

# Welcome and Introduction

## Pacific Arctic Group (PAG)

**Sung-Ho Kang**

Chair, Pacific Arctic Group

Director, Division of Polar Ocean Environment

Korea Polar Research Institute (KOPRI), Incheon, Republic of Korea

PAG Spring meeting

13 March 2016

University of Alaska Fairbanks (UAF)

Alaska, USA



<http://pag.arcticportal.org/>

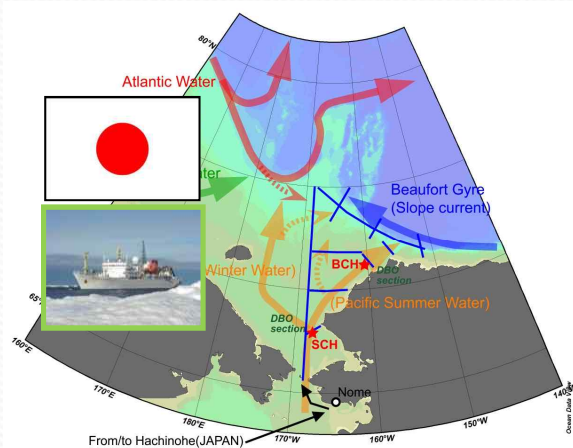
# Pacific Arctic Group

- The Pacific Arctic Group (PAG) is an informal group of organizations and individuals having **a Pacific perspective on Arctic science**. Originally organized under the International Arctic Science Committee (IASC), the PAG is now an **independent affiliate of the IASC** and has as its mission **to serve as a Pacific Arctic regional partnership to plan, coordinate and collaborate** on science activities of mutual interest. The PAG has established five objectives:
  - To identify gaps in knowledge and priority research needs across the Pacific Arctic Region and seek means to implement programs and activities that address them.
  - To facilitate and coordinate science operations among PAG member countries.
  - To promote and facilitate data accessibility and integrated data bases for the region.
  - To serve as a forum for information exchange on Pacific Arctic Region (PAR) science programs.
  - To establish and maintain a direct link between PAG and other relevant science organisations.

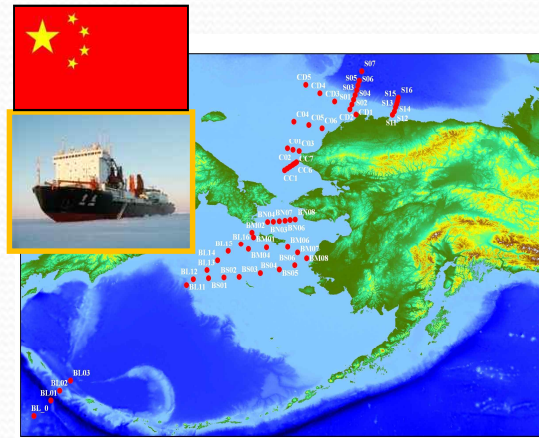


# PAG research cruises in Pacific Arctic Region

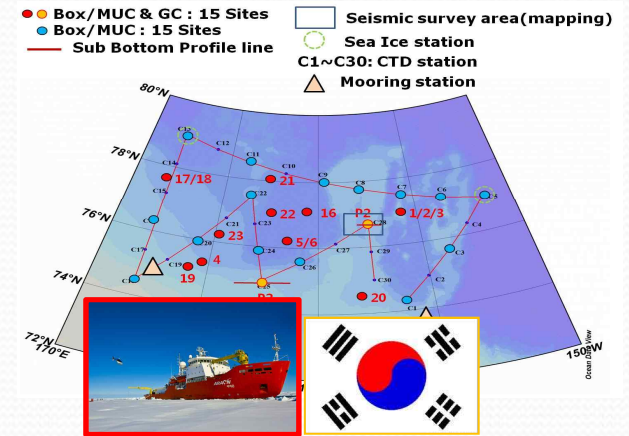
## Japan: RV Mirai



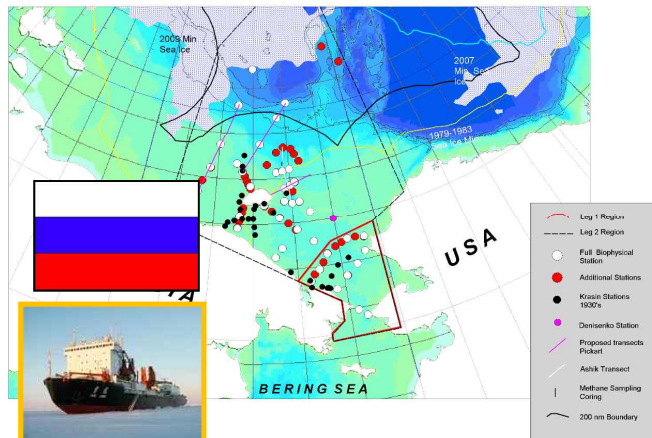
## China: RV Xuelong



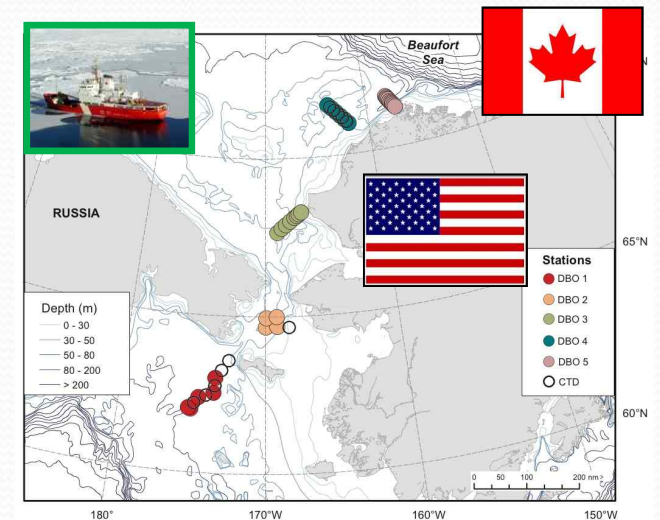
## Korea: RV Araon



## Russia-USA: RV Khromov



## Canada: CCGS Sir Wilfrid Laurier, Louis St. Laurent



## USA: Healy, RV Aquila, Brown etc.



# Sharing information on annual field activities

2015 PAG and DBO Field Season: Sampling Contributors (as of April 17, 2015)

Region Key: DBO1=So. St. Lawrence Is., DBO2=Chirikov Basin, DBO3=So Chukchi Sea, DBO4=NE Chukchi Sea, DBO5=Barrow Canyon.

Dates (Port calls)	Ship	DBO Region	Projects	PAG contact	Chief Scientist
May 13-June 19 (Dutch-Dutch)	Healy	---	Under-ice and open water blooms in the Chukchi Sea	Robert Pickart <a href="mailto:rpickart@whoi.edu">rpickart@whoi.edu</a>	Kevin Arrigo <a href="mailto:arrigo@stanford.edu">arrigo@stanford.edu</a>
June 30-July 8 (Nome-Nome)	Norseman 2	3	Bering Strait Mooring Project/AON	Rebecca Woodgate <a href="mailto:woodgate@apl.washington.edu">woodgate@apl.washington.edu</a>	Rebecca Woodgate <a href="mailto:woodgate@apl.washington.edu">woodgate@apl.washington.edu</a>
June-July	Norseman 2	-	Walrus tagging	Chad Jay <a href="mailto:cjay@usgs.gov">cjay@usgs.gov</a>	Chad Jay <a href="mailto:cjay@usgs.gov">cjay@usgs.gov</a>
July 8-17 (Anadyr-Anadyr)	Khromov	3	RUSALCA Bering Strait mooring	Kathy.Crane@noaa.gov <a href="mailto:Phyllis.Stabeno@noaa.gov">Phyllis.Stabeno@noaa.gov</a>	<a href="mailto:Kathy.Crane@noaa.gov">Kathy.Crane@noaa.gov</a>
July 4-29-August 15 (Dutch-Barrow)	Healy	5	AON	Robert Pickart <a href="mailto:rpickart@whoi.edu">rpickart@whoi.edu</a>	Robert Pickart <a href="mailto:rpickart@whoi.edu">rpickart@whoi.edu</a>
July 4-23 (Victoria, BC-Barrow)	Sir Wilfrid Laurier	1,2,3,4,5	C30/DBO	Jackie Grebmeier <a href="mailto:jgrebmei@umces.edu">jgrebmei@umces.edu</a>	<a href="mailto:Svein.Vagle@dfo-mpo.gc.ca">Svein.Vagle@dfo-mpo.gc.ca</a>
July 18-Sept 18 (Shanghai-return)	Xuelong	(1-2 partial), 3,5	Chinese Arctic Research Expedition	Jianfeng He <a href="mailto:jhe@pric.org.cn">jhe@pric.org.cn</a>	Jianfeng He <a href="mailto:jhe@pric.org.cn">jhe@pric.org.cn</a>
August 1-23 (Nome-Barrow) August 25- Sept 10 (Barrow-Nome)	Araon	3	ARA05, Korean Arctic Ocean Expedition (KOPRI)	Sung-Ho Kang <a href="mailto:shkang@kopri.re.kr">shkang@kopri.re.kr</a>	Leg 1 Eun Jin Yang <a href="mailto:ejyang@kopri.re.kr">ejyang@kopri.re.kr</a> Leg 2 Seung Il Nam <a href="mailto:sinam@kopri.re.kr">sinam@kopri.re.kr</a>
August 9-30 (Barrow-Tromso)	Oden	-	SEWUS-C3	Martin Jakobsson <a href="mailto:martin.jakobsson@geo.su.se">martin.jakobsson@geo.su.se</a>	Martin Jakobsson <a href="mailto:martin.jakobsson@geo.su.se">martin.jakobsson@geo.su.se</a>
August 18-Sept 8 (Barrow-Barrow)	Annika Marie	5	AON	Carin Ashjian <a href="mailto:cashjian@whoi.edu">cashjian@whoi.edu</a>	Carin Ashjian <a href="mailto:cashjian@whoi.edu">cashjian@whoi.edu</a>
August-October	Westward Wind	4* (modified)	CSESP	Tom Weingartner <a href="mailto:weingart@ims.uaf.edu">weingart@ims.uaf.edu</a>	Bob Day <a href="mailto:bday@abrinc.com">bday@abrinc.com</a> John Burns <a href="mailto:jburns@r@gci.net">jburns@r@gci.net</a>
Aug 30-Sept 12 (Dutch-Nome)	Alaska Endeavor	2	BASIS	<a href="mailto:Ed.Farley@noaa.gov">Ed.Farley@noaa.gov</a>	<a href="mailto:jim.murphy@noaa.gov">jim.murphy@noaa.gov</a>
Aug 25-Oct 6 (Japan-Dutch)	Mirai	-	JAMSTEC	Takashi Kikuchi <a href="mailto:takashik@jamstec.go.jp">takashik@jamstec.go.jp</a>	Shigeto Nishino <a href="mailto:nishinos@jamstec.go.jp">nishinos@jamstec.go.jp</a>
Aug 6 – Sep 4 (Kodiak-Dutch)	Brown	4,5	ARCWEST/CHAOZ-X	<a href="mailto:Sue.Moore@noaa.gov">Sue.Moore@noaa.gov</a> <a href="mailto:Catherine.Berchok@noaa.gov">Catherine.Berchok@noaa.gov</a>	<a href="mailto:Phyllis.stabeno@noaa.gov">Phyllis.stabeno@noaa.gov</a>
Sept 6-Sept 26 TENTATIVE!! (Nome-Dutch)	R/V Aquila	1,2,3,4,5 PAM moor + vis/PAM survey; 1,4,5 biophys. moor.	ARCWEST/CHAOZ-X	<a href="mailto:Sue.Moore@noaa.gov">Sue.Moore@noaa.gov</a> <a href="mailto:Catherine.Berchok@noaa.gov">Catherine.Berchok@noaa.gov</a>	<a href="mailto:Catherine.Berchok@noaa.gov">Catherine.Berchok@noaa.gov</a>
Sept 21-Oct 14 (Dutch-Kodiak)	Oscar Dyson	1	BASIS	Ed Farley : <a href="mailto:ed.farley@noaa.gov">ed.farley@noaa.gov</a>	Lisa Eisner : <a href="mailto:lisa.eisner@noaa.gov">lisa.eisner@noaa.gov</a>
September-October	Louis S St-Laurent	-	JOIS	<a href="mailto:Bill.Williams@dfo-mpo.gc.ca">Bill.Williams@dfo-mpo.gc.ca</a>	<a href="mailto:Bill.Williams@dfo-mpo.gc.ca">Bill.Williams@dfo-mpo.gc.ca</a>

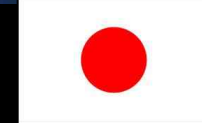
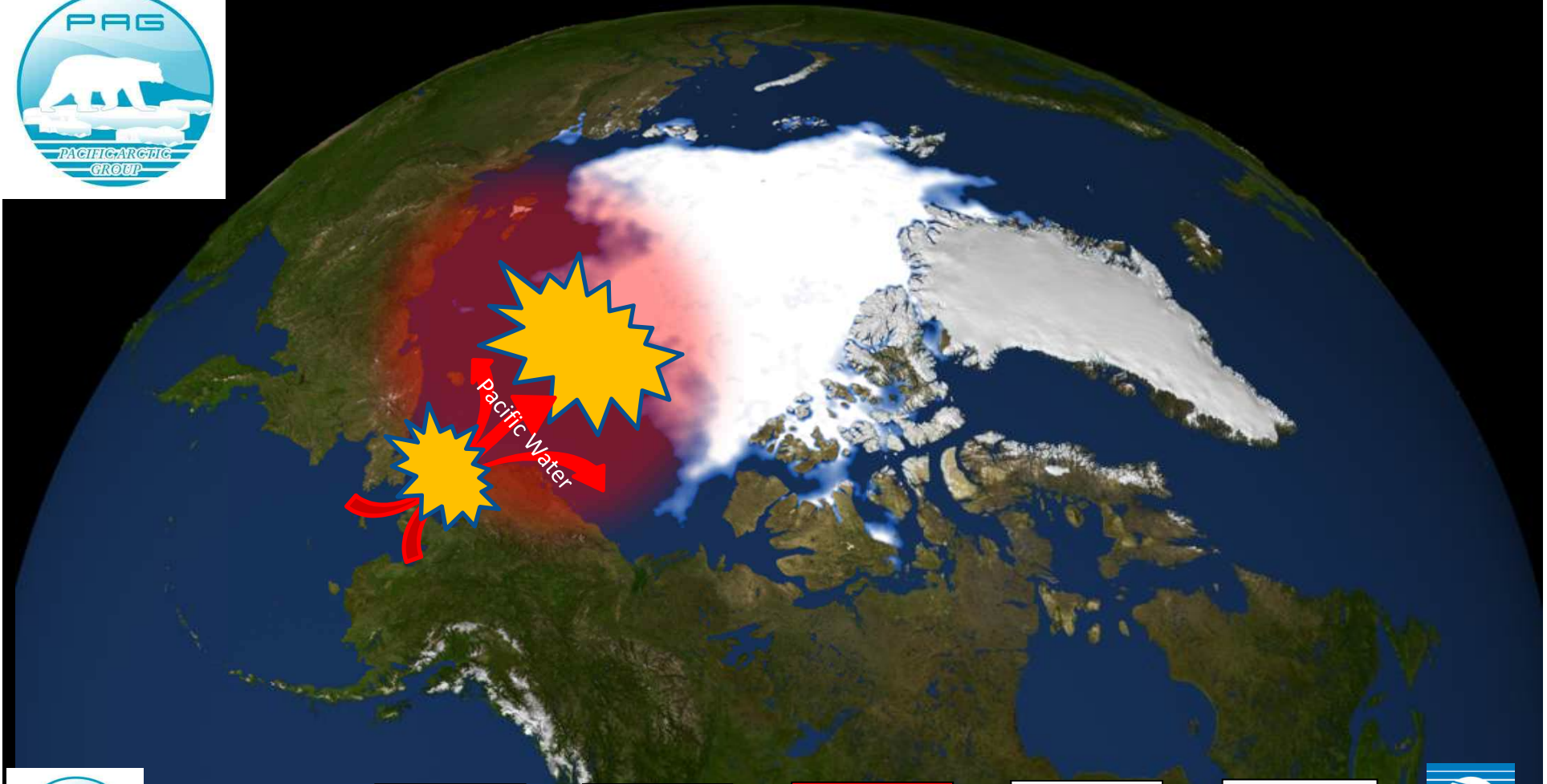


# Pacific Arctic Group

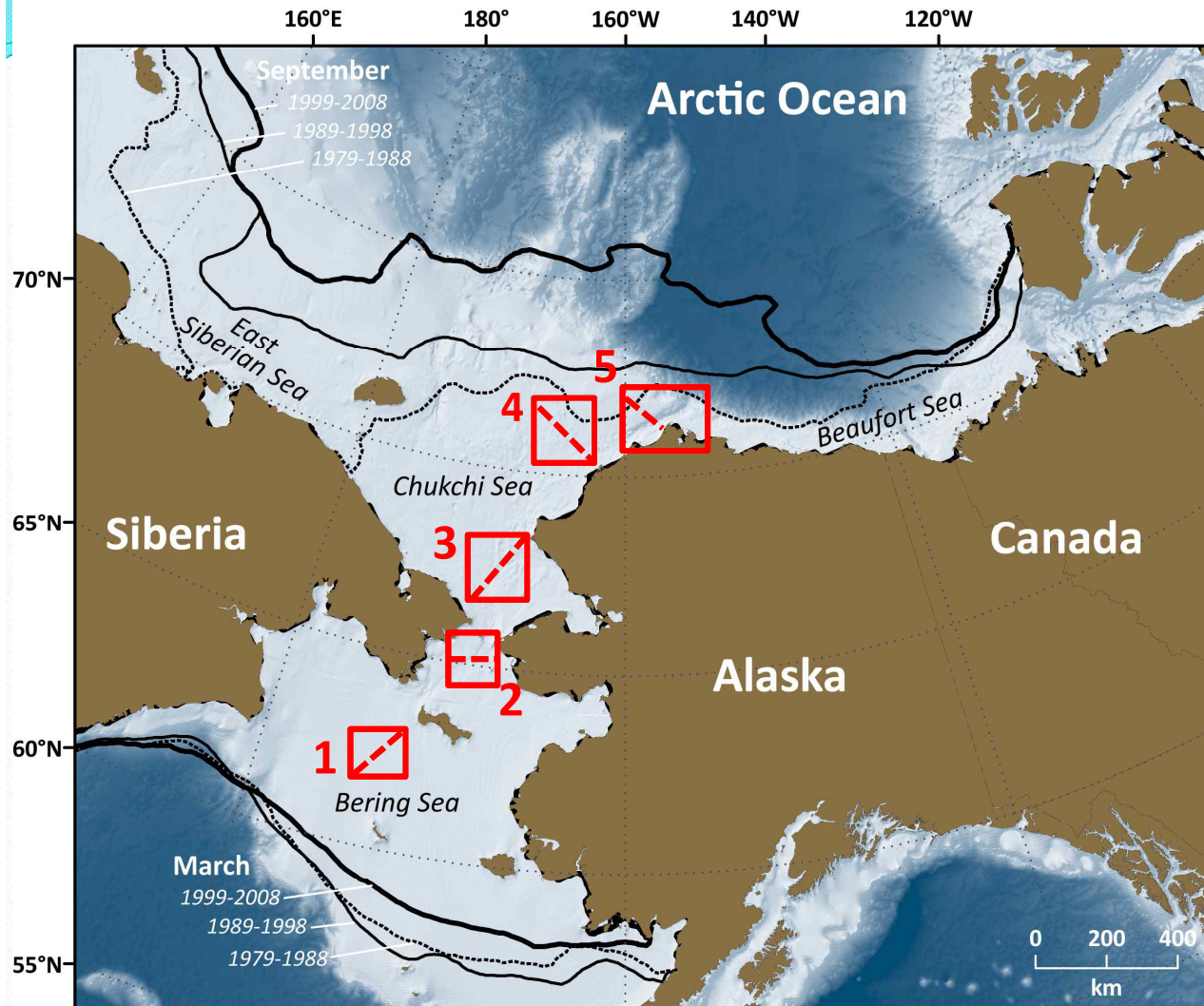
- PAG **shares information** on annual field activities in the Pacific Arctic region
- PAG **continues to develop and implement long-term monitoring activities** such as the Distributed Biological Observatory (DBO) and Pacific Arctic Climate Ecosystem Observatory (PACEO)
- PAG **undertakes Pacific Arctic regional, multidisciplinary syntheses of scientific findings** in the marine region relevant to ongoing scientific objectives at the core of the PAG
- PAG is engaged in **project development and sampling in the Pacific Arctic region** to investigate climate, oceanography, air-sea ice interactions, physical oceanography, and modeling



PAG is engaged in **project development and sampling in the Pacific Arctic region** in rapid transition to investigate climate, oceanography, air-sea ice interactions, physical oceanography, and modeling



## Continued development and implementation of long-term monitoring activity in the lower Pacific Arctic - the Distributed Biological Observatory (DBO)



[modified by Karen Frey from Grebmeier et al. 2010, EOS 91]

- DBO sites (red boxes) are regional “hotspot” transect lines and stations located along a latitudinal gradient
- DBO sites are considered to exhibit high productivity, biodiversity, and overall rates of change
- DBO sites will serve as a change detection array for the identification and consistent monitoring of biophysical responses
- Sites occupied by national and international entities with shared data plan



# The 3<sup>rd</sup> DBO Workshop NOAA, PMEL 9-10 March 2016, Seattle, WA

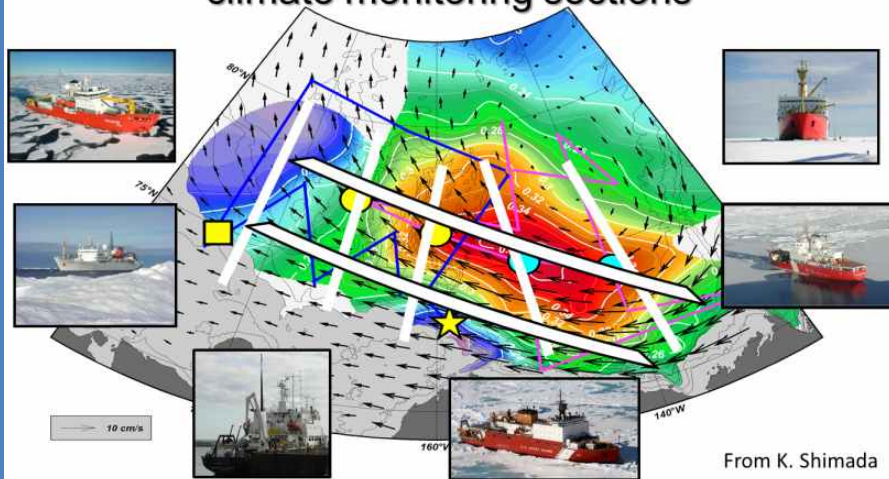


## Objectives of the workshop

- Present results from the 2010-2015 DBO field program and commit to multidisciplinary papers to showcase results of the DBO international effort
- Evaluate the DBO data submission effort through the EOL DBO Metadata site and linkage to other national archives
- Review US-IARPC Draft DBO Implementation Plan + International 10-year future efforts



## Proposed international Pacific Arctic climate monitoring sections



From K. Shimada

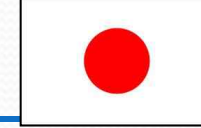
Background color: dynamic height at 100dbar relative to 800dbar from Mirai and Louis S. St-Laurent 2008 cruises (Oceanic Beaufort Gyre)

Black vectors: average sea ice motion vectors for Nov. 2007- Apr. 2008 (Sea Ice Beaufort Gyre)

Symbols: Mooring array in 2012-2013 (TUMSAT/KOPRI/NIPR & WHOI)

## New development and of long-term monitoring activity in the higher Pacific Arctic - the Pacific Arctic Climate Ecosystem Observatory (PACEO)

- **In the higher Pacific Arctic** that could provide valuable data to forecasters and modelers of climate change impacts on and surrounding the Arctic reaching to the mid-latitudes.
- The area of observing interest includes the **outer shelf of the East Siberian and Chukchi Seas northwards to 80° N** and extending from the **Makarov Basin in the West to the Canada Basin in the East**.





Integrating Arctic Research - a Roadmap for the Future

3rd International Conference on Arctic Research Planning ICARP III



### current ICARP III partners





3RD INTERNATIONAL CONFERENCE  
ON ARCTIC RESEARCH PLANNING

## Research priorities

### [1] The Role of the Arctic in the Global System

- Assessing and understanding rapid Arctic climate change and Arctic amplification, including their impact on atmosphere and ocean circulation and connections to the global climate system;
- Focusing on the dramatically shrinking sea ice cover, understanding the origins of this change and its impact on the extra-Arctic and the global climate system;
- Improving our understanding of the physical interrelation between the Arctic and the extra-Arctic, e.g., by assessing the impact of the mid-latitudes on Arctic amplification and vice versa;
- Enhancing our understanding of the fully coupled physical climate system [atmosphere-ocean-ice] on diverse space and time scales and the physical mechanisms of Arctic amplification and its connection to mid-latitude extremes of episodic nature and the factors influencing severe weather events;
- Linking studies across all spheres: biosphere, social sphere and the physical spheres [atmosphere, hydrosphere, cryosphere, lithosphere, political and economic systems, etc.]; and
- Defining worldwide implications of a globalized Arctic within the Anthropocene.

be made and integrated with new and innovative modeling approaches to provide more timely information to Arctic residents and policy-makers alike. The Arctic requires a collaborative, co-designed and integrated Arctic observing system of systems, relying on concerted ground observations, remote sensing, modeling and traditional and local knowledge. Examples of building blocks for this observing system of systems include the Multidisciplinary drifting Observatory for the Study of Arctic Climate Change [MOSAiC], the Circumpolar Biodiversity Monitoring Program [CBMP], the Pacific Arctic Group [PAG] Climate Observatory System and the Global Terrestrial Network for Permafrost [GTN-P]. This observing system of systems should form the foundation for renewed efforts to develop coupled environmental and socio-economic models, with a focus on predictions at the local, regional and circumpolar level. Focus should be given to:

### [2] Observing and Predicting Future Climate Dynamics and Ecosystem Responses

- Establishing a robust, sustained, co-designed and participatory observing system of systems, as reflected in the ongoing efforts of Sustaining Arctic Observing Networks [SAON], relying on existing and new networks and infrastructure and innovative experiments to generate environmental and socio-economic observations to improve our ability to predict local, regional and global processes;
- Establishing flagship observatories as part of this observing system of systems to provide comprehensive measurements over the entire Arctic region;
- Developing an international agreement for standards and maintenance of key observing systems;
- Supporting international efforts to make Arctic data and metadata easily accessible, such as the SAON/ IASC Arctic Data Committee [ADC];
- Facilitating knowledge transfer between environmental, socio-economic and traditional and local knowledge, making use of platforms, such as the CryoNet component of the Global Cryosphere Watch [GCW], the International Network for Terrestrial Research and Monitoring in the Arctic [INTERACT] and the Circumpolar Arctic Coastal Communities Observatory Network [CACCON];
- Supporting the development and deployment of new technology to improve our understanding of the physical, ecological and social environments of the Arctic, including unmanned vehicles, remote sensing, autonomous systems and telemedicine, among others;
- Focusing on fully coupled modeling, i.e., air-ice-sea interactions, in order to provide reliable weather forecasts, decadal predictions and rapid prediction of extreme events as a major contribution to the Year of Polar Prediction [YOPP], allowing the development of tools required to facilitate rapid decision-making at local, regional and global scales;
- Fully integrating ice-shelf dynamics, permafrost, ecology and economics into existing modeling frameworks, including models used in the Intergovernmental Panel on Climate Change [IPCC] framework, allowing improved representation of complex processes;
- Making more effective use of traditional and local knowledge by engaging northern and indigenous communities and involving local, regional and global stakeholders in the co-design of sustained observation systems and models to help define mitigation and adaptation strategies.

### [3] Understanding the Vulnerability and Resilience of Arctic Environments and Societies and Supporting Sustainable Development

- Concentrating on research to harvest and manage living and non-living Arctic resources in a sustainable manner, including risk-based assessments, and to understand the consequences of continued resource development;
- Performing integrative analyses of sustainability and actionable adaptation policies and challenges for Arctic communities;
- Understanding impacts of extreme weather events that result in temporary changes, such as snow melt and have ecological and societal impacts;
- Assessing the diverse impacts of climate change and human activities on Arctic biodiversity and its consequences for ecosystem goods and services and societal impacts;
- Understanding long-term human responses to Arctic change, including in the areas of food and water security;
- Developing integrated sustainability indicators to assess conditions and dynamics of Arctic social-ecological systems;
- Examining the role of institutions, resources, traditional and emerging economies as factors and instruments of sustainable development;
- Examining the role played by equity, agency, power and justice along key axes of difference in the Arctic, i.e., gender, age and identity;
- Examining sustainable development and infrastructure in urban areas, recognizing that with Arctic warming and greater accessibility to Arctic resources, urbanization is likely to continue.

# Pacific Arctic Group

- The **Spring PAG meeting** is held during Arctic Science Summit Week and are focused on **“business” issues** and an **update on research plans** for the coming field season.
- The **Fall PAG meeting** is hosted at various locations in alternating PAG countries after the field season and is focused on **review of accomplishments** during the previous summer and outlooks for the future. These discussions are useful **in developing scientific exchanges and other types of collaborations during and after field operations.**
- The **spring 2016 PAG meeting** will provide country updates on 2016 field activities and on the developing Pacific Arctic Climate Ecosystem Observatory (PACEO) and shelf-basin exchange lines, sea ice studies, the Distributed Biological Observatory (DBO), and ongoing synthesis activities.



# Pacific Arctic Group 2016 Spring Meeting Agenda



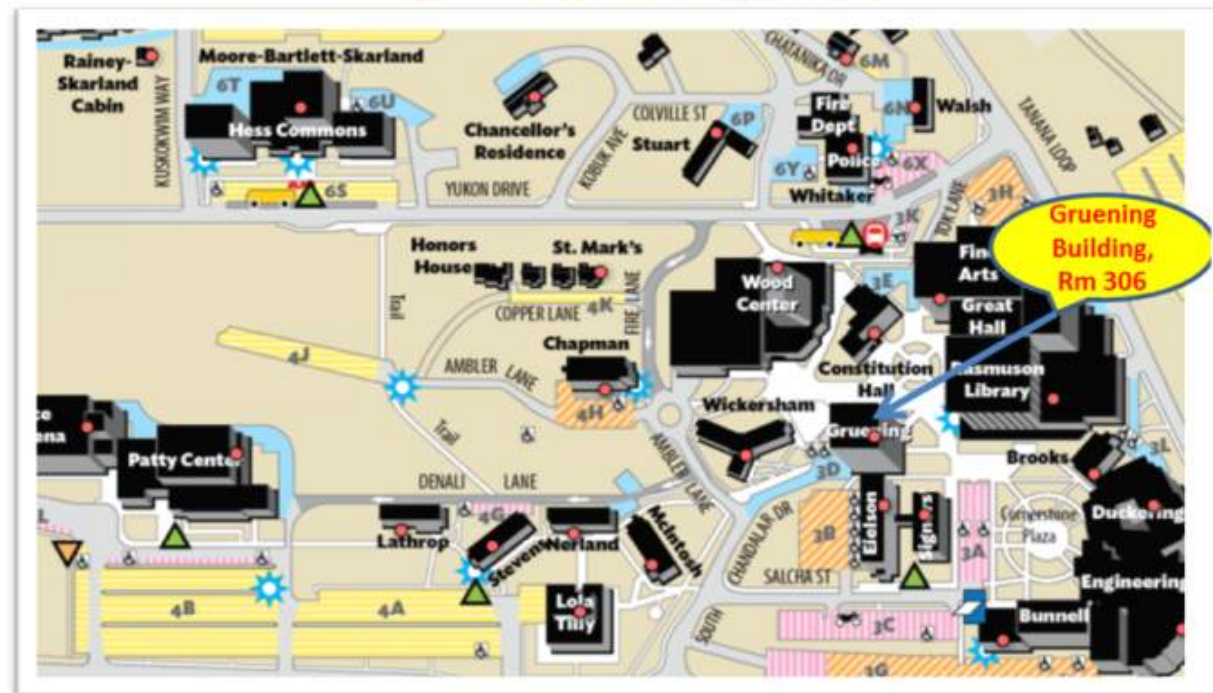
(PAG, <http://pag.arcticportal.org/>)

**Arctic Science Summit Week, Fairbanks, Alaska, USA**

**Date: 13 March 2016, (9:00 – 17:00)**

**Venue: University of Alaska Fairbanks (UAF), Gruening Bld, Rm 306**

<http://www.uaf.edu/campusmap/>



## Introduction and Welcome (Sung-Ho Kang)

### Agenda items

1. Update plans for 2016 field season
  - Canada: **Bill Williams**
  - China: **Jianfeng He**
  - Japan: **Takashi Kikuchi**
  - Korea: **Eun Jin Yang**
  - Russia: **Sergei Priamikov**
  - United States: **Jackie Grebmeier**
  
2. Updates for planning of PAG joint field and modeling activities
  - C/Basin and shelf-basin exchange lines (**Koji Shimada**)
  - RUSALCA program (**Jeremy Mathis, Aleksey Ostrovskiy**)
  - NABOS (**Igor Polyakov**)
  - Satellite Observations (**Hyun-Cheol Kim**)
  - Sea ice and atmosphere (**Joo-Hong Kim**)
  - Modeling activities (**Xiandong Zhang, Jia Wang, Baek Min Kim**)
  - Coordination of Mooring Activities (**Phyllis Stabeno, Kyung Ho Cho**)
  - Long-term planning for Joint Program Scientific Research and Monitoring in the central Arctic Ocean and adjacent shelf areas (**Phil Mundy**)
  - Arctic Observing Summit (AOS) – Potential directions to pursue in regards to coordinated observation in the Pacific Arctic sector (**Hajo Eicken**)
  - Other updates or proposals for new activities?



3. Status report on PAG-endorsed DBO and PACEO ongoing and planned future activities (**Jackie Grebmeier**-lead, with results from others beyond presented in country reports)

- The 3rd DBO data meeting; data management and policy; DBO publication (**Jackie Grebmeier**)
- Brief highlight of science findings from the DBO program, examples of results 2010-2015 (**Jackie Grebmeier**)
- Results from Pilot PACEO program in 2015 and plans for 2016 field activities
  - Physical Oceanography (**Kyung Ho Cho, Koji Shimada, Hajime Yamaguchi**)
  - Sea Ice Dynamics (**Joo-Hong Kim, Jinping Zhao**)
  - Carbon cycling and Ocean Acidification (**Jessica Cross**)
  - Biogeochemical Oceanography (**Carin Ashjian, Jinyoung Chung, Sun Yong Ha**)
  - Ecosystem (**Eun Jin Yang, Hyoung Sul La, Jackie Grebmeier, Lee Cooper**)
- Other updates or proposals for new activities?



#### 4. Data sharing issues

- Update on DBO data archive and metafile input (**Jackie Grebmeier**)
- Web GIS for PAG (**Hyun-Cheol Kim**)

#### 5. PAG Synthesis activities

- Biogeosciences – Special Issue Update (**Takashi Kikuchi**)
- Other plans?

#### 6. Interactions with other organizations – IASC, SAON, FARO, others

- ICARPIII update (**Sung-Ho Kang**)
- North Pacific Research Board's Arctic Program (**Danielle Dickson**)
- CAFF/PAME/AMAP activities (**Phil Mundy**)
- Gordon Research Conference/Seminar, March 2017, CA (**Jackie Grebmeier**)
- ASSW 2017 Science Symposium (**Takashi Kikuchi**, SSC of the ASSW 2017)
- ART (Arctic in Rapid Transition) (**Monika Kędra**)
- Arctic Waterways Safety Committee (**Renee Crain, Lee Cooper**)
- Others? (**Seth Danielson, Sue Moore, Sei-Ichi Saitoh, Liyang Zhan, Catherine Mecklenburg, Renee Crain, Ho Kyung Ha**)





## 7. PAG structure

- Executive committee composed of PAG Chair, Vice-Chairs, and leads from each of PAG activities: DBO (Jackie Grebmeier), Canada Basin, PACEO (Koji Shimada), sea ice-atmosphere (Joo-Hong Kim)
- Current rotation plan: Chair and Secretariat
- 2014-2016 – Korea (Sung-Ho Kang, KOPRI)
- 2016-2018 – Japan (TBD)
- 2018-2020 – Canada, Russia, China, USA?

## 8. Future PAG meetings

- Fall 2015 – Incheon, Korea (1.5 day)
- ASSW 2016 – Fairbanks, Alaska (1 day)
- **Fall 2016 – Qingdao, China (1.5 day)**
- ASSW 2017 – Prague, Czech Republic
- Fall 2017 – Tokyo, Japan
- ASSW 2018 – Davos, Switzerland
- Fall 2018 – Canada or Russia?

## 9. others?

## 10. End of meeting

