

**02 INFORMATION ABOUT PRINCIPAL INVESTIGATORS/PROJECT DIRECTORS(PI/PD) and
co-PRINCIPAL INVESTIGATORS/co-PROJECT DIRECTORS**

Submit only ONE copy of this form for each PI/PD and co-PI/PD identified on the proposal. The form(s) should be attached to the original proposal as specified in GPG Section II.C.a. Submission of this information is voluntary and is not a precondition of award. This information will not be disclosed to external peer reviewers. **DO NOT INCLUDE THIS FORM WITH ANY OF THE OTHER COPIES OF YOUR PROPOSAL AS THIS MAY COMPROMISE THE CONFIDENTIALITY OF THE INFORMATION.**

PI/PD Name: Hajo Eicken

Gender: ☒ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race:
(Select one or more)

☐ American Indian or Alaska Native
☐ Asian
☐ Black or African American
☐ Native Hawaiian or Other Pacific Islander
☒ White

Disability Status:
(Select one or more)

☐ Hearing Impairment
☐ Visual Impairment
☐ Mobility/Orthopedic Impairment
☐ Other
☐ None

Citizenship: (Choose one) ☐ U.S. Citizen ☒ Permanent Resident ☐ Other non-U.S. Citizen

Check here if you do not wish to provide any or all of the above information (excluding PI/PD name): ☒

REQUIRED: Check here if you are currently serving (or have previously served) as a PI, co-PI or PD on any federally funded project ☒

Ethnicity Definition:

Hispanic or Latino. A person of Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race.

Race Definitions:

American Indian or Alaska Native. A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.

Asian. A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.

Black or African American. A person having origins in any of the black racial groups of Africa.

Native Hawaiian or Other Pacific Islander. A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

White. A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

WHY THIS INFORMATION IS BEING REQUESTED:

The Federal Government has a continuing commitment to monitor the operation of its review and award processes to identify and address any inequities based on gender, race, ethnicity, or disability of its proposed PIs/PDs. To gather information needed for this important task, the proposer should submit a single copy of this form for each identified PI/PD with each proposal. Submission of the requested information is voluntary and will not affect the organization's eligibility for an award. However, information not submitted will seriously undermine the statistical validity, and therefore the usefulness, of information received from others. Any individual not wishing to submit some or all the information should check the box provided for this purpose. (The exceptions are the PI/PD name and the information about prior Federal support, the last question above.)

Collection of this information is authorized by the NSF Act of 1950, as amended, 42 U.S.C. 1861, et seq. Demographic data allows NSF to gauge whether our programs and other opportunities in science and technology are fairly reaching and benefiting everyone regardless of demographic category; to ensure that those in under-represented groups have the same knowledge of and access to programs and other research and educational opportunities; and to assess involvement of international investigators in work supported by NSF. The information may be disclosed to government contractors, experts, volunteers and researchers to complete assigned work; and to other government agencies in order to coordinate and assess programs. The information may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records", 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records", 63 Federal Register 268 (January 5, 1998).

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PI/PD Name: Susan E Fox

Gender: ☐ Male ☒ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race:
(Select one or more)

☐ American Indian or Alaska Native
☐ Asian
☐ Black or African American
☐ Native Hawaiian or Other Pacific Islander
☒ White

Disability Status:
(Select one or more)

☐ Hearing Impairment
☐ Visual Impairment
☐ Mobility/Orthopedic Impairment
☐ Other
☒ None

Citizenship: (Choose one) ☒ U.S. Citizen ☐ Permanent Resident ☐ Other non-U.S. Citizen

Check here if you do not wish to provide any or all of the above information (excluding PI/PD name): ☐

REQUIRED: Check here if you are currently serving (or have previously served) as a PI, co-PI or PD on any federally funded project ☒

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PI/PD Name: Helen V Wiggins

Gender: ☐ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race:
(Select one or more)

☐ American Indian or Alaska Native
☐ Asian
☐ Black or African American
☐ Native Hawaiian or Other Pacific Islander
☒ White

Disability Status:
(Select one or more)

☐ Hearing Impairment
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List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:

Not Listed

REVIEWERS NOT TO INCLUDE:

Not Listed

List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:

Not Listed

REVIEWERS NOT TO INCLUDE:

Not Listed

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 13-1					FOR NSF USE ONLY	
NSF 13-1					NSF PROPOSAL NUMBER	
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)					1331100	
ARC - ARCTIC SYSTEM SCIENCE PROGRAM						
DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION	
01/31/2013	2	14010000 ARC	5219	615245164	01/31/2013 5:54pm	
EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)		SHOW PREVIOUS AWARD NO. IF THIS IS <input type="checkbox"/> A RENEWAL <input type="checkbox"/> AN ACCOMPLISHMENT-BASED RENEWAL		IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> IF YES, LIST ACRONYM(S)		
926000147						
NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE			ADDRESS OF Awardee ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE			
University of Alaska Fairbanks Campus			University of Alaska Fairbanks Campus			
AWARDEE ORGANIZATION CODE (IF KNOWN)			West Ridge Research Bldg 008			
0010637000			Fairbanks, AK. 997757880			
NAME OF PRIMARY PLACE OF PERF			ADDRESS OF PRIMARY PLACE OF PERF, INCLUDING 9 DIGIT ZIP CODE			
University of Alaska Fairbanks Campus			University of Alaska Fairbanks Campus			
			930 Koyukuk Drive			
			Fairbanks ,AK ,997757340 ,US.			
IS Awardee ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)		<input type="checkbox"/> SMALL BUSINESS <input type="checkbox"/> FOR-PROFIT ORGANIZATION		<input type="checkbox"/> MINORITY BUSINESS <input type="checkbox"/> WOMAN-OWNED BUSINESS		<input type="checkbox"/> IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE
TITLE OF PROPOSED PROJECT Collaborative Research: Research, Synthesis, and Knowledge Transfer in a Changing Arctic: Science Support for the Study of Environmental Arctic Change (SEARCH)						
REQUESTED AMOUNT \$ 5,800,466	PROPOSED DURATION (1-60 MONTHS) 60 months		REQUESTED STARTING DATE 07/01/13		SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE	
CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW						
<input type="checkbox"/> BEGINNING INVESTIGATOR (GPG I.G.2)			<input type="checkbox"/> HUMAN SUBJECTS (GPG II.D.7) Human Subjects Assurance Number _____			
<input type="checkbox"/> DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e)			Exemption Subsection _____ or IRB App. Date _____			
<input type="checkbox"/> PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D., II.C.1.d)			<input type="checkbox"/> INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)			
<input type="checkbox"/> HISTORIC PLACES (GPG II.C.2.j)			_____			
<input type="checkbox"/> EAGER* (GPG II.D.2) <input type="checkbox"/> RAPID** (GPG II.D.1)			_____			
<input type="checkbox"/> VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____			_____			
PHS Animal Welfare Assurance Number _____						
PI/PD DEPARTMENT Geophysical Institute Department		PI/PD POSTAL ADDRESS 903 Koyukuk Drive				
PI/PD FAX NUMBER 907-474-7290		P.O. Box 757320				
		Fairbanks, AK 997757320				
		United States				
NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Email Address		
Hajo Eicken	PhD	1990	907-474-7280	hajo.eicken@gi.alaska.edu		
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						

CERTIFICATION PAGE

Certification for Authorized Organizational Representative (or Equivalent) or Individual Applicant

By electronically signing and submitting this proposal, the Authorized Organizational Representative (AOR) or Individual Applicant is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding conflict of interest (when applicable), drug-free workplace, debarment and suspension, lobbying activities (see below), nondiscrimination, flood hazard insurance (when applicable), responsible conduct of research, organizational support, Federal tax obligations, unpaid Federal tax liability, and criminal convictions as set forth in the NSF Proposal & Award Policies & Procedures Guide, Part I: the Grant Proposal Guide (GPG). Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U.S. Code, Title 18, Section 1001).

Conflict of Interest Certification

When the proposing organization employs more than fifty persons, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Conflict of Interest:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the organization has implemented a written and enforced conflict of interest policy that is consistent with the provisions of the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Section IV.A; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the organization's expenditure of any funds under the award, in accordance with the organization's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent), is providing the Drug Free Work Place Certification contained in Exhibit II-3 of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency?

Yes ☐

No ☒

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) or Individual Applicant is providing the Debarment and Suspension Certification contained in Exhibit II-4 of the Grant Proposal Guide.

Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding \$100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding \$150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Certification Regarding Nondiscrimination

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is providing the Certification Regarding Nondiscrimination contained in Exhibit II-6 of the Grant Proposal Guide.

Certification Regarding Flood Hazard Insurance

Two sections of the National Flood Insurance Act of 1968 (42 USC §4012a and §4106) bar Federal agencies from giving financial assistance for acquisition or construction purposes in any area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards unless the:

- (1) community in which that area is located participates in the national flood insurance program; and
- (2) building (and any related equipment) is covered by adequate flood insurance.

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) or Individual Applicant located in FEMA-designated special flood hazard areas is certifying that adequate flood insurance has been or will be obtained in the following situations:

- (1) for NSF grants for the construction of a building or facility, regardless of the dollar amount of the grant; and
- (2) for other NSF grants when more than \$25,000 has been budgeted in the proposal for repair, alteration or improvement (construction) of a building or facility.

Certification Regarding Responsible Conduct of Research (RCR)

(This certification is not applicable to proposals for conferences, symposia, and workshops.)

By electronically signing the Certification Pages, the Authorized Organizational Representative is certifying that, in accordance with the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Chapter IV.B., the institution has a plan in place to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students and postdoctoral researchers who will be supported by NSF to conduct research. The AOR shall require that the language of this certification be included in any award documents for all subawards at all tiers.

CERTIFICATION PAGE - CONTINUED

Certification Regarding Organizational Support

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that there is organizational support for the proposal as required by Section 526 of the America COMPETES Reauthorization Act of 2010. This support extends to the portion of the proposal developed to satisfy the Broader Impacts Review Criterion as well as the Intellectual Merit Review Criterion, and any additional review criteria specified in the solicitation. Organizational support will be made available, as described in the proposal, in order to address the broader impacts and intellectual merit activities to be undertaken.

Certification Regarding Federal Tax Obligations

When the proposal exceeds \$5,000,000, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Federal tax obligations. By electronically signing the Certification pages, the Authorized Organizational Representative is certifying that, to the best of their knowledge and belief, the proposing organization:

- (1) has filed all Federal tax returns required during the three years preceding this certification;
- (2) has not been convicted of a criminal offense under the Internal Revenue Code of 1986; and
- (3) has not, more than 90 days prior to this certification, been notified of any unpaid Federal tax assessment for which the liability remains unsatisfied, unless the assessment is the subject of an installment agreement or offer in compromise that has been approved by the Internal Revenue Service and is not in default, or the assessment is the subject of a non-frivolous administrative or judicial proceeding.

Certification Regarding Unpaid Federal Tax Liability

When the proposing organization is a corporation, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Federal Tax Liability:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the corporation has no unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

Certification Regarding Criminal Convictions

When the proposing organization is a corporation, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Criminal Convictions:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the corporation has not been convicted of a felony criminal violation under any Federal law within the 24 months preceding the date on which the certification is signed.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE		SIGNATURE		DATE	
NAME Andrew M Gray		Electronic Signature		Jan 31 2013 5:47PM	
TELEPHONE NUMBER 907-474-1851	EMAIL ADDRESS UAF-OSP@alaska.edu			FAX NUMBER 907-474-5444	

* EAGER - EArly-concept Grants for Exploratory Research

** RAPID - Grants for Rapid Response Research

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 13-1					FOR NSF USE ONLY	
NSF 13-1					NSF PROPOSAL NUMBER	
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)					1331083	
ARC - ARCTIC SYSTEM SCIENCE PROGRAM						
DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION	
01/31/2013	2	14010000 ARC	5219	796268548	01/31/2013 5:54pm	
EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)		SHOW PREVIOUS AWARD NO. IF THIS IS <input type="checkbox"/> A RENEWAL <input type="checkbox"/> AN ACCOMPLISHMENT-BASED RENEWAL		IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> IF YES, LIST ACRONYM(S)		
920137088						
NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE			ADDRESS OF Awardee ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE			
Arctic Research Consortium of the U.S.			Arctic Research Consortium of the U.S.			
AWARDEE ORGANIZATION CODE (IF KNOWN)			3535 College Road, Suite 101			
5300001191			Fairbanks, AK. 997093710			
NAME OF PRIMARY PLACE OF PERF			ADDRESS OF PRIMARY PLACE OF PERF, INCLUDING 9 DIGIT ZIP CODE			
Arctic Research Consortium of the U.S.			Arctic Research Consortium of the U.S.			
			Fairbanks ,AK ,997093710 ,US.			
IS Awardee ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)		<input type="checkbox"/> SMALL BUSINESS <input type="checkbox"/> FOR-PROFIT ORGANIZATION		<input type="checkbox"/> MINORITY BUSINESS <input type="checkbox"/> WOMAN-OWNED BUSINESS		<input type="checkbox"/> IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE
TITLE OF PROPOSED PROJECT Collaborative Research: Research, Synthesis, and Knowledge Transfer in a Changing Arctic: Science Support for the Study of Environmental Arctic Change (SEARCH)						
REQUESTED AMOUNT \$ 1,958,907	PROPOSED DURATION (1-60 MONTHS) 60 months		REQUESTED STARTING DATE 07/01/13		SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE	
CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW						
<input type="checkbox"/> BEGINNING INVESTIGATOR (GPG I.G.2) <input type="checkbox"/> HUMAN SUBJECTS (GPG II.D.7) Human Subjects Assurance Number _____ Exemption Subsection _____ or IRB App. Date _____						
<input type="checkbox"/> DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e) <input type="checkbox"/> INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)						
<input type="checkbox"/> PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d)						
<input type="checkbox"/> HISTORIC PLACES (GPG II.C.2.j)						
<input type="checkbox"/> EAGER* (GPG II.D.2) <input type="checkbox"/> RAPID** (GPG II.D.1)						
<input type="checkbox"/> VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____ PHS Animal Welfare Assurance Number _____						
PI/PD DEPARTMENT		PI/PD POSTAL ADDRESS				
		3535 College Road, Suite 101				
PI/PD FAX NUMBER		Fairbanks, AK 997093710				
907-474-1604		United States				
NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Email Address		
Susan E Fox	MS	1992	907-474-1600	fox@arcus.org		
CO-PI/PD						
Helen V Wiggins	MS	1999	907-474-1600	helen@arcus.org		
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						

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Conflict of Interest Certification

When the proposing organization employs more than fifty persons, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Conflict of Interest:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the organization has implemented a written and enforced conflict of interest policy that is consistent with the provisions of the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Section IV.A; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the organization's expenditure of any funds under the award, in accordance with the organization's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent), is providing the Drug Free Work Place Certification contained in Exhibit II-3 of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency?

Yes ☐

No ☒

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) or Individual Applicant is providing the Debarment and Suspension Certification contained in Exhibit II-4 of the Grant Proposal Guide.

Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding \$100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding \$150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Certification Regarding Nondiscrimination

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is providing the Certification Regarding Nondiscrimination contained in Exhibit II-6 of the Grant Proposal Guide.

Certification Regarding Flood Hazard Insurance

Two sections of the National Flood Insurance Act of 1968 (42 USC §4012a and §4106) bar Federal agencies from giving financial assistance for acquisition or construction purposes in any area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards unless the:

- (1) community in which that area is located participates in the national flood insurance program; and
- (2) building (and any related equipment) is covered by adequate flood insurance.

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) or Individual Applicant located in FEMA-designated special flood hazard areas is certifying that adequate flood insurance has been or will be obtained in the following situations:

- (1) for NSF grants for the construction of a building or facility, regardless of the dollar amount of the grant; and
- (2) for other NSF grants when more than \$25,000 has been budgeted in the proposal for repair, alteration or improvement (construction) of a building or facility.

Certification Regarding Responsible Conduct of Research (RCR)

(This certification is not applicable to proposals for conferences, symposia, and workshops.)

By electronically signing the Certification Pages, the Authorized Organizational Representative is certifying that, in accordance with the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Chapter IV.B., the institution has a plan in place to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students and postdoctoral researchers who will be supported by NSF to conduct research. The AOR shall require that the language of this certification be included in any award documents for all subawards at all tiers.

CERTIFICATION PAGE - CONTINUED

Certification Regarding Organizational Support

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that there is organizational support for the proposal as required by Section 526 of the America COMPETES Reauthorization Act of 2010. This support extends to the portion of the proposal developed to satisfy the Broader Impacts Review Criterion as well as the Intellectual Merit Review Criterion, and any additional review criteria specified in the solicitation. Organizational support will be made available, as described in the proposal, in order to address the broader impacts and intellectual merit activities to be undertaken.

Certification Regarding Federal Tax Obligations

When the proposal exceeds \$5,000,000, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Federal tax obligations. By electronically signing the Certification pages, the Authorized Organizational Representative is certifying that, to the best of their knowledge and belief, the proposing organization:

- (1) has filed all Federal tax returns required during the three years preceding this certification;
- (2) has not been convicted of a criminal offense under the Internal Revenue Code of 1986; and
- (3) has not, more than 90 days prior to this certification, been notified of any unpaid Federal tax assessment for which the liability remains unsatisfied, unless the assessment is the subject of an installment agreement or offer in compromise that has been approved by the Internal Revenue Service and is not in default, or the assessment is the subject of a non-frivolous administrative or judicial proceeding.

Certification Regarding Unpaid Federal Tax Liability

When the proposing organization is a corporation, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Federal Tax Liability:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the corporation has no unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

Certification Regarding Criminal Convictions

When the proposing organization is a corporation, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Criminal Convictions:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the corporation has not been convicted of a felony criminal violation under any Federal law within the 24 months preceding the date on which the certification is signed.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE		SIGNATURE	DATE
NAME Helen V Wiggins		Electronic Signature	Jan 31 2013 5:01PM
TELEPHONE NUMBER 907-474-1600	EMAIL ADDRESS helen@arcus.org	FAX NUMBER 907-474-1604	

* EAGER - EArly-concept Grants for Exploratory Research

** RAPID - Grants for Rapid Response Research

PROJECT SUMMARY

Overview:

The Arctic is experiencing dramatic, accelerating change with impacts on local, regional and global scales. A better understanding of the present and future state of the Arctic system is vital for a wide range of stakeholders including Arctic residents, the private sector, agencies and decision-makers. The complex nature of Arctic change requires a cross-cutting transdisciplinary research program that also engages decision-makers to provide science-based answers in response to stakeholder questions. SEARCH is uniquely positioned to serve this function. SEARCH has a long history of successfully facilitating collaborative and effective research and is widely recognized throughout the international Arctic community as the program that is focused on the complex issues of Arctic change. No other entity can claim such an established base from which to support activities that transcend the findings of individual research projects and will bring together participants from diverse backgrounds and different fields of research. This proposal describes a new organizational structure and approach that will serve the needs of the scientific community and agencies, while remaining flexible to adjust to the new challenges and opportunities in a rapidly changing Arctic. The new SEARCH structure will better coordinate science; exchange knowledge and tools between science and stakeholders; drive targeted syntheses; and connect scientists, communities, and agencies to answer questions around Arctic change.

Intellectual Merit :

SEARCH will facilitate innovative research in response to scientific priorities and stakeholder questions about complex Arctic change that emerge from activities within the new SEARCH framework. Specifically, this proposal will implement activities to address four goals: (i) improve understanding, advance prediction, and explore consequences of changing Arctic sea ice, (ii) document and understand how degradation of near-surface permafrost will affect Arctic and global systems, (iii) improve predictions of future land-ice loss and impacts on sea level, and (iv) analyze societal and policy implications of Arctic environmental change. In addition, a set of activities will be undertaken that integrates findings across the four goals. These goals will be achieved by facilitating research across disciplines, scales and among agencies; advancing scientific synthesis of data, model output and expert projections; creating networks of people and research groups that promote efficiencies and scientific discovery; developing tools useful to stakeholders and decision-makers; and enhancing research coordination. The structure supporting these advances comprises a Project Office, Executive Director and an Arctic Observing Network (AON) Coordinator. Multi-disciplinary Action Teams focused on each of the four SEARCH goals will work on synthesis of data, model output, projections and findings to advance the field. The SEARCH Science Steering Committee will track outcomes, oversee activities and ensure adherence to the SEARCH vision and provide guidance on data management through interactions with the Advanced Cooperative Arctic Data and Information Service.

Broader Impacts :

The proposed SEARCH structure involves stakeholders from the outset of all activities to ensure activities have societal benefit and fosters two-way communication of research findings and information needs. Proposed activities to develop collaborative science and information products include Knowledge Exchange (KE) Workshops that will facilitate networking among stakeholders, agencies and scientists; the inclusion of stakeholders in the membership of each Action Team; and the inclusion of stakeholders in all SEARCH meetings and conferences. Cross-disciplinary learning and training opportunities will be provided through post-doc positions and KE Fellowships. A set of activities focused around the theme "Arctic Futures 2050" will address head-on the need to frame scientific findings in a way that can help decision-makers plan for the future. All of these activities will lead to development of research products that address societal priorities and can help inform policy. The project office will communicate all activities and products through publicly accessible information and products.

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	Total No. of Pages	Page No.* (Optional)*
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Project Summary (not to exceed 1 page)	1	_____
Table of Contents	1	_____
Project Description (Including Results from Prior NSF Support) (not to exceed 15 pages) (Exceed only if allowed by a specific program announcement/solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)	15	_____
References Cited	3	_____
Biographical Sketches (Not to exceed 2 pages each)	4	_____
Budget (Plus up to 3 pages of budget justification)	9	_____
Current and Pending Support	3	_____
Facilities, Equipment and Other Resources	2	_____
Special Information/Supplementary Documents (Data Management Plan, Mentoring Plan and Other Supplementary Documents)	2	_____
Appendix (List below.) (Include only if allowed by a specific program announcement/ solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)	_____	_____
Appendix Items:		

*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

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1. INTRODUCTION AND MOTIVATION

The Arctic is in peril. Its natural systems are undergoing large, and in many areas accelerating changes that stress local communities and challenge government agencies (Francis et al. 2009; Callaghan et al. 2011; Serreze & Barry 2011; Lovcraft & Eicken 2011). Many of the environmental changes have global consequences, as do many of the economic impacts of Arctic-focused industries (Huntington et al. 2012; Francis & Vavrus 2012; Huebert et al. 2012). Accelerating change is well documented, as is the degree of interconnection between transformations underway in different Arctic subsystems. This requires a faster and more comprehensive approach to anticipating ramifications of the changes coupled with a focused response on ever-shorter timescales.

Progress along these lines remains slow, however. Despite increasing data collections, understanding of recent changes and the flow of effective information has not kept pace with increasing demands. A significant part of this problem lies with poor coordination among scientists, agencies, and stakeholders. To remedy this situation, we propose a new framework that will lead to improvements and a transformation of the way in which scientists, decision-makers, and stakeholders work on issues of Arctic change. The new structure integrates recommendations of the Study of Environmental Arctic Change (SEARCH) and the Arctic System Science Program (ARCSS 2007) scientific communities.

The new framework addresses a major conundrum facing the Arctic research community: In a rapidly changing Arctic, how can researchers muster an effective response to the emergence of new, pressing scientific questions, while at the same time meeting the urgent information needs of stakeholders and government agencies? Building on scientific community input, partnerships with agencies and stakeholders, and collaborative networks that strengthen links to other national and international programs, we propose implementation of a support structure and a series of activities that will enable the U.S. Arctic research community to meet these complex challenges. The proposed framework leverages the resources of a network of researchers, agency personnel, and stakeholders interested in the problem of Arctic change (Fig. 1; see also Murray et al. 2012).

By fostering collaboration that allows for co-production of knowledge and exchange across a range of Arctic research disciplines and societal concerns, the proposed framework addresses the biggest challenge identified at the conclusion of the Fourth International Polar Year 2007-08 (IPY), paraphrased as “From Knowledge to Action” (K2A). Specifically, K2A highlights two challenges: 1) How can we *synthesize* a plethora of individual research findings and scientific products into a system-wide understanding of Arctic change? 2) How can such understanding *empower* the broad range of stakeholders to devise sustainable and effective responses to the problems and opportunities posed by Arctic change? As pointed out in assessments of the IPY (Krupnik et al. 2011; National Research Council 2012), these key questions remain unresolved. The new SEARCH framework was established by the Science Steering Committee (SSC) in working with a range of partners and other programs, and designed to focus on synthetic activities and connect these with needs from across the Arctic. The new SEARCH activities will help to collect, synthesize and understand the necessary information to explore scenarios of what futures are in store for the Arctic, how they may unfold, and how they might affect the rest of the global system.

The core of this proposal consists of a range of interlinked research and synthesis activities and involves the scientific community, agencies and stakeholders. Sections 2 and 3 provide background information about the evolution of SEARCH and its new orientation. Section 4 describes a proposed new SEARCH organizational structure and management structure. Proposed activities and SEARCH goals are detailed in Section 5. Products, outcomes and broader impacts are listed in Sections 6 and 7.

2. BACKGROUND: DEVELOPMENT OF SEARCH AND RESULTS OF PRIOR SUPPORT

SEARCH was conceived from the recognition of major changes in the Arctic ocean-ice-atmosphere system in the 1990's and grew to a broadly interdisciplinary program focusing on observing, understanding, and responding to change (Morison et al. 2001; SEARCH 2003; a full timeline is available at: <http://www.arcus.org/search/sciencecoordination/development>). The Arctic Research Consortium of the U.S. (ARCUS) has facilitated SEARCH activities through a Cooperative Agreement with NSF, “Providing Organizational Support to the U.S. Arctic Science Program,” (ARC-0618885; \$2,188,440

3/2008–2/2013). Additional support was obtained to further develop the SEARCH observing component (NSF ARC-0960363; 9/2009–8/2012; \$23,017; "Task Force Activities to Aid with Design and Implementation Planning of the Arctic Observing Network - Phase 1"; PIs H. Eicken and J.E. Walsh).

One of the early foci for SEARCH was development of priorities for the IPY through a large community workshop (SEARCH 2005); the resulting report was heavily utilized in the creation of the Arctic Observing Network (AON). Work on AON continued with the Arctic Observation Integration Workshop in 2008 (SEARCH 2008) and an AON meeting in 2009 (SEARCH 2009), which focused on sharing AON results and providing recommendations for observing technologies and activities.

In spring 2008, SEARCH launched the Sea Ice Outlook (SIO; Overland et al. 2009; Calder et al. 2011). The SIO produces reports throughout summer on the expected sea ice minimum in an open process that synthesizes modeling and data analysis perspectives. Each year, over 20 U.S. and international groups contribute to the Outlook; the website receives over 40,000 hits a year and significant press attention. In 2011, an Outlook user survey showed it is valued by a diverse array of users, including scientists (e.g., by assessing modeling techniques), operational centers, resource managers (e.g., to help manage ice-dependent wildlife), educators (e.g., as a learning tool in classrooms), and the public. The National Research Council (NRC) cited the SIO as "one of IPY's key legacies" (NRC 2012). Building on the SIO, the Sea Ice for Walrus Outlook (SIWO) project was initiated to provide weekly reports and forecasts (April-June) on ice conditions relevant to walrus in the Northern Bering and southern Chukchi Sea. SIWO synthesizes weather and ice forecasts, satellite data, and local observations. It is used by subsistence hunters and coastal communities (V. Metcalf, Eskimo Walrus Commission, pers. comm).

In 2010, SEARCH and ARCUS organized the State of the Arctic Conference, which reviewed understanding of the Arctic system during rapid environmental change. The conference included over 200 talks, a day of international collaboration talks led by the International Study of Arctic Change (ISAC), and 220 posters, with 448 on-site participants and over 200 joining via webcast. Several media outlets covered the conference. Products included a resolution outlining recommendations for future Arctic science; a science highlights paper (Eicken et al. 2011a), a brochure for policymakers; and other digital media. This conference represented an important turning point in SEARCH, as it underscored the importance of information for policy and decision-makers in addition to efforts focused on scientific understanding.

Despite much progress made on AON, challenges remained. An AON Design and Implementation (ADI) Task Force led development of a report with detailed recommendations for the rigorous design and optimization of observing systems (ADI 2012). To link academic and agency efforts, SEARCH held a U.S. Arctic Observing Coordination Workshop in 2012 that brokered productive discussions and follow-up work between academic scientists, agency scientists, and resource managers (SEARCH, in press). At the same time, SEARCH turned its attention to the "Understanding Arctic Change" (UAC) component of the program through the UAC Task Force in collaboration with the ARCSS Committee. The resulting report detailed scientific questions and activities to advance system-level understanding; the SEARCH SSC adopted these recommendations into its planning efforts and this proposal (Walsh et al. 2012).

Intellectual Merit of Accomplishments: All SEARCH activities have been designed to advance knowledge of environmental arctic change. SEARCH has fostered new research efforts, such as AON and sea ice prediction projects, as well as individual research projects emerging from discussions at workshops and conferences. SEARCH white papers and reports summarize emerging research issues and key gaps by working with the broader community through committee and task force activities. In addition, SEARCH has strengthened arctic science by facilitating communication between academic scientists, agencies, and stakeholders to begin weaving together existing efforts.

Broader Impacts of Accomplishments: SEARCH has increasingly engaged stakeholders and agency personnel in activities to ensure that science recommendations (described in reports and white papers) address societal and decision-maker needs. In addition, activities such as the SIO and the SIWO specifically provide products to those outside the research community.

This proposal aims to translate past and future input from the broader research community, stakeholders and agencies into networked and cross-cutting activities that bring together observing, understanding and responding expertise within a more coherent and agile structure.

3. SEARCH VISION, MISSION, GOALS, AND FUNCTIONS

As a multi-agency interdisciplinary program that addresses Arctic change, SEARCH must meet inherent challenges of a complex program as it moves to full implementation. Therefore, SEARCH and ARCUS have led a collaborative strategic planning process to produce a clear vision and a supporting action plan, including: a new vision and mission; a set of prioritized cross-disciplinary five-year goals and objectives; a set of planned activities to achieve the goals that build on the energy and ongoing efforts of the research community and funding agencies, and that are responsive to decision-maker needs; and an organizational structure that allows SEARCH to be more thematically-focused and adaptive. Such a structure should also offer hooks for funding agencies to identify specific interests that can be supported.

The new SEARCH Vision is *achieving scientific understanding of Arctic environmental change to help society understand and respond to a rapidly changing Arctic*. The SEARCH mission is to provide a foundation of Arctic change science through collaboration with the research community, funding agencies, and other stakeholders.

The SEARCH five-year science goals will address the vision in areas of scientific and societal urgency, with significant input from the broader scientific community. They complement existing agency priorities and national research plans and support the overarching SEARCH science questions developed in the Understanding Arctic Change report (Walsh et al. 2012). The five-year science goals are:

1. Improve Understanding, Advance Prediction, and Explore Consequences of Changing Arctic Sea Ice
2. Document and Understand How Degradation of Near-Surface Permafrost Will Affect Arctic and Global Systems
3. Improve Predictions of Future Land-ice Loss and Impacts on Sea Level
4. Analyze Societal and Policy Implications of Arctic Environmental Change

Full descriptions of each goal and related objectives are available at www.arcus.org/search/goals. The goals integrate observing, understanding, and responding activities in a thematic approach and encourage multi-disciplinary activities. Each goal provides a central focus around which to explore issues within the physical (e.g., sea ice and land ice dynamics), natural (e.g., wildlife, tundra) and social (e.g., adaptation, public perception) sciences. They are not considered to be fully representative of the important science topics for SEARCH, but as those that are most ready for implementation, can be achieved in five years, and complement existing national Arctic science priorities (e.g., Interagency Arctic Research Policy Committee (IARPC) Research Plan, National Oceanic and Atmospheric Administration (NOAA) Arctic Vision & Strategy, U.S. Arctic Research Commission (USARC) Goals and Objectives, US Carbon Cycle Science Plan). New activities may be launched on an annual or biennial basis and can be driven from the scientific community. The specific activities proposed for each goal are described in Section 5.

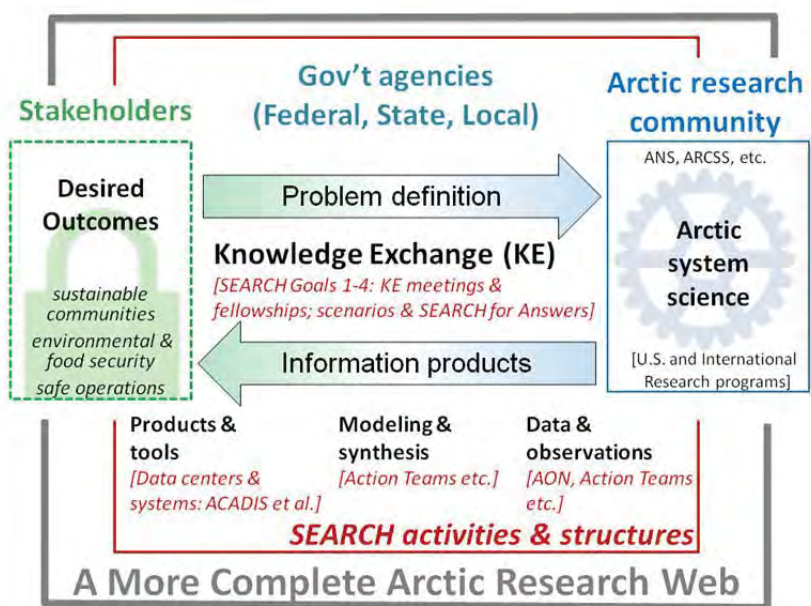
The development of a new framework stems in part from detailed review of other science support structures relevant to SEARCH in combination with an analysis of strengths and weaknesses of SEARCH structure and activities, current best practices in organizational design principles, recommendations from community reports (e.g., Walsh 2012; ADI Task Force 2012), a Responding to Arctic Change workshop organized by ISAC (Murray et al. 2012), and solicited feedback. The new framework is organized around a small set of topic-oriented goals where interdisciplinary research and better integration with stakeholders is the only way to achieve advanced understanding and predictability (Fig. 1). SEARCH will maintain a focus in each of these research arenas to identify needs and challenges to help establish new research and development opportunities with funding agencies. SEARCH will also pursue critical synthesis activities that cut across these arenas, such as a well-coordinated science supporting the AON and an effort to develop Arctic Futures 2050 scenarios to align and prepare research in physical, ecological and societal domains for a possible new state.

The SEARCH activities and structure described in this proposal are designed to:

- Facilitate research activities across disciplines, among agencies, and across local-to-global scales;
- Advance scientific synthesis of data, model output, projections, and findings;
- Create networks of people that reduce overlap, promote efficiencies, and foster development of cross-disciplinary research programs;

- Develop information and tools useful to stakeholders and decision-makers;
- Enhance coordination between new and existing research efforts;
- Identify emerging issues in Arctic environmental change and contribute to prioritizing national Arctic research goals (such as past contributions to the NOAA Arctic Strategy or the IARPC Research Plan);
- Promote Arctic science and scientific discovery;
- Communicate Arctic research to the White House and Congress (through IARPC and the USARC), the private sector, and the public; and
- Collaborate with national and international science programs to achieve common goals.

Fig. 1: Schematic illustrating how the SEARCH framework links research activities within Arctic natural science (ANS) and Arctic system science (ARCSS) while at the same time establishing a context for collaboration, coordination and exchange between the academic research community, agencies and stakeholders to address problems stemming from rapid Arctic change (see also Murray et al. 2012). ACADIS is the NSF-funded Advanced Cooperative Arctic Data and Information System.



4. NEW SEARCH STRUCTURE AND MANAGEMENT

SEARCH Structure: A more directly science-oriented organizational and support structure is necessary to address the issues of coordination, synthesis and stakeholder involvement as described above. This proposal, submitted on behalf of the SSC, seeks funding to implement the new framework (Fig. 2) and to support activities over a five-year time span. The SSC understands that agencies other than NSF and the private sector will contribute to the implementation. A core principle of the support structure is to channel scientific vision and guidance from the community, with focused, bottom-up activities contributing to the five-year goals. These activities will create opportunities for researchers, students, agency personnel and experts from the stakeholder and decision-maker communities to participate and benefit. These aims will be achieved by a hierarchy of Action Teams and ad-hoc Working Groups formed around the SEARCH five-year goals, supported by a Science Office with links to other relevant programs and entities, such as ACADIS and the University Corporation for Atmospheric Research (UCAR) National Climate Predictions and Projections support system (NCP). The Action Teams will drive much of the science on the five-year goal timescale. They will be the nexus that links the research community to stakeholders and partners, and will be charged to refine and advance the mission of the focal question that is their subject.

The role of the **SEARCH SSC** will evolve into a committee tasked with ensuring that the SEARCH vision reflects the interests of the broader community SEARCH represents and that it is embodied in Action Team activities. The SSC will oversee other components within the SEARCH structure, monitor progress as outlined in Fig. 3 and Section 5 and adjust the program's trajectory. The SSC will work with the scientific community, drawing on the Action Teams, to develop the next set of five-year goals and to update SEARCH science plans. The SSC will help maintain linkages and serve functions relevant to partner agencies and other entities. This latter goal will be achieved in close collaboration with the

Science Office, which the SSC will oversee. The SSC composition would be diversified and may include more agency scientists and stakeholders, with a new SSC charter to be drafted.

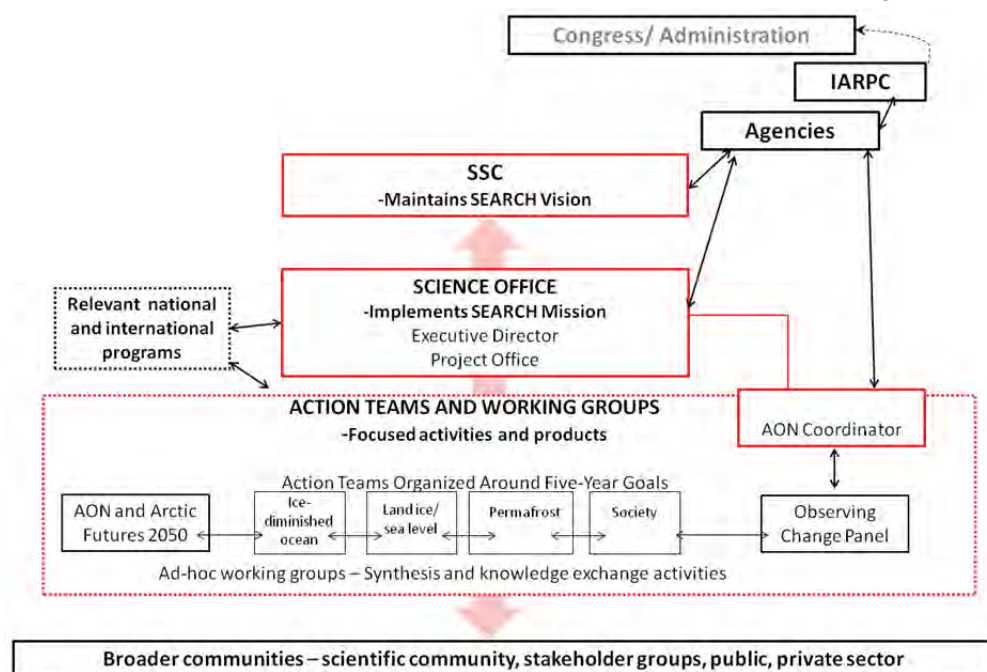
The concept of **Action Teams** addresses several challenges confronting the scientific community. Integrating the former tri-partite approach of observing, understanding, and responding to change into each Action Team helps remove barriers that have hindered progress in the past. The Action Teams would serve as standing groups, each organized around one of the five-year goals, and responsible for implementing the specific goal activities detailed in Section 5. The Action Teams will supplant the current panel structure (with the Observing Change Panel transitioning into a different body, see below) and will be composed of 6–10 people, drawing from the broader community. They will include agency personnel and stakeholders with a range of disciplinary backgrounds and perspectives (including physical, natural, and social scientists on each Action Team). Each team will have funds for a postdoctoral researcher to help advance its goals, one month salary support for the Team chair, and project management support (see Postdoc Mentoring Plan and Budget Explanation in Supplementary Documentation).

To maintain flexibility, involve broader segments of the scientific community and increase capacity without creating more standing committees, Action Teams or the Science Office will have the ability to convene short-term **Ad-hoc Working Groups** on an as-needed basis. These groups are modeled after the SEARCH working groups driving the sea ice outlook efforts (SIO, SIWO) and structures successfully employed by the CLIVAR (Climate Variability and Predictability) and PAGES (Past Global Changes) programs. They will help address specific issues, such as development of modeling tools, review of data and information products, or address activities that integrate across the five-year goals (see also Fig. 3).

Management of SEARCH: With oversight and guidance from the SSC, a **SEARCH Science Office** will perform all the program management functions and will forge cooperative relationships between academia, agencies, and stakeholders. The Science Office will consist of three connected components.

(1) The **Executive Director (ED)** will be responsible for all tasks related to implementing SEARCH, will oversee day-to-day activities, and will report to the SSC. A program of this size cannot be effectively run through volunteer efforts alone. The ED will oversee and track progress of the Action Teams, serve as the primary contact for SEARCH and as a liaison to agencies, and ensure transparent communication between all constituencies. The ED will also work with the SSC to develop annual program plans articulating clear and measurable annual milestones. At least initially, the ED would be located at the International Arctic Research Center (IARC) at UAF. Further details are available in the UAF Budget Explanation section.

Figure 2: Schematic outline of a community and framework built around SEARCH science.



(2) The **Project Office** (PO) functions will be provided by ARCUS, which has a proven track record of support for SEARCH. PO responsibilities include: strategic planning, project management, meeting planning, web development, organizational support for Action Teams and the SSC, and communications and outreach. ARCUS will be responsible for ensuring timely and open exchange of information, milestones, and products between all SEARCH components and to the science and stakeholder communities. ARCUS will also ensure ongoing connection and communication between the Action Teams and collaboration that leads to synthesis products (see Fig. 4). After the kick-off meeting in Year 1 (Fig. 3), the PO will work with the ED, AC, SSC, and Action Teams to develop a program plan that provides an annual timeline and milestones for SEARCH activities. Through this program plan the SSC will track SEARCH accomplishments and adjust plans, if needed. Details on PO duties are available in the ARCUS Budget Explanation.

(3) The **AON Coordinator** (AC) will focus on activities that ensure the interagency AON is meeting the needs of the scientific and stakeholder communities. Success and coordination for AON can only be achieved through a dedicated point person to integrate needs, responsibilities and deliverables. The AC will translate needs and findings between the Action Teams into agency recommendations for AON; facilitate advances in AON data management; and lead a review of observations with respect to SEARCH goals and objectives. These objectives are achieved by having the AC work closely with ACADIS, the NSF AON Program Director and the IARPC implementation groups that focus on AON. The position would be co-located with ACADIS and UCAR in Boulder (see Data Management Plan and UAF Budget Explanation). To aid in the transition to a new SEARCH structure, the **SEARCH Observing Change Panel** (OCP) will remain in place and work closely with IARPC for the next two years (Fig. 3).

In addition, after the first year of implementation, SEARCH will convene an external advisory board for a review of SEARCH activities on an annual or biennial basis (Fig. 3). SEARCH will interact with agency representatives at several levels. The ED will hold the primary responsibility of high-level interaction with agency representatives, including IARPC. Agency scientists have already been an integral part of the SEARCH SSC and panels but will be included at a greater level in future SSC member rotations and will also be included on each Action Team. The broader scientific community will be represented on the Action Teams and related Working Groups, and will have opportunities to participate directly in many of the SEARCH activities (e.g., Knowledge Exchange Workshops, synthesis activities). In addition, SEARCH will hold townhall meetings at large conferences and offer webinars for community input.

Details on support structure implementation and administration are provided in the Budget Explanation. As SSC Chair, H. Eicken serves as PI on this proposal and will lead the initial implementation of the support structure as faculty member at UAF with a joint appointment at UAF's IARC. Once the ED and AC have been hired through a search committee based out of UAF but with representation by the SSC and key SEARCH partners (such as ACADIS), some of the functions initially served by the PI would devolve to these two positions. While ED and AC report to the SEARCH SSC, the IARC Director serves as the employment-based supervisor.

5. PROPOSED ACTIVITIES

Each of the four 5-year goals will have a specific set of activities, discussed in sections 5.2. In addition to these focused activities, SEARCH will implement cross-cutting activities that integrate across the goals to provide a more holistic system-level approach, resulting in products and outcomes detailed in Fig. 4.

5.1. Cross-cutting activities and integration framework

The four SEARCH goals originate in different disciplinary areas, involve different members of the research community, and tend to interact with different sets of stakeholders and partners. Yet, accomplishing the SEARCH mission requires integration across these themes, to be achieved through a series of connected activities, culminating in a range of products and an overarching assessment of the state of Arctic research and a vision for "Arctic Futures 2050" (Fig. 3).

A major outcome of activities is the **Arctic Futures 2050** scenarios process and open science meeting. The development of scenarios is a potentially transformative activity that has recently gained traction in

the Arctic science community (Brigham 2011; Meisen & Macklin 2012; Richter-Menge et al. 2012). Scenarios describe plausible future states of the Arctic system or its components based on recent trajectories and projected changes. They combine a range of data including climate model output, paleo-data, results from data synthesis and systems modeling as well as expert scientific and traditional ecological knowledge (Eicken & Lovcraft 2011). A recent international workshop on Responding to Arctic Change (Murray et al. 2012), organized by ISAC with participation by SEARCH, underscored the potential for scenarios development and modeling as a tool to achieve synthesis and integration while at the same time meeting stakeholder information needs and characterizing uncertainty.

Arctic Futures 2050 will focus on plausible states of the Arctic by 2050, potential trajectories leading up to these states, and identification of key uncertainties and variables that can be tracked to anticipate and respond to such change. The data, information products and modeling tools that inform the scenarios will be developed jointly with, e.g., the USGS Alaska Climate Science Center and UCAR's NCPP support system. A UAF summer school in partnership with the North Slope Science Initiative (NSSI) and the Association of Polar Early Career Scientists in Year 3 will set the stage for scenario development and synthesis. Findings from each of the five-year goal activities will feed into the scenarios development, and collaborative tools will be created that allow for advanced scenarios development and analysis through on-line participation (Gauger & Mueller-Stoffels 2007; Mueller-Stoffels & Eicken 2011).

These efforts will expand through Years 4 and 5 to generate cross-cutting, synthetic scenarios and assessments (Fig. 3), culminating in the **Arctic Futures 2050 Open Science Meeting** in Year 5. This capstone conference will be patterned after the 2010 State of the Arctic Meeting and the 2003 SEARCH Open Science Meeting, also to help identify future research directions. These activities will bring together a diverse cross-section of scientific disciplines and stakeholders, driven by decision-maker information needs. Scientists and stakeholders will define framing questions and jointly establish tangible products (Fig. 4). While the scenarios speak to the state of the Arctic by mid-century, such a long view is key to identifying major uncertainties and associated indicator variables. The latter can then be tracked by observing networks to help anticipate major state changes in the Arctic system much earlier than mid-century target dates (Eicken & Lovcraft 2011). Findings from scenario development will inform AON design and other synthesis activities throughout and beyond the project period.

To set the stage of Arctic Futures 2050 and all other activities, a **Kick-off Meeting** will gather the SSC, Action Teams, and stakeholder and agency representatives. This meeting aims to articulate the SEARCH vision in the context of planned action team activities, create a shared purpose, identify the top priorities and information needs flowing from stakeholder interests and concerns, and then review and adapt the collaboration and synthesis framework to the tasks and associated deliverables at hand. The meeting will result in a clear set of agreed upon products and plans for each activity, and, equally important, establish collective trust and momentum for the program objectives.

The initial Kick-Off meeting would be followed by collaboration and establishment of activities at the Action Team level. Here online communication and – where appropriate – **Goal Workshops** (focused on the five-year goals) will drive the development of products and initial synthesis.

AON Coordination and Support is a distinct activity because of its unique needs that cut across themes. The ADI Task Force (2012) and an interagency Arctic Observing Network coordination meeting in March 2012 have provided recommendations for optimizing and coordinating an interagency AON. SEARCH will work with agencies to implement community recommendations; guiding AON to meet scientific, agency, and stakeholder needs including local observational and citizen science networks; and developing AON data products. The AON coordinator (AC, see Section 4) would facilitate and oversee these activities. A Responding to Change Stakeholder Workshop planned by ISAC (Murray et al. 2012) will contribute to SEARCH goals as well. A pilot project activity in collaboration with ACADIS and Action Team postdocs would be initiated in Year 2 to create a data/information product from existing AON data and Action Team activities that will address stakeholder information needs (Fig. 3). These products would also align with identified metrics to aid in the prioritization and siting of observations, thereby addressing a key recommendation from the ADI Task Force.

The AON Coordination Workshop led to the formation of ad-hoc working groups that can address AON issues within the SEARCH goals structure. As an example, the Barrow flagship site, comprising major AON projects, federal and state long-term observing programs and infrastructure and community support, lends itself to a cross-cutting design and optimization study because it links key science questions and processes in the coastal region. Similarly, emerging IARPC working groups with SEARCH membership can provide guidance on how to best implement an effective AON management structure as outlined in the ADI Task Force report. Through close collaboration with IARPC Implementation Groups, these SEARCH activities would help support the transition of the AON into a true interagency effort under the auspices of IARPC. Here, the SEARCH ED and AC can also rely on collaborative efforts such as the international Arctic Observing Summit (AOS, Fig. 3), planned as a biennial event under the auspices of ISAC and the Arctic Council's Sustaining Arctic Observing Networks (SAON) initiative. The SEARCH OCP and the SSC Chair are helping lead planning for this first summit and will use this forum as a way to engage the broader international community in the goals outlined below (see also Fig. 3).

For each of the four science goals and for AON, an online “dashboard” webpage, modeled on the “Arctic Report Card” project, will be developed. This “dashboard” webpage will provide an easy-to-read, real-time graphical presentation of the status of each theme—a status of science objectives, activities, progress or challenges, new findings and products. The dashboard will result in not just greater transparency in assessing progress but will also allow for closer management and tracking of tasks over time. Anyone would be able to go to the dashboard webpage to get a quick at-a-glance overview for each goal.

Building on earlier recommendations by the broader SEARCH community (Walsh et al. 2012), an important element of advancing the SEARCH vision is the establishment of **Knowledge Exchange (KE) Fellowships**. These address the challenge of cooperation across the different perspectives among and within academia, stakeholder organizations, and agencies. Fellowships will allow agency personnel and stakeholders to immerse themselves in an academic environment. Junior researchers (Ph.D students or post-docs) will participate in a reciprocal arrangement with an agency or stakeholder organization (e.g., for a week up to several months). Knowledge gained through these fellowships will be shared within the SEARCH structure and inform activities (e.g. KE workshops). Such bridge-building between the scientific and stakeholder communities is at the core of this proposal and these fellowships are an investment in improving communication between these communities, and pave the way for a new generation of scientists who are more aware of stakeholders' needs. Based on preliminary communications, private sector support for this program is anticipated. Agency-based leadership programs (Developmental Assignment) will be another source of support. The SEARCH SSC received positive feedback from a similar assignment by National Marine Fisheries Service personnel to the SEARCH SIWO in 2012.

Knowledge Exchange (KE) Workshops in Year 2 will build on the activities of Year 1 and bring together stakeholders, academic and agency researchers, and agency program managers to network, identify emerging issues, synthesize and improve access to existing datasets and model output (with ACADIS' Arctic Data Explorer tool as an important resource), and link to other activities and programs that are currently not active at this interdisciplinary breadth. The goals of each workshop will differ, but none will be typical of traditional scientific or planning meetings. Rather, these meetings will serve as a forum for knowledge co-production, identified as a key prerequisite for the development of actionable science and sustainable solutions addressing rapid environmental and socio-economic change (Kerckhoff & Lebel 2006; National Research Council 2012). A major tenet of SEARCH's new approach is to facilitate more personal interactions between different communities so that the exchanges of information, planning ideas and community needs are more fully appreciated and common goals are formed at the onset with a deeper more effective awareness of the challenges and consequences faced by each involved participant.

In subsequent years, these collaborations and networking activities will increasingly seek to develop ties between the different themes as guided by the Action Teams (Fig. 3). For example, joint workshops and cross-cutting KE fellowships will provide overarching perspectives on scientific problems and stakeholder concerns related to, e.g., a changing Arctic Ocean and coastal processes impacted by thawing permafrost.

Communications, Networking and Outreach, inherent in all of these activities, will be coordinated and organized by the Project Office. A re-structured SEARCH website will serve as the central public information resource on all SEARCH science and activities. A thematic portal will be developed for each of the five-year goals, with information on scientific results, activities, people, and products. A section of the website will be devoted to information products for decision-makers and the public, with scenarios as an ideal tool to engage these constituencies (e.g., Smith 2010). The website will be built on a dynamic database structure to allow for advanced search, filter, and user-centered tools. An open webinar series will provide opportunities for presentation and discussion of science findings or challenges. SEARCH will also organize annual informational Congressional briefings on policy-relevant Arctic change topics. Through these different activities, SEARCH will be in a position to serve as an Arctic science ‘think tank’, or “**SEARCH for Answers**”. Thus, scientists, agency personnel, public, the media and decision-makers will be able to contact SEARCH for Answers with scientific questions related to the five-year goals. A clear process for queries will be developed and managed through the SEARCH Project Office.

The products outlined in Fig. 4 will serve as milestones for a review of progress by the SSC on an annual basis. These SSC meetings will also serve as a venue to review and as necessary recalibrate the direction of SEARCH vis-à-vis the perspectives of the scientific community (through input at townhall meetings, etc.) and agencies (through guidance by IPMC and IARPC). Arctic Observing Summits and other meetings led by ISAC will provide a similar venue for review of activities at the international level.

5.2. Activities to Implement the Five-Year Goals

5.2.1. Goal #1: Improve Understanding, Advance Prediction, and Explore Consequences of Changing Arctic Sea Ice (Co-lead J. Francis, Rutgers University, Co-Lead TBD)

Core activities for this goal (Fig. 3) are (i) assessing the predictability of summer Arctic sea ice extent, thickness and properties on seasonal to decadal timescales and improving ice forecasts, and (ii) exploring consequences of the changing ice cover on Arctic ecosystems, the global climate system, and people.

Ongoing Activities: Through ongoing work led by SEARCH in partnership with US and international programs (World Climate Research Program, Climate and Cryosphere, CliC; World Meteorological Association Polar Prediction Project; and others), the sea ice prediction component has already made significant progress, resulting in the establishment of two communities of practice centered around seasonal pan-Arctic prediction (SIO; Calder et al. 2011) and regional information products related to ice use and marine mammal habitat (SIWO; Eicken et al. 2011b). These communities support their activities by leveraging a broad range of international resources, and developing partnerships with agencies (e.g. NSF; NOAA, National Weather Service; NASA IceBridge flights) and others (Eskimo Walrus Commission). The activities generate data products and sea ice forecasts; surveys and interaction with users indicate that these products are used by residents from coastal communities, resource managers and to a lesser extent industry. We anticipate that community activities can be sustained using existing funding opportunities. The team will leverage past and current research projects focused on how rapid Arctic change is affecting local ecosystems and the climate system beyond the borders of the Arctic. Gaps in our knowledge of these connections will be identified, prioritized, and explored for possible agency-funded investigations.

Collaborative Scenario Development “Arctic Futures 2050”: The framework and activities are part of an iterative process where, (1) stakeholders identify questions of concern related to consequences of an ice-diminished Arctic by 2030-50; (2) the research community develops independent scenarios of ice-diminished Arctic Ocean futures for 2030-50 using collaborative on-line tools (e.g., model simulations); (3) stakeholders review the scenarios and potentially refine questions or ask new ones; (4) researchers explore ways in which data and information products can address stakeholder questions and further refine the scenarios; and (5) further iterations occur as necessary. Products from this activity will include scenarios presented in the form of narratives, visuals, data and information products, model output, and summary documents that are written up specifically for different audiences (e.g., policymakers, general public, transportation industry etc.). These theme-based products will then tie into the overarching KE meeting and Arctic Futures 2050 Open Science Meeting (Section 5.1, Fig. 3). Due to the pan-Arctic, international relevance of this goal, we will partner with ISAC (details in Murray et al. 2012).

Kick-off and Knowledge Exchange Meetings: These meetings will foster collaborative work that cannot occur without networking and building new interdisciplinary research programs. A new study from the National Academies of Science (Richter-Menge et al. 2012) provides a wealth of information about the current state and future directions of sea-ice prediction and stakeholder needs for sea-ice products on seasonal and decadal time scales. This report and stakeholder participation will guide Action Team activities and will drive the kick-off meeting, Year 2 workshop and Year 3 KE meeting (Fig. 3). Support lined up by CliC, ONR Global and others for the nascent sea ice prediction network will foster working group activities under the guidance of the Action Team and lead into KE meetings and other activities connecting sea ice change with ecological and global impacts. Outcomes will be determined by further work at the team and Working Group level to include, e.g., a synthesis of plausible consequences of an ice-diminished Arctic Ocean on ecosystems on 5-10 year time scales, analysis of the value of geographic or paleo-analogs for sea ice in a warming Arctic, summarized findings from other research (e.g., NOAA's Synthesis of Arctic Research), and lessons for ecosystem managers, regulators, Arctic coastal communities and policymakers.

Knowledge Exchange Fellowship: We propose two KE fellowships that would allow (i) an agency representative to join an academic research group focusing on, e.g., links between a changing ice cover, marine mammals, ecosystems and people, and (ii) a junior researcher to work with an agency to gain insight into translation of management mandates into science questions.

5.2.2. Goal #2: Document and Understand How Degradation of Near-Surface Permafrost Will Affect Arctic and Global Systems (E.A.G. Schuur, University Florida, Lead)

The tentative sequence of planned activities follows the plan outlined in Fig. 3. Briefly, this goal is composed of science, coordination, and communication objectives. The science objective has three main themes: (i) improve observation and prediction of the nature, timing, and location of permafrost thaw; (ii) improve prediction of how degradation of near-surface permafrost will influence the dynamics of the Arctic landscape; (iii) improve prediction of how permafrost degradation will influence fish, wildlife, and human communities. Each theme will be managed by independent Working Groups put in place by the Action Team with guidance from the SSC.

Related National and International Activities: Opportunities for progress toward this goal will benefit from linking with ongoing US activities such as the Permafrost & Carbon Research Coordination Network (RCN), NASA's Carbon in Arctic Reservoirs Vulnerability Experiment and Arctic-Boreal Vulnerability Experiment, Department of Energy's Atmospheric Radiation Measurement program and Next Generation Ecosystem Experiment - Arctic (see letter of support in Supplementary Documentation), and Department of Interior's Landscape Conservation Cooperative initiative. There are a number of international activities and networks, some currently with U.S. participants, that could also be linked, such as the Global Terrestrial Network for Permafrost, the Circumpolar Active Layer Monitoring program, the Changing Permafrost in the Arctic and its Global Effects in the 21st Century project, and the Arctic Monitoring and Assessment Program of the Arctic Council. Currently these initiatives are only loosely coordinated. SEARCH can facilitate their coordination, seek additional national and international partners (especially in industry), and develop outreach and education materials based on a synthesis of results from these projects that can be used to inform critical stakeholders and decision-makers.

Working Groups and Community Meetings: After the kick-off meeting each working group will hold an initial community meeting to assess the state of the art in research for their theme, identify the areas or specific topics most important to advance the science, and lay out a first coordination and activities plan (Fig. 3). As is the case with Action Teams, each Working Group will interact primarily via email and conference calls, along with an annual face-to-face meeting. The community-wide, open meetings in Years 2 and 4 will help define and review the focus and progress, and to summarize the results.

Scenario and Data Product Development: Each Working Group will engage with key Arctic stakeholders, agencies, and the research community to identify a set of scenarios for likely impacts of permafrost degradation on ecological and human communities. Additional expertise and guidance will be provided by the Action Team for Goal #4. The scenarios will be used to identify where data already exist

to address the community-generated scenarios and where tangible, urgent research questions could be addressed in the short-term. Outcomes from these activities will allow working groups to facilitate the development of potential partner-funded research projects to develop the data products needed to address the scenarios defined by the community. In Year 5, the Action Team will create a summary report that provides a community view on the trajectory of future permafrost change and the likely impacts on Arctic and global systems. The report will summarize the accomplishments of the Goal #2 theme, evaluate the scenario analyses, describe available data products, and outline additional research needed to address the next priorities as SEARCH continues to evolve (the latter in coordination with IARPC and USARC).

Knowledge Exchange Fellowships: We propose to coordinate at least two extended stays by an agency representative (e.g., USGS, USFWS) with an academic research group and the placement of at least two junior permafrost researchers with a partnering agency.

Research Coordination Activities: We will build on the successful Permafrost & Carbon RCN. This network has taken the first steps to coordinate the community of researchers who focus on carbon dynamics in the permafrost zone, and to synthesize scientific information into datasets useable by regional and global models. The Action Team will expand that coordination (facilitated through the community meetings and scenario development activities) to include the broader context of permafrost research, including changes in permafrost temperatures, permafrost extent, and landscape evolution and also facilitate connections with potential stakeholders to include community leaders, industries, non-governmental organizations, and policy-makers. As an outcome of increased research coordination and synthesis, the Working Groups will be able to evaluate how scientific information and knowledge is assimilated by potential end users and will seek partner funding to begin to address questions that also meet end users' interests. An ongoing activity within ACADIS to benefit the activities is the development of a data "showcase" focused on borehole temperature data, designed to standardize data formats from automatic loggers to facilitate broader data reuse.

Communication: In addition to communication and outreach activities (see 5.1), we also propose to produce and circulate an annual "State of Permafrost Research" report that summarizes Working Group progress, and observations for existing networks. This product will assist in the location, analysis and digestion of important and useful existing permafrost data and will be designed for use by influential, non-technical audiences.

5.2.3. Goal #3: Improve Predictions of Future Land-ice Loss and Impacts on Sea Level (F. Straneo, Woods Hole Oceanographic Institution, and T. Scambos, National Snow and Ice Data Center, Co-Leads with assistance from SSC member R. Bindshadler)

Progress in this goal requires a multi-faceted approach as the environmental science involves not only ice and ocean processes, but also atmospheric dynamics and geodesy, and while the topic intersects the interests of many funding organizations, it falls fully within none. Thus it is imperative that the funding agency representatives be engaged in the discussion leading to an integrated, multidisciplinary research strategy so that a coherent, feasible and meaningful research program is formulated. Specific Working Groups have yet to be defined but likely will be led by scientists with expertise in the areas of atmospheric dynamics (or coupled-climate modeling) and geodesy as well as stakeholder representatives of groups directly impacted by sea level rise (e.g., coastal communities, fisheries or coastal industries and perhaps the US Navy), so that the Action Team covers not only the environmental processes at play, but also represents those impacted by rising sea level.

Participation in ongoing national and international activities: SEARCH's integrated, end-to-end approach will complement existing activities related to the land ice/ sea level goal. It will leverage existing reports defining necessary science (e.g., the recent white paper from the U.S. CLIVAR Working Group on Greenland Ice Sheet/Ocean Interactions; U.S. CLIVAR 2012), informal discussions held to discuss the establishment of a new observational network, and an upcoming U.S. CLIVAR and other agencies-sponsored workshop on Greenland Ice Sheet mass change.

Kick-off and Knowledge Exchange Meetings: The initial meeting will help participants see the Land Ice/Sea Level topic through new eyes and better appreciate the financial and technological limitations of

what is possible. Broad participation during the meetings is encouraged, and some meeting talks may be webcast. The outcomes of this meeting include specific plans that define what measurements must be undertaken, specific recommendations about where to undertake these studies, how to maintain these measurements and what products the studies must produce for which target audiences. A timetable will be established among the participants and agencies against which acceptable progress can be judged. This plan and timetable, then, define the tasks and pace of separate Working Groups. Meeting discussions may also assist funding agencies to identify an appropriate topic, timing, and scale of research solicitations.

Working group activities: These cannot be specified at this time, but current research provides a means to anticipate some of the tasks around which Working Groups might form. In the case that the initial meeting identifies two particular fjords (say, one in Greenland and one in coastal Alaska) that present a simple geometry or offer historical data or hold some other advantage as research sites, then an interdisciplinary Working Group might coalesce around each site with investigators skilled in establishing a suite of oceanographic instruments to be deployed at the near-ice and near continental-slope-break regions as well as on-ice GPS and meteorological sensors. Local residents could also be involved in some of the instrumentation maintenance (led by a post-doctoral researcher); and geodesists may contribute various past and future scenarios of local sea level rise to compare with local history and to give a sense of what the future might hold. Another Working Group might focus on the broader pattern of net sea level change, accounting for rates of uplift and sea level change, to identify and work with stakeholders in the most vulnerable areas to develop mitigation strategies tuned to the likely magnitude and rate of shoreline intrusion.

Knowledge Exchange Fellowship: An example of a KE fellowship would be a junior scientist placed in a local community and charged with ensuring the quality of data collected by local residents. Such an opportunity would provide valuable experience not only in communicating the importance of data collection and analysis, but also give the researcher a view into what scientific data and analyses are most meaningful to the local residents.

Contributions to Arctic Futures 2050 Synthesis: It is anticipated that the Working Groups active under this topic will make a number of specific contributions to SEARCH's synthesized assessment of the state of the Arctic in 2050. Predictions of land ice loss will provide not only the obvious projections of contributions to global sea level change, but geodetic analysis will provide a regional to local distribution of relative sea level along Arctic coastlines highlighting the risk level at each location. These risks impact human health, economic well-being and community stability, thus strongly influence public policy and link to the Action Team for Goal #4. Lost land ice exposes new ground, frequently permafrost, and alters the thermal gradients of remaining ice-covered ground giving the permafrost Working Groups new areas and thermal conditions to consider. Similarly, the discharge of increasing amounts of freshwater not only affects the oceanography of the fjords fed by the discharging glaciers, but also alters the broader-scale oceanographic circulation that can have a direct impact on the presence and movement of sea ice.

5.2.4. Goal #4: Analyze Societal and Policy Implications of Arctic Environmental Change (SSC members Susan Crate and Karen Pletnikoff will serve as primary contacts until an interim Team Lead has been appointed)

Humans, who are both agents of change and vulnerable to it, are integral to the rapid change in contemporary Arctic environments. Therefore, it is equally critical to understand how people living in the Arctic perceive, understand, and respond to those changes. Due to the interdependence the Arctic has with the rest of the world, it is also imperative to understand how Arctic change is perceived outside the Arctic, including how perceptions influence policy development which in turn influences the rate and extent of change. The aim of this goal is to understand Arctic inhabitants' experiences and responses to environmental change, and develop methods to anticipate future adaptations, assess and improve perceptions on the part of the public and policymakers, and raise general knowledge about Arctic environmental issues. The implementation of this goal requires two overall strategies.

The first will be to focus on the social science of Arctic change. Although humans are an integral part of the ecosystem, understanding them requires an approach that is vastly different from the other research

areas. The Action Team will undertake two major tasks: (1) summarize findings to date and identify gaps in knowledge about how Arctic communities, both urban and rural, are perceiving, understanding, responding, and adapting to Arctic change, and (2) generate a comprehensive assessment of societal response based on that summary. A post-doc will work with the team on this focus.

The second is to work towards the integration of society-policy issues into the other five-year goals, as well as into the AON and into the cross-cutting synthesis activities. For each of these tasks, society-policy issues will be used in concert with scientific needs, to define all products and activities. The Action Team for this goal will coordinate with each of the other Action Teams and AON to ensure that the society-policy issues within each five-year goal are sufficiently addressed by involving social scientists in the activities and KE workshops. The Action Team will also coordinate the participation of social scientists for an emphasis on society/policy issues in the scenarios development activities (see Section 5.1).

In addition to the activities undertaken within the SEARCH structure itself, SEARCH will advocate for funded research to address key scientific gaps for this goal. The gaps include:

- Cross-sectional and longitudinal studies of responses, policies, and unintended consequences of changes such as sea level and weather effects to provide insights for near-future choices;
- Rigorous studies of perceptions and knowledge about Arctic environmental issues among the general public, Arctic residents, and other stakeholders as relevant to policy development;
- Evaluation of the progress to date, including gaps and success, in efforts to communicate with and educate the broad public about Arctic change.

Building on research results, SEARCH and the broader Arctic science community can develop innovative ways to strengthen communication efforts through effective outreach and education approaches. In addition, there continues to be a need to entrain more society-policy experts in the Arctic science enterprise. This need will be addressed through targeted capacity-building activities, for example, through inclusion of social science experts outside the Arctic into SEARCH activities, networking at meetings, and closer collaboration with other U.S. and international programs with a social-science component (e.g., International Social Sciences Association, ArcticNet, etc.).

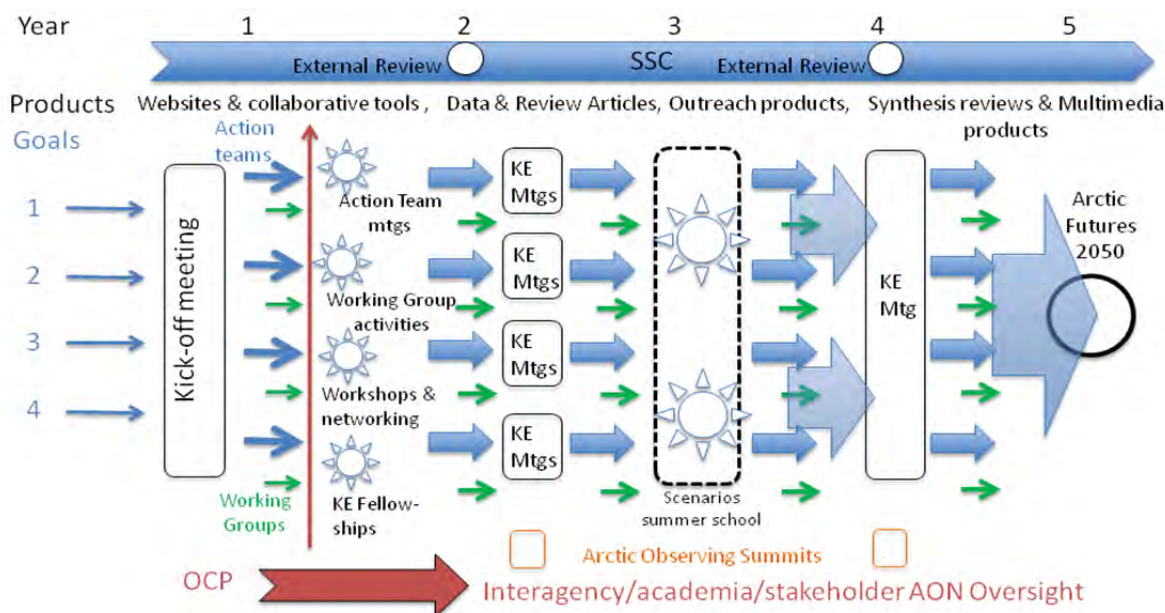


Fig. 3. Schematic of structure and timeline of Action Team and Working Group activities over five years. Project activities will alternate between targeted goal-focused activities and cross-cutting synthesis tasks.

6. OUTCOMES AND PRODUCTS

The new SEARCH structure encompasses science-topic oriented goals as well as cross-cutting synthesis efforts. While the science goals are driven by Action Teams, the broad synthesis-oriented

activities (AON, Arctic Futures 2050) are coordinated out of the PO. Each of these activities has clear objectives that fall under scientific or applied syntheses, as well as critical educational and strategic communication contributions. SEARCH offers a suite of logistic and organizational tools that ensure success in meeting the needs of the communities. Fig. 4 summarizes these synthesis efforts and describes the teams and cross-cutting elements that are coordinated through SEARCH and its new PO.

Building of communities: Building new networks and relationships with stakeholders is an important outcome that will be particularly beneficial for young scientists and post-docs. SEARCH will create opportunities for the scientific community to respond to the grand challenge emerging from the IPY that calls for Knowledge to Action (NRC 2012). The successful development of the ensuring new cross-disciplinary research programs and networks can be tracked by monitoring the number of disciplines and backgrounds represented in KE workshops and Action Team activities. Here the PO and ED will provide a new service by making such networking information available to the SSC, the scientific community and SEARCH agency partners for planning and evaluation purposes. The ED will also play an important role in building networks for SEARCH, particularly with agencies and the private sector.

Action Team products: Cross-disciplinary collaborative research projects will generate products such as publications, conference presentations, data products and white papers that will synthesize findings across Action Teams, furthering scientific research on Arctic system change. Synchronizing activities across themes as outlined in Fig. 3, will enhance the impact and information content of these products as they examine interrelated processes and development from different disciplinary perspectives. Prior to completion of synthesis products, Action Teams may create intermediate products such as online visual dashboards (see 5.1), which will allow others to see who is working on part of the synthesis activity as it progresses, and this will help foster more collaborative work.

AON-related products and outcomes: An important outcome from the work of the AON Coordinator, the Observing Change Panel and the Action Teams is guidance and coordination for the AON to continue to serve the scientific community while meeting broader sets of stakeholder needs. This can take the form of implementing recommendations that the AC provides to agencies, using input from the scientific community. Another outcome is the creation of new data and information products through collaborative work between post-docs, the AC and ACADIS to leverage data from the AON and other sources. The new SEARCH structure will also foster the emergence of an interagency oversight structure for the AON. Activities at the level of the Action Teams and Working Groups will foster advances in observing system design and optimization by using team-derived criteria and metrics to guide model- and theory-based assessments.

Arctic Futures 2050 products: A Working Group will be established to develop different scenarios for a future Arctic state in 2050 across the goals. Final synthesis products will be made easily accessible and will take the form of narratives, visuals, online and interactive information tools, conceptual models and model output, or other multimedia synthesis products (Fig. 4). Such products will meet major needs identified by government agencies such as those in the Department of Interior (e.g., NSSI partner agencies, J. Payne, pers. comm.) while at the same time serving the private sector and engaging the broad public.

Education, Public Outreach and Strategic Communication products: The SEARCH Science Office will facilitate greater communication between a wide range of participants involved in SEARCH activities. Interdisciplinary workspaces, regular Video/Teleconference and webinar updates will link SEARCH communities. Outreach activities will also include town hall activities, SEARCH-sponsored panel discussions at national conferences (e.g., American Meteorological Society Polar Meteorology and Oceanography Conference) and informational Congressional briefings. The Science Office will also work on open communication products that will allow the public to interact with SEARCH scientists on questions related to Arctic change, such as online forums (as described in SEARCH for Answers).

7. BROADER IMPACTS

Our proposal will allow SEARCH to act as the nexus that brings together scientists, stakeholders and agencies to address pressing issues related to Arctic change, leverage resources and work collaboratively.

These disparate groups rarely meet but SEARCH is uniquely positioned to provide networking opportunities and a support structure that facilitates travel, meetings, communication and coordination. Agencies and scientists will also benefit from increased AON-related coordination that results in useful information products. SEARCH synthesis and scenarios activities will generate multimedia products and tools designed to help stakeholders reduce uncertainty and plan for future Arctic change. Additionally, SEARCH activities invest in capacity building for young scientists, bringing them closer to stakeholder groups through KE workshops, fellowships and research projects that may involve local communities. We anticipate that SEARCH will facilitate the formation of transdisciplinary networks with links to existing national and international efforts. Finally, SEARCH will broaden understanding of the consequences of Arctic change, highlight emerging issues with social and policy importance, and communicate these findings to the public, media and decision-makers.

	Permafrost	Land Ice Loss	Arctic Sea Ice	Societal & Policy	AON	Arctic 2050	New goals
Scientific Syntheses (for science) assess, describe, budget, integrate, assimilate, predict	<ul style="list-style-type: none"> observing & predicting nature & timing of thaw carbon budget community report on landscape response to thaw 	<ul style="list-style-type: none"> design targeted instrument network integrating modeling tools (energy, melt, geodesy, sea level) 	<ul style="list-style-type: none"> determine sea ice predictability seasonal – decadal guide observ. network design seasonal outlook support CliC in sea ice prediction find low summer ice analog 	<ul style="list-style-type: none"> develop databases of: (i) social science/ interdisciplinary research in Arctic communities on climate change; (ii) qualitative & quantitative approaches proven to work efficiently develop best-practices recommendations for integrating across disciplines & stakeholders integration into each goal 	<ul style="list-style-type: none"> ACADIS integration pilot project with ACADIS data network design Arctic-systems reanalyses serve activities Barrow flagship site + new ones 	<ul style="list-style-type: none"> Environmental & human scenarios across all SEARCH goals feedback systems in 2050 Interdisciplinary workspaces 	<ul style="list-style-type: none"> ...
SEARCH Coordination for New Research Needs and Opportunities: <ul style="list-style-type: none"> SEARCH works with agencies, industry & communities to identify data & research needs, then coordinates development of new funding opportunities. Each Action Team will rely on team websites & collaborative tools to facilitate synthesis & collaborative research 							
Applied Syntheses (for stakeholders) deliver timely information, predict, warn, link broad range of interests	<ul style="list-style-type: none"> prediction of social-ecological system responses 2050-scenarios 	<ul style="list-style-type: none"> projected regional sea level estimates Stakeholder-driven products 2050-scenarios coastal risk tool 	<ul style="list-style-type: none"> Sea ice prediction network with outlooks Sea Ice for Walrus Outlook sea ice area, property & thickness products 2050-scenarios 	<ul style="list-style-type: none"> perception of Arctic change in & outside of Arctic ecosystem & people response to changes Life in 2050-Arctic 	<ul style="list-style-type: none"> Internat. Arctic Observing Summit open data archives real time data develop funding opportunities to fulfill agency needs 	<ul style="list-style-type: none"> 2050-scenarios scenario tools multi-media products novel tele/meet framework to link scientists & stakeholders 	<ul style="list-style-type: none"> ...
Knowledge Exchange Interns/Fellows: Junior scientists & managers bridging between science, government, business & local communities to educate about tools and scientific knowledge, ensure data quality, learn from needs & develop response options SEARCH Coordination for New Tools: SEARCH works with agencies, industry & communities to identify monitoring, management & prediction tools for stakeholder needs & adaptation planning							
Education, Public Outreach & Strategic Communication exchange knowledge & capability, translate	SEARCH Knowledge Exchange Workshops: Every 2 or 3 years, Open Science meeting with Knowledge Exchange activities provides cross-links between science & stakeholder groups & activities and sets research plans & products with agencies SEARCH for Answers: <ul style="list-style-type: none"> Communication and Educational Outreach by SEARCH Program Office building on its community resources Organize regular open Webinars and distribute Newsletters, Multimedia products and videos, and other products for scientists and stakeholders Expand knowledge about Arctic change across Arctic communities and beyond the Arctic SEARCH Publication Series: <ul style="list-style-type: none"> Arctic Now and Arctic Futures 2050 book, White papers, Special issues, Review articles, Team and Topic Monographs for State of Science or Management Challenges 						

Fig. 4: Outcomes and products of the new SEARCH framework.

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- Walsh, J., S. Elliott, J. Schimel, H. Wiggins. (eds.) 2012. Recommendations for Understanding Arctic System Change: Report from a Workshop. 17 pp.

BIOGRAPHICAL SKETCH

HAJO EICKEN

PROFESSIONAL PREPARATION:

January 1988: Diploma Degree in Mineralogy, Technical University of Clausthal, Germany

December 1990: Ph.D. degree (Geophysics programme) from the University of Bremen, Germany

APPOINTMENTS:

June 2007-present: Professor of Geophysics, Geophysical Institute and Dept. of Geology and Geophysics, University of Alaska Fairbanks (since 2009 also at International Arctic Research Center)

March 1998-June 2007: Associate Professor of Geophysics / Sea-ice geophysicist at the Geophysical Institute and Dept. of Geology and Geophysics, University of Alaska Fairbanks

September 1996-August 1996: Status as lecturer at the University of Bremen, Dept. of Geosciences (holding a course on Physical chemistry and phase relations in petrology during the summer and a course on Technical rock physics during the winter semester)

October 1995-February 1998: Senior scientist at the Alfred Wegener Institute (Department of Oceanic and Atmospheric Physics, head of research group "Sea ice physics and remote sensing")

August 1992-September 1995: Employment as staff scientist at the Alfred Wegener Institute (Department of Oceanic and Atmospheric Physics)

February 1991-July 1992: Employment as Postdoctoral scientist at the Alfred Wegener Institute (Department of Geophysics and Glaciology)

May 1988 - January 1991: Employment as Ph.D. student at the Alfred Wegener Institute for Polar and Marine Research in Bremerhaven, Germany (Department of Geophysics and Glaciology)

PRODUCTS:

Five publications relevant to the project

Eicken, H. (2012) Internationally Coordinated, Cooperative Arctic Marine Science during the Fourth International Polar Year: Lessons for Future Arctic Ocean Science Agreements. In: S. Wasum-Rainer et al. (eds), *Arctic Science, International Law and Climate Change - Legal Aspects of Marine Science in the Arctic Ocean*, Beitr. ausländ. Öffentl. Recht Völkerr., Springer, 235:285-298

Eicken, H., B. Forbes, H. Wiggins (2011) State of the Arctic Conference 2010: International Perspectives on Progress of Research Responsive to Decision-Makers' Information Needs. *Ambio*, 40(7), 824-827

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Lovecraft, A. L., and H. Eicken (eds., 2011) *North by 2020: Perspectives on Alaska's Changing Social-Ecological Systems*. University of Alaska Press, Fairbanks, AK, 736pp.

Five other publications:

Eicken, H., J. Jones, Rohith MV, C. Kambhamettu, F. Meyer, A. Mahoney, M. L. Druckenmiller (2011) Environmental security in Arctic ice-covered seas: From strategy to tactics of hazard identification and emergency response. *Marine Technol. Soc. J.*, 45(3), 37-48

Eicken, H., R. Gradinger, K. Shirasawa, M. Salganek, D. K. Perovich, M. Lepparanta (eds., 2009) *Sea Ice Field Research Techniques*; University of Alaska Press.

Haas, C., Hendricks, S., Eicken, H., and Herber, A. (2010) Synoptic airborne thickness surveys reveal state of Arctic sea ice cover. *Geophys. Res. Lett.*, 37: L09501, doi:09510.01029/02010GL042652.

Krembs, C., H. Eicken, J. W. Deming (2011) Exopolymer alteration of physical properties of sea ice and implications for ice habitability and biogeochemistry in a warmer Arctic. *PNAS*, 108(9), 3653-3658

Petrich, C., H. Eicken, J. Zhang, J. Krieger, Y. Fukamachi, and K. I. Ohshima (2012), Coastal landfast sea ice decay and breakup in northern Alaska: Key processes and seasonal prediction, *J. Geophys. Res.*, 117, C02003, doi:10.1029/2011JC007339

BIOGRAPHICAL SKETCH

SYNERGISTIC ACTIVITIES:

Leadership in developing and implementing University of Alaska IPY initiatives, including North by 2020 – A Forum for local and global perspectives on the North, aimed at improving exchange between scientists and different stakeholder groups at an international level

Leadership in co-organizing series of international SEARCH/DAMOCLES Integrating Arctic Observations Workshops (Spring 2008); based on workshop recommendations helped implement Arctic Sea Ice Outlook (2008-present), an international, community-wide effort at synthesis and integration (www.arcus.org/search/seaiceoutlook/); co-developed and co-leads Sea Ice for Walrus Outlook (2010-present)

Implemented coastal ice observatory that is responsive to stakeholder information needs and integrates geophysical approaches and local knowledge by bringing together a diverse group of experts

Service on steering committees and commissions, such as NSF's Study of Environmental Arctic Change (SEARCH, 1999-2003), International Association for the Physical Sciences of the Ocean (IAPSO) Sea-Ice Commission (1997-), Chair of Science Advisory Group for Barrow Arctic Science Consortium (2001-2006), NSF-OAII Steering Committee (2000-2004), Chair of SEARCH Observing Change Panel (2005-2010), Chair of SEARCH SSC (2010-)

Service as Associate Editor of JGR Oceans (1999-2003), Selection Editor of new AGU Editor's Choice Journal Cryosphere (2003-2006), Associate Editor of Cold Regions Science and Technology (2006-2011); Associate Editor of The Cryosphere/Discussions (2010-)

COLLABORATORS AND OTHER AFFILIATIONS:

Collaborators and Co-Authors (during last 48 months):

J. Deming, B. Light, Y. Yu (UW); S. Nghiem (JPL); T. Markus (NASA-GSFC), D.K. Perovich, M. Sturm (CRREL); J. Maslanik (Colorado), K. Golden (Utah); I. Krupnik (Smithsonian); B. Baker (Vermont Law); P. Schlosser (Columbia); J. Overland (NOAA); C. Haas (Calgary), S. Gerland (Tromsø), M. Ingham (VUW, Wellington, NZ); K. Shirasawa, K.-I. Ohshima (HU, Sapporo, Japan); S. Hendricks, M. Nicolaus (AWI-Germany)

Graduate Advisors:

Ph.D. advisors: M.A. Lange (University of Münster), H. Miller (University of Bremen)

Postdoc advisor: P. Lemke (Alfred-Wegener-Institute)

Graduate Students and Postdoctoral Scholars:

Ph.D./Masters advisees: Total (14) Involved in supervision of Ph.D. theses of C. Haas (completed in 1996), J. Kolatschek (completed in 1998), J. Freitag (completed in 1999); Karoline Frey (1999-2002), Aaron Stierle (1999-2001), Andrew Mahoney (2000-2006), Lars Backstrom (2002-06), Heike Merkel (2003-07), Jeremy Miner (2003-2009), Jeremy Harbeck (2006-), Matthew Druckenmiller (2006-2011), Josh Jones (2009-), Megan O'Sadnick (2012-), Oliver Dammann (2012-)

Undergraduate thesis advisees: J. M. Tapp (2001-04), P. Huck (2004-2005) and others; Post-Doc advisees: Daniel Pringle (2004-2008), Chris Petrich (2007-2009), Adrienne Tivy (2009-2011), Olivia Lee (2012-)

Executive Director

A biographical sketch is not available for this person as the position will be filled at a later date.

For desired qualifications and tasks please refer to section 4 of the Project Description and the UAF Budget Justification.

AON Coordinator

A biographical sketch is not available for this person as the position will be filled at a later date.

For desired qualifications and tasks please refer to section 4 of the Project Description and the UAF Budget Justification.

Susan E. Fox
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PROFESSIONAL PREPARATION

B.S. Communications, College of Communication, Boston University

M.S. Public Affairs, John W. McCormack Graduate School
of Policy Studies, U/Mass Boston

APPOINTMENTS

2009 – present	Executive Director, Arctic Research Consortium of the United States
2006-2009	Vice President, The Forbes Group
2002-2006	Executive Director, American Association of Law Libraries
1994-2002	Executive Director, Society of American Archivists
1991-1994	Director of Programs, Belfer Center for Science & International Affairs, John F. Kennedy School of Government, Harvard University
1988-1991	Administrative Director, Science, Technology & Public Policy Program, John F. Kennedy School of Government, Harvard University
1984-1988	Assistant to the Executive Director, International Physicians for the Prevention of Nuclear War
1980-1984	Staff Associate, Arthur D. Little, Inc.
1977-1979	Research Assistant, Cambridge Chamber of Commerce

PUBLICATIONS

Fox, S. 2009. American Society of Association Executives. *Journal of Association Leadership, Conquering the Digital Divide.*

Fox, S., Butterfield, B. 2007 American Society of Association Executives. *Associations Now. Preparing for the Millennial Tsunami.*

Fox, S. 2007. American Society of Association Executives. *Journal of Association Leadership. Open Access.*

Fox, S. 2006 American Society of Association Executives. *Associations Now. The Great Escape.* How online gaming develops leadership skills in the work place.

SYNERGISTIC ACTIVITIES

Ms. Fox has over 20 years' experience overseeing education programs for national professional associations. Her work includes developing educational needs assessments, program evaluations, and content delivery systems ranging from face-to-face adult education workshops to widely distributed digital delivery. Specific examples of past activities include:

- Programmatic review, analysis, and redesign of continuing education program for the American Association of Law Libraries. The redesigned program focused more clearly on content areas important to the profession and incorporated a wider range of delivery mechanisms in order to broaden scope and reach. Hired and supervised staff with high degree of technical and content creation skill.
- Expanded scope and focus of continuing education program for the Society of American Archivists. Broadened content areas to reflect impact of technology and the changing nature of the profession.

Helen V. Wiggins
Director of Programs – ARCUS
3535 College Road, Suite 101
Fairbanks, AK 99709
Phone: 907-474-1600
Email: helen@arcus.org

PROFESSIONAL PREPARATION

University of Maryland	Geography	B.S. 1995
University of Georgia	Geography	M.A. 1999
University of Georgia	Geography	Ph.D. Program

APPOINTMENTS

2008 to present – Director of Programs, ARCUS

2004 to 2008 – Program Coordinator, ARCUS

2003 to 2004 – Project Manager, ARCUS

1999 to 2000 –Research Technician, Savannah River Ecology Laboratory (Combining geospatial tools for forest ecology applications)

1997 to 1999 – Teaching Assistant, University of Georgia (Environmental Science)

1997 – GIS Analyst, S.C. Department of Health & Environmental Control

1995 to 1997 – Project Leader, University of Maryland Mission to Planet Earth Project

PUBLICATIONS

Reynolds JH, Wiggins HV, eds. 2012. Shared Science Needs: Report from the Western Alaska Landscape Conservation Cooperative Science Workshop. Western Alaska Landscape Conservation Cooperative Anchorage, AK, 142 pp.

H. Eicken, B. Forbes, H. Wiggins. 2011. State of the Arctic Conference 2010: International Perspectives on Progress of Research Responsive to Decision-Makers Information Needs. AMBIO. Volume 40, Number 7 (2011), 824-827, DOI: 10.1007/s13280-011-0153-5.

Arctic Observation Integration: Workshops Report. 2008. Fairbanks, Alaska: SEARCH Project Office, Arctic Research Consortium of the United States. 55 pages.

Study of Environmental Arctic Change (SEARCH). 2005. *Study of Environmental Arctic Change: Plans for Implementation During the International Polar Year and Beyond. Report of the SEARCH Implementation Workshop, May 23–25, 2005*. Fairbanks, AK: Arctic Research Consortium of the U.S. 90 pages.

Study of Environmental Arctic Change (SEARCH). 2005. *Proceedings of the SEARCH Open Science Meeting, 27–30 October 2003, Seattle, Washington*. Fairbanks, AK: Arctic Research Consortium of the U.S. 334 pages.

Foresman, T.W., Wiggins, H.V., and D.L. Porter. 1996. Metadata Myth: Misunderstanding the Implications of Federal Metadata Standards. First IEEE Metadata Conference. Silver Spring, MD.

Foresman, T.W., Wiggins, H.V., Porter, D.L., Masuoka, P. and W. Acevedo. 1996. Design and Documentation of a Baltimore-Washington Regional Spatial Data Testbed for Environmental Model Calibration and Verification. Third International Conference on Integrating Geographic Information and Environmental Modeling. Sante Fe, NM.

Parker, A.J., Parker, K.C. and H. Wiggins-Brown. (2000). Disturbance and Scale Effects on Southern Old-Growth Forests (USA): The Sand Pine Example. *Natural Areas Journal*, 20:273-279.

SYNERGISTIC ACTIVITIES

- Coordinates of interdisciplinary scientific planning and education and outreach
- Networking between individuals, programs, and organizations
- Facilitates the development of online education resource databases designed to make available curricular materials to teachers based on scientific research, and reflection on pedagogical methods and teacher professional development
- Facilitates the representation of students and young investigators in scientific workshops and symposia
- Facilitates transfer of science and science education issues to the public through liason with press outlets
- Training in strategic planning and project management best practices

COLLABORATIONS & OTHER AFFILIATIONS:

Through her current professional appointment, Ms. Wiggins works and collaborates with a large number of members of the arctic science and education communities

PhD Graduate Advisor:

Dr. Albert Parker, University of Georgia (Biogeography)

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION				FOR NSF USE ONLY			
University of Alaska Fairbanks Campus				PROPOSAL NO.		DURATION (months)	
						<div style="display: flex; justify-content: space-between;"> Proposed Granted </div>	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Hajo Eicken				AWARD NO.			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	
				CAL	ACAD	SUMR	Funds granted by NSF (if different)
1. Hajo Eicken - PI				0.23	0.00	0.00	2,587
2. AON Coordinator TBN - Sr. Personnel				12.00	0.00	0.00	109,470
3. Executive Dir TBN - Sr. Personnel				12.00	0.00	0.00	131,364
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				24.23	0.00	0.00	243,421
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				5.00	0.00	0.00	38,075
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							281,496
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							100,367
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							381,863
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							26,988
2. FOREIGN							9,533
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 6,000							
2. TRAVEL 0							
3. SUBSISTENCE 0							
4. OTHER 0							
TOTAL NUMBER OF PARTICIPANTS (2) TOTAL PARTICIPANT COSTS							6,000
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							250
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							428,573
6. OTHER							4,000
TOTAL OTHER DIRECT COSTS							432,823
H. TOTAL DIRECT COSTS (A THROUGH G)							857,207
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Facilities and Administration (Rate: 49.5000, Base: 522634)							
TOTAL INDIRECT COSTS (F&A)							258,704
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							1,115,911
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							1,115,911
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Hajo Eicken				FOR NSF USE ONLY			
ORG. REP. NAME* Andrew Gray				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION University of Alaska Fairbanks Campus				FOR NSF USE ONLY			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Hajo Eicken				PROPOSAL NO.		DURATION (months)	
				Proposed		Granted	
AWARD NO.							
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	
				CAL	ACAD	SUMR	Funds granted by NSF (if different)
1. Hajo Eicken - PI				0.23	0.00	0.00	2,678
2. AON Coordinator TBN - Sr. Personnel				12.00	0.00	0.00	113,301
3. Executive Dir TBN - Sr. Personnel				12.00	0.00	0.00	135,962
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				24.23	0.00	0.00	251,941
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				5.00	0.00	0.00	39,408
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							291,349
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							103,881
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							395,230
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							28,176
2. FOREIGN							10,028
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 6,000							
2. TRAVEL 0							
3. SUBSISTENCE 0							
4. OTHER 0							
TOTAL NUMBER OF PARTICIPANTS (2) TOTAL PARTICIPANT COSTS							6,000
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							250
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							529,686
6. OTHER							4,200
TOTAL OTHER DIRECT COSTS							534,136
H. TOTAL DIRECT COSTS (A THROUGH G)							973,570
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
Facilities and Administration (Rate: 49.5000, Base: 437884)							
TOTAL INDIRECT COSTS (F&A)							216,753
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							1,190,323
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							1,190,323
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Hajo Eicken				FOR NSF USE ONLY			
ORG. REP. NAME* Andrew Gray				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION University of Alaska Fairbanks Campus				FOR NSF USE ONLY			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Hajo Eicken				PROPOSAL NO.		DURATION (months)	
				Proposed		Granted	
AWARD NO.							
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	
				CAL	ACAD	SUMR	Funds granted by NSF (if different)
1. Hajo Eicken - PI				0.23	0.00	0.00	2,771
2. AON Coordinator TBN - Sr. Personnel				9.00	0.00	0.00	87,950
3. Executive Dir TBN - Sr. Personnel				12.00	0.00	0.00	140,720
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				21.23	0.00	0.00	231,441
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				5.00	0.00	0.00	40,787
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (1) OTHER							9,066
TOTAL SALARIES AND WAGES (A + B)							281,294
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							100,611
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							381,905
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							29,484
2. FOREIGN							10,572
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 6,000							
2. TRAVEL 0							
3. SUBSISTENCE 0							
4. OTHER 0							
TOTAL NUMBER OF PARTICIPANTS (2) TOTAL PARTICIPANT COSTS							6,000
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							250
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							462,423
6. OTHER							4,400
TOTAL OTHER DIRECT COSTS							467,073
H. TOTAL DIRECT COSTS (A THROUGH G)							895,034
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Facilities and Administration (Rate: 49.5000, Base: 426611)							
TOTAL INDIRECT COSTS (F&A)							211,172
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							1,106,206
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							1,106,206
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Hajo Eicken				FOR NSF USE ONLY			
ORG. REP. NAME* Andrew Gray				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION University of Alaska Fairbanks Campus				FOR NSF USE ONLY			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Hajo Eicken				PROPOSAL NO.		DURATION (months)	
				Proposed		Granted	
AWARD NO.							
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	
				CAL	ACAD	SUMR	Funds granted by NSF (if different)
1. Hajo Eicken - PI				0.23	0.00	0.00	2,868
2. AON Coordinator TBN - Sr. Personnel				9.00	0.00	0.00	91,028
3. Executive Dir TBN - Sr. Personnel				12.00	0.00	0.00	145,645
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				21.23	0.00	0.00	239,541
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				5.00	0.00	0.00	42,215
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							9,383
TOTAL SALARIES AND WAGES (A + B)							291,139
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							104,132
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							395,271
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							30,919
2. FOREIGN							11,170
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 6,000							
2. TRAVEL 0							
3. SUBSISTENCE 0							
4. OTHER 0							
TOTAL NUMBER OF PARTICIPANTS (2) TOTAL PARTICIPANT COSTS							6,000
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							250
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							583,769
6. OTHER							4,600
TOTAL OTHER DIRECT COSTS							588,619
H. TOTAL DIRECT COSTS (A THROUGH G)							1,031,979
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Facilities and Administration (Rate: 49.5000, Base: 442210)							
TOTAL INDIRECT COSTS (F&A)							218,894
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							1,250,873
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							1,250,873
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Hajo Eicken				FOR NSF USE ONLY			
ORG. REP. NAME* Andrew Gray				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION				FOR NSF USE ONLY			
University of Alaska Fairbanks Campus				PROPOSAL NO.		DURATION (months)	
						Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Hajo Eicken				AWARD NO.			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Hajo Eicken - PI				0.23	0.00	0.00	2,969
2. AON Coordinator TBN - Sr. Personnel				9.00	0.00	0.00	94,214
3. Executive Dir TBN - Sr. Personnel				12.00	0.00	0.00	150,743
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				21.23	0.00	0.00	247,926
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				5.00	0.00	0.00	43,692
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							9,711
TOTAL SALARIES AND WAGES (A + B)							301,329
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							107,775
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							409,104
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							32,501
2. FOREIGN							11,831
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____ 0							
2. TRAVEL _____ 0							
3. SUBSISTENCE _____ 0							
4. OTHER _____ 0							
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							250
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							451,716
6. OTHER							4,800
TOTAL OTHER DIRECT COSTS							456,766
H. TOTAL DIRECT COSTS (A THROUGH G)							910,202
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Facilities and Administration (Rate: 49.5000, Base: 458486)							
TOTAL INDIRECT COSTS (F&A)							226,951
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							1,137,153
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							1,137,153
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Hajo Eicken				FOR NSF USE ONLY			
ORG. REP. NAME* Andrew Gray				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION University of Alaska Fairbanks Campus				FOR NSF USE ONLY			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Hajo Eicken				PROPOSAL NO.		DURATION (months)	
				Proposed		Granted	
AWARD NO.							
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	
				CAL	ACAD	SUMR	Funds granted by NSF (if different)
1. Hajo Eicken - PI				1.15	0.00	0.00	13,873
2. AON Coordinator TBN - Sr. Personnel				51.00	0.00	0.00	495,963
3. Executive Dir TBN - Sr. Personnel				60.00	0.00	0.00	704,434
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				112.15	0.00	0.00	1,214,270
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (10) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				25.00	0.00	0.00	204,177
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (1) OTHER							28,160
TOTAL SALARIES AND WAGES (A + B)							1,446,607
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							516,766
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							1,963,373
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							148,068
2. FOREIGN							53,134
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 24,000							
2. TRAVEL 0							
3. SUBSISTENCE 0							
4. OTHER 0							
TOTAL NUMBER OF PARTICIPANTS (8) TOTAL PARTICIPANT COSTS							24,000
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							1,250
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							2,456,167
6. OTHER							22,000
TOTAL OTHER DIRECT COSTS							2,479,417
H. TOTAL DIRECT COSTS (A THROUGH G)							4,667,992
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							1,132,474
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							5,800,466
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							5,800,466
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Hajo Eicken				FOR NSF USE ONLY			
ORG. REP. NAME* Andrew Gray				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

F. Budget justification

The budget for the proposed SEARCH science support is structured such that ARCUS provides services pertaining to the SEARCH SSC and Action Teams as a whole, including outreach, networking, and other services outlined in the budget explanation for the ARCUS portion of the grant. The International Arctic Research Center (IARC) at UAF supports the research and synthesis activities by the Action Teams and serves as the initial hiring institution for the Executive Director and AON Coordinator. Over the past decade, IARC has evolved into a resource for the scientific community to foster networking and research activities such as those outlined for the Action Teams and is hence well positioned to offer the support outlined in the proposal and below. At the same time, for the first two years of this proposal, the chairmanship of the SSC is held by H. Eicken at UAF, who is serving as the PI of this proposal on behalf of the SSC. The support structure is designed such that with a new chair appointed in Year 3, IARC will maintain the core functions in support of Action Teams, whereas those aspects in direct support of the new chair may migrate to that person's home institution. To facilitate this evolution (summarized in a table at the end of this section), these external functions are set up as generic subcontracts (in some cases to as of yet unidentified institutions) in the budget.

Salaries:

As chair of the SSC, Hajo Eicken will serve as PI to help oversee implementation of the support structure, with 200 hours total requested (1 wk/yr; \$61.44/hr). After two years, with a new SSC Chair coming in, it is anticipated that the Executive Director will step into the position of PI for the present grant, with of Eicken's support transferred to the new SSC Chair. Salary for the new SSC Chair, 134 hours/year in years 3-5 (\$60/hr) is also requested.

Funds are requested to support a full time position (2080 hrs/yr) of Executive Director (ED; \$60.00/hour), responsible for all tasks related to implementing the SEARCH support structure, linking to agencies and stakeholders, and oversight of day-to-day activities. The ED would be hired through UAF and report to the SEARCH SSC, with the IARC Director serving as formal supervisor. The SSC is developing a job description with a focus on an ED with the skills and knowledge to successfully develop and maintain high-level and productive working relationships with agencies, national and international programs, and stakeholder groups; and to implement a complex programmatic mission. The physical location of the ED may evolve during the course of the project. Initially, a presence in Alaska will be most appropriate due to the nature of the position. Most of the agencies active in SEARCH have a strong presence in Alaska, as do the stakeholders, and much of the early coordination will require strong engagement with both groups. At the same time, both IARC and ARCUS as key elements of the support structure are located in Fairbanks, AK.

The position of the AON Coordinator (AC) will be hired through UAF as well, with the AC reporting to the ED. However, due to the strong links to ACADIS and the presence of UCAR/NCAR and a broader range of Arctic-focused research programs relevant to SEARCH located in Boulder, Colorado, it is planned to co-locate the AC with ACADIS at the University of Colorado – Boulder. The AC job description will focus on a broad working knowledge of arctic observing activities, the ability to balance perspectives from a variety of disciplines and stakeholder groups, and the ability to maintain open communication with all other components of the SEARCH structure. The AC position will be fulltime (2080 hrs/yr; \$50/hr) for Years 1 and 2. For the subsequent years, it is anticipated that external support by partner agencies will account for 3 months of salary per year, thus we have budgeted 1560 hrs/yr in years 3-5.

While ACADIS serves as the principal archive of record for AON and other Arctic research projects and will hence play a strong role in the proposed activities, as outlined in the data management plan, funding is requested to support 2610 hrs (3 mos./yr) for a Data Analyst (\$40.31/hr). This position would help capture data generated by Action Team and Knowledge Exchange meetings and the "Arctic Futures 2050" activities.

Funding for an Admin position at IARC (\$26.29/hr) at 1740 hrs/yr (2 mos./yr) is requested to provide the necessary support with travel arrangements, meeting logistics and other support functions pertaining to the work of the ED and the Action Team sub-award activities (described below).

A leave reserve of 1.7% is included for faculty salaries, 21.7% for professionals, 0.7% for PostDocs and 22.2% for support (classified) personnel. Salaries are listed at the FY13 rate and include a 3.5% inflation increase for staff and faculty each year.

Benefits:

Staff benefits are applied according to UAF's FY13 negotiated fringe benefit rates. Rates are 34.1% for UNAC faculty, 29.4% for non-union faculty, 42.8% for professionals, and 52.0% for support (classified). A copy of the rate agreement is available at <http://www.alaska.edu/cost-analysis/negotiation-agreements/>.

Two Months Rule Waiver: IARC researchers are all soft-funded and thus must use research or other sources of funding for their salary support. Because our faculty have no hard-money funding on their contracts we specifically would like to request a waiver of the two months rule so that our faculty and other researchers may charge more than 2 months to NSF during any 12 month period.

Travel:

Both the ED and AC position are associated with substantial travel for coordination and collaboration.

Domestic: Funds are requested to support travel to 12 national level conferences per year for collaboration, outreach and to disseminate research results, locations are to be determined and origin and destination are placeholders. Travel for 6 trips is estimated from Fairbanks to Washington DC at \$1,100 for RT airfare and 6 trips are estimated from Boulder, CO to Washington DC at \$500 for RT airfare. Per Diem in Washington DC is estimated at \$71/day for meals, \$226/night for lodging, \$100/trip/person, for ground transportation.

Foreign: Two trips per year are budgeted to attend International Conferences; one of these trips is based on travel from Fairbanks, AK to Oslo, Norway (Placeholder) at \$3,000 for RT airfare. Per Diem in Oslo is estimated at \$212/day for lodging, \$286/day for meals and \$100/trip for ground transportation. Another trip is estimated from Boulder, CO to Tokyo, Japan (Placeholder) at \$1,300 for RT airfare. Per Diem in Tokyo is estimated at \$270/day for lodging, \$245/day for meals and \$100/trip for ground transportation.

Travel estimates include a 10% increase for airfare and ground transportation each year. All travel is in accordance with the UA Board of Regents regulations for Alaska in-state travel and GSA/JTR Regulations.

Materials and Supplies:

Funds of \$250/year are requested for project-related materials and supplies.

Other Direct Costs:

\$500 is requested for fees associated with project related communication expenses, such as copying, postage, toll charges, etc. Funds of \$21,500 are requested for conference registration fees.

Participant Support Costs:

While we are in the process of seeking outside funding in support of the Knowledge Exchange Fellowships for agency personnel and junior scientists, we request supplemental support of \$24,000 (\$3,000/person) to help offset costs for early career researchers awarded a fellowship.

Subawards:

Each of the four Action Teams will receive a subaward on this project. As outlined in the project description, themes 1-3 (ice-diminished Arctic Ocean, near-surface permafrost, land ice and sea level)

will receive both salary and travel support. Theme 4 (policy and societal implications) is of a more integrative nature and will receive the same salary support; travel will be conducted through the three different Action Teams in which members from Action Team 4 will participate, as well as support through the ARCUS portion of the grant for smaller-scale coordination meetings. The interim Team (Co-) Leads have been identified for themes 1-3 and corresponding subawards, each in the amount of \$643,983, will be made to these teams, with team leads located at the following interim institutions: Rutgers University, Jennifer Francis, PI; University of Colorado Boulder, Ted Scambos, PI; Woods Hole Oceanographic Institute, Fiametta Straneo, PI, University of Florida, Edward Schuur, PI. The fourth subaward, in the amount of \$524,218, will be to the institution associated with the Action Team leadership for SEARCH Goal 4 (Policy and societal implications).

These subawards each include approximately 1 month salary/year for a Senior Scientist and 6 months funding/year for a postdoc. \$65,195 for travel is budgeted for each subaward so members from each Action Team can attend 3 National meetings and 1 International meeting each year. \$1,250 for each subaward is included for miscellaneous project supplies.

In addition, three of the subawards each include funds of \$52,000 to hold two ~30-person workshops and two ~100-person conferences and provide participant support in the amount of \$41,765.

Since each Action Team will work with its members to refine the broad implementation plan laid out in the project description, distribution of funds among the different items may shift.

Indirect Costs:

Facilities and Administrative (F&A) Costs are negotiated with the Office of Naval Research. The negotiated rate for Sponsored Research at UAF is 49.5% of the Modified Total Direct Costs (MTDC), which is determined by space on campus. MTDC includes Total Direct Costs minus tuition, scholarships, subaward amounts over \$25,000 and equipment. A copy of the agreement is available at:

<http://www.alaska.edu/cost-analysis/negotiation-agreements/>.

Overall timeline for implementing the new SEARCH support structure

	Year 1	Year 2	Year 3	Year 4	Year 5
SSC	SSC composition reviewed, new rotations	Annual SSC rotations	Annual SSC rotations	Annual SSC rotations	Culminating review of achievements; Program adjustments and new support proposal
Transition from Panels to Action Teams	Action Teams Populated; "Understanding" and "Responding to Change" Panels Dissolved		"Observing Change" Panel likely dissolved as new AON committees come into place (e.g., through IARPC)		
Personnel	ED and AON Coordinator Hired	Data Analyst Hired	ED takes over as Principal Investigator		
External Review		External Advisory Board convened for program review		External Advisory Board convened for program review	

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION				FOR NSF USE ONLY		
Arctic Research Consortium of the U.S.				PROPOSAL NO.		DURATION (months)
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR				AWARD NO.		
Susan Fox						
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer
				CAL	ACAD	SUMR
1. Susan E Fox - ARCUS Executive Director				2.02	0.00	0.00
2. Helen V Wiggins - Director of Programs				3.46	0.00	0.00
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				5.48	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				8.36	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (0) UNDERGRADUATE STUDENTS						0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						102,982
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						49,431
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						152,413
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						12,282
2. FOREIGN						0
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ 0						
2. TRAVEL 22,200						
3. SUBSISTENCE 61,080						
4. OTHER 0						
TOTAL NUMBER OF PARTICIPANTS (57) TOTAL PARTICIPANT COSTS						83,280
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						900
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						1,550
3. CONSULTANT SERVICES						10,000
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						70,900
TOTAL OTHER DIRECT COSTS						83,350
H. TOTAL DIRECT COSTS (A THROUGH G)						331,325
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
Total Indirect Costs (Rate: 41.1800, Base: 331325)						
TOTAL INDIRECT COSTS (F&A)						136,440
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						467,765
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						467,765
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PD NAME				FOR NSF USE ONLY		
Susan Fox				INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*				Date Checked	Date Of Rate Sheet	Initials - ORG
Helen Wiggins						

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

1331083

SUMMARY PROPOSAL BUDGET

YEAR **2**

ORGANIZATION Arctic Research Consortium of the U.S.				FOR NSF USE ONLY			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Susan Fox				PROPOSAL NO.	DURATION (months)		
				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Susan E Fox - ARCUS Executive Director				2.02	0.00	0.00	28,889
2. Helen V Wiggins - Director of Programs				3.46	0.00	0.00	35,088
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				5.48	0.00	0.00	63,977
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				8.36	0.00	0.00	39,005
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							102,982
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							49,431
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							152,413
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							5,292
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 0							
2. TRAVEL 12,000							
3. SUBSISTENCE 35,920							
4. OTHER 0							
TOTAL NUMBER OF PARTICIPANTS (40) TOTAL PARTICIPANT COSTS							47,920
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							700
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							1,050
3. CONSULTANT SERVICES							10,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							29,600
TOTAL OTHER DIRECT COSTS							41,350
H. TOTAL DIRECT COSTS (A THROUGH G)							246,975
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Total Indirect Costs (Rate: 41.1800, Base: 246975)							
TOTAL INDIRECT COSTS (F&A)							101,704
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							348,679
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							348,679
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Susan Fox				FOR NSF USE ONLY			
ORG. REP. NAME* Helen Wiggins				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION Arctic Research Consortium of the U.S.				FOR NSF USE ONLY			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Susan Fox				PROPOSAL NO.		DURATION (months)	
						Proposed	Granted
				AWARD NO.			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Susan E Fox - ARCUS Executive Director				2.02	0.00	0.00	28,889
2. Helen V Wiggins - Director of Programs				3.46	0.00	0.00	35,088
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				5.48	0.00	0.00	63,977
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				8.36	0.00	0.00	39,005
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							102,982
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							49,431
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							152,413
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							5,292
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 0							
2. TRAVEL 12,000							
3. SUBSISTENCE 35,920							
4. OTHER 0							
TOTAL NUMBER OF PARTICIPANTS (40) TOTAL PARTICIPANT COSTS							47,920
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							700
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							1,050
3. CONSULTANT SERVICES							10,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							29,600
TOTAL OTHER DIRECT COSTS							41,350
H. TOTAL DIRECT COSTS (A THROUGH G)							246,975
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
Total Indirect Costs (Rate: 41.1800, Base: 246975)							
TOTAL INDIRECT COSTS (F&A)							101,704
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							348,679
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							348,679
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Susan Fox				FOR NSF USE ONLY			
ORG. REP. NAME* Helen Wiggins				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION				FOR NSF USE ONLY			
Arctic Research Consortium of the U.S.				PROPOSAL NO.		DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR				AWARD NO.		Proposed	Granted
Susan Fox							
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Susan E Fox - ARCUS Executive Director				2.02	0.00	0.00	28,889
2. Helen V Wiggins - Director of Programs				3.46	0.00	0.00	35,088
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				5.48	0.00	0.00	63,977
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				8.36	0.00	0.00	39,005
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							102,982
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							49,431
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							152,413
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							5,292
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 0							
2. TRAVEL 12,000							
3. SUBSISTENCE 35,920							
4. OTHER 0							
TOTAL NUMBER OF PARTICIPANTS (40) TOTAL PARTICIPANT COSTS							47,920
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							700
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							1,050
3. CONSULTANT SERVICES							10,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							29,600
TOTAL OTHER DIRECT COSTS							41,350
H. TOTAL DIRECT COSTS (A THROUGH G)							246,975
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
Total Indirect Costs (Rate: 41.1800, Base: 246975)							
TOTAL INDIRECT COSTS (F&A)							101,704
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							348,679
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							348,679
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME				FOR NSF USE ONLY			
Susan Fox				INDIRECT COST RATE VERIFICATION			
ORG. REP. NAME*				Date Checked	Date Of Rate Sheet	Initials - ORG	
Helen Wiggins							

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION				FOR NSF USE ONLY			
Arctic Research Consortium of the U.S.				PROPOSAL NO.		DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR				AWARD NO.		Proposed	Granted
Susan Fox							
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Susan E Fox - ARCUS Executive Director				2.02	0.00	0.00	28,889
2. Helen V Wiggins - Director of Programs				3.46	0.00	0.00	35,088
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				5.48	0.00	0.00	63,977
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				8.36	0.00	0.00	39,005
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							102,982
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							49,431
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							152,413
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							12,282
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 0							
2. TRAVEL 16,200							
3. SUBSISTENCE 46,280							
4. OTHER 0							
TOTAL NUMBER OF PARTICIPANTS (47) TOTAL PARTICIPANT COSTS							62,480
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							950
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							1,250
3. CONSULTANT SERVICES							15,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							70,900
TOTAL OTHER DIRECT COSTS							88,100
H. TOTAL DIRECT COSTS (A THROUGH G)							315,275
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
Total Indirect Costs (Rate: 41.1800, Base: 315275)							
TOTAL INDIRECT COSTS (F&A)							129,830
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							445,105
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							445,105
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME				FOR NSF USE ONLY			
Susan Fox				INDIRECT COST RATE VERIFICATION			
ORG. REP. NAME*				Date Checked	Date Of Rate Sheet	Initials - ORG	
Helen Wiggins							

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

1331083

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION Arctic Research Consortium of the U.S.				FOR NSF USE ONLY			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Susan Fox				PROPOSAL NO.	DURATION (months)		
				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Susan E Fox - ARCUS Executive Director				10.10	0.00	0.00	144,445
2. Helen V Wiggins - Director of Programs				17.30	0.00	0.00	175,440
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				27.40	0.00	0.00	319,885
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				41.80	0.00	0.00	195,025
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							514,910
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							247,155
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							762,065
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							40,440
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 0							
2. TRAVEL 74,400							
3. SUBSISTENCE 215,120							
4. OTHER 0							
TOTAL NUMBER OF PARTICIPANTS (224) TOTAL PARTICIPANT COSTS							289,520
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							3,950
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							5,950
3. CONSULTANT SERVICES							55,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							230,600
TOTAL OTHER DIRECT COSTS							295,500
H. TOTAL DIRECT COSTS (A THROUGH G)							1,387,525
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							571,382
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							1,958,907
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							1,958,907
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Susan Fox				FOR NSF USE ONLY			
ORG. REP. NAME* Helen Wiggins				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

ARCTIC RESEARCH CONSORTIUM OF THE UNITED STATES (ARCUS) BUDGET JUSTIFICATION

As the SEARCH Project Office, ARCUS requests funds for: staffing at approximately 1.15 FTE/year (tasks and responsibilities listed below); meeting support for two annual in-person SSC meetings, the Kick Off Meeting in Year 1 and the Culminating Arctic Futures 2050 Meeting in Year 5; and communications and outreach costs. SEARCH meeting logistics costs (i.e., travel, venue) are split between the ARCUS and IARC budgets; the meeting organization and planning tasks, however, will primarily be ARCUS' responsibility.

ITEM A: SENIOR PERSONNEL: \$319,885 Total

Funding is requested to cover 5.48 calendar months/year for senior personnel, which includes salary support at 3.46 calendar months/year for co-PI H. Wiggins/SEARCH Project Office Lead and 2.02 calendar months/year for PI/ARCUS Executive Director, S. Fox.

ITEM B: OTHER PERSONNEL - \$195,025 Total

Funding is requested for 8.36 months/year for a SEARCH Project Manager.

ARCUS Staffing Tasks & Responsibilities:

The total staff time of senior and other personnel (Items A + B) is equivalent to approximately 1.15 FTE per year. Tasks and responsibilities will complement those supported by the UAF/IARC budget (e.g., the Science Office/Executive Director, AON Coordinator, and Data Analyst). ARCUS staff tasks and responsibilities will include:

- **Strategic Planning** - Work with the SEARCH Executive Director, Science Steering Committee (SSC), and Action Teams to plan and execute strategic and organizational development of the program: develop annual work plans; develop and track resulting milestones, review progress every other year in consultation with an external review committee, help guide organizational adjustments as needed to achieve evolving needs and goals.
- **Conference/Meeting Planning** - Work with relevant groups to: develop meeting goals and desired outcome(s); convene and manage organizing committees; develop agendas; invite participants; arrange logistics for the meetings for which ARCUS is requesting logistics support (see Item G.6); meeting announcements and communications; meeting website development and maintenance; onsite meeting support, including note-taking, presenter/AV support, and web streaming/video when appropriate; and work the meeting participants to develop and disseminate final product(s).
- **Science Steering Committee (SSC) Management** - Work in collaboration with the SEARCH Executive Director on all aspects of SSC management, including: develop a new Terms of Reference and ensure activities comply with the Terms; manage the SSC membership rotation process; provide project management support to track SSC action items and tasks; organize twice-yearly in-person SSC meetings; organize monthly SSC teleconferences; and other administrative support for the SSC.

- **Action Team Support** - Specific support will be dependent on the group, activity, and needs beyond what is provided by the post-doctoral support through the IARC budget, but may include activities such as: provide administrative support (e.g., arranging teleconferences, drafting memos), work with individual Team members to ensure timely completion of tasks and milestones, develop communications and website content, and ensure lines of communication with other Action Groups, the SSC, and the broader research and stakeholder communities.
- **Communications and Outreach** - The success of the new SEARCH organizational structure will be dependent on transparent, timely, and clear communications. ARCUS will: develop and maintain two-way communication and collaboration strategies between all SEARCH components—the SEARCH Science Office, the SSC, Action Teams and Working Groups, and the broader scientific and stakeholder communities (communications with agency heads and representatives will primarily be the responsibility of the SEARCH Executive Director); develop, launch, and maintain a new SEARCH website that provides a social-networking platform for information exchange and communication of products, results, and outcomes; organize regular (e.g., quarterly) open webinars on SEARCH-relevant topics; organize and facilitate teleconferences; develop and distribute an online newsletter; maintain a SEARCH email list; organize “Town Hall” activities at large scientific conferences; organize an annual Congressional Briefing; and other communications activities, as activities warrant.

ITEM C: FRINGE BENEFITS - \$247,155

Fringe Benefits are calculated at the current rate of 39% plus federal payroll taxes at a rate of 9%.

TOTAL SALARIES, WAGES, AND FRINGE BENEFITS = \$762,065

ITEM D: EQUIPMENT – None requested

ITEM E: TRAVEL - \$40,440

Line 1 – Domestic: Request for travel (airfare, lodging, per diem, ground transportation) for Project Office staff to travel to the kick-off meeting in Year 1; two SSC meetings per year for each of the five years; the Knowledge Exchange Meetings; the culminating Arctic Futures 2050 meeting; and the annual fall AGU meeting for a SEARCH Town Hall, sessions, and side meetings (26 travel slots total).

Line 2 – Foreign – None requested

ITEM F: PARTICIPANT SUPPORT COSTS – \$289,520

Request for airfare, lodging, per diem, and ground transportation for 20 participants (SSC members and key guests) for each of the two SSC meetings per year; 17 participants for the Kick-off meeting in Year 1 and 7 participants for the culminating Arctic Futures 2050 meeting in Year 5 (support will be for key participants without other travel support, such as stakeholder representatives). Total number of participants = 224. Participant support costs for the other proposed SEARCH meetings are included in the IARC budget.

ITEM G: OTHER DIRECT COSTS: \$ 295,500 Total

Line 1. Materials and Supplies - \$ 3,950

Funding is requested to cover office supplies and meeting supplies for the kick-off meeting, twice-yearly SSC meetings, and the culminating Arctic Futures 2050 meeting.

Line 2. Publication Costs/Documentation/Dissemination - \$5,950

Support is requested to cover the costs of printing and publication of information and outreach materials, including annual plans and reports and meeting/conference reports; publications will be primarily delivered in online-format to keep printing costs down.

Line 3. Consultant Services - \$55,000

Consultant Services are requested at \$10,000/year for Years 1-4 and \$15,000/year in Year 5 for short-term tasks related to design and layout of printed and online meeting publications, reports, and products.

Line 4. Computer Services – None requested.

Line 5. Subawards – None requested.

Item 6. Other - \$ 230,600 Total

Other direct costs will support:

- Teleconference and web-meeting fees for the SSC, Action Groups, public webinars, and related communications: (\$4,700 for Year 1, \$4,400 for Years 2-4, \$3,700 for Year 5).
- Meetings Support (venue, AV, catering):
 - \$19,600 per year for one stand-alone SSC meeting
 - \$5,600 per year for a second SSC meeting, which will be organized as a ‘side meeting’ at another SEARCH or related conference to save costs
 - In Year 1, support for the Kick-off Meeting at \$41,000 (assuming a 3-day meeting with 70-85 participants, including web-streaming).
 - In Year 5, support for the culminating Arctic Futures 2050 meeting at \$41,000 (assuming a 3-day meeting with 70-85 participants, including web-streaming).

ITEM I. INDIRECT COSTS - \$571,383

Indirect costs are calculated at the current institutional rate of 41.18% of total direct costs.

Current and Pending Support Form

PI NAME: Hajo Eicken									
Has the current proposal been submitted to any other funding source? No					If "Yes" list name of funding source:				
Current Support									
Principal Investigator and Project Title	Supporting Agency Program Name Point of Contact	2013	2014	2015	2016	2017	Start/End Dates	Award Amount	Location of Research
PI: Sharpton, National Center for Island, Maritime, and Extreme Environment Security	University of Hawaii, CIMES; Program Officers: Theo Gemelas (DHS); Margo Edwards (UH)	0.0	0.0	0.0	0.0	0.0	10/01/07-12/29/13	\$2,075,000	Alaska
PI: Eicken, Collaborative Research on the State of the Arctic Sea Ice Cover: Sustaining the integrated Seasonal Ice Zone Observing Network (SIZONET)	NSF ARC - AON Implementation Program Officer: Erica L. Key	1.0	0.5	0.0	0.0	0.0	01/01/10-12/31/14	\$1,419,891	Alaska
PI: Eicken, Collaborative Research: Probing Internal Structure and Transport Processes in Antarctic Sea Ice with Low-Frequency Electromagnetic Techniques	NSF CMG/ARC; Program Officer: William Wiseman, Jr.	1.0	0.0	0.0	0.0	0.0	10/1/09-09/30/13	\$308,728	Alaska
PI: Eicken, Study of Environmental Arctic Change: Supporting Goals and Implementation through Enhanced Planning, Assessment of Past Activities and Coordination with International Efforts	NSF OPP ARCSS Program Officer: Neil Swanberg	3.0	3.0	0.0	0.0	0.0	04/01/11 - 03/31/15	\$471,220	Alaska
PI: Eicken, The role of sea ice berm formation to alter environmental marine forcing in West Alaska coastal communities	U.S. Fish and Wildlife Service Western AK LCC Science Coordinator: Joel Reynolds	0.0	0.0	0.0	0.0	0.0	06/01/12 - 12/31/13	\$173,759	Alaska
PI: Mahoney, CDI-Type I: Collaborative Research: A Computational Thinking Approach to Mapping Critical Marine Mammal Habitat Through Readily-Deployable Video Systems	NSF - GEO Program Officer: Therese Moretto Jorgensen	1.0	1.0	0.0	0.0	0.0	09/15/11-08/31/14	\$265,000	Alaska
PI: Eicken, Comparative Evaluation of Coastal Currents and Ice Movement in Northeastern Chukchi Sea	North Slope Borough	0.5	0.2	0.0	0.0	0.0	10/01/12 - 06/30/14	\$172,587	Alaska
PI: Mahoney, The Mass Balance of Multiyear Ice in the Southern Beaufort Sea	Office of Naval Research Contract Specialist: Millie Abdi	1.0	1.0	0.0	0.0	0.0	07/01/12 - 06/30/15	\$282,175	Alaska
Pending Support									
Principal Investigator and Project Title	Supporting Agency Program Name Point of Contact	2013	2014	2015	2016	2017	Start/End Dates	Requested Amount	Location of Research
PI: Lovecraft, The North Slope Arctic Scenarios Project (NASP): Envisioning Futures and Strategizing Pathways for Sustainable Healthy Communities	NSF - OPP	0.5	1.5	1.0	0.0	0.0	07/01/13 - 06/30/16	\$954,290	Alaska
PI: Eicken, Collaborative Research: An Innovative Network to Improve Sea Ice Prediction in a Changing Arctic	NSF	0.0	0.4	0.4	0.4	0.4	04/01/13 - 09/30/17	\$107,852	Alaska
PI: Lee, Community Observations for Monitoring Sea Ice and Marine Mammal Migratory Behavior Around Bering Strait During the Spring Hunting Season	NPRB	0.0	0.0	0.0	0.0	0.0	07/01/13 - 01/31/15	\$106,393	Alaska
PI: Eicken, Collaborative Research: Research, Synthesis, and Knowledge Transfer in a Changing Arctic: Science Support for the Study of Environmental Arctic Change (SEARCH) (THIS PROPOSAL)	NSF	0.2	0.2	0.2	0.2	0.2	07/01/13 - 06/30/18	\$5,800,466	USA

Current and Pending Support Form

PI NAME: AON Coordinator, TBN									
Has the current proposal been submitted to any other funding source? No					If "Yes" list name of funding source:				
Current Support									
Principal Investigator and Project Title	Supporting Agency Program Name Point of Contact	2013	2014	2015	2016	2017	Start/End Dates	Award Amount	Location of Research
Pending Support									
Principal Investigator and Project Title	Supporting Agency Program Name Point of Contact	2013	2014	2015	2016	2017	Start/End Dates	Requested Amount	Location of Research
PI: Eicken, Collaborative Research: Research, Synthesis, and Knowledge Transfer in a Changing Arctic: Science Support for the Study of Environmental Arctic Change (SEARCH) (THIS PROPOSAL)	NSF	12.0	12.0	9.0	9.0	9.0	07/01/13 - 06/30/18	\$5,800,466	USA

Current and Pending Support Form

PI NAME: Executive Director, TBN									
Has the current proposal been submitted to any other funding source? No					If "Yes" list name of funding source:				
Current Support									
Principal Investigator and Project Title	Supporting Agency Program Name Point of Contact	2013	2014	2015	2016	2017	Start/End Dates	Award Amount	Location of Research
Pending Support									
Principal Investigator and Project Title	Supporting Agency Program Name Point of Contact	2013	2014	2015	2016	2017	Start/End Dates	Requested Amount	Location of Research
PI: Eicken, Collaborative Research: Research, Synthesis, and Knowledge Transfer in a Changing Arctic: Science Support for the Study of Environmental Arctic Change (SEARCH) (THIS PROPOSAL)	NSF	12.0	12.0	12.0	12.0	12.0	07/01/13 - 06/30/18	\$5,800,466	USA

Current and Pending Support for Susan Fox

Title: Providing Organizational Support to the U.S. Arctic Science Program (ARC-0618885)

Source: National Science Foundation

Project Location: Fairbanks, Alaska

Total Award Amount: \$9,312,684

Starting Date: 1 March 2008

Ending Date: 28 February 2013

Support Type: Current

Person-months per year committed to the project: 9 calendar months

Title: Collaborative Research: An Innovative Network to Improve Sea Ice Prediction in a Changing Arctic

Source: National Science Foundation

Project Location: Fairbanks, Alaska

Total Award Amount: \$435,591

Starting Date: 04/01/2013

Ending Date: 10/01/2013

Support Type: Pending

Person-months per year committed to the project: 0.1 calendar month

Title: PolarTREC: Teachers and Researchers Exploring and Collaborating (ARC0956825)

Source: National Science Foundation

Project Location: Fairbanks, Alaska

Total Award Amount: \$2,164,168

Starting Date: 4/15/2010

Ending Date: 3/31/2014

Support Type: Current

Person-months per year committed to the project: <0.5 calendar month

Current and Pending Support for Helen V. Wiggins

Title: Providing Organizational Support to the U.S. Arctic Science Program (ARC-0618885)

Source: National Science Foundation

Project Location: Fairbanks, Alaska

Total Award Amount: \$9,312,684

Starting Date: 1 March 2008

Ending Date: 28 February 2013

Support Type: Current

Person-months per year committed to the project: 9 calendar months

Title: Collaborative Research: An Innovative Network to Improve Sea Ice Prediction in a Changing Arctic

Source: National Science Foundation

Project Location: Fairbanks, Alaska

Total Award Amount: \$435,591

Starting Date: 04/01/2013

Ending Date: 10/01/2013

Support Type: Pending

Person-months per year committed to the project: 2.3 calendar months

H. Facilities, Equipment, and Other Resources

International Arctic Research Center, University of Alaska Fairbanks

The International Arctic Research Center is a multidisciplinary research institute with specialists focusing upon many aspects of arctic research including atmospheric science, oceanography, geochemistry, ecology and hydrology. We possess expertise and an excellent staff capable of conducting field research under harsh conditions and experienced in analyzing and archiving large data sets and in computer analyses including global and regional climate, oceanic circulation, sea ice and ecosystems modeling. Our facilities include analytical laboratories and field preparation facilities. Our computer facilities include access to numerous workstations, the IARC-JAXA Information System (IJIS), and the Arctic Region Supercomputing Center (ARSC). IJIS consists of two Cluster Server Systems, 6 Terra-Bytes (TB) hard disk memory capacity with two automatic tape-backup silos, 30 TB total, for satellite data storage, and 25 PC workstations and 5 PC laptops for satellite data analysis. The Clusters consist of a 12-node Sun Microsystems v440-servers running Solaris 5.9 Operating System with Sun N1 Grid Engine 6, and a 24-node Sun Microsystems v20-servers running Red Hat Enterprise Linux 3 operating system and Sun N1 Grid Engine 6 (Linux). ARSC operates multi-teraflop supercomputers and multi-petabyte storage systems with service to the US DoD, the UAF community and many users elsewhere in the nation. ARSC's staff members include computational scientists, systems administrators and storage specialists, user consultants, visualization and database specialists, and a communications and outreach department.

Our position in the University of Alaska allows advantages in logistics and an extensive network of colleagues with vast experience in climatological, geophysical, hydrological, meteorological and oceanographic research and an understanding of the arctic biome that one only attains through personal investigations in the field. Our staff are well experienced and well-equipped to conduct travel logistics safely and successfully.

The resources of the Geographic Information Network of Alaska (GINA), housed at the International Arctic Research Center (IARC), are also available for this proposed research. GINA is the University of Alaska's mechanism for organizing and sharing its diverse data and technological capabilities among the Alaskan, Arctic, and world communities. Established in 2001 as an initiative of UA's President, this network promotes collaboration at the local, state, and federal levels by increasing community-wide participation in the discovery and sharing of geospatial data. GINA's services greatly expand the range of available research analysis capabilities in order to address the research, inventory, and monitoring needs of Alaska. GINA services include:

- Maintaining an enterprise-level, geographic information system (GIS) with online archiving, internet mapping, and metadata services.
- Offering training and assistance in satellite image processing, GIS, and visualization.
- Providing custom processing, server-side analysis, and visualization tools.
- Uniting and extending UA's GIS and remote sensing activities through the use of internationally adopted standards and a shared web portal.

GINA's system architecture is focused on fast, flexible and redundant systems. Our primary operating system environment is a Linux distribution derived from Redhat Enterprise

Linux. We use a combination of physical and virtual systems for a flexible hosting environment for a variety of applications; including satellite data processing, highly-available database clusters, web applications, and data distribution services.

GINA uses a variety of storage back ends ranging from targeted use of solid state storage, a large fibre channel storage area network, massive hard drive raid storage, which provides over 300TB of spinning storage. Additional secure, off-site storage and long-term archive is provided by the Arctic Region Supercomputing Center (ARSC). GINA is part of the International Arctic Research Center and is beginning to add use of their NSF approved data archive for providing another level of archive redundancy and availability for NSF related data products.

GINA manages the University of Alaska's Earth Planetary Remote Sensing computing lab. The lab provides an environment for training students in the use of remote sensing and GIS tools. The lab seats 16 students providing both Linux and Windows environments allowing a full range of tools and platforms to be hosted in the lab.

IARC has advanced telecommunications facilities for web-based teleconferencing to facilitate working groups meetings for developing data protocols and for providing outreach to schools and stakeholders.

In addition to personal office space for collaborators and students available at IARC, IARC has several offices for visiting scientists, available to scientists and other visitors that may be entrained into the project.

Facilities, Equipment, and Other Resources

ARCUS has the organizational resources to support the proposed work; the activities undertaken through this project will rely on the office facilities and equipment of ARCUS. ARCUS is equipped with advanced communications, web-conferencing, and Internet capability with a secure operating environment for the servers and other computer equipment necessary to sustain the work proposed, as well as sufficient administrative personnel support. ARCUS has its own server and T1 line and is equipped with the latest PC and Mac computer hardware.

Supplementary Documentation – Data management plan

The data archive and portal of record for NSF-supported AON and other Arctic observing activities is ACADIS, a collaborative effort between the National Snow and Ice Data Center of the University of Colorado – Boulder, the University Corporation for Atmospheric Research (UCAR), UNIDATA, and the National Center for Atmospheric Research (NCAR). The lead PIs are Mark Serreze (NSIDC) and Jim Moore (UCAR). As outlined in the project description, the present proposal is meant to develop closer linkages between the Arctic research community involved with the SEARCH themes, agencies and stakeholders. Hence, the activities described in the proposal will principally rely on ACADIS for data archival and management support. In the past, SEARCH has provided feedback and guidance to ACADIS and other data management centers, mostly through formal and informal communication between the SEARCH Observing Change Panel (OCP), and in particular the SEARCH Data Advisory Group it oversees (Chair: S. Oberbauer). At the same time, SEARCH SSC member L. Hamilton serves on the ACADIS Data Advisory Committee.

However, two key elements of the present proposal will help implement a more integrated approach to information and knowledge exchange (as outlined in Fig. 1) and help ACADIS address key challenges in serving the scientific community's data needs. First, the AON Coordinator (AC), who will be working out of the University of Colorado – Boulder, will serve as a liaison between the core constituencies of SEARCH (Figures 1 and 2) and entities generating, archiving or disseminating data sets, including ACADIS and other relevant centers such as the North Slope Science Initiative's (NSSI) data repository with links to a number of different NSSI partner agencies. The AC will furthermore ensure that findings and outcomes from the different Action Team activities translate into improved, more accessible data sets and information products. To achieve these goals, the AC would work closely with the ACADIS Data Curators Team, led by Lynn Yarmey. The three ACADIS Data Curators are placed in central positions to identify and take advantage of dependencies and opportunities at the intersection of different ACADIS project activities. For example, key Data Curator roles include, (i) making sure decisions made in the Metadata Subgroup are communicated and translated to the Workflows Subgroup, and (ii) fill in potential communication and coordination gaps between the different project levels, organizations, working groups, stakeholders, development projects, etc. As such, the Data Curators Team is currently very much inward-looking, with an aim towards streamlining ACADIS operations and translating ACADIS Advisory Committee and data providers' feedback into system changes. Here, the more outward-facing AC will serve as a complement to these activities and help ensure that Data Curators focus on the essential priorities identified by the broader constituent community.

Second, the Action Teams will generate information products as a result of, e.g., the "Arctic Futures 2050" scenarios development or some of the other activities described in Section 4 of the proposal text. In order to help transfer these information products into data archival and management frameworks, a data analyst programmer with the International Arctic Research Center (IARC) at UAF will provide support to the Action Teams. The data analyst will participate in workshop and knowledge exchange meetings to capture relevant data (such as specific scenarios and related products) and contribute to the development of derived information products from existing data in collaboration with the AC and the ACADIS team. Locating this position at IARC yields several benefits. First, IARC houses the Geographic Information Network of Alaska (GINA) which provides data management support to NSSI. Hence, the data analyst, who will be drawn from the ranks of GINA, can help identify and develop synergies with agency management programs. IARC and specifically GINA also have partnerships with state agencies and other federal programs active in the Alaskan Arctic that can help advance some of the SEARCH goals and the objectives of this proposal in the realm of data management and dissemination.

The activities proposed for ARCUS will not involve scientific data collection. All products of activities, including publications, reports, summaries of tasks and outcomes, and meeting/workshop information will be made publicly and freely available on the SEARCH website, which will be hosted at ARCUS. All products and website data are archived on secure back-up drives.

Supplementary Documentation – Data management plan

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The activities proposed for ARCUS will not involve scientific data collection. All products of activities, including publications, reports, summaries of tasks and outcomes, and meeting/workshop information will be made publicly and freely available on the SEARCH website, which will be hosted at ARCUS. All products and website data are archived on secure back-up drives.

Supplementary Documentation - Post-doc mentoring plan

Each of the four SEARCH Action Teams will be working closely with a postdoctoral fellow. The goal is to involve the fellows such that they are provided the opportunity to work with observations and datasets or employ model simulations in ways that foster synthesis and advance the overarching objectives of the theme that they are associated with. For example, through the partnership with the Next Generation Ecosystem Experiment program (NGEE, see letter of support by Dr. S. Wulfschleger) the postdoc working with the near-surface permafrost theme may explore approaches to scale up from the NGEE field site at Barrow through the use of remote sensing or AON permafrost observatory network data. Alternatively, the postdoc may explore how remote-sensing approaches advanced through the NASA Arctic-Boreal Vulnerability Experiment (ABOVE) program may lead to information products that address concerns by stakeholders who have to adapt to a landscape characterized by permafrost degradation and changing vegetation patterns.

This integration of postdoctoral research into the Action Team activities is based on the successful approach to postdoctoral mentoring developed at the National Center for Ecological Analysis and Synthesis (NCES) in Santa Barbara. At NCES, postdoctoral fellows in residence work with teams of scientists to advance synthesis for specific projects. Along the same lines, postdoctoral fellows play a central role in the Carbon & Permafrost Research Coordination Network (C&P RCN) co-led by E.A.G. Schuur (designate interim Action Team Lead for the near-surface permafrost theme, SEARCH five-year goal #2) and D. McGuire (SSC member).

By providing such baseline support, a postdoctoral fellow can help nucleate broader research activities within the Team and serve as a catalyst for knowledge exchange between the scientific community, agencies and stakeholders. The Action Teams and SEARCH SSC will engage different agencies in the process of defining research areas for postdoctoral fellows to ensure that findings and outcomes from the fellowships find their way into practice as well. Here, the USGS Climate Science Center (CSC) in Alaska is a key partner and preliminary planning with Center Director Dr. S. Gray hold promise for supplemental support to advance CSC interests, e.g., in climate model downscaling in relation to near-surface permafrost degradation and land cover change. Such exchange is further fostered by the opportunity to apply for knowledge exchange fellow/internships that are meant to inform the focus of the knowledge exchange workshops (Fig. 1, Section 5.1; note that these fellowships will be open for any early-career researchers to apply, they are not limited to the Action Team fellows).

Typically, postdocs will work closely with an Action Team Lead or one of the team members, who would serve as the primary advisor and mentor at their respective home institution. Each Action Team will set specific goals and metrics for success of the respective post-docs. Professional development and research milestones will be guided by a post-doc mentoring plan that has been developed and refined over the past several years under the leadership of the International Arctic Research Center (IARC) with support from the UAF Graduate School (a copy of the plan is available at <http://www.uaf.edu/gradsch/post-doc-resources/>). Due to the unique nature of the project with postdocs potentially assuming responsibilities that relate to knowledge exchange and coordination of the Action Team, care will be taken to review and provide guidance on both research and science management. Here, different action team members such as those affiliated with a government agency may also provide guidance and mentorship. The postdocs will complete a self-assessment based on the National Postdoc Association checklist that will then help identify specific professional development support and activities. Postdoc mentoring, available resources, common guidelines and expectations will also be part of the agenda of the kick-off meeting that involves leadership from all Action Teams, SSC and SEARCH panels. The fellow will then be involved in Action Team leadership meetings and other activities as outlined for each team in Section 5.

The postdoc fellowships offer a range of opportunities to pursue research at the intersection of Arctic system science and stakeholder interests (Fig. 1). The resources available through the SEARCH science office will allow the fellows to build skills and explore innovative research and science management approaches that will prepare them for future careers in academia, agencies or the private sector.

OAK RIDGE NATIONAL LABORATORY

MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

Stan D. Wulschleger
Environmental Sciences Division
P.O. Box 2008
Oak Ridge, TN 37831-6301
Tel (865) 574-7839
Email wulschlegsd@ornl.gov

January 16, 2013

Dr. Hajo Eicken
Geophysical Institute
University of Alaska Fairbanks
P.O. Box 757320
Fairbanks, AK 99775-7320

Hajo,

I have read your proposal entitled “Research, Synthesis, and Knowledge Transfer in a Changing Arctic” and want to provide my full support to what represents a positive step forward in terms of promoting improved communication and collaboration who are working in high-latitude systems. Your plans and those of your colleagues, to guide and facilitate much-needed exchange of information among the scientific community are encouraging. I especially find exciting your thoughts on hosting Knowledge Exchange Workshops that will facilitate networking among stakeholders, agencies, and scientists. As Director of the Next-Generation Ecosystem Experiments (NGEE Arctic; <http://ngee-arctic.ornl.gov/>) project, sponsored by the Department of Energy, our team would welcome the opportunity to participate and contribute to these efforts. Not only would your proposed activities stimulate discussions and exchange of information among researchers interested in degradation of near-surface permafrost, but we could begin to engage others in a systems-level perspective of the Arctic. This would involve integration of our work with that of others working in diverse areas of sea ice, land-ice interactions, and in societal and policy arenas as well. This would be exciting activity for the SEARCH community to pursue and one that would likely benefit many efforts currently taking place in Alaska and beyond. The opportunities to provide leadership in these areas are many.

Good luck with your submission and let me know if and when I can contribute to this effort.

Sincerely,



Stan D. Wulschleger, Ph.D.
Climate Change Science Institute, Environmental Sciences Division
Oak Ridge National Laboratory
Oak Ridge, TN 37831-6301
Email wulschlegsd@ornl.gov

11 January 2013

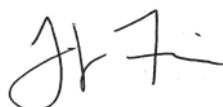
Dr. Hajo Eicken
Geophysical Institute
University of Alaska Fairbanks
P.O. Box 757320
Fairbanks, AK 99775-7320

Dear Dr. Eicken,

Following our e-mail conversation in recent weeks, this letter confirms my acceptance to serve as co-chair of the SEARCH Action Group addressing the 5-year goal to "Improve Understanding, Advance Prediction, and Explore Consequences of Changing Arctic Sea Ice." As discussed, the other co-chair, to be identified in the near future, will bring expertise in marine ecosystems to enable stronger integration of physical and biological system understanding and how they are responding to widespread Arctic change.

I look forward to working with you and the rest of the SEARCH Science Steering Committee on this important endeavor. If I can provide any further information, please do not hesitate to contact me.

Sincerely,



Jennifer Francis, Ph.D.

CURRICULUM VITA

Jennifer A. Francis

Institute of Marine and Coastal Sciences, Rutgers University
francis@imcs.rutgers.edu

Education:

1975-1978 **University of New Hampshire**, Durham, New Hampshire. Zoology major.
1985-1988 **San Jose State University**, San Jose, Cal.. B.S. in Meteorology, May 1988.
1988-1994 **University of Washington**, Seattle, Washington
Ph.D. in Atmospheric Sciences, August 1994. Dissertation title: *Arctic Process and Climate Studies with the TOVS Satellite Sounder*.

Employment:

10/1994- **Institute of Marine and Coastal Sciences**, Rutgers University, New Jersey
1995-2003 Assistant Research Professor, member of Graduate Program faculty
2003-2007 Associate Research Professor
2007- Research Professor I
Department of Environmental Sciences, Rutgers University
Full member of Graduate Program, Graduate Program in Atmospheric Sciences since Jan. 2006.
1988-1994 **Polar Science Center**, Applied Physics Laboratory, University of Washington
Graduate Research Assistant (Advisor: Dr. Drew Rothrock)

Graduate Student Advisees

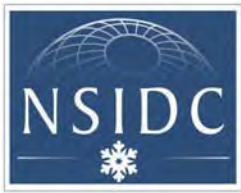
Ph.D. Students: Yonghua Chen (5/05), Natasa Skific (4/2009), Michael Foster (10/08).
M.S. Students: Linong Yan (10/03), Natasa Skific (11/05), Marc Chiacchio (1/01), David Groves (1/01, U. of WA).
Ph.D. committee: Weihang Chan, U. of Delaware

Five most relevant products

Francis, J.A. and S.J. Vavrus, 2012: Evidence linking Arctic amplification to extreme weather in mid-latitudes. *Geophys. Res. Lett.*, 39, L06801, doi:10.1029/2012GL051000.
Overland, J.E., **J.A. Francis**, E. Hanna, and M. Wang, 2012: The recent shift in early summer arctic atmospheric circulation, *Geophys. Res. Lett.*, doi:10.1029/2012GL053268.
Francis, J.A., W. Chan, D.J. Leathers, J.R. Miller, and D.E. Veron, 2009: Winter northern hemisphere weather patterns remember summer Arctic sea ice extent. *Geophys. Res. Lett.*, 36, L07503, doi:10.1029/2009GL037274.
Skific, N., **J.A. Francis**, and J.J. Cassano, 2009: Attribution of Projected Changes in Atmospheric Moisture Transport in the Arctic: A Self –Organizing Map Perspective. *J. Climate*, 22, 4135–4153, doi:10.1175/2009JCLI2645.1.
Serreze, M.C. and **J. Francis**, 2006: The Arctic amplification debate. *Climatic Change*, doi: 10.1007/s10584-005-9017-y.

Other related products	<p>Francis, J.A. and E. Hunter, 2007: Changes in the fabric of the Arctic's greenhouse blanket, <i>Env. Res. Lett.</i>, 2, doi:10.1088/1748-9326/2/4/045011.</p> <p>Francis, J.A. and E. Hunter, 2006: New insight into the disappearing Arctic sea ice. Feature article, <i>Eos Trans. of AGU</i>, 87, 509-524.</p> <p>Francis, J.A. and E. Hunter, 2007: Drivers of declining sea ice in the Arctic Winter, <i>Geophys. Res. Lett.</i>, 34, L17503, doi:10.1029/2007GL030995.</p> <p>Francis, J. A., D. M. White, J. J. Cassano, W. J. Gutowski, L. D. Hinzman, M. M. Holland, M. A. Steele, and C. J. Vorosmarty, 2009: An Arctic Hydrologic System in Transition: Feedbacks and Impacts on Terrestrial, Marine, and Human Life. <i>J. Geophys. Res.</i>, 114, G04019, doi:10.1029/2008JG000902.</p> <p>Skific, N., J.A. Francis, and J.J. Cassano, 2009: Attribution of Seasonal and Regional Changes in Arctic Moisture Convergence, <i>J. Climate</i>, 22, 5115–5134, DOI:10.1175/2009JCLI2829.1.</p>
Synergistic Activities	<p>NSF-funded project, Roles of Moist Static Energy Transport in the Changing Arctic System, completed in 2009.</p> <p>NSF-funded Collaborative Research, Roles of Clouds and Their Accomplices in Modulating the Trajectory of the Arctic System, 1/07-12/11, Collaborators: Drs. Stephen Vavrus (U. of Wisconsin) and Axel Schweiger (U. of Washington).</p>
Collaborators and Other Affiliations	<p>Dr. Yonghua Chen, NASA/GISS</p> <p>Dr. Natasa Skific, Rutgers University</p> <p>Dr. James Miller, Rutgers University</p> <p>Stephen Vavrus, University of Wisconsin</p> <p>Graduate Advisor: Dr. Drew Rothrock, University of Washington</p>

Total number of graduate students advised and postdoctoral scholars sponsored: 12



National Snow and Ice Data Center

World Data Center for Glaciology, Boulder

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January 10, 2013

To: Hajo Eicken, Geophysical Institute, University of Alaska

Re: SEARCH Proposal, Memo of participation and interest

Hello Hajo -

I am looking forward to working the SEARCH group mapping out strategies on the general problem of ice-ocean interaction — working with representatives from the funding agencies toward better integration across disciplinary lines, and supporting a data-gathering and logistical framework that aims us towards solutions to the thorny problem of decadal- to century-scale prediction of ice mass balance and sea level rise. I'm also very glad that Fiamma Straneo will co-lead the ice-ocean action group with me, and that Robert Bindshadler will remain involved. This is a good team, with a wide range of experience and perspective and some history of working well together.

As Bob Bindshadler related in his write-up, I've been interested in the general topic for several year, particularly from the in-situ instrumentation side. But more generally, I think the coming few decades require better intellectual and measurement integration across climate, cryosphere, and ocean studies. We are seeing that the pace of climate change in the Arctic is challenging our ability to respond. The Earth is changing so fast at the poles that science and observational systems are struggling to keep up.

In your notes sent late last week, you outlined a few ideas about how the funding might be used. At this time, I would expect to be a part of this for 2-3 years at least. In the first year, I think the best course would be to plan on using 4 weeks of support for my participation, and reduce or push post-doctoral support ahead in time to a point when we have clear tasking and ideas (in particular, work that leads to manuscripts, which generally are critical to a post-doctoral researcher).

I am excited and honored to be a part of this effort.

Sincerely,

Ted A. Scambos, Lead Scientist, NSIDC/CIRES, University of Colorado



Ted A. Scambos

PROFESSIONAL PREPARATION:

1977 B.S. Geology, State University of New York at Stony Brook
 1980 M.S. Geology, Virginia Polytechnic Institute and State University
 1991 Ph.D. Geology, University of Colorado
 1990-1993 Postdoctoral study at NASA Goddard Space Flight Center, Oceans & Ice;
 Glaciology and Remote Sensing.

APPOINTMENTS:

2004 Lead Scientist of Science Staff; National Snow and Ice Data Center (NSIDC),
 CIRES, University of Colorado, Boulder
 1993–2009 Research Scientist I, II, III, and Senior Research Scientist (successively), NSIDC
 1990 Postdoctoral Research Scientist, Hughes STX Corporation Goddard Space Flight Center
 1985 Graduate Research Assistant, University of Colorado
 1980 Geologist, Phillips Petroleum Corporation
 1977 Graduate Teaching Assistant Virginia Tech and State University

Research Interests and Outreach:

Ted Scambos' research has focused on the use of satellite data and field measurements to map the Antarctic ice sheet and its response to climate changes. He has developed several new methods of using satellite data and autonomous stations for ice flow mapping, topographic mapping, image enhancement, and grain size measurement. As part of the science team at NSIDC, he has contributed to studies of the recent Arctic sea ice decline and glacier retreat. He has also written about the history of Antarctic exploration.

Significant Publications:

Scambos, T. A., R. Ross, D. Ainley, T. Haran, J. Bohlander, K.-W. Seo, A. Behar, and D. R. MacAyeal, 2013. A camera and multi-sensor automated station design for polar physical and biological systems monitoring: AMIGOS. *Journal of Glaciology*, in press.

Straneo, F., P. T. Scambos; 2012. Challenges to understanding the dynamic response of Greenland's marine terminating glaciers to oceanic and atmospheric forcing. *Bulletin of the American Meteorological Society*, accepted.

Scambos, T., M. Frezzotti, and 10 others, 2012. Low-accumulation 'wind glaze' areas on the East Antarctic Plateau: implications for continental ice mass balance. *J. Glaciol.* 58(210), doi: 10.3189/2012JoG11J232.

Scambos, T., H. A. Fricker, C-C Liu, J. Bohlander, J. Fastook, A. Sargent, R. Massom, and A-W Lu, 2009. Ice shelf disintegration by plate bending and hydro-fracture: satellite observations and model results of the 2008 Wilkins Ice Shelf break-ups. *Earth and Planetary Sci. Lett.*, 280(1-4), doi:10.1016/j.epsl/2008.12.027.

Stroeve, J., M. Holland, W. Meier, T. Scambos, and M. Serreze, 2007. Arctic Sea Ice Decline: Faster than Forecast. *Geophys. Res. Lett.*, 34, L09501, doi: 10.1029/2007GL029703.

Fricker, H. A., T. A. Scambos, R. A. Bindshadler, and L. Padman, 2007. An active sub-glacial water system in West Antarctica mapped from space. *Science*, doi: 10.1126/science.1136897

Howat, I., I. Joughin, and T. Scambos, 2007. Rapid changes in ice discharge from Greenland outlet glaciers. *Science*, doi: 10.1126/science.1138478.

Scambos, T., T. Haran, M. Fahnestock, T. Painter, and J. Bohlander, 2007. MODIS Mosaic of Antarctica (MOA) data sets: Continent-wide ice surface morphology and snow grain size. *Remote Sensing of Environment*, 111 (2-3), 242-257, doi:10.1016/j.rse/2006/12/020.

Scambos, T. A., Hulbe, C., and Fahnestock, M. A., 2003. Climate-induced ice shelf disintegration in the Antarctic Peninsula. *In: Antarctic Peninsula Climate*, Ant. Res. Series vol. 79, 79–92.

AWARDS AND RECOGNITION:

Valedictorian of Earth and Space Sciences, SUNY Stony Brook 1977
 Harry Waldrop Graduate Student Award, U of Colorado Boulder 1987
 Univ. of Tasmania Visiting Fellow award 1997
 USGS names 'Scambos Glacier' in West Antarctica 2002
 Selected to Excellence in Leadership Program, U. Colorado 2010

SYNERGISTIC ACTIVITIES:

Mentored several undergraduate and high school students, introducing them to polar ice studies and scientific investigation: with Ben Haugen, B.S. Geology thesis on Arapaho Glacier (graduated summa cum laude); with Ian Brown of Tacoma, WA, a study of blue ice using Landsat imagery (published in *J. Glac.*); with Kyle Steike of Mt. Carmel, NY, a study of Barnes Ice Cap using images and elevation maps (won regional science fair, honorable mention in Westinghouse Science Talent Search).

Ten+ field seasons in Antarctica, to West Antarctica, East Antarctica, Antarctic Peninsula, and surrounding sea ice and icebergs; under US program, and on joint expeditions with the Australian, Argentine, and Norwegian programs (now, one planned with Korean program). Topics have been ice stream dynamics, megadune formation, sub-glacial lake studies, iceberg and ice shelf climate change evolution, and remote sensing cal-val.

Frequent spokesperson on climate change and polar events to the media: NPR, Time Magazine, BBC, New York Times; K-16 presentations and lectures.

COMMITTEE, EDITORIAL, AND PROJECT SERVICE:

Science Editor, Journal of Glaciology, Annals of Glaciology	2001 - present
Chair, NSF McMurdo Area User's Committee (MAUC)	2001 - 2005
Session chair at Fall AGU	6 times, 1997-2011
ICESat Science liason for NSIDC	2005 - present
Landsat Science Team	2012 - present
Co-PI, Landsat 7 Science Team	1997 - 2002

RECENT COLLABORATORS:

Robert Bindshadler NASA Goddard Space Flight Center
 Mark Fahnestock, University of New Hampshire
 Helen Amanda Fricker, Scripps Institute of Oceanography
 Christina Hulbe, Portland State University
 Christopher Shuman, NASA Goddard Space Flight Center
 Etienne Berthier, LEGOS, University of Toulouse, France

GRADUATE AND POST-DOCTORAL ADVISORS

Master's Degree at Virginia Tech: Dr. David Wones (deceased)
 Ph. D. Degree at University of Colorado: Dr. Lang Farmer
 Post-doctoral advisor at NASA/Goddard: Dr. Robert Bindshadler

GRADUATE AND POST-DOCTORAL ADVISEES

New Ph.D. student: Karen Alley (starting in Fall 2012)
 Current advisees: Dan McGrath, Mike MacFerrin, Mahsa Moussavi (advisory committee)
 Mr. Atsu Muto, Ph.D. Geography, University of Colorado, rec'd Dec 2010
 Dr. Ian Howat, post-doctoral appointment at NSIDC and APL/U. Washington
 Mr. John Maurer, Masters of Arts, Geography, University of Colorado, 2006
 Mr. Geir Kvaran, Masters of Arts, Geography, University of Colorado, 2000

**College of Liberal Arts and Sciences**

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Department of Biology

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352-392-3704

Dear Dr. Eicken

Jan. 10, 2013

I am happy to provide this letter of interest to serve as an interim Action Team Lead for the SEARCH goal theme "Document and Understand How Degradation of Near-Surface Permafrost Will Affect Arctic and Global Systems". As you have indicated in your proposal, the NSF-funded Permafrost Carbon Research Coordination Network that I currently run in collaboration with co-PI Dave McGuire at the University of Alaska Fairbanks has the potential for synergy with this new effort. Furthermore, lessons learned in the RCN project that aims to connect and synthesize field measurements in formats that can be used by regional and global models will be useful for the development of this new SEARCH Action Team. I look forward to the development of further collaboration along the lines of what is described in your proposal.

All the best,

A handwritten signature in black ink, reading "Edward A. Schuur". The signature is fluid and cursive, with the first name "Edward" and last name "Schuur" clearly legible.

Edward (Ted) Schuur
Associate Professor of Ecosystem Ecology
tschuur@ufl.edu

EDWARD ARTHUR GEORGE SCHUUR

Associate Professor of Ecosystem Ecology,
 Department of Biology, University of Florida, 220 Bartram Hall, Gainesville, FL 32611
 Phone: 352-392-7913; Fax 352-392-3993; Email: tschuur@ufl.edu

Education

University of Michigan, Cellular and Molecular Biology, B.S., *magna cum laude*, (1991)
 University of California/Berkeley, Soil Science/Ecosystem Ecology, Ph.D., (1999)
 University of California/Irvine, Bioinformatics/Isotopes, Postdoc Fellow (1999-2002)

Appointments

Associate Professor, Department of Biology, University of Florida (2008-present)
 Assistant Professor, Department of Botany, University of Florida (2002-2008)

Most Related Products (from >70 submitted or published papers).

1. **Schuur, E.A.G.**, B.W. Abbott, and 34 co-authors of the Permafrost Carbon Network. 2011. High risk of permafrost thaw. *Nature* 480:32-33.
2. Mack, M.C, M.S. Bret-Harte, T.N. Hollingsworth, R.R Jandt, **E.A.G Schuur**, G.R. Shaver, and D.L. Verbyla. 2011. Carbon loss from an unprecedented Arctic tundra wildfire. *Nature* 475:489-492. doi:10.1038/nature10283
3. McGuire A.D., R.W. Macdonald, **E.A.G. Schuur**, J.W. Harden, P. Kuhry, D.J. Hayes, T.R. Christensen, and M. Heimann. The carbon budget of the northern cryosphere region. *Current Opinion in Environmental Sustainability* 2:231-236, doi 10.1016/j.Cosust.2010.05.003.
4. **Schuur, E.A.G.**, J.G. Vogel, K.G. Crummer, H. Lee, J. O. Sickman, and T.E. Osterkamp. 2009. The effect of permafrost thaw on old carbon loss and net carbon exchange in upland tundra. *Nature* 459:556-559.
5. **Schuur, E.A.G.**, J. Bockheim, J. Canadell, E. Euskirchen, C.B. Field, et al. 2008. Vulnerability of permafrost carbon to climate change: Implications for the global carbon cycle. *BioScience* 58: 701-714.

Other Relevant Products

6. Grosse, G., J. Harden, M. Turetsky, A.D. McGuire, P. Camill, C. Tarnocai, S. Frolking, **E.A.G Schuur**, et al. 2011. Vulnerability of high latitude soil carbon in North America to disturbance. *J. Geophys. Res. Biogeosciences*, 116, G00K06, doi:10.1029/2010JG001507.
7. Tarnocai, C., J.G. Canadell, G. Mazhitova, **E.A.G. Schuur**, P. Kuhry, and S. Zimov. 2009. Soil Organic Carbon Pools in the Northern Circumpolar Permafrost Region. *Global Biogeochemical Cycles* 23, GB2023, doi:10.1029/2008GB003327.
8. Zimov, S.A., **E.A.G. Schuur**, and F.S. Chapin III. 2006. Permafrost in the global carbon budget. *Science* 312:1612-1613.
9. Randerson, J.T., S.D. Chambers, F.S. Chapin III, M.G. Flanner, M.L. Goulden, J.W. Harden, P.G. Hess, Y. Jin, H. Liu, M.C. Mack, J.C. Neff, G. Pfister, **E.A.G. Schuur** et al. 2006. The impact of boreal forest fires on climate. *Science* 314:1130-1132.
10. Mack, M.C.*, **E.A.G. Schuur***, M.S. Bret-Harte, G.R. Shaver, and F.S. Chapin III. 2004. Ecosystem carbon storage in arctic tundra reduced by long-term nutrient fertilization. *Nature* 431: 440-443.

Synergistic Activities

1. **Lead Organizer and Instructor.** Development and teaching of a short course to expand the application of radiocarbon measurements. Radiocarbon in Ecology and Earth System Science, taught July 2004-2011 in collaboration with Dr. Susan Trumbore. University of California, Irvine.
2. **Media and Public Outreach.** Interviews on global change in high latitude ecosystems for: Public Radio, LA Times, Reuters, Science News, Bioscience, Newsweek, BBC, Associated Press, Nature News, many others. Publication of a National Park Fact Sheet entitled Permafrost Thaw and Carbon Balance, distributed at Denali Park, Alaska
3. **Review Panels & Workshops:** Environmental Protection Agency, Science to Achieve Results (STAR) program. March, 2005, Washington DC; North American Carbon Program (NACP).

- May, 2003, Washington DC; NCEAS Working Group on the Vulnerability of Carbon in Permafrost: Pool size and Potential Effects on the Climate System, March & December 2006; Carbon Respired by Terrestrial Ecosystems Workshop. Durham, NH. 2007; LTER Disappearing Cryosphere. Mar 2009, Marine Biological Laboratory, Woods Hole, MA; DOE Arctic Deep Warming Experiment Workshop. Salt Lake, UT, 2009; NASA Vulnerability and Resilience of Subarctic and Arctic Landscapes (VuRSAL) Scoping Study. Fairbanks, AK, 2009; Arctic Council of Ministers' Cryosphere project SWIPA (Snow, Water, Ice, Permafrost in the Arctic) 2009-ongoing; NASA Interdisciplinary Science (IDS) Panel. January, 2010, Washington DC.
4. **Grant and Manuscript Reviewer** for multiple US and international agencies, and journals.
 5. **Steering Group Member.** Taiga Zone (D19) National Ecological Observation Network (NEON), 2009-ongoing. US Carbon Cycle Science Program, 2010-ongoing; DOE Next-Generation Global Change Experiment: Arctic Deep Warming. 2010-ongoing.

COLLABORATORS AND OTHER AFFILIATIONS:

B.W. Abbott (UAF), M.P.M. Aidar, Ron Amundson (UC Berkeley), E. Baath, T.M Barrett, Jenny Baseman (UAF), E.A Beever, D. Bhadra, N.B. Bliss, James Bockheim (U Wisconsin), B.M. Bolker, L. Bourgeau-Chavez, Breck Bowden (U Vt), M.S. Bret-Harte (UAF), D. Bronson, V. Brovkin, M. Bustamante, P. Camill (Bowdoin), Barbara Campbell (U Delaware), J.L. Campbell, Josep Canadell (CSIRO, Australia), Chanton (Florida State University), F. Stuart Chapin III (UAF), Torben Christensen (Lund University), P. Ciais, M. Clark, C. Coetsee, J.S. Conn, Joseph Craine (U Kansas), P.M. Crill (Stockholm U), L.K. Crone, Ben Crosby (U Idaho), Kathryn Grace Crummer (UF), C.I. Czimczik (UCI), D.V. D'Amore, Todd Dawson (UC Berkeley), Ellen Dorrepaal (Abisko), H.W. Ducklow (MBL), A.J. Elmore, E.S. Euskirchen (UAF), Mike Flinn (Appalachian State University), A.G. Fountain (Portland State), Nancy French, N. Fresco, Steve Frolking (UNH), S.E. Godsey (Idaho State), S.J. Goetz (WHRC), Mike Goosef (Penn State University), Tom Gower (U Wisconsin), G. Grosse (UAF), T.A. Handley, Tom Hansen (U Delaware), Jennifer Harden (USGS), H.J. Hawkins, Dan Hayes (Oak Ridge Nat Lab), Martin Heimann (Max Planck Institute), Terry Henkel (Humbolt State University), P.E. Hennon, Erik Hobbie (UNH), Teresa Hollingsworth (UAF) H.W. Hubberton, Gustaf Hugelius (Stockholm U), K.S. Inglett, R.R. Jandt, J.D. Jastrow, K.D. Johnson, Jill Johnstone (U Saskatchewan), Jeremy Jones (UAF), Torre Jorgenson (Ecoscience), A. Kahmen, J. Kampman, Evan Kane (Michigan Tech University), Mikhail Kanevskiy (UAF), K. Kielland (UAF), D. Kierstead, T. Kleinen, George Kling (U Michigan), K. Koba, C. Koven (Lawrence Berkeley Nat Lab), K. Krieger, G. Krinner, J.J. Kruse, Peter Kuhry (Stockholm University), J.R. Larouche (UVM), M. Lavoie, D.M. Lawrence (NCAR), M. Loranty (Colgate), R.W. Macdonald, Michelle Mack (UF), M.I. Makarov, S. Marchenko (UAF), Tim Martin (UF), Anthony D. McGuire (U of Alaska), Kendra McLauchlan (U of Kansas), A. Michelsen, G.B. Nardoto, Steve Oberbauer (Florida International University), Jon O'Donnell (UAF), Tom Osterkamp (UAF), A.P. Ouimette (UNH), P.P. Overduin, Linda Pardo (USDA Forest Service), T. Patterson, A.R. Pearce (U Vt), J. Penuelas, Chien-Lu Ping (University of Alaska), S.W. Polson, E.D. Rastetter, Peter Reich (University of Minnesota), W.J. Riley, Annette Rinke (Alfred Wegener Institute), Vladimir Romanovsky (UAF), Roger Ruess (UAF), T.S Rupp (UAF), A.B.K. Sannel, C. Schädel, C.S. Schaedel, K. Schaefer, L. Schirrmeister, Gaius Shaver (Woods Hole), Yuri Shur (UAF), James Sickman (UC Riverside), J. Sky, Elena Sparrow (UAF), S.E. Stammerjohn, Christine Staudhammer (U Alabama), W.D. Stock, J. Straub, Rob Streigl (USGS), Z.M. Subin, P.F. Sullivan, Charles Tarnocai (Agriculture and Agri-Food Canada), R. Tateno, Pamela Templer (Boston U), S.F Trainor, J.M. Trappe, Merritt Turetsky (U Guelph), D.W. Valentine, David Verbyla (UAF), Ross Virginia (Dartmouth), Mark Waldrop (USGS), K. M. Walter-Anthony, Jeff Welker (UAA), S. Wetterich, Kim Wickland (USGS), M.W. Williams, C.J. Wilson, J.M. Wolken, Joe Wright (STRI), J. Yarie (UAF), Sergei Zimov (NE Science Station)

Advisors: Charles Yocum, U Michigan (B.S.), Pamela Matson, Stanford University (Ph.D.), Susan Trumbore, Max Planck, Jena Germany (Postdoc).

Advisees: (Total 16) Koushik Dutta (Postdoc; Northern Minnesota, Duluth), Juan Posada (Postdoc; McGill University) Jason Vogel (Postdoc; Texas A&M), Susan Natali (Postdoc), Christina Schaedel (Postdoc), Rosvel Bracho (Postdoc), Kirsten Coe (Postdoc) Hanna Lee (Ph.D; NCAR), Jordan Mayor (Ph.D.; STRI), Elizabeth Fay Belshe (Ph.D.), Caitlin Hicks, (Ph.D), Verity Salmon (Ph.D.), Leslie Boby (M.S.), Andres Baron (M.S.), Christian Trucco (M.S.), Elizabeth Webb (M.S.).



WOODS HOLE OCEANOGRAPHIC INSTITUTION

Fiammetta Straneo, *Associate Scientist*

To: Hajo Eicken
Geophysical Institute, University of Alaska

Re: SEARCH Proposal, Land Ice Loss/Sea Level Rise Action Team

January 11th, 2013

Dear Hajo,

I hereby wish to express my interest in working with the SEARCH group to address the goals outlined in the 2012 white paper and, in particular, that of improving predictions of future land-ice loss and its impact on sea level rise (goal #3). This is a complex scientific problem of great societal relevance and one that I am very interested in. The plan proposed by SEARCH complements and extends the efforts of the U.S. CLIVAR Working Group on Greenland Ice Sheet Ocean Interactions (GRISO) which I co-chair. The GRISO Working group recently released a white paper summarizing the state of knowledge regarding Greenland Ice Sheet/Ocean Interactions and is organizing a scientific workshop, to be held in June 2013, which will foster interaction between the diverse scientific disciplines working at this problem. These activities will, I believe, provide the background for the Land Ice Loss Action Team for the novel approach proposed by SEARCH to bring together scientists, agencies and stakeholders.

I am therefore honored and looking forward to working with Ted Scambos and Bob Bindshadler in the Land Ice Loss Action Team. To their extensive experience in studying land-ice, I can contribute many years of research in the North Atlantic/Arctic regions and, more recently, on the oceanic forcing of Greenland's glaciers as well as a connection to the broader oceanographic community. I am willing to initially commit to 2-3 years of work with the Action Team and to assess at a later time, jointly with SEARCH, the benefits of serving for the full five years of the project.

Yours sincerely

Fiammetta Straneo

Fiammetta Straneo

Department of Physical Oceanography
 Woods Hole Oceanographic Institution (WHOI)
 Woods Hole, Massachusetts 02543
 Tel: (508) 289-2914; Fax: (508) 457-2181
[Email: fstraneo@whoi.edu](mailto:fstraneo@whoi.edu)

Education:

1992: Laurea cum Laude (with honors) in Physics, University of Milan, Italy. Advisor N. Pinardi
 1999: Ph. D. in Physical Oceanography, University of Washington. Advisor: M. Kawase

Employment:

2009-present: Associate Scientist with Tenure, Physical Oceanography Department, WHOI
 2006-2009: Associate Scientist, Physical Oceanography Department, WHOI
 2002-2006: Assistant Scientist, Physical Oceanography Department, WHOI
 1999-2002: Post-doctoral Scholar, CICOR, WHOI, Advisor R. Pickart

Products: (5 most relevant and 5 others)

Straneo, F., P. Heimbach, O. Sergienko, G. Hamilton, G. Catania, S. Griffies, R. Hallberg, A. Jenkins, I. Joughin, R. Motyka, L. Padman, W.T. Pfeffer, S.F. Price, E. Rignot, T. Scambos, M. Truffer, A. Vieli, Understanding the dynamic response of Greenland's Marine Terminating Glaciers to Oceanic and Atmospheric Forcing, *Bull. Amer. Meteor. Soc.*, in press.

Straneo, F., D. Sutherland, D. Holland, C. Gladish, G. Hamilton, H. Johnson, E. Rignot, Y. Xu, M. Koppes, 2012: Characteristics of ocean waters reaching Greenland's glaciers, *Annals of Glaciol.*, 53, 202-210.

Sutherland, D. and F. Straneo, 2012: Estimating ocean heat transports and submarine melt rates in Sermilik Fjord, Greenland, using lowered ADCP velocity profiles. *Annals of Glaciology*, 53, pp50-58.

St-Laurent, P., F. Straneo, D. Barber, 2012: A conceptual model of an Arctic sea. *J. Geophys. Res.*, 117, C06010, doi:10.1029/2011JC007652.

Andresen, C., F. Straneo, M.H. Ribergaard, A. Bjork, T. Andersen, A. Kuijpers, N. Norgaard-Pedersen, K.H. Kjaer, F. Schjoth, K. Weckstrom, A. Ahlstrom, 2011: Rapid response of Helheim Glacier, Greenland to climate variability over the last century. *Nature Geoscience*, doi:10.1038/ngeo1349, 5, 37-41.

Straneo, F., R. Curry, D.A. Sutherland, G. Hamilton, C. Cenedese, K. Väge, L.A. Stearns, 2011: Impact of fjord dynamics and subglacial discharge on the circulation near Helheim Glacier in Greenland. *Nature Geoscience*, doi:1038.ngeo1109, 4, 332-327.

Straneo, F., G. Hamilton, D.A. Sutherland, L.A. Stearns, F. Davidson, M. O. Hammill, G.B. Stenson, A. Rosing-Asvid. 2010. Rapid circulation of warm subtropical waters in a major glacial fjord off East Greenland. *Nature Geoscience*, 3, 182-186.

Sutherland, D. A., F. Straneo, S. Lentz, P. St-Laurent, 2011: Observations of fresh, anticyclonic eddies in the Hudson Strait outflow, *J. Mar. Sys.*, 88, 375-384.

Straneo, F., and F. Saucier, 2008. The outflow from Hudson Strait and its contribution to the Labrador Current. *Deep-Sea Research I*, 55, 926-946.

Straneo, F., 2006. On the connection between dense water formation, overturning, and poleward heat transport in a convective basin. *Journal of Physical Oceanography*, 36(9), 1822–1840.

Educational Activities:

MIT-WHOI Graduate Joint Program in Oceanography

Straneo is a faculty member of the MIT-WHOI Joint Graduate Program in Oceanography and holds the Seward Johnson/Education Coordinator Chair for Physical Oceanography. She teaches one course a year, including core and elective courses, and has developed several new interdisciplinary courses.

Graduate Students Advised or co-Advised: (7)

Rebecca Jackson (PhD Candidate, MIT-WHOI JP), Marilena Oltmanns (PhD Candidate, MIT-WHOI JP); R. Sciascia (PhD candidate U. Torino, co-advisor); Renske Gerderloos (Ph.D. 2012, Utrecht University, co-advisor); Tatiana Rykova (Ph.D. 2010, MIT-WHOI Joint Program); Pierre St. Laurent (Ph.D 2010, Univ. of Quebec at Rimouski); Dorotea Iovino (Ph.D. 2007, University of Bergen, co-advisor).

Post-docs Advised: (5)

Clark Richards (2012-), James Holte (2010-), Xujing Davis (2009-2011); Dave Sutherland (2008-2009; now faculty at U. of Oregon, OR); Carlos Moffat (2008-2009; now faculty at U. of Concepción, Chile), Julie Deshayes (2006-2008; now scientist at Laboratoire des Physique des Océans, CNRS, France)

Recent Lectures at Summer Schools:

2010 Advanced Course in Climate Dynamics - Ice-Sheet/Ocean Interactions, Norway, Principal Lecturer.
2011 Regional Climate Dynamics in the Mediterranean and beyond: An Earth System perspective, Valsavarenche, Italy, Principal Lecturer.

Synergistic Activities:

National and International Committees

- Co-Chair: Ice-Sheet/Ocean Interactions in Greenland, U.S. CLIVAR Working Group 2011-pres.
- Observing Change Panel, SEARCH, 2012-pres.
- Science Team: U.S. CLIVAR Atlantic Meridional Overturning Circulation (AMOC), 2009-pres.
- International Steering Committee: Arctic-Subarctic Ocean Fluxes (ASOF) 2009-pres.
- Steering Committee MPOWIR (Mentor Phys. Ocean. Women to Increase Retention) 2008-pres.

Reviewer: Science, GRL, Nature Geoscience, J. of Climate, J. Physical Oceanography, Atmosphere-Oceans, Deep-Sea Research, J. Geophysical Res., NSF, J. Mar. Systems, J. Mar. Res., NSERC (Canada), NERC (UK). Associate Editor Annals of Glaciology 2011.

Outreach and Science Dissemination Activities

Over the last year, Straneo has given talks about her research to numerous journalists, policy makers, independent research organizations and public outreach venues including several K-12 schools, the Museum of Science Boston, NECN cable network, the Weather Channel, WBZ Boston, NPR. Her research has been featured in numerous media including The New York Times, NPR, Der Spiegel, Liberation, The Guardian, German Public Radio and Television and Italian Public Television.

Associates and Collaborators Within Last Four Years: C. Andresen (GEUS); C. Cenedese, S. Das; R. Curry, T. Farrar, R. Pickart, A. Pluddeman; M. Spall, H. Singh; R. Weller (WHOI); S. Dery (UNBC); C. Gladish (NYU); T. Haine (JHU); G. Hamilton (U. Maine); P. Heimbach (MIT); D. Holland (NYU); C. Katsman (KNMI); R. Gelderloos (U Oxford); H. Johnson (U. Oxford); J. Lilly (NWRA); E. Rignot (JPL/NASA); T. Rossby (URI); O. Sergienko (GFDL), H. Søliland (IMR); L. Stearns (U. Kansas); P. St-Laurent (ODU); D. Sutherland (UO); K. Väge (UioB); I. Yashayaev (BIO).