middle and lower atmosphere, atmospheric tele-connections, and modes of variability. This study will provide data and analyses in support of studies of ozone depletion, stratospheric climate, climate oscillations in the Arctic, and long-range horizontal and vertical transport in the Arctic.

We have three specific goals; (i) a study of the Arctic atmosphere that uses observations, modeling and theoretical interpretation to document 3-D structure and evolution of the Arctic vortex and anticyclones with emphasis on vortex-vortex interactions and stratospheric warming/mesospheric cooling events during IPY (ii) to determine our ability to forecast synoptic-scale weather events in the troposphere based on observations and analyses of the mesosphere and stratosphere and (iii) a study of the coupling between anomalous stratospheric weather and tropospheric annular modes during IPY.

Relevance to IPY: This study addresses all six IPY themes. Using the Arctic as a vantage point, the study will generate benchmark datasets and analyses that will reveal the current state of the polar environment, support studies of climate change, detect and analyze polar-global interactions, investigate new frontiers, and address environmental questions of importance to polar societies. The study is a part of the IPY Expression of Intent PASSMeC (#11) that is a component of two IPY proposals; IPY-SPARC (#196) and LASOA (#217). These proposals have both been endorsed by the IPY Joint Committee. The study will also be integrated into the IPY educational and outreach programs.

Broader Impacts: The proposed activity will support education and training of students in science and engineering. The activity will jointly draw on and contribute to research infrastructure in the Arctic, enhance international collaborations, and promote collaboration among observers, modelers and theorists. The research results will be integrated into the University of Alaska and University of Colorado IPY Education and Outreach programs and disseminated through a variety of professional, educational, and outreach programs. The observations, analyses and results of this activity will directly contribute to the CAWSES, CEDAR, SEARCH, SPARC and WAACM programs. The study will support Arctic environmental studies by extending our understanding of coupling between the middle and lower atmosphere. The possibility of improving tropospheric weather forecasts is of high value to the public.



Fig 1. Location of observatories in Arctic Rayleigh lidar network. The four sites are at Poker Flat Research Range (PFRR), Eureka Stratospheric Observatory (ESO), Sondrestrom Upper Atmospheric Research Facility (SUARF), and Arctic Lidar Observatory for Middle Atmosphere Research (ALOMAR). Yellow boundary shows the Arctic Monitoring and Assessment Boundary. Adapted from SEARCH [2005].

4) Development of Data Products for the University of Wisconsin High Spectral Resolution Lidar ♦

#0612452

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Awarded Amount to Date:

\$158,787.00

Program Manager: Renee D. Crain

Start Date: February 1, 2007

Expires: January 31, 2008 (Estimated)

Home Page:

<http://lidar.ssec.wisc.edu/>

Abstract: An initial deployment of instruments was made during 2005 at Eureka on Ellesmere Island in the Canadian Arctic which included the NOAA cloud radar and the University of Wisconsin Arctic High Spectral Resolution Lidar (AHSRL). Both instruments currently return continuous high quality data and in combination, they provide unique information on the optical and micro-physical characteristics of clouds. The eye-safe AHSRL provides vertical profiles of depolarization, optical depth, and backscatter cross section and operates as an Internet Appliance which is remotely controlled from the University of Wisconsin laboratory. The AHSRL is able to gather well-calibrated data sets at much lower cost than possible with conventional lidars. Data is transmitted via the Internet and is made available to researchers around the world in real time via a publicly accessible web site. Construction of the AHSRL was funded by NSF grant OPP-9910304. NOAA provided funds to install the AHSRL in Eureka, and through agreements with the Canadian Network for Arctic Change (CANDAC), NOAA has provided an instrument shelter, Internet communications, electrical power, spare parts, and a technician who tends to all of the SEARCH instrumentation. NOAA is also providing airfare, lodging, and per diem support for University of Wisconsin when maintenance related travel is required to the Eureka site. This proposal requests salary support for the University of Wisconsin personnel who operate the AHSRL and to make the data available to the Arctic research community via their web site. The PI's also propose to prepare and publish climatological summaries of cloud data.

5) Collaborative Research: IPY: Cloud Properties Across the Arctic Basin from Surface and Satellite Measurements - An Existing Arctic Observing Network *◇

#0632177

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Awarded Amount to Date:
\$66,809.00

#0632187:

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Awarded Amount to Date:
\$56,364.00

Program Manager: Neil R. Swanberg
Start Date: March 15, 2007
Expires: February 29, 2008 (Estimated)

NOAA/ESRL Polar Processes Team:
<http://www.esrl.noaa.gov/psd/psd3/arctic/>

ARM Archive:

<http://www.archive.arm.gov/>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Walden/>

Abstract: This research will increase the fundamental understanding of both temporal and spatial variability of Arctic clouds. Knowledge of Arctic cloud properties is important for understanding the overall energy balance of the Arctic, and how Arctic climate interacts with the global climate system. There have been many short-term field experiments to study Arctic clouds at specific locations, but there is a lack of knowledge regarding the temporal and spatial variability of cloud properties across the Arctic. The longest record of data exists at the North Slope of Alaska ARM site, but this is only at a single location. New data are now available from other ground-based sites that complement the measurements in Alaska and broaden our understanding of Arctic clouds. This group will combine these ground-based measurements at

various sites with satellite observations to make a network of cloud observations across the Arctic.

**Cloud properties across the Arctic Basin from surface and satellite measurements –
An existing Arctic Observing Network**

Submitted to NSF Office of Polar Programs, Arctic Natural Sciences Section, May 2006

This proposed work directly addresses many stated objectives and goals for both SEARCH and the IPY. SEARCH has identified the need for long-term observations of important Arctic climate parameters, such as clouds, and has recognized the value of coordinated surface-satellite activities, both of which are fundamental components of our proposal. Additionally, by making the link between disparate observations at multiple sites to a comprehensive, long-term cloud data set, this study is a combination of "Observing Activities" and "Understanding Activities," two components of the SEARCH objectives. Arctic clouds will be one of the important indicators signifying if, and when, the Arctic system is moving to a new climatic state; the identification of such change is one of the main goals of SEARCH. The proposed work of data integration and analysis of Arctic cloud observations will yield a significant contribution to the legacy of infrastructure and data that will result from the IPY.

The proposed work specifically addresses the following four questions:

What are the macrophysical and microphysical properties of clouds at various locations in the Arctic? A comprehensive suite of macro- and micro-physical cloud property retrieval algorithms will be applied to Arctic cloud measurements from various surface sites. The derived products will provide a baseline of Arctic cloud properties upon which to identify and understand future change, and to validate models.

How do Arctic cloud properties vary both temporally and spatially? Multi-year records of cloud observations from Barrow, Alaska and Eureka, Canada will be used to investigate inter-annual cloud variability. Additionally, time periods of overlapping measurements at the different stations are expected to provide important insight into the spatial dependence of cloud properties.

How do the spatial and temporal variability of Arctic cloud properties depend upon regional "forcing" parameters? Using ancillary data at each surface site, differences or similarities in cloud properties, and their variability, will be associated with regional meteorological properties that contribute to the forcing of cloud formation to explain the observed variability.

Do satellite retrievals yield similar cloud properties and variability to the coincident surface-based measurements? Cloud properties derived from the surface measurements will be related to retrievals from satellite instruments. Based on this information, the satellite measurements will then be used to expand our analysis to other regions of the Arctic, in particular the locations of possible future or newly coordinated surface sites, such as Tiksi, Russia and Ny'Alesund, Norway.

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6) Ultraviolet and Visible Radiation at Barrow, Alaska: Climatology and Influencing Factors on the Basis of Version 2 National Science Foundation Network Data *

Not listed on NSF FastLane

Principle Investigator:

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Abstract: [1] Spectral ultraviolet (UV) and visible irradiance has been measured near Barrow, Alaska (71°N, 157°W), between 1991 and 2005 with a SUV-100 spectroradiometer. The instrument is part of the U.S. National Science Foundation's UV Monitoring Network. Here we present results based on the recently produced “version 2” data release, which supersedes published “version 0” data. Cosine error and wavelength-shift corrections applied to the new version increased biologically effective UV dose rates by 0–10%. Corrected clear-sky measurements of different years are typically consistent to within $\pm 3\%$. Measurements were complemented with radiative transfer model calculations to retrieve total ozone and surface albedo from measured spectra and for the separation of the different factors influencing UV and visible radiation. A climatology of UV and visible radiation was established, focusing on annual cycles, trends, and the effect of clouds. During several episodes in spring of abnormally low total ozone, the daily UV dose at 305 nm exceeded the climatological mean by up to a factor of 2.6. Typical noontime UV Indices during summer vary between 2 and 4; the highest UV Index measured was 5.0 and occurred when surface albedo was unusually high. Radiation levels in the UV-A and visible exhibit a strong spring-autumn asymmetry. Irradiance at 345 nm peaks on approximately 20 May, 1 month before the solstice. This asymmetry is caused by increased cloudiness in autumn and high albedo in spring, when the snow covered surface enhances downwelling UV irradiance by up to 57%. Clouds reduce UV radiation at 345 nm on average by 4% in March and by more than 40% in August. Aerosols reduce UV by typically 5%, but larger reductions were observed during Arctic haze events. Stratospheric aerosols from the Pinatubo eruption in 1991 enhanced spectral irradiance at 305 nm for large solar zenith angles. The year-to-year variations of spectral irradiance at 305 nm and of the UV Index are mostly caused by variations in total ozone and cloudiness. Changes in surface albedo that may occur in the future can have a marked impact on UV levels between May and July. No statistically significant trends in monthly mean noontime irradiance were found.

7) IPY: Collaborative Research on the State of the Arctic Sea Ice Cover: An Integrated Seasonal Ice Zone Observing Network (SIZONET) *◇

#0632398

Principal Investigator:

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Awarded Amount to Date:

\$320,310.00

#0632130

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Awarded Amount to Date:

\$174935

Program Manager: Neil R. Swanberg

Start Date: April 1, 2007

Expires March 31, 2008 (Estimated)

Home Page:

<http://www.gi.alaska.edu/snowice/sea-lake-ice/>

Data:

<http://www.gi.alaska.edu/snowice/sea-lake-ice/data.html>

Alaska Ocean Observing System:

<http://www.aos.org/>

Geographic Information Network of Alaska Swath Viewer:

<http://sv.gina.alaska.edu/>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Eicken/>

Abstract: This interdisciplinary project implements an integrated program of observing seasonal ice in the context of environmental, geo-political and socio-economic change in the North. In addition to sampling of sea-ice state variables, the observation-system design is guided by the concept of sea-ice system services (SISS). By assessing the nature and extent of SISS, an integrated observation network can be built that will lead to prediction of key trends in a changing Arctic in a way that provides maximum benefit for the broadest range of affected interests. The first iteration of this observation program will help to address these major scientific questions: 1) To what extent are changes in the SIZ at the local level throughout the Arctic correlated with large-scale change in summer minimum ice extent?, 2) How does the SIZ respond to amplified ice-albedo feedback in seasonal ice as opposed to the buffering effects of enhanced snow-ice interaction and ice deformation?, 3) How strongly does coastal sea ice impact change in terrestrial environments?, 4) What does the sub-Arctic Okhotsk Sea teach about impending Arctic environmental and socio-economic change? While the focus of this project is on the Western Arctic, which has seen some of the most dramatic sea-ice reductions in past decades, an international team has been assembled from six nations that maximizes synergies and allows these questions to be addressed in a circum-Arctic context along a latitudinal gradient spanning the entire extent of the seasonal ice zone, well into the perennial ice. Observations in the western Arctic sector include shore-based and drift-ice measurements of ice motion, key mass-balance variables and critical snow and ice properties such as albedo, as well as airborne electromagnetic ice thickness measurements. Pan-Arctic data of seasonal ice evolution and ice-type distribution will be extracted from satellite microwave remote-sensing observations. All data will be ingested into an archival and dissemination system that is linked to the Alaska Ocean Observing System and administered by the Geographic Information Network of Alaska. Education at the K-12 and university levels and public outreach are integral parts of the project, with an international field course, web-based engagement of students and the general public, public lectures in local communities, and other modes of presentation taking a prominent role in the project. Stakeholders at various levels will be engaged through the SISS approach, and scientists will work with community-based observers to calibrate and validate the methodology.

Intellectual Merit: In a rapidly changing Arctic, the shrinking and thinning sea-ice cover plays an important role as indicator and agent of environmental change. A dramatic shrinking of the perennial ice cover has greatly increased the extent and hence importance of the Arctic seasonal ice zone (SIZ). The SIZ is predicted to occupy much of the Arctic by mid-to late century, but data are sorely lacking to aid in tracking, understanding and predicting change over this important component of the Arctic cryosphere. This interdisciplinary project implements an integrated program of observing seasonal ice in the context of sweeping environmental, (geo)political and socio-economic change in the North. In addition to sampling of sea-ice state variables, the observation-system design is guided by the concept of sea-ice system services (SISS). By assessing the nature and extent of SISS, an integrated observation network can be built that will lead to prediction of key trends in a changing Arctic in a way that provides maximum benefit for the broadest range of affected interests. The first iteration of this observation program meets demands expressed by the scientific community to help improve modeling capabilities and determine whether the Arctic is moving to a new state (as expressed in Study of Environmental ARctic Change [SEARCH] planning documents) and will help to address these major scientific questions: (1) To what extent are changes in the SIZ at the local

level throughout the Arctic correlated with large-scale change in summer minimum ice extent? (2) How does the SIZ respond to amplified ice-albedo feedback in seasonal ice as opposed to the buffering effects of enhanced snow-ice interaction and ice deformation? (3) How strongly does coastal sea ice impact change in terrestrial environments? (4) What does the sub-Arctic Okhotsk Sea teach about impending Arctic environmental and socio-economic change? While the focus of this project is on the Western Arctic, which has seen some of the most dramatic sea-ice reductions in past decades, an international team has been assembled from six nations that maximizes synergies and allows these questions to be addressed in a circum-Arctic context along a latitudinal gradient spanning the entire extent of the seasonal ice zone, well into the perennial ice. Observations in the western Arctic sector include shore-based and drift-ice measurements of ice motion, key mass-balance variables and critical snow and ice properties such as albedo, as well as airborne electromagnetic ice thickness measurements. Pan-Arctic data of seasonal ice evolution and ice-type distribution will be extracted from satellite microwave remote-sensing observations. All data will be ingested into an archival and dissemination system that is linked to the Alaska Ocean Observing System and administered by the Geographic Information Network of Alaska.

Broader impacts: The International Polar Year (IPY) presents a once-in-a-generation opportunity to substantially advance understanding of the Arctic and Antarctic systems. Within the framework of this project, this opportunity will be used to engage the next generation of polar researchers, communicate with the public and stakeholders, develop long-lasting collaborations within the polar research community, and form linkages with the larger scientific community. Education at the K-12 and university levels and public outreach are integral parts of the project, with an international field course, web-based engagement of students and the general public, public lectures in local communities, and other modes of presentation taking a prominent role in the project. Stakeholders at various levels will be engaged through the SISS approach, and scientists will work with community-based observers to calibrate and validate the methodology. The project's efforts will be of significant practical value to federal and local agencies, coastal managers and native subsistence communities.

Relevance to the IPY: The work is motivated by the goals of the IPY and SEARCH and directly addresses four out of five IPY science challenges. The international partnership sustaining the pan-Arctic nature of this project has been endorsed in the form of several IPY Proposal Clusters (one of them led by the two principal investigators). The project's IPY legacy will be the foundation of a focused, long-term Arctic sea-ice observing network that advances several key objectives of the international IPY and SEARCH efforts and addresses stakeholders' needs.

8) Ice Mass Balance Buoy Network: Coordination with DAMOCLES ◇

#0612391

Principal Investigator:

Jacqueline Richter-Menge - jrichtermenge@crrel.usace.army.mil

Co-Principle Investigator:

Donald Perovich

Department of Army Cold Regions Research and Engineering Laboratory

72 Lyme Road

Hanover, NH 03755

603-646-4219

Awarded Amount to Date:

\$393,665.00

Program Manager: Renee D. Crain

Start Date: February 1, 2007

Expires: January 31, 2008 (Estimated)

Home Page:

<http://www.crrel.usace.army.mil/sid/IMB/index.htm>

Real-Time Data:

<http://www.crrel.usace.army.mil/sid/IMB/newdata.htm>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Perovich/>

Abstract: This proposal seeks support to deploy an array of autonomous ice mass balance buoys designed to ascertain thermodynamic changes in the mass balance of Arctic sea ice. Specifically, the ice mass balance (IMB) buoys will be incorporated in the Developing Arctic Modeling and Observing Capabilities for Long-term Environmental Studies (DAMOCLES) atmosphere-ice-ocean observing array with the intention of being operational during the International Polar Year (IPY). The sea ice component of the DAMOCLES sea ice array includes a variety of instruments that examine ice thickness at varying temporal and spatial scales. The IMB adds the critical capability to autonomously attribute thermodynamically-driven changes in the thickness of the ice cover. The IMB buoy can determine what portion of the thickness changes are due to differences in snow depth, ice growth, surface melt, and bottom melt. A substantial portion of this proposed effort will be directed towards building and deploying IMBs. In the first year, 14 IMBs will be built and deployed with logistics support provided by DAMOCLES. During the deployment of each buoy, a surface-based survey will be conducted to determine the spatial distribution of snow depth and ice thickness. The effort in the second and third years will consist of analyzing, disseminating, and archiving the data from the IMBs, to create a data base of information that can be widely used to improve the understanding of changes in the Arctic sea ice cover. This work will significantly enhance ongoing ice mass balance (IMB) buoy deployments currently sponsored by NOAA, as a contribution to Study of Environmental Arctic Change (SEARCH), and coordinated with the International Arctic Buoy Programme (IABP) and the North Pole Environmental Observatory (NPEO). The extensive outreach plans associated

with DAMOCLES, SEARCH, and IPY will be fully supported. Further, the existing ice balance Web site (<http://www.crrel.usace.army.mil/sid/IMB/index.htm>) will be expanded to include the IMB data collected during DAMOCLES and a section designed specifically for the public, presenting the sea ice mass balance work in the broader climate change context. Educational outreach will be demonstrated through classroom visits with a local elementary school, the involvement of undergraduate students, and community lectures.

Project Summary: This proposal seeks support to deploy an array of autonomous ice mass balance buoys designed to ascertain thermodynamic changes in the mass balance of Arctic sea ice. Specifically, the ice mass balance (IMB) buoys will be incorporated in the Developing Arctic Modelling and Observing Capabilities for Long-term Environmental Studies (DAMOCLES) atmosphere-ice-ocean observing array. This array is scheduled for deployment in the Arctic Ocean in September 2006, with the intention of being operational during the International Polar Year (IPY). The sea ice component of the DAMOCLES sea ice array includes a variety of instruments that examine ice thickness at varying temporal and spatial scales. The IMB adds the critical capability to autonomously attribute thermodynamically-driven changes in the thickness of the ice cover. The IMB buoy can determine what portion of the thickness changes are due to differences in snow depth, ice growth, surface melt, and bottom melt. A substantial portion of this proposed effort will be directed towards building and deploying IMBs. In the first year, 14 IMBs will be built and deploy with logistics support provided by DAMOCLES. During the deployment of each buoy, a surface-based survey will be conducted to determine the spatial distribution of snow depth and ice thickness. The effort in the second and third years will consist of analyzing, disseminating, and archiving the data from the IMBs, to create a data base of information that can be widely used to improve the understanding of changes in the Arctic sea ice cover.

Intellectual Merit: This work is motivated by the desire to contribute to (1) an improved understanding of the Arctic Ocean environment and (2) the design and establishment of an effective International Arctic Ocean Observing System. The proposed effort supports the achievement of these goals by the coordinated deployment of atmosphere, ice and ocean instruments, providing a comprehensive and widely disseminated dataset to investigate the complex interaction of these system components. This work will significantly enhance ongoing ice mass balance (IMB) buoy deployments currently sponsored by NOAA, as a contribution to Study of Environmental Arctic Change (SEARCH), and coordinated with the International Arctic Buoy Programme (IABP) and the North Pole Environmental Observatory (NPEO). Further, it directly addresses major Arctic science questions, identified in the recent Arctic Climate Impact Assessment (ACIA) report, the report from the SEARCH Implementation Workshop, and endorsed International Polar Year (IPY) projects. Active involvement in DAMOCLES will be another step toward realizing a close coordination of IPY activities between DAMOCLES and the US SEARCH program and, more broadly, lays the groundwork for the establishment of an International Arctic Ocean Observing System.

Broader Impacts: From a scientific standpoint, IMB data will assist large-scale modeling efforts to develop and improve the treatment of ice growth and decay used in large-scale sea ice models and GCMs and to assess the relative impact of ice dynamics and thermodynamics on the observed changes in the Arctic sea ice cover. Results from this program will also provide

baseline data to support the development of sensors and algorithms to remotely sense snow depth, ice thickness, pond fraction, and the onset of freezeup. More generally, since this work is part of the IPY, there is an extraordinary opportunity to capture the imagination of the public and of schoolchildren. The extensive outreach plans associated with DAMOCLES, SEARCH, and IPY will be fully supported. Further, the existing ice balance Web site (<http://www.crrel.usace.army.mil/sid/IMB/index.htm>) will be expanded to include the IMB data collected during DAMOCLES and a section designed specifically for the public, presenting the sea ice mass balance work in the broader climate change context. An active commitment to educational outreach will be demonstrated through classroom visits with a local elementary school, the involvement of undergraduate students, and community lectures.

9) Design and Initialization of an Ice-Tethered Array Contributing to the Arctic Observing Network

#0519899

Principle Investigator:

John Toole - jtoole@whoi.edu

Co-Principal Investigators:

Andrey Proshutinsky

Richard Krishfield

Woods Hole Oceanographic Institution

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508-289-2462

Awarded Amount to Date:

\$600,000.00

Program Manager: Simon Stephenson

Start Date: February 1, 2006

Expires: January 31, 2008 (Estimated)

Home Page:

<http://www.whoi.edu/itp/>

Data:

<http://www.whoi.edu/itp/data.html>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Toole/>

Abstract: This is a proposal to continue development and deployment in the Arctic Ocean of new ice-tethered profiling (ITP) buoys that are an automated profiling CTD instrument capable of returning daily high-vertical-resolution measurements of the upper 800 m ocean underneath sea-ice during all seasons over an approximately 3-year life time. The proposal is collaborative on an international scale and the plan is to eventually extend the scope of this work to involve up to 17 IPTs. Ideally they would be deployed in conjunction with a suite of other automated instruments. □□ This new source of high-vertical-resolution CTD data from all seasons and from multiple years will increase knowledge of the state and variability of the Arctic Ocean by an unprecedented amount. The publicly available data from the proposed ITPs will provide the basis for both process studies and model validation/assimilation research, work that will ultimately lead to better understanding of the Arctic Ocean's role in global climate change. □□ In addition, the project will, in consultation with the polar research community, use this information to develop a plan for establishing and maintaining ITPs within a full array of IBO's contributing to a sustained Arctic Ocean observing system, as was discussed and recommended by participants of the international workshop Arctic Observing Based on Ice-Tethered Platforms.

10) IPY: Towards an Arctic Observing Network: An Array of Ice-Tethered Profilers to Sample the Upper Ocean Water Properties During the International Polar Year ◊

#0631951:

Principal Investigator:

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Co-Principal Investigator:

Carin Ashjian

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508-289-2462

Awarded Amount to Date:

\$743,156.00

Program Manager: Martin Jeffries

Start Date: February 1, 2007

Expires: January 31, 2008 (Estimated)

Home Page:

<http://www.whoi.edu/itp/>

Data:

<http://www.whoi.edu/itp/data.html>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Toole/>

Abstract: Funds are provided to initiate massive sampling of the Arctic Ocean water properties during all seasons. In order to detect and monitor change, this project documents the Arctic Ocean variability using a series of expendable instruments that will provide real time information about sea ice drift and the properties of the Arctic water column. This will be accomplished by expanding ongoing efforts to develop, test and field a set of WHOI Ice-Tethered Profilers (ITPs): autonomous instruments that return high-vertical-resolution measurements of upper (~800 m) ocean temperature and salinity beneath sea ice during all seasons at better than daily temporal resolution over a projected three-year lifetime. Support is provided to build and deploy 4 ITP systems in 2007 and an additional 4 in 2008, and to acquire and make publicly available the data from those instruments through 2009.

11) Ocean-Ice Interaction Measurements Using Autonomous Ocean Flux Buoys in the Arctic Observing System

#0520328

Principal Investigator:

Timothy Stanton - stanton@nps.edu

Co-Principle Investigator:

William Shaw

Naval Postgraduate School

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Monterey, CA 93943

831-656-2099

Awarded Amount to Date:

\$343,512.00

Program Manager: Simon Stephenson

Start Date: February 1, 2006

Expires: January 31, 2008 (Estimated)

Abstract: This is a proposal to continue deployment in the Central Arctic and to extend deployment to the Western Arctic of Autonomous Ocean Flux Buoys (AOFB) on ice floes with co-located instruments measuring T/S profiles, ice fluxes and surface forcing including atmospheric bulk fluxes and radiative terms. Observations of vertical fluxes of heat, salt and momentum between the ocean interior and surface are important to our understanding and modeling of processes that maintain perennial ice cover in the Arctic, particularly at a time of such rapid changes in ice coverage and volume. □ □ Underway alterations of the Arctic system, in particular of its thermodynamic balance, may be precursory indicators of more widespread changes to come. Yet the observations to fully document such processes are lacking. To begin to address this measurement gap, it is proposed to deploy 4 ocean flux buoys each year for a four years. This award funds the first year of the expanded deployment while the network design takes place under the auspices of SEARCH and the International Polar year (2007-2008). The work will be conducted with other researchers who will make complimentary, co-located observations and share logistic costs which would otherwise be overwhelming. This co-operative approach was discussed and recommended by participants of the international workshop Arctic Observing Based on Ice-Tethered Platforms. □

12) Toward Developing an Arctic Observing Network. An Array of Surface Buoys to Sample Turulent Ocean Heat and Salt Fluxes During the IPY ◇

#0632041

Principle Investigator:

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Co-Principal Investigator:

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831-656-2099

Awarded Amount to Date:

\$483,777.00

Program Manager: Martin Jeffries

Start Date: April 15, 2007

Expires: March 31, 2008 (Estimated)

Abstract: Funds are provided for the deployment of an expanded autonomous, ice-based, network for observing turbulent fluxes in the upper boundary layer of the ocean and, in collaboration with other investigators, for quantifying the thermodynamic balance of sea ice over multi-year drifts at multiple locations in the Arctic. These observations will contribute to the Arctic Observation Network during the International Polar Year. In particular, these observations will allow documentation of the regional variability in the role of the upper ocean in storing heat and melting sea ice, documentation of how ocean-to-ice heat fluxes are affected by the structure and heat content of the Arctic halocline, understanding of the forcing mechanisms involved, and testing and improvement of ocean-to-ice flux parameterizations for use in large scale models.

13) The Collaborative O-Buoy Project: Deployment of a Network of Arctic Ocean Chemical Sensors for the IPY and Beyond *

#0612457

Principle Investigator:
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Award Amount to Date:
\$112,184.00

#0612331

Principal Investigator:
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West Boothbay Harbor, ME 04575
207-633-9600

Awarded Amount to Date:
\$165,869.00

#0612047

Principal Investigator:
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West Lafayette, IN 47907
765-494-4600

Awarded Amount to Date:
\$150,785.00

#0611992

Principal Investigator:
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Department of Army Cold Regions Research & Engineering Laboratory
72 Lyme Road
Hanover, NH 03755
603-646-4219

Awarded Amount to Date:
\$134,113.00

Program Manager: William J. Wiseman, Jr.
Start Date: May 15, 2007
Expires: April 30, 2008 (Estimated)

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Matrai/>

Abstract: The Arctic Ocean is a rapidly changing and hostile environment: remote and, at times, inaccessible; □ air temperatures as low as -50oC; months of darkness; a sea ice cover that is constantly moving and deforming; pervasive moisture during the melt season; drifting snow and marauding mammals. These conditions make any observation difficult, but pose particular difficulties for autonomous sensors. To date, most long-term Arctic atmospheric observations, and in particular most chemistry data, have been collected on land, although the Arctic Ocean and its sea ice cover modify the climate and atmospheric composition of the entire region. It is known that surface chemistry involving sea salt results in destruction of ozone (O3) and elementary mercury (Hg) at the surface during spring time in the Arctic. However, due to the logistics challenge of long term measurements, there have been very few such measurements of O3 or other chemical species in the atmosphere above the Arctic Ocean surface (except from satellites and aircraft). Because of new developments in instrumentation, power management, and instrumentation control, there is a new opportunity to realize this goal through development of robust, unattended, self-contained and autonomous buoys. □□ Long-term, ocean-based atmospheric data sets are needed to quantify seasonal and interannual variability in a fast changing ice field that will vary in different regions of the Arctic Ocean. To further this goal, the project will integrate 3 different chemical measurement instruments aimed at key gases, into weather-tight, self-powered, ice-tethered buoys; two of these specialized buoys will be field tested at Barrow, Alaska. This development will improve understanding of the fundamental chemical and physical processes, and improve the understanding of how atmosphere-surface interactive processes respond to Arctic System-wide changes in physical and climatic conditions. The O-Buoy instrument package will initially consist of three sensors: 1) a MAX-DOAS BrO instrument, 2) an O3 detector, and 3) a CO2 analyzer. □□ In year 1 an autonomous buoy will be developed with instruments that are robust, low power, with a data/power/instrument control management system package that allows computer control for periodic operation, and data transmission via the Iridium satellite system. It year 2 and 3 there will be initial testing and refinement at Barrow, Alaska. To achieve this goal, we plan on coordination with collaborating researchers as part of the Ocean-Atmosphere-Sea Ice-Snowpack (OASIS) program (<http://www.OASIShome.net>). □□

14) Coordination, Data Management, and Enhancement of the International Arctic Buoy Programme (IABP)

#0520287

Principal Investigator:

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University of Washington

1100 NE 45th Street, Suite 300

Seattle, WA 98105

206-543-4043

Awarded Amount to Date:

\$400,000.00

Program Manager: Simon Stephenson

Start Date: March 15, 2006

Expires: February 29, 2008 (Estimated)

Home Page and Data:

<http://iabp.apl.washington.edu/>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Rigor/>

Abstract: The award supports for a network of automatic data buoys to monitor synoptic-scale fields of surface air pressure, air temperature, and ice motion throughout the Arctic Ocean, an activity that was recommended by the National Academy of Sciences in 1974. APL initiated the program in 1978 and became the International Arctic Buoy Programme in 1991 to provide meteorological and oceanographic data for real-time operational requirements and research purposes including support to the World Climate Research Programme and the World Weather Watch Programme. Thus the program fits extremely well into the RSL program Long-term observations component. □□The IABP is composed of 20 different research and operational institutions from 9 different □countries (<http://iabp.apl.washington.edu/Participants.htm>). The IABP is funded and managed by □Participants of the program. Management of the IABP is the responsibility of the Executive □Committee, and operation of the program was delegated to the Coordinator of the IABP, Ignatius □Rigor. □□This award renews NSF funding of the IABP through the USIABP. Funds from this proposal will be used for the Coordination, Data Management and deployment of enhanced buoys by the USIABP. The IABP provides long-term observations from the Arctic Ocean, which are essential for Arctic forecasting and research.

15) Collaborative Research: North Pole Station: A Distribution Long-Term Environmental Observation *

#0352984

Principal Investigator:
Robert Collier - rcollier@coas.oregonstate.edu
Kelly Falkner (Former Principal Investigator)
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Corvallis, OR 97331
541-737-4933

Awarded Amount to Date:
\$174,824.00

Program Manager: Simon Stephenson
Start Date: September 1, 2004
Expires: August 31, 2007 (Estimated)

#0352754

Principal Investigator:
James Morison - morison@apl.washington.edu
Co-Principal Investigators:
Knut Aagaard
Richard Moritz
Andreas Heiberg
Michael Steele
University of Washington
1100 NE 45th Street, Suite 300
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206-543-4043

Awarded Amount to Date:
\$4,322,908.00

Program Manager: Martin Jeffries
Start Date: September 1, 2004
Expires: August 31, 2008 (Estimated)

#0352687

Miles McPhee - mmcphree@starband.net
McPhee Research Company
450 Clover Springs Road
Naches, WA 98937
509-658-2575

Awarded Amount to Date:
\$26,940.00

Program Manager: Simon Stephenson
Start Date: September 1, 2004
Expires: August 31, 2007 (Estimated)

Home Page and Data:

<http://psc.apl.washington.edu/northpole/index.html>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Morison/>

Abstract: The purpose of the North Pole Environmental Observatory (NPEO) is to help track and understand ongoing changes in the arctic environment, and to increase the availability of long-term environmental data in the Arctic by providing a data and infrastructure resource for other polar science and climate investigations. NPEO was first established in 2000 and includes an automated drifting station of buoys fixed to the sea ice, an ocean mooring, and airborne hydrographic surveys. The North Pole is an excellent location for long-term measurements. Near the flank of the Lomonosov Ridge, it has proven to be a sensitive site for changes in upper ocean frontal structure and changes in the Atlantic water flowing along the ridge. A history of expeditions to the North Pole provides a benchmark of ocean and sea ice observations. The drifting station deployment at the North Pole fills a geographic gap in drifting buoy coverage of the International Arctic Buoy Program's (IABP). Time series observations of ice thickness there provide a unique measure of sea ice in the Transpolar Drift. The airborne hydrographic surveys reach critical areas that are difficult to reach by other means. □□NPEO observations are necessary to understand the impacts of a changing Arctic environment on ecosystems, indigenous communities and society at large. NPEO enhances the infrastructure for research by providing basic infrastructure and data for research activities in the central Arctic.

**16) IPY: Collaborative Research: Aerial Hydrographic Surveys for IPY and Beyond:
Tracking Change and Understanding Seasonal Variability ***

#0634226

Principal Investigator:

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Co-Principal Investigators:

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Michael Steele

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Awarded Amount to Date:

\$267,302.00

#0634167

Principal Investigator:

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Pacific Marine Sciences and Technology LLC

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Oakland, CA 94610

415/606-2274

Awarded Amount to Date:

\$29,921.00

#0634122

Principal Investigator:

Robert Collier - rcollier@coas.oregonstate.edu

Oregon State University

Corvallis, OR 97331

541-737-4933

Awarded Amount to Date:

\$143,395.00

#0634097

Principal Investigator:

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McPhee Research Company

450 Clover Springs Road

Naches, WA 98937

509-658-2575

Awarded Amount to Date:
\$42,490.00

#0633979

Principal Investigator:
Andrey Proshutinsky - aproshutinsky@whoi.edu
Woods Hole Oceanographic Institution
183 Oyster Pond Road
Woods Hole, MA 02543
508-289-2462

Awarded Amount to Date:
\$24,432.00

Program Manager: Martin Jeffries
Start Date: May 15, 2007
Expires: April 30, 2008 (Estimated)

Home Page and Data:

<http://psc.apl.washington.edu/northpole/index.html>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Morison/>

Abstract: Annual springtime, large-scale airborne surveys of the Arctic Ocean will be conducted in two regions: the central Arctic Ocean (annual surveys), and the southern Beaufort Sea (odd-year surveys). The surveys will sample the two main circulation features of the Arctic Ocean, the Transpolar Drift Stream and the Beaufort Gyre. The total number of stations will reach a maximum of about 25 at each location during IPY, decreasing to a lower level after IPY as part of a long-term Arctic Observing Network (AON). The proposed surveys have two main goals: (a) observe Arctic Ocean change by taking sea ice and ocean sections across frontal features, and (b) advance understanding of seasonal variability in the sea ice - upper ocean system to map the growth and melt of ice and to reduce seasonal bias in comparisons of past and future hydrographic records. □□ Five meridional sections will be done during IPY from the North Pole south to 85N, with possible extensions. Pairs of sections will be done annually after IPY. In the Beaufort Sea, the work will include two meridional sections extending to 78N and two nearly zonal sections that will pre-sample summertime icebreaker cruise tracks. After IPY, subset of sections will be done in odd-numbered years. To resolve seasonal change, station locations will be chosen to provide end-of-winter comparisons with end-of-summer measurements made by Ice Tethered Platforms (ITPs) and icebreakers. At each station a variety of physical and chemical ocean data, including temperature, salinity, and dissolved oxygen will be collected using proven methods. A new nitrate sensing system will expand the high-resolution chemical profiling. Bottle samples of tracers such as dissolved oxygen, barium, phosphate, silicate, nitrate, nitrite, ammonium, □ alkalinity, and oxygen isotopes will be taken. In collaboration with US and European sea ice scientists, snow and sea ice thickness data will be acquired both along our flight tracks using remote sensing and in situ while on station. In collaboration with US, European, and Canadian scientists, we will extend our section data from the central Arctic

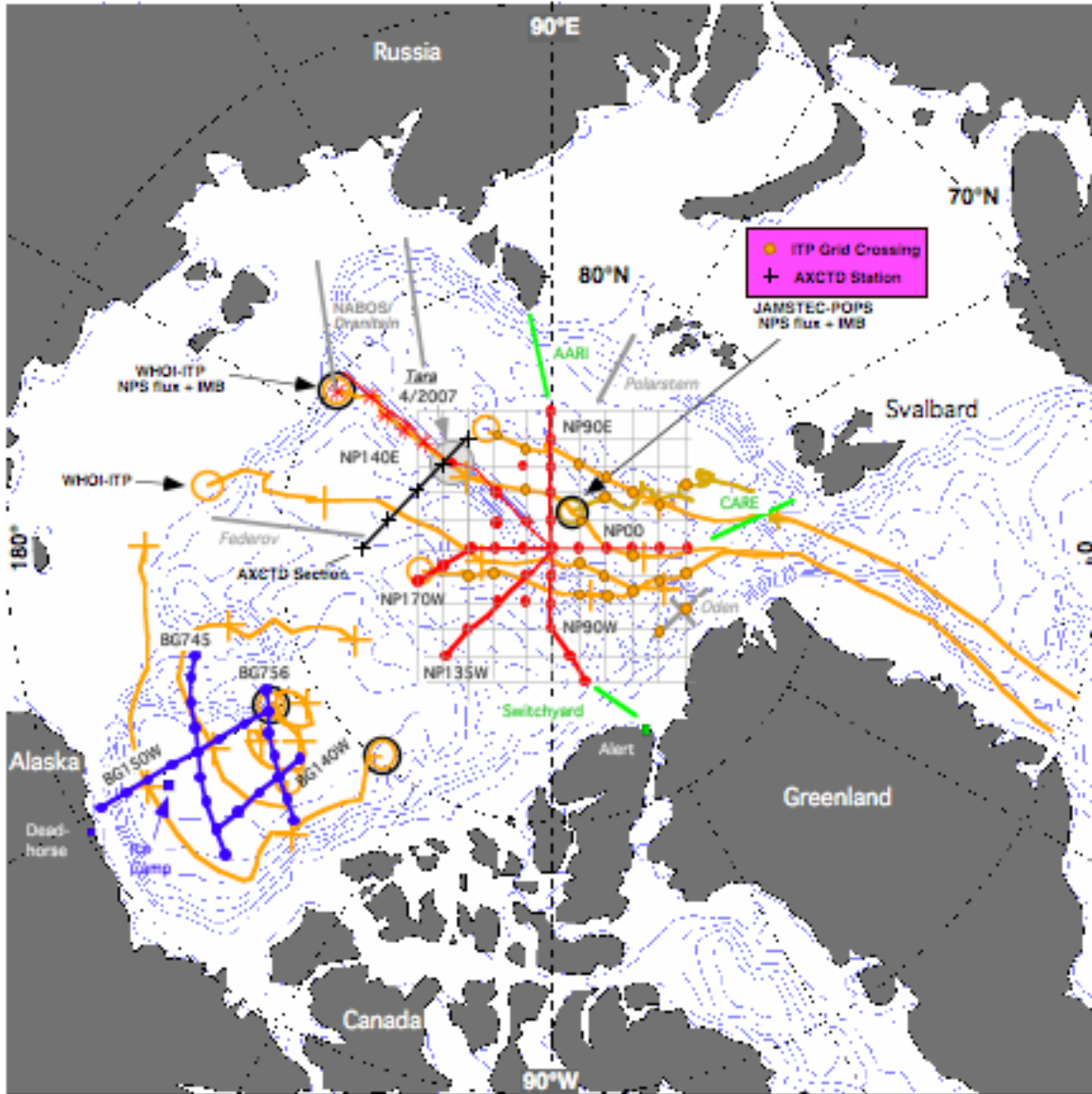
toward the coastlines. □□ Together with information from ITPs, this project will give the most comprehensive, synoptic view of springtime, Arctic Ocean sea ice- ocean conditions since the Soviet airborne survey programs in the 1970s. This proposed component of the AON will effectively track Arctic Ocean change, and, with corresponding summer measurements, will provide seasonal coverage with which to test system models and their ability to capture system variability. We will help to ensure continuity in the US capability to undertake and remain at the forefront of such science efforts by training two graduate students and so directly engage the next generation of polar scientists. The public will be engaged in polar discovery through a range of activities including, giving public lectures, communicating with the press, giving K-12 presentations, being on the Advisory Board for the Earth & Sky NPR radio program's proposed IPY Polar Heroes project, being a science advisor for the San Francisco Exploratorium proposed IPY project, being on the □ Science Advisory Team of MacGillivray Freeman Films' proposed IPY "Polar Quest" IMAX movie, and contributing to the annual Seattle Pacific Science Center- Polar Science Weekend. □□□

Intellectual Merit: We propose to take annual springtime, large-scale airborne surveys of the Arctic Ocean. These surveys will be in two regions: the central Arctic Ocean (2007 and 2008), and the southern Beaufort Sea (2007 only). They will thus sample the two main circulation features of the Arctic Ocean, the Transpolar Drift Stream and the Beaufort Gyre. In both cases, we will leverage existing operational capabilities (The North Pole Environmental Observatory (NPEO) in the central Arctic; and US Navy Ice Camp in the Beaufort Sea). The total number of stations will reach a maximum of about 25 at each location during IPY, anticipating a somewhat lower number of sections and stations after IPY as part of a long-term Arctic Observing Network (AON). Our proposed surveys have two main goals: (a) observe Arctic Ocean change by taking sea ice and ocean sections across frontal features, and (b) advance our understanding of seasonal variability in the sea ice – upper ocean system to map the growth and melt of ice and to reduce seasonal bias in comparisons of past and future hydrographic records.

We will do five meridional sections during IPY from the North Pole south to 85°N, with possible extensions. In the Beaufort Sea, we will do two meridional sections extending to 78°N and two nearly zonal sections that will pre-sample summertime icebreaker cruise tracks. To resolve seasonal change, station locations will be chosen to provide winters-end comparisons with summers-end measurements made by Ice Tethered Platforms (ITPs) and icebreakers. At each station, we will collect a variety of physical and chemical ocean data, including temperature, salinity, and dissolved oxygen using proven methods. We will expand the high-resolution chemical profiling through inclusion of a new nitrate sensing system. We will take bottle samples of tracers such as dissolved oxygen, barium, phosphate, silicate, nitrate, nitrite, ammonium, alkalinity, and oxygen isotopes. In collaboration with US and European sea ice scientists, we will acquire snow and sea ice thickness data both while on station. We will endeavor to make common sections with DAMOCLES ice scientists making remote sensing measurements of ice thickness and draft. In collaboration with US, European, and Canadian scientists, we will extend our section data from the central Arctic toward the coastlines.

Broader impacts: This project, together with information from ITPs, will give the most comprehensive, synoptic view of springtime, Arctic Ocean sea ice – ocean conditions since the Soviet airborne survey programs in the 1970s. Based on experience, our proposed component of the AON will effectively track Arctic Ocean change, and with corresponding summer measurements, will provide seasonal coverage with which to test system models and their ability

to capture system variability. We will help to ensure continuity in the US capability to undertake and remain at the forefront of such science efforts by training two graduate students and so directly engage the next generation of polar scientists. The public will be engaged in polar discovery through a range of activities including, giving public lectures, communicating with the press, giving K-12 presentations, being on the Advisory Board for the Earth & Sky NPR radio program's proposed IPY Polar Heroes project, and contributing to the annual Seattle Pacific Science Center -Polar Science Weekend.



17) Collaborative Research: A Modular Approach to Building an Arctic Observing System for the IPY and Beyond in the Switchyard Region of the Arctic Ocean *◇

#0633878

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Co-Principal Investigators:

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Awarded Amount to Date:

\$120,802.00

#0633885

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Co-Principal Investigators:

Craig Lee

Jason Gobat

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Awarded Amount to Date:

\$325,537.00

#0633343

Principal Investigator:

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National Aeronautics and Space Administration

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Telephone number not available

Awarded Amount to Date:

\$47,000.00

Program Manager: Martin Jeffries

Start Date: April 1, 2007

Expires: March 31, 2008 (Estimated)

Home Page:

<http://psc.apl.washington.edu/switchyard/>

Data Page:

http://psc.apl.washington.edu/switchyard/graphics_data_form.html

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Schlosser/>

Abstract: Funds are provided for the design, development, and implementation of a component of an Arctic Ocean Observing System in the Switchyard region of the Arctic Ocean (north of Greenland and Nares Strait) that will serve the scientific studies developed for the IPY (International Polar Year), SEARCH (Study of Environmental ARctic Change), and related programs. The defining elements of the System are: (1) a multi-platform design, (2) combination of proven technology with adaptation of innovative, highly promising, new tools for operation under sea ice cover that are considered to be future backbones of a quasi-permanent, pan-Arctic Ocean System, (3) a modular approach that allows expansion of the system to a pan-Arctic scale, and (4) ongoing refinement of the design through evaluation of combined data and modeling results. □□ Specifically, the project will continue and expand two aircraft-based sections between Alert and the North Pole for long-term observation of hydrographic properties and a set of tracers aimed at resolving relative age structure (CFC's, tritium/³He) and freshwater components (¹⁸O and Ba) in the upper water column, utilizing the Arctic CTD/rosette system. This modular system is deployed through a 12" hole drilled through the sea ice and traces temperature, salinity, and dissolved oxygen, while at the same time allowing the collection of up to 12 water samples. The study also will continue one helicopter section across the shelf slope just west of Nares Strait to capture the structure and transport of the water masses coming around the Canadian Basin on their way to Nares and Fram Straits. To complete the quantitative assessment of the transport of the water masses from the Canadian Basin towards Nares Strait and Fram Strait, a set of 7 new, low-cost, lightweight moorings will be deployed across the shelf just west of Nares Strait to separate the individual transports through these straits. Finally, the planned in situ observations will be augmented by satellite-derived observations of the sea ice motion and mass budget.

18) The Beaufort Gyre System: The Flywheel of the Arctic

#0424864

Principal Investigator:

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508-289-2462

Awarded Amount to Date:

\$2,978,071.00

Program Manager: Simon Stephenson

Start Date: October 1, 2004

Expires: September 30, 2008 (Estimated)

Home Page:

<http://www.who.edu/beaufortgyre/>

Data:

<http://www.who.edu/beaufortgyre/data.html>

AON PI Meeting Presentation

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Proshutinsky/>

Abstract: This project explores the hypothesis that the state and variability of the Beaufort Gyre (BG) system (ocean, sea ice and atmosphere) are natural indicators of Arctic climate health. The major goal of this proposal is to understand the structure of the BG system, its regulating mechanisms, and impact on Arctic climate. The project team intend to accomplish this by investigating the composition and variability during the period 2003 - 2008 of the atmospheric, cryospheric and oceanic components of this system based on a specially designed observational program, improved modeling studies, and analyses of improved and reconstructed historical data sets. □□The project will use several major methods to explore the BG system: in situ observations, satellite remote sensing technology, methods of tracer analyses, numerical modeling, historical data mining and reconstruction procedures, and statistical analyses tools. New technologies will be applied; moored profiler instrumentation, satellite techniques allowing mapping of sea ice thickness and sea surface heights in the ice covered regions, and an easily-deployed Ice-Tethered Profiler (ITP) capable of returning daily high-vertical-resolution measurements of upper ocean temperature and salinity. This project relies extensively on working with other NSF projects, and Canadian collaborators, subcontracting with Russian scientists, and freely obtaining other products from our USA and international collaborators from Germany and UK.

19) IPY: Observing the Dynamics of the Deepest Waters in the Arctic Ocean ◇

#0632201:

Principal Investigator:

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Awarded Amount to Date:

\$89,718.00

Program Manager: Martin Jeffries

Start Date: March 1, 2007

Expires: February 29, 2008 (Estimated)

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Timmermans/>

Abstract: Funds are provided to support field research and analysis that will begin to develop an understanding of the dynamics and properties of the deep waters of the Canada Basin. The work builds on preliminary deep mooring observations near 2500-m depth that suggest a dynamically active environment in these deep waters, not the quiet basin previously assumed. The aim of the proposed work is to observe the horizontal and vertical motion in the deep Canada Basin over one year. To this end, the co-PIs will add instruments to the deep portion of two moorings that are scheduled to be deployed in the Canada Basin for one IPY year (2007-2008). The additional instruments will record velocity, pressure, temperature, and salinity below 2200 m. These will provide long time-series measurements in the deep Canada Basin, and will be a vital component of the "snapshot in time" of the state of the Arctic Ocean between 2007 and 2009.

20) An Innovative Observational Network for Critical Arctic Gateways: Understanding Exchanges through Davis Fram Straits ◇

#0632231

Principal Investigator:

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Co-Principal Investigator:

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Jason Gobat

Kathleen Stafford

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Awarded Amount to Date:

\$714,538.00

Program Manager: Martin Jeffries

Start Date: April 1, 2007

Expires: March 31, 2008 (Estimated)

Home Page:

<http://iop.apl.washington.edu/>

Seaglider:

<http://iop.apl.washington.edu/seaglider/>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Lee/>

Abstract: Funds are provided in support of a study to understand exchanges across a major gateway linking the Arctic with the subpolar North Atlantic " Davis Strait (Canadian Arctic Archipelago). The proposed study purports to quantify, with robust error estimates, Davis Strait watermass variability, volume, liquid freshwater, heat and ice fluxes at weekly to inter-annual timescales. These measurements will be used to advance understanding of the impacts of these exchanges on large scale characteristics of the Atlantic and Arctic Oceans. □□ The proposed observation system, currently under development in Davis Strait, employs complementary techniques to resolve critical aspects of the exchange. The system includes: □(1) A sparse array of subsurface moorings, each instrumented with an upward looking sonar, an Acoustic Doppler Current Profiler (ADCP), conductivity-temperature (CT) sensors, and (deep) conventional current meters, will provide time series of upper ocean currents, ice velocity, and ice thickness, □(2) Shelf sites instrumented with ADCPs, CT sensors and an innovative, low-cost package for collecting CT time series in the ice-threatened near-surface region, and □(3) Acoustically navigated Seagliders to provide year-round, repeated, high-resolution hydrographic sections across the straits. □ The Davis Strait network will be undertaken in collaboration with the Bedford Institution of Oceanography.

21) Comparison of Water Properties and Flows in the U.S. and Russian Channels of the Bering Strait - 2005 to 2006

#0528632

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206-543-4043

Awarded Amount to Date:

\$99,596.00

Program Manager: Simon Stephenson

Start Date: May 15, 2005

Expires: October 31, 2007 (Estimated)

Home Page:

<http://psc.apl.washington.edu/HLD/Bstrait/bstrait.html>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Weingartner/>

Abstract: This project will continue the collection of a key dataset for understanding and modeling the Arctic Ocean. There have been continuous measurements of the through flow of the Bering Strait since 1990 but only at three sites in the center and on US side of the Strait. Data have been used to model the behavior of the whole channel with the central mooring acting as a surrogate for the variability of the Russian side component. However, there is a new agreement between NOAA and Russian counterparts to measure the through flow on the Russia side of the Bering Strait and make those data available. Therefore this year offers a unique opportunity to finally calibrate the model with data from the Russia side of the Strait while concurrently measuring with the long term array.

22) IPY: Collaborative Research: The Pacific Gateway to the Arctic-Quantifying and Understanding Bering Strait Oceanic Fluxes *◇

#0632154:

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Awarded Amount to Date:

\$452,714.00

#0631713:

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Awarded Amount to Date:

\$174,173.00

Program Manager: William J. Wiseman, Jr.

Start Date: March 1, 2007

Expires: February 29, 2008 (Estimated)

Home Page:

<http://psc.apl.washington.edu/HLD/Bstrait/bstrait.html>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Weingartner/>

Abstract: Funds are provided for an observationally focused study of the entire Bering Strait region (in collaboration with Russian, Canadian and Japanese scientists). The study will include deployment of a high resolution mooring array from 2007-2009, covering the two channels of the strait and one "climate" site to the north of the strait, annual CTD surveys and mooring servicing, satellite data analysis and theoretical and modeling efforts. Science objectives are: 1) to measure the velocities and water properties of the Bering Strait throughflow;

2) to understand the physical processes influencing the properties of the Bering Strait throughflow, with special focus on mechanisms driving change, and consequent impacts on the Arctic Ocean;

3) to quantify oceanic fluxes of volume, freshwater, heat, nutrients and chlorophyll biomass through the strait;

4) to design an optimum monitoring system for oceanic fluxes through the Bering Strait.

The PIs' hypotheses are that Bering Strait throughflow properties are set by global and regional oceanic and atmospheric processes, which are vulnerable to climate change, and that understanding the physical processes and scalings in the strait are key to quantifying current conditions, assessing future change scenarios, and designing an efficient observational scheme for this oceanic gateway.

23) Bering Sea Sub-Network: International Community-Based Observation Alliance for Arctic Observing Network

#0634079

Principal Investigator:

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Awarded Amount to Date:

\$346,740.00

Program Manager: Martin Jeffries

Start Date: June 1, 2007

Expires: May 31, 2008 (Estimated)

□

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Gofman/>

Abstract: 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 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.

Hydrology / Cryosphere

24) Thermal State of Permafrost (TSP): The U.S. Contribution to the International Permafrost Observation Network

#0520578

Principal Investigator:

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907-474-7314

Awarded Amount to Date:

\$274,850.00

Program Manager: Simon Stephenson

Start Date: September 1, 2006

Expires: August 31, 2008 (Estimated)

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Romanovsky/>

Abstract: This proposal will formally link approximately 66 Alaskan boreholes with similar sets of observations in other countries, and in so doing will formally initiate the International Network of Permafrost Observatories (INPO). This work will coordinate data collection using standard equipment and protocols at the Alaskan borehole sites and at a selected and comparable number of Russian borehole sites. The Alaskan and Russian borehole temperature data sets will provide the baseline to reconstruct past surface temperatures, to assess the future rates of change in near-surface permafrost temperatures and permafrost boundaries, and to provide spatial data for validation of climate scenario models and temperature reanalysis approaches. This proposal provides the US contribution to the proposed International Polar Year Thermal State of Permafrost (IPY/TSP) project that proposes to measure temperatures in a large number of globally distributed boreholes in order to provide a "snapshot" of permafrost temperatures in both time and space.

25) IPY: Development of a Network of Permafrost Observatories in North America and Russia: The US Contribution to the International Polar Year ◇

#063240

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907-474-7314

Awarded Amount to Date:

\$313,871.00

Program Manager: Neil R. Swanberg

Start Date: February 15, 2007

Expires: January 31, 2008 (Estimated)

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Romanovsky/>

Abstract: This proposal will formally link approximately 66 Alaskan boreholes with similar sets of observations in other countries and in so doing will formally initiate the International Network of Permafrost Observatories (INPO). The work entailed will coordinate data collection using standard equipment and protocols at the Alaskan borehole sites and at a select and comparable number of Russian borehole sites. The Alaskan and Russian borehole temperature data sets will provide the baseline needed to (1) reconstruct past surface temperatures, (2) assess the future rates of change in near-surface permafrost temperatures and permafrost boundaries, and (3) provide spatial data for validation of climate scenario models and temperature reanalysis approaches. This proposal requests support for permafrost long-term measurements and related activities for a three-year period encompassing the IPY period, including provisions for (a) the upgrade and maintenance of the existing Alaskan and Russian borehole sites, and (b) technological, logistical and operational support of observations at sites selected in Russia. This proposal shall constitute the US contribution to the proposed International Polar Year Thermal State of Permafrost (IPY/TSP) project. It proposes to measure temperatures in a large number of globally distributed boreholes in order to provide a "snapshot" of permafrost temperatures in both time and space. Education and training are stated goals of this project given there are fewer than ten government and academic researchers dealing with the acquisition and analysis of permafrost temperatures within the US. In addition, this proposal provides for the training of several young specialists, and intends to pursue the establishment of permafrost curricula with field sites in both Alaska and Russia and exchange of students; for example, with Tyumen State Oil and Gas University and the University Centre in Svalbard (UNIS). The researchers' experience will also be applied to local community concerns about degrading permafrost both in Alaska and Russia.

Intellectual Merit: There exists no global database that defines the thermal state of permafrost within a specific time interval. Internationally, reported or unpublished temperature measurements have been obtained at various depths and periods over the past five or more decades, and it is known that these temperatures have changed at different rates in different regions. Analysis of temperature measurements obtained in these boreholes provides historical records of secular surface climate changes (deep holes) and interannual to decadal changes in surface boundary layer (intermediate depths). The Global Terrestrial Network for Permafrost (GTN-P) is a metadata based system established in the late 1990s under the World Meteorological Organization (WMO) which currently contains more than 425 documented borehole and 125 active layer sites across both polar regions. In Alaska, two major series of boreholes exist within the GTN-P with observations dating back to the 1970s; the US Geological Survey deep boreholes (>125 m) and the University of Alaska's intermediate boreholes (<100m). This proposal will formally link approximately 66 Alaskan boreholes with similar sets of observations in other countries, and in so doing will formally initiate the International Network of Permafrost Observatories (INPO). This work will coordinate data collection using standard equipment and protocols at the Alaskan borehole sites and at a selected and comparable number of Russian borehole sites. The Alaskan and Russian borehole temperature data sets will provide the baseline to reconstruct past surface temperatures, to assess the future rates of change in near-surface permafrost temperatures and permafrost boundaries, and to provide spatial data for validation of climate scenario models and temperature reanalysis approaches. This proposal provides the US contribution to the proposed International Polar Year *Thermal State of Permafrost (IPY/TSP)* project that proposes to measure temperatures in a large number of globally distributed boreholes in order to provide a "snapshot" of permafrost temperatures in both time and space.

Broader Impacts: IPY themes addressed in this proposal include Themes 1 and 2 on the current state and change of the polar environment. Broader concerns related to a warming Earth and the many societal issues in the high latitude and high mountain regions of planet Earth will be addressed. The Arctic Climate Impact Assessment (ACIA) report in 2004 renewed concerns that enhanced thawing or degradation of permafrost has had major impacts on infrastructure, coastal processes and local communities, reflecting concerns of IPY Theme 6-Human Societies in Polar Regions. The objective and plans of the INPO closely complement the interagency Study of Environmental Arctic Change (SEARCH) and its terrestrial requirements to systematically assess recent changes in the pan-arctic landmass and terrestrial ecosystems. This project also addresses objectives of the terrestrial Circumarctic Environmental Observatories Network (CEON) and of the new US (National Aeronautics and Space Administration, NASA)- Russian (Russian Academy of Sciences) program titled Northern Eurasia Earth Science Partnership Initiative (NEESPI).

Education and training are major goals of this project. Within the US there are fewer than ten government and academic researchers dealing with the acquisition and analysis of permafrost temperatures. This proposal provides for training of several young specialists. The establishment of permafrost curricula will be pursued with field sites and exchange of students; for example, Tyumen State Oil and Gas University and the University Centre in Svalbard (UNIS). The researchers' experience will also be applied to local community concerns about degrading permafrost.

This proposal requests support for permafrost monitoring and related activities for a three-year period, and includes the upgrading and maintenance of the existing Alaskan sites and for logistical and operational support of observations at selected sites in Russia.

26) IPY: Collaborative Research: A Prototype Network for Measuring Arctic Winter Precipitation and Snow Cover (Snow-Net) *◇

#0632131

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Awarded Amount to Date:

\$224,451.00

#0632133

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Awarded Amount to Date:

\$78,000.00

#0632160

Principal Investigator:

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Svetlana Berezovskaya

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907-474-7314

Awarded Amount to Date:

\$160,597.00

Program Manager: Janet M. Intrieri

Start Date: March 15, 2007

Expires: February 29, 2008 (Estimated)

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Yang/>

Abstract: A prototype international network is proposed to measure snowfall and ground snow at 5 arctic sites concurrently in an effort to improve the ability to monitor. All of the sites have been identified as key locations in a pan-arctic monitoring network and will augment existing meteorological and snow measuring instrumentation with solid-state snow pillows, heated plate precipitation sensors, snow fences, and eddy correlation towers for computation of sublimation. Ground surveys will also be conducted for snow cover depth, water equivalent, and other properties using tools that allow rapid collection of extensive data. These will be augmented with aerial photography and airborne remote sensing from inexpensive platforms (kites and UAVs) to visualize drift and deposition patterns. The combined suite of instruments and measurements is designed to allow closure of the winter water balance at each site, for the first time balancing the precipitation with measured accumulation. Using a set of modeling tools (e.g., a melt model, and a transport model for blowing snow), the PI's will a) develop methods and algorithms for quality checking both meteorological and snow data by cross-comparison between sensors and instruments, b) close the water balance in a way that produces more accurate values of winter precipitation and snow on the ground than are currently being collected, and c) apply a methodology to historical data from the existing gauge network to produce better estimates of past trends.

Intellectual merit: Temperature and precipitation are the most important metrics of climate change, yet a strong case can be made that our ability to produce accurate and reliable records of arctic precipitation is poor. The root of the problem is that for 8 to 10 months of the year, precipitation falls as a solid (snow, hail, diamond dust, sleet, and rime). Wind, drifting snow, and the propensity for snow to stick to gauges, combine to make monitoring solid precipitation a difficult task. In addition, solid precipitation accumulates and forms a long-lasting snow cover that, if anything, impacts the arctic system even more than the precipitation amount. Both snowfall and snow on the ground are changing, yet we are in a poor position to monitor this change. Part of the problem is that winter precipitation and snow on the ground are currently monitored by two separate systems. Here we propose a prototype international network where we will measure snowfall and snow on the ground concurrently, thereby improving our ability to monitor both of these better. At 5 arctic sites (all identified as key locations in a pan-arctic monitoring network), we will augment existing meteorological and snow measuring instrumentation with solid-state snow pillows, heated plate precipitation sensors, snow fences (to capture the wind-blown flux), and eddy correlation towers for computation of sublimation. Several times a winter at the sites we will conduct ground surveys of snow cover depth, water equivalent, and other properties using tools that allow rapid collection of extensive data. These will be augmented with aerial photography and airborne remote sensing from inexpensive platforms (kites and UAVs) to visualize drift and deposition patterns. The combined suite of instruments and measurements is designed to allow us to close the winter water balance at each site, for the first time balancing the precipitation with measured accumulation. Using a set of modeling tools (e.g., a melt model, and a transport model for blowing snow), we will a) develop methods and algorithms for quality checking both meteorological and snow data by cross-comparison between sensors and instruments, b) close the water balance in a way that produces more accurate values of winter precipitation and snow on the ground than are currently being

collected, and c) apply our methodology to historical data from the existing gauge network to produce better estimates of past trends. Our effort, or one like it, is essential if we are to understand arctic precipitation and snow cover trends.

Broader impacts: The proposed project will substantially advance our understanding of how best to monitor arctic precipitation and will result in better knowledge of the spatial and historic trends in arctic winter precipitation and snow cover. Within the U.S., this understanding will directly benefit the *National Resource Conservation Service* (NRCS), one of the prime agencies charged with monitoring precipitation and snow cover, because they are a partner in the project. Similarly, the results of the project will have impact in Canada and Russia, where our partners are the agencies charged with arctic precipitation monitoring (*Environment Canada* and *Roshydromet*). Collectively, we will form an international arctic snow cover and winter precipitation group that can address the challenges of producing high quality assessments of arctic winter weather trends together. Specifically, as result of the proposed work, this group will a) identify the environmental conditions under which instruments become unreliable and learn how to flag these in the operational records, and b) identify favorable pairings of instruments that facilitate quality checking and which, when used in tandem, produce better data from both instruments. In addition, the project will contribute to the education of a graduate student, and will have direct impact on the general public through the publication of an English-Inupiat glossary of snow terms that will be used in the *North Slope Borough School District Bilingual Education Program*.

Relevance to IPY: Arctic precipitation and snow cover know no international boundaries. If we want to understand pan-arctic climate trends and feedbacks, we have to ensure that all the arctic nations are monitoring this critical component of the arctic system accurately and reliably. That is why the proposed project is international in scope (U.S.-Japan-Canada-Russia). It also directly addresses the National Research Council's No. 1 recommendation for IPY of assessing large-scale environmental change in the Polar Regions, and will leave a legacy of improved monitoring sites across the Arctic.

27) Long-term Measurements and Observations for the International Arctic Research Community on the Kuparuk River Basin, Alaska

#0335941

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907-474-7314

Awarded Amount to Date:

\$837,679.00

Program Manager: Simon Stephenson

Start Date: April 15, 2004

Expires: March 31, 2008 (Estimated)

Home Page and Past Data:

http://www.uaf.edu/water/projects/NorthSlope/upper_kuparuk/upper_kuparuk.html

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Kane/>

Abstract: The overall goal of this project is to continue making systematic hydrologic and meteorological measurements responsive to science community needs on the Kuparuk River on the North Slope of Alaska, an representative extensively studied watershed. The project will produce timely high quality, long-term data to improve understanding of hydrological processes, to detect and quantify climate induced change, to enable the development of new models of hydrologically related processes in time and space and to verify remote sensing techniques.

28) Arctic Great Rivers Observatory (Arctic-GRO)

Project Number not Available in Fastlane

Principal Investigator:

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Co-Principal Investigator:

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Newly Funded

Abstract: The river linkage between the land and the Arctic Ocean plays a central role in the rapidly evolving dynamics of the Arctic System. Six great rivers provide the majority of the continental fresh water to the Arctic Ocean, the most landlocked and freshwater-dominated of the Earth's seas. By measuring the flux of water and constituents at the junction between the continents and the ocean in these key rivers, it is possible to efficiently assess changes occurring across vast regions of the continents that may diagnose environmental change on land and forecast imminent changes in circulation and biogeochemical processes in the Arctic and North Atlantic Oceans. We propose an Arctic Great Rivers Observatory (Arctic-GRO) project that will assess river constituent fluxes in the Ob', Yenisey, Lena, Kolyma, Yukon, and Mackenzie Rivers. These observations will be used to test hypotheses about the magnitude, controls and ecological significance of these fluxes and will provide new information on inter-annual variability and on trends in the major fluxes of constituents to the Arctic Ocean.

Relevance to the IPY: Monitoring the great arctic rivers is an essential component of any comprehensive Arctic Observatory program and is critical for understanding environmental change in the Arctic, a goal of SEARCH. The data collection will represent a pulse of activity within the IPY timeframe and will provide a legacy of data for future investigations. Sampling of large rivers provides one of the most efficient ways of detecting broad-scale environmental change in the Arctic. One example is the measured trend in Siberian rivers discharge over the past several decades which almost certainly indicate recent change in constituent fluxes as well, although available data are not yet adequate to demonstrate trends in constituent fluxes. Models of the climate, hydrology and biogeochemistry of the arctic atmosphere-land-ocean system must include land-ocean linkages but data to quantify the biogeochemical linkages is sparse at best. Land-ocean fluxes play an important role in the 3 major feedbacks from the Arctic to the global climate system; affecting sea ice extent and albedo through inter annual variability in discharge onto the shelf seas, affecting trace gas feedbacks through transport of dissolved gases and

organic carbon, and affecting ocean circulation through trends in freshwater inputs to the Arctic and North Atlantic Oceans. This proposal takes advantage of existing international collaborations and infrastructure that have been developed over the last decade and are now poised to contribute to IPY. The Arctic-GRO also represents a major component of the Arctic Circumpolar Coastal Observatory Network (ACCO-Net), an overarching IPY initiative designed to link key coastal erosion monitoring sites established as part of the international Arctic Coastal Dynamics project with major arctic river sampling sites established as part of the NSF Freshwater Integration (FWI) study.

Broader Impacts: Arctic-GRO is based upon strong scientific collaborations among US, Canadian and Russian scientists with experience in arctic hydrology, biogeochemistry, ecology and global change. All data collected will be available to the entire scientific community through the project web site and through the ARCSS data management center at the National Snow and Ice Data Center (NSIDC). The project will link with and extend the “Student Partners Project” beyond its 2008 termination date. “Student Partners” is an IPY science and education effort involving K-12 students and their teachers at each sampling site. Teachers and their students are educated in global change and in-turn collect river samples of selected constituents at higher frequencies than would otherwise be possible, thereby improving the science.

29) Columbia Glacier Project

Project Number not Available in Fastlane

Principal Investigator:

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Newly Funded

Abstract: PROJECT SUMMARY

Intellectual merit. This is a proposal to study both ongoing and historical changes in dynamics at the rapidly retreating Columbia Glacier, in south central coastal Alaska. Tidewater glaciers (TWGs) like Columbia Glacier terminate in the ocean and merit special attention because they exhibit some of the largest and strongly non-linear dynamic volume changes of all glaciers worldwide. In addition, most ice sheet mass loss occurs at marine-ending outlet glaciers that display dynamic instabilities very similar to TWG. Yet, the response of these glaciers to climate forcing remains very poorly understood. This proposal requests support to continue an unmatched 30-year record of observations at Columbia Glacier and to study the similarities between it and the rapidly retreating Greenland outlet glaciers. Project goals are aimed at a predictive capability for future TWG volume changes, which are a dominant constituent of global sea level rise.

A variety of measurements including vertical aerial photogrammetry (and subsequent feature-tracking), terrestrial time-lapse photogrammetry, airborne radar, GPS surveying, and meteorological monitoring will provide robust constraints for both inverse and forward modeling of the stress and flow fields.

The need for a better understanding of the interaction between climate forcing, glacier dynamics and ice volume change is widely recognized and has led to recommendations for better glacier observations in the IPCC 2007 Summary for Policymakers, the SEARCH Implementation Plan, the IPY E.U. initiative GLACIODYN, as well as the NSF call for an Arctic Observing Network. Both the SEARCH Implementation Plan and GLACIODYN list Columbia Glacier specifically as a key glaciological site. The proposed work is strongly aligned with the goals of GLACIODYN, and has been endorsed by their steering committee.

Broader impacts. Because of their large numbers, small glaciers presently dominate the cryosphere's contribution to global sea level rise. The largest uncertainties in this contribution are from TWG where volume changes are controlled by unmeasured and poorly understood dynamical processes. Rapid freshwater inputs of glaciers and ice sheets directly affect ocean currents, and catastrophic retreats have affected global climate, as evidenced through Heinrich Events. Regional and local changes from rapid volume change at TWGs affect fjord geometry

and circulation while exposing new landmass, which causes large changes in terrestrial ecosystems including some of the strongest observed isostatic rebound signals.

The proposed activity will create new partnerships through collaborations with European colleagues interested in advancing terrestrial photogrammetric methodology, and through a forward modeling (FEM) collaboration with A. Vieli. The activity is a collaboration between researchers from the Universities of Colorado and Washington, and has a strong educational component, involving undergraduates and two graduate students. Two of the University of Colorado Co-Investigators are new PhDs just getting started in their research careers.

Outreach will occur through channels offered by INSTAAR and National Snow and Ice Data Center (NSIDC), local outreach activities conducted by the PI's in Valdez, AK, and University of Washington. Data will be provided to the GLACIODYN outreach coordinator, who will use Virtual Globe technology for project visualization. Results will appear in peer-reviewed journals, presentations at national and international meetings, and small workshops focusing on software and algorithm development, and will be archived at NSIDC and UNAVCO.

Terrestrial Ecosystems

30) IPY: Collaborative Research: Study of Arctic Ecosystem Changes in the IPY using the International Tundra Experiment ◇

#0632144

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Awarded Amount to Date:

\$35,027.00

#0632184

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Awarded Amount to Date:

\$84,714.00

#0632263

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Awarded Amount to Date:

\$62,696.00

#0632277

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Awarded Amount to Date:
\$273,162.00

Program Manager: Martin Jeffries
Start Date: February 15, 2007
Expires: January 31, 2008 (Estimated)

Data:

<http://nsidc.org/>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Hollister/>

Abstract: This project will use the sampling power of the International Tundra Experiment (ITEX) Network to quantify changes in phenology, vegetation, and ecosystem properties that have occurred in tundra over the past 10-15 years in response to climate change and experimental warming, and to use the Network as the foundation for monitoring and prediction of future changes. Among the earliest signals of climate warming in the Arctic have been changes in the seasonal timing of life cycle events (phenology). Plants are leafing, flowering, and fruiting earlier than ever recorded. Because phenology and physiology are tightly coupled, ecosystem functions such as primary production, as well as the outcome of competition depend on phenological responses. Species phenological and physiological responses to warming differ, causing changes in community composition, biodiversity, and ecosystem function. However, in contrast to phenology, change in community composition is difficult to detect and ascribe to a particular phenomenon. Changes in phenology and species abundance being reported across the Arctic are consistent with the findings of the long-term experimental warming of the ITEX network, a plot-scale, nondestructive, warming experiment conducted across the tundra biome beginning in 1990. Remote sensing analyses have also detected earlier greening and increased biomass across polar regions, but cannot readily identify the basis for changes in community composition, can only infer function, and can say nothing about community trajectories. □ □

The ITEX network was specifically designed to study phenology and community composition, and has also been used effectively to study ecosystem processes. It is perfectly positioned for an intensive, comprehensive study of decadal-scale changes in phenology, community composition, and ecosystem function in response to background climate change, and has the added value of long-term experimental warming. The baseline data and sampling power of the ITEX network and its experimental approach are unparalleled. This effort will compare the results of a renewed field campaign of phenology and plant community composition measurements on warmed and control plots during the IPY with historical data from 10-15 years ago. The PIs will hold two

workshops to synthesize the long-term phenological and community changes observed across the network. Furthermore, a new suite of minimally invasive measurements will cross compare indices of ecosystem function - including: leaf, litter, and soil nutrients; isotopic composition; and secondary chemistry - in the control and warmed plots across the network. The long-term nature of these experiments and the global coverage of the coordinated network will lead to unique insights regarding the tundra response to past, ongoing, and future climate changes.

Project Summary: The overarching goals of this project are to use the sampling power of the International Tundra Experiment (ITEX) Network to quantify changes in phenology, vegetation, and ecosystem properties that have occurred in tundra over the past 10-15 years in response to climate change and experimental warming, and to use the Network as the foundation for monitoring and prediction of future changes. Among the earliest signals of climate warming in the Arctic have been changes in the seasonal timing of life cycle events (phenology). Plants are leafing, flowering, and fruiting earlier than ever recorded. Because phenology and physiology are tightly coupled, ecosystem functions such as primary production, as well as the outcome of competition depend on phenological responses. Species phenological and physiological responses to warming differ, causing changes in community composition, biodiversity, and ecosystem function. However, in contrast to phenology, change in community composition is difficult to detect and ascribe to a particular phenomenon. Changes in phenology and species abundance being reported across the Arctic are consistent with the findings of the long-term experimental warming of the ITEX network, a plot-scale, nondestructive, warming experiment conducted across the tundra biome beginning in 1990. Remote sensing analyses have also detected earlier greening and increased biomass across polar regions, but cannot readily identify the basis for changes in community composition, can only infer function, and can say nothing about community trajectories. The ITEX network was specifically designed to study phenology and community composition, and has also been used effectively to study ecosystem processes. The ITEX network is perfectly positioned for an intensive study of recent changes in phenology, community composition, and ecosystem function in response to background climate change, and has the added value of long-term experimental warming. The baseline data and sampling power of the ITEX network and its experimental approach are unparalleled.

Intellectual merit: We will compare the results of a renewed field campaign of phenology and plant community composition measurements on warmed and control plots during the IPY with our historical data from 10-15 years ago. We will run two workshops to synthesize the long-term phenological and community changes observed across the network. Furthermore, a new suite of minimally invasive measurements will cross compare indices of ecosystem function - including: leaf, litter, and soil nutrients; isotopic composition; and secondary chemistry - in the control and warmed plots across the network.

Broader Impacts: This study will provide research opportunities and training for two young investigators, a postdoctoral fellow, and several graduate, undergraduate, and high school students. We will also actively seek participation of underrepresented residents of the community at Barrow, Alaska, and we have incorporated formal education components about the teleconnections between the Arctic and the Earth System in the communities of Anchorage, AK and Miami, FL. The findings of this work will be published as broadly synthetic works of

international interest. Because of these teleconnections, findings of this circumpolar project will be of general importance to decision makers. Finally, meetings of the ITEX network will provide a learning experience rich in synthetic understanding of topics from a variety of international and cultural viewpoints.

Relevance to IPY: This project meets the goals of the IPY program as an international network with a strong research, networking and outreach components studying effects of warming and climate variability on ecosystems in the Arctic. The ITEX network has been specifically endorsed the IPY Secretariat as project #188 as demonstrating a high level of adherence to IPY themes and goals. A related endorsement of the Circumarctic Terrestrial Biodiversity (CAT-B) initiative, an offshoot of ITEX, is further evidence of the relevance of this program to IPY. The project will also link with other IPY themes including Back to the Future and The Greening of the Arctic.

31) IPY: Collaborative Research on Carbon, Water, and Energy Balance of the Arctic Landscape at Flagship Observatories and in a Pan-Arctic Network ◇

#0632139

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Co-Principal Investigators:

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Awarded Amount to Date:

\$395,656.00

#0632264

Principal Investigator:

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Co-Principal Investigators:

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Awarded Amount to Date:

\$708,344.00

Program Manager: William J. Wiseman, Jr.

Start Date: March 15, 2007

Expires: February 29, 2008 (Estimated)

Arctic LTER Home Page;

<http://ecosystems.mbl.edu/arc/>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Shaver/>

Abstract: Funds are provided to establish two observatories, in the U.S. and Russia, and form a PanArctic network of observatories where coordinated measures of landscape-level carbon, water, and energy balance are carried out and results made available in a unified database. The observatories will be established at two existing sites of research on landscape-level carbon, water, and energy balance - Toolik Lake (Alaska) and Cherskii (Siberia) - and the network of observatories across the Arctic where similar long-term observations of carbon, water and energy

variables are made or proposed as part of IPY will include Toolik, Cherskii, Abisko (Sweden, the main site of the ABACUS project), Zackenberg (Greenland), and several sites in Arctic Canada.

Funds are specifically provided for instruments and personnel at Toolik and Cherskii, as well as international workshops and visits among the sites to ensure that data and instrumentation are easily comparable. Rather than studying one process at a time, this effort focuses on simultaneous measurements of carbon, water, and energy fluxes of the Arctic terrestrial landscape at hourly, daily, seasonal, and multiyear time scales. These are major regulatory drivers of the Arctic System, forming key linkages and feedbacks between the land surface, the atmosphere, and the oceans.

The data collected will become a legacy by using measurement and data archiving approaches that are comparable among observatories. The data management protocols and archives used for nearly 20 years by the NSF Arctic Long Term Ecological Research (LTER) project (based at Toolik Lake) will be used; data will be archived in the Arctic LTER database and, through links to the National Snow and Ice Data Center (NSIDC), will be generally available to the community.

32) Development and Implementation of the Terrestrial Circumarctic Environmental Observations Network (CEON)

#0622406

Principal Investigator:

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Awarded Amount to Date:

\$504,051.00

Program Manager: Martin Jeffries

Start Date: May 15, 2006

Expires: April 30, 2008 (Estimated)

Home Page:

<http://www.ceoninfo.org/>

CEON Internet Map Server:

<http://www.ceonims.org/>

Barrow Area Info Database:

<http://www.baidims.org/>

AON PI Meeting Presentation:

<http://www.eol.ucar.edu/projects/aon-cadis/meetings/200703/projects/Tweedie/>

Abstract: The key objective of this three-year award is to further the international and multidisciplinary development of the terrestrial Circumarctic Environmental Observatories Network (CEON, www.ceoninfo.org). CEON's mission is to strengthen the capacity for emerging monitoring, research and policy needs at high northern latitudes by making data available that is adequate and suitable for addressing a series of well defined key scientific questions and uncertainties. As a priority, this award aims to satisfy the immediate developmental needs identified by the CEON stakeholder community and, where relevant, the Arctic Climate Impact Assessment (ACIA). This award will also support several other initiatives with a strong Arctic and environmental observation focus, including the second International Conference on Arctic Research Planning (ICARP II), the US National Academy of Sciences blue ribbon panel designing an Arctic Observation Network (AON), and the International Polar Year (IPY). □□ Specifically, this award will: □1. Establish a joint US-Swedish CEON Science Coordination Office (SCO). This is critical for CEON's transition to becoming a fully implemented and multi-laterally funded international network. □2. Convene annual CEON stakeholder and working group meetings to foster the community-based decision making necessary for the development of CEON. Annual stakeholder meetings are likely to attract up to 150 arctic and non-arctic specialists and will encourage CEON partners to convene meetings before or after the CEON meeting and hold and/or participate in workshops that will be used, for example, to offer instruction on standardized sampling protocols and technologies. □3. Continue

the development of novel web-based information portals and visualization tools that improve the capacity for transferring scientific, logistic, and educational knowledge and information both within and outside of CEON. These include a CEON email list, the CEON-Internet Map Server (CEON-IMS - www.ceonims.org), the capacity to build regionalized IMS applications centered on focal observatory platforms partnered to CEON, a methodological and standards database, and novel visualization tools that enhance education, outreach and information interactivity.

Data Management and Coordination

33) IPY: Exchange for Local Observations and Knowledge in the Arctic (ELOKA) ◇

#0632345

Principal Investigator:

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Awarded Amount to Date:

\$212,539.00

Program Manager: Martin Jeffries

Start Date: May 1, 2007

Expires: April 30, 2008 (Estimated)

Home Page:

<http://nsidc.org/eloka/>

Abstract: 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.

34) Collaborative Research, IPY: A Cooperative Arctic Data and Information Service (CADIS) ◇

#0632296

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Awarded Amount to Date:

\$215,466.00

#0632313

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Awarded Amount to Date:

\$440,585.00

Program Manager: Martin Jeffries

Start Date: March 1, 2007

Expires: February 29, 2008 (Estimated)

Home Page:

<http://www.eol.ucar.edu/projects/aon-cadis/>

Abstract: This project will develop a Cooperative Arctic Data and Information Service (CADIS) that will support the Arctic Observing Network (AON) and Study of Environmental Arctic Change (SEARCH) programs. CADIS will provide the discovery, access, and use of scientific data by providing near-real-time data delivery, a repository for data storage, a portal for the discovery, and tools to manipulate data. This system and data service will be built in a stepwise coherent manner and result in comprehensive long-term management for Arctic scientific data. CADIS will be a joint effort of the University Corporation for Atmospheric Research (UCAR), the National Snow and Ice Data Center (NSIDC), and the National Center for Atmospheric Research (NCAR). The project team will develop a new body of cyberinfrastructure by leveraging, integrating, and extending UCAR's Community Data Portal (CDP) framework and Unidata's THREDDS environment to form the CADIS system and portal. The CADIS portal will

make it easier for scientists to locate, display, subset, publish, and analyze related data sets provided by a network of data providers. In the first year, a metadata plan will be completed; it will include AON projects and Long Term Observatory (LTO) projects. In the second year, the CADIS portal will be populated with metadata from the AON and LTO projects. In the third year, real-time delivery through CADIS of selected AON and IASOA (International Arctic System for Observing the Atmosphere) data will be accomplished, and tools for searching via a map interface, and a map server showing the location of selected AON or SEARCH components (where metadata are available) will be added. Also in the third year, system performance will be evaluated and documented, and a future direction charted. Guidance from the scientific and lay user communities will be key to implementing the CADIS facility. Information will be received via questionnaires, meetings, standing committees and individual queries to assess CADIS effectiveness and recommend improvements. This project is highly relevant to International Polar Year goals for developing comprehensive data management plans and creating legacy data sets. The intellectual merit lies in the stepwise development of a new cyberinfrastructure for management of Arctic scientific data. The broader impact of CADIS is that it creates a foundation for long-term access to data archives, discovery, delivery and analysis by the Arctic science community and other users.