

Pacific Arctic Group: USA Country Report

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University of Maryland Center for Environmental Science, Chesapeake
Biological Laboratory, Solomons, Maryland, USA



PACIFIC ARCTIC GROUP 2016 MEETING

OCTOBER 27, 2016
SOPHIA INTERNATIONAL HOTEL
QINGDAO, CHINA



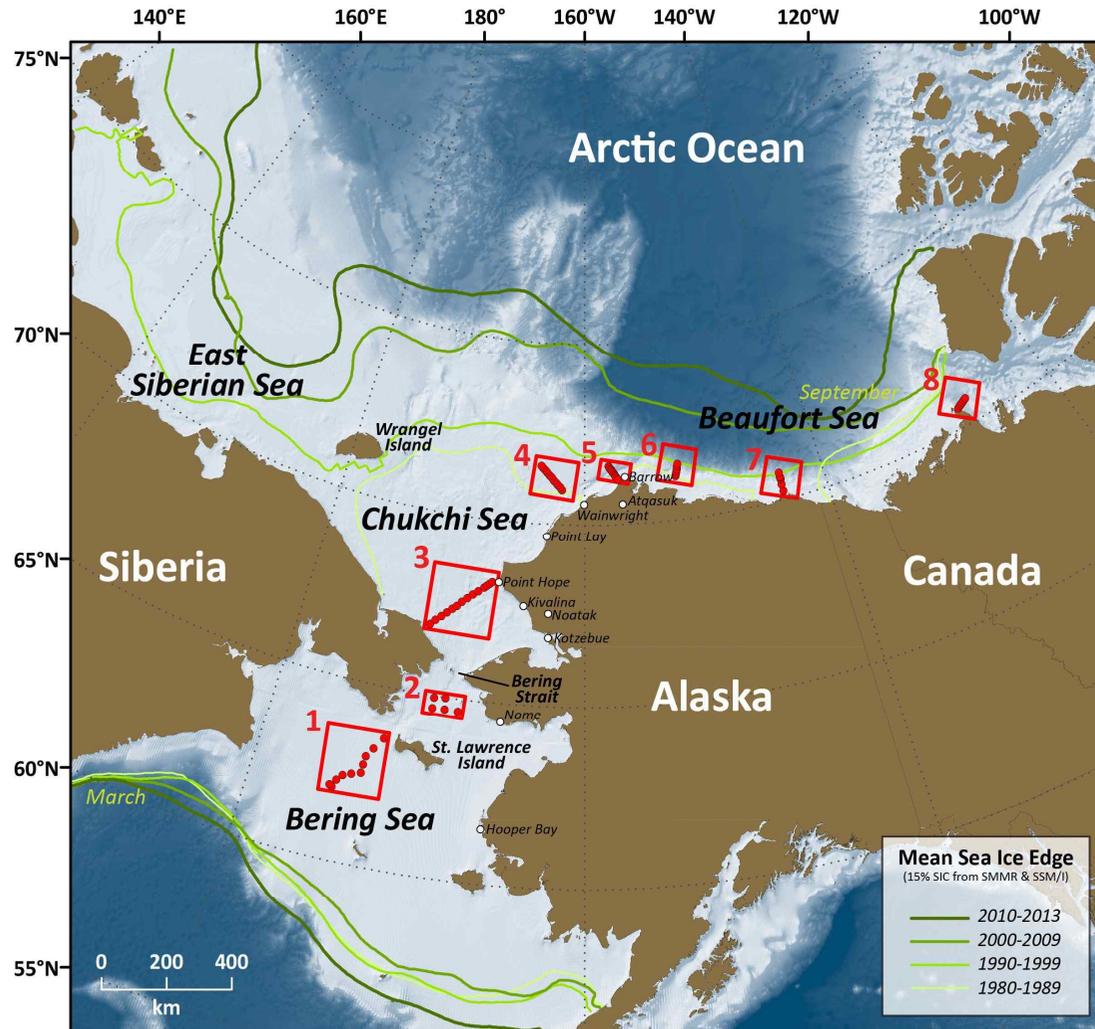
<http://pag.arcticportal.org>

2016 PAG and DBO Field Plan

2016 PAG and DBO Field Season (10_24_16): Sampling Contributors. Projects Key: AON=US Arctic Observing Network (National Science Foundation); ArCS=Arctic Challenge for Sustainability; C30=Canada's Three Oceans; CHINARE=Chinese Arctic Research Expedition; DBO=Distributed Biological Observatory, JAMSTEC= Japan Agency for Marine-Earth Science and Technology; KOPRI = Korea Polar Research Institute; NOAA=National Oceanic and Atmospheric Administration; Office of Naval Research (ONR) Marginal Ice Zone (MIZ) project; PMEL=Pacific Marine Environmental Laboratory; RUSALCA=Russian-American Long-term Census of the Arctic. **DBO Region Key:** DBO1=So. St. Lawrence Is., DBO2=Chirikov Basin, DBO3=So Chukchi Sea, DBO4=NE Chukchi Sea, DBO5=Barrow Canyon, DBO6=East Beaufort Sea, DBO7=Beaufort Sea Central, DBO8=Bathurst polynya region.

Dates (Port calls)	Ship	DBO Region	Projects	PAG contact	Chief Scientist
July 7-15 (Nome-Nome)	Norseman II	3	Bering Strait Mooring Project/AON	Rebecca Woodgate woodgate@apl.washington.edu	Rebecca Woodgate woodgate@apl.washington.edu
July 1-22 (Victoria, BC-Barrow)	Sir Wilfrid Laurier	1,2,3,4,5	C30/DBO (AON)	Jackie Grebmeier jgrebmei@umces.edu	Svein Vagle Svein.Vagle@dfo-mpo.gc.ca
July (2-Aug 10 (Seward- Seward)	Healy	- (Arctic Basin)	NOAA Ocean Exploration	Russell Hopcroft rrhopcroft@alaska.edu	Russell Hopcroft rrhopcroft@alaska.edu
July 11-Sept 28	Xuelong	3, 5+Arctic Basin	CHINARE	Jianfeng He hejianfeng@pric.org.cn	Jianfeng He hejianfeng@pric.org.cn
Aug 5-25	Araon	3+Chukchi Borderland+ East Siberian Sea	Korean Expedition (KOPRI) ocean and Sea-ice researches	Sung-Ho Kang shkang@kopri.re.kr	Leg 1 - Eun-Jin Yang ejyang@kopri.re.kr
Aug 27-Sept 10		Chukchi Borderland	Geophysical/paleoceanographic researches	-same	Leg 2 - Young Ken Jin ykjin@kopri.re.kr
Aug 15-Sept 16	Healy	-	Navy	-NA	Navy/Worester
Aug 22-Oct 5	Mirai	3,5+Arctic Basin	Japanese ArCS	Takashi Kikuchi takashik@jamstec.go.jp	Shigeto Nishino nishinos@jamstec.go.jp
Aug-Sept	TBD	3,4,5	NOAA/PMEL	Phyllis.Stabeno@noaa.gov	Phyllis.Stabeno@noaa.gov
August-Sept	Sikuliaq	3,4,5,6	Arctic N Fixation Arctic Productivity/	rccrain@nsf.gov .	Laura Juranek ljuranek@coas.oregonstate.edu ; Rachel Sipler
Aug 24-Oct 4	Oscar Dyson F/V Cape Flattery	1 2	NOAA/AFSC/EMA/FOCI	jeanette.gann@noaa.gov	lisa.eisner@noaa.gov
Sept 19-Oct 6	Healy	-	UNCLOS	Rene.crain@nsf.gov	Larry Mayer larry@ccom.unh.edu
Oct 3-11	Sir Wilfrid Laurier	4,8	C30	Bill.Williams@dfo-mpo.gc.ca	Humfrey.Melling@dfo-mpo.gc.ca
Oct-Nov	Sikuliaq	Arctic Basin	ONR Acoustics	M. Badley/Arctic Shelf-Basin/Sonar Performance	Navy/ONR

Linking Physics to Biology: the Distributed Biological Observatory (DBO)



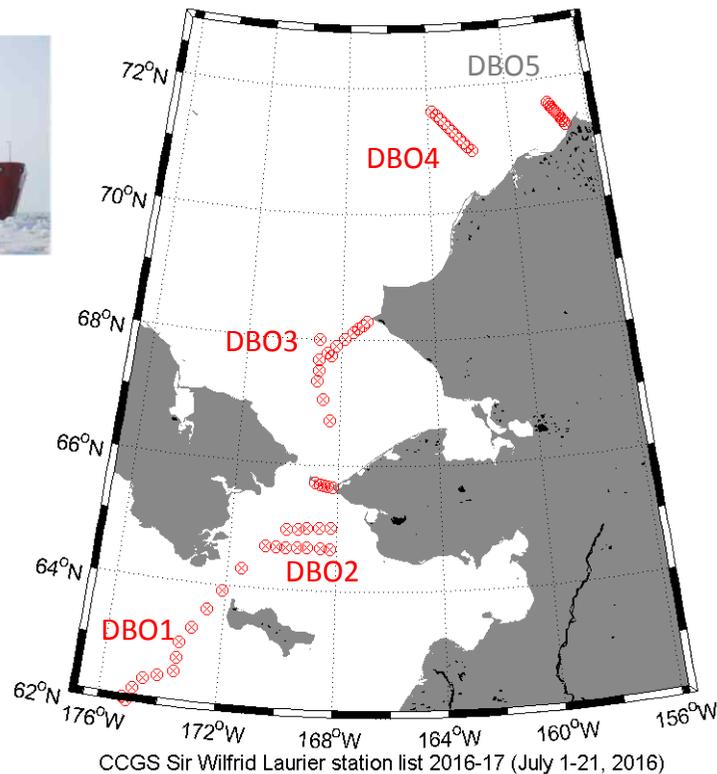
- DBO sites serve as a change detection array for consistent monitoring of biophysical responses





Canada's Three Oceans (C3O) and the Distributed Biological Observatory (DBO): *CCGS Sir Wilfrid Laurier*, July 10-22, 2016

Focus: sampling along latitudinal transect lines developed as a “change detection array” for consistent monitoring of biophysical responses to changing environmental conditions



Estimated Timeline:

- July 14-south St. Lawrence Island (**DBO1**)
- July 15-Chirikov Basin (**DBO2**)-added 7 new stations (3 full, 4 CTD only)
- July 17: SE Chukchi Sea (**DBO3**)-closest station 5 nm from coast, estimate time within 12 nm to be 2 hrs
- July 19: NE Chukchi Sea off Wainwright (**DBO4**)-closest station 30 nm offshore
- July 20: off Barrow (**DBO5**)-closest station 5 nm from coast, estimate time within 12 nm to be 2 hrs-too much ice

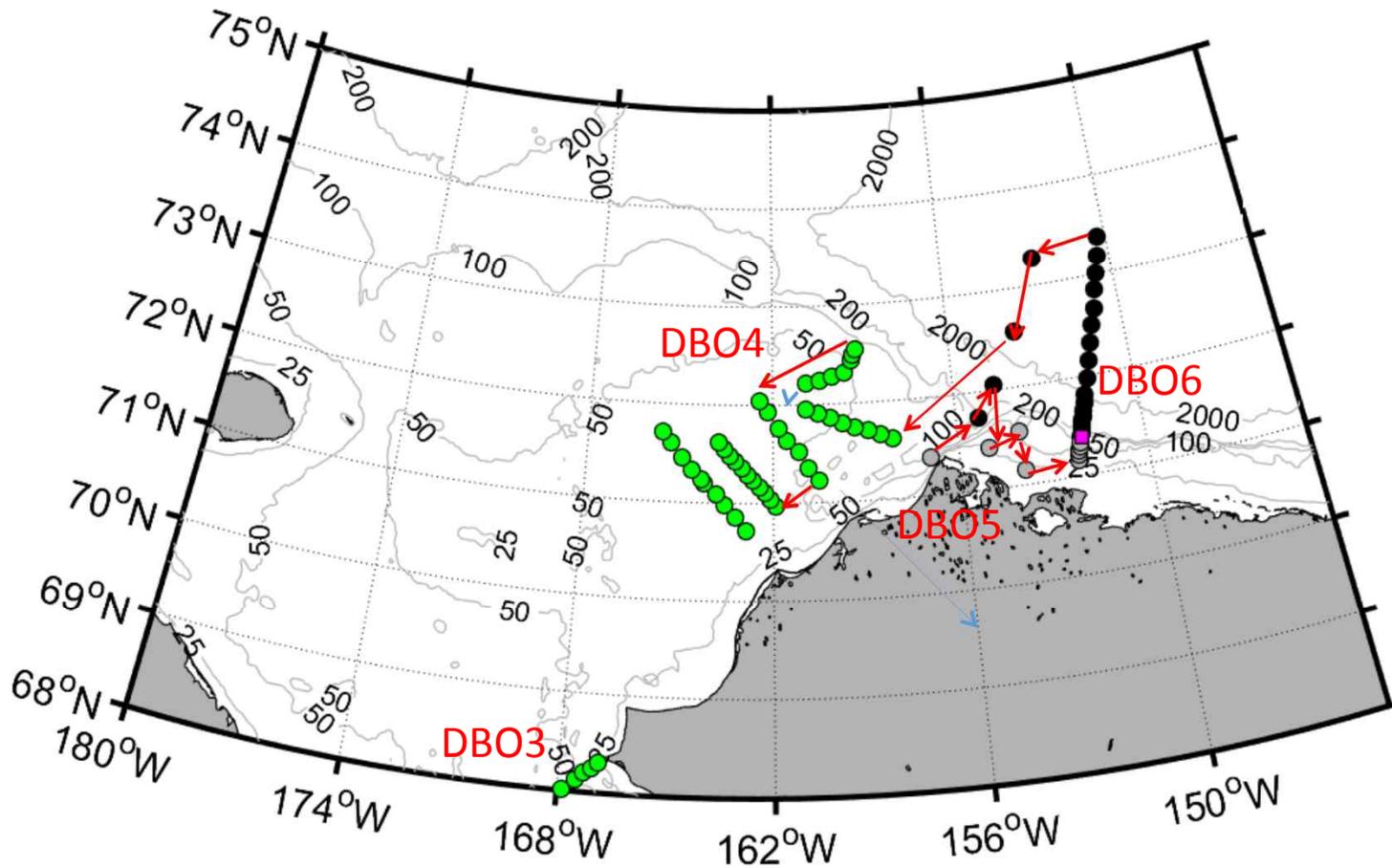
DBO data collections

- Seawater temperature and salinity; velocity measurements
- Nutrients, chlorophyll, carbon products, CDOM
- Phytoplankton, zooplankton and macrobenthic abundance, biomass, community structure
- Marine mammal and seabird surveys

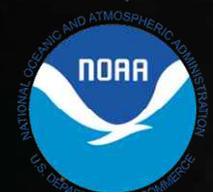
Contact: Dr. Svein Vagle,
Canadian Chief Scientist
USA: Jackie Grebmeier,
UMCES and PAG,
jgrebmei@umces.edu



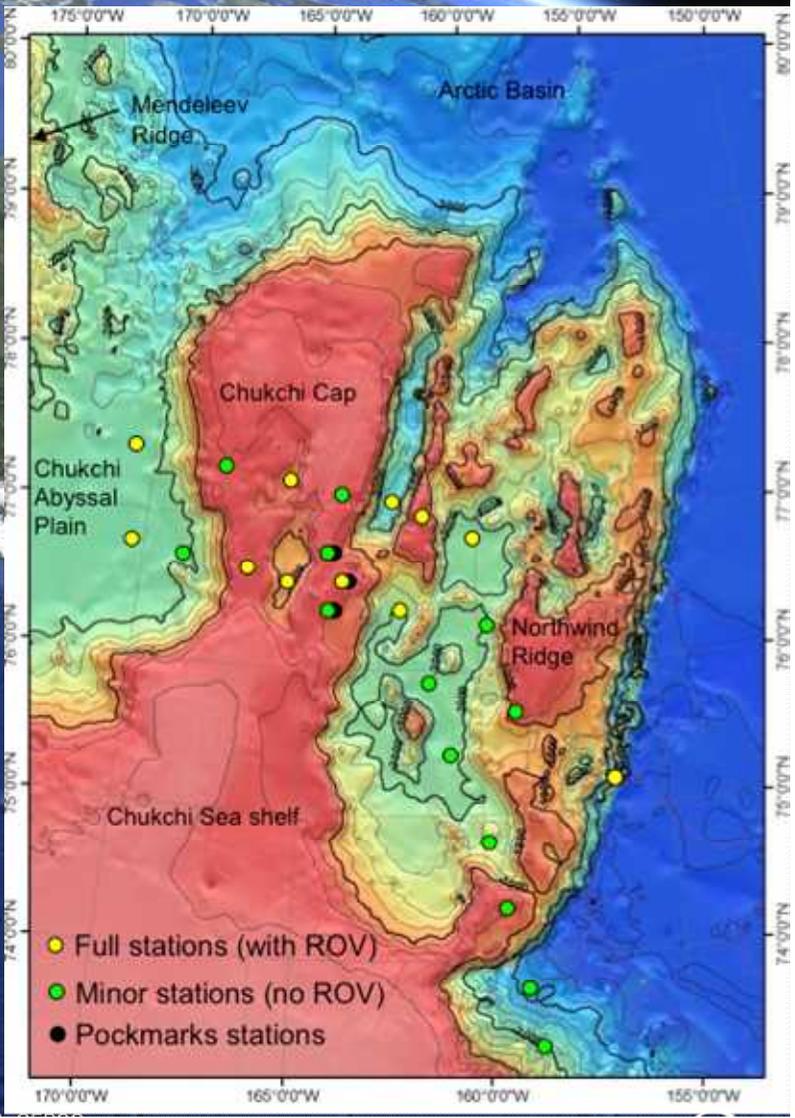
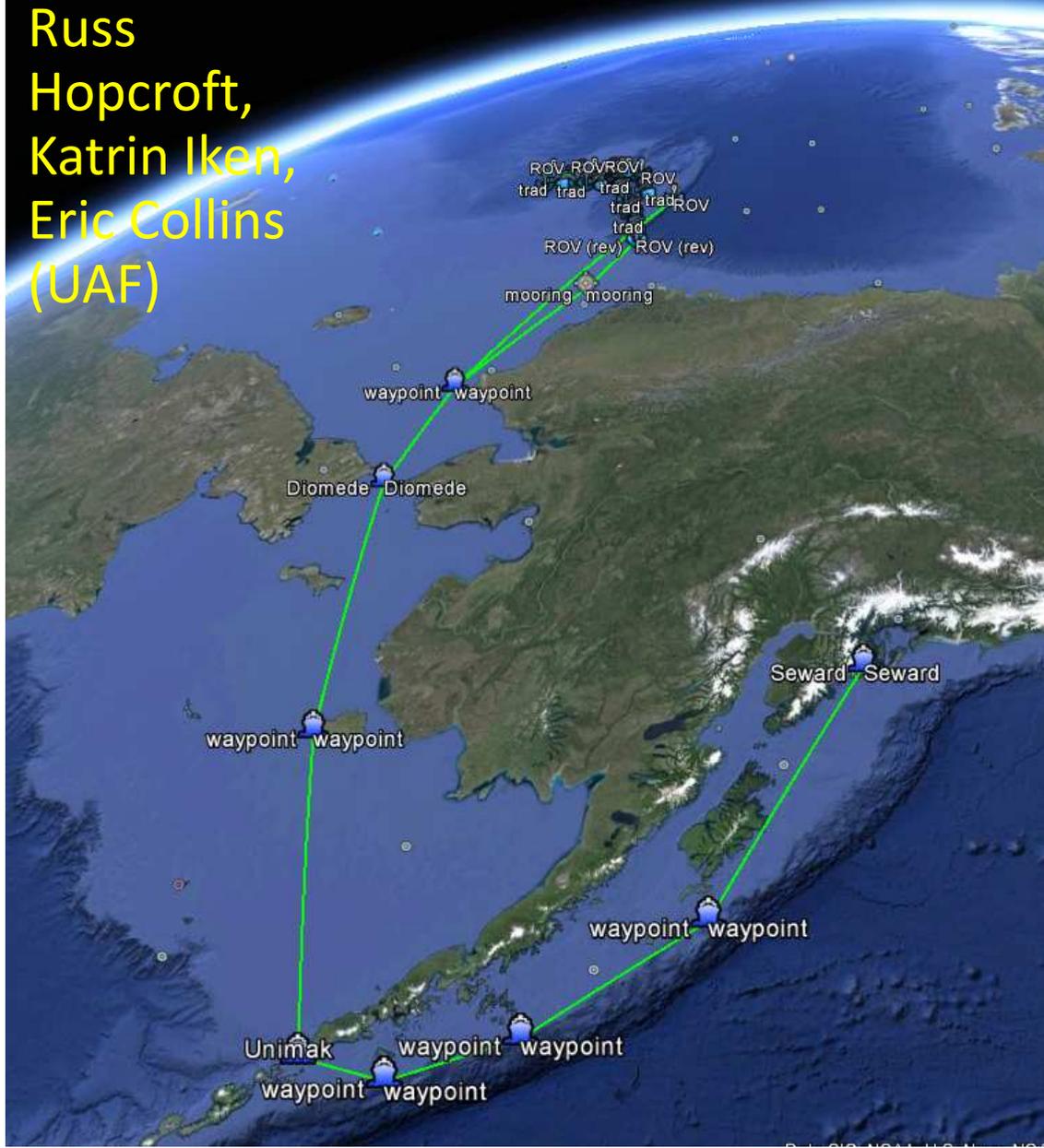
Laura Juranek (OSU) 2016 August cruise (DBO 3,4,5,6)



The Chukchi Borderlands



Russ
Hopcroft,
Katrin Iken,
Eric Collins
(UAF)

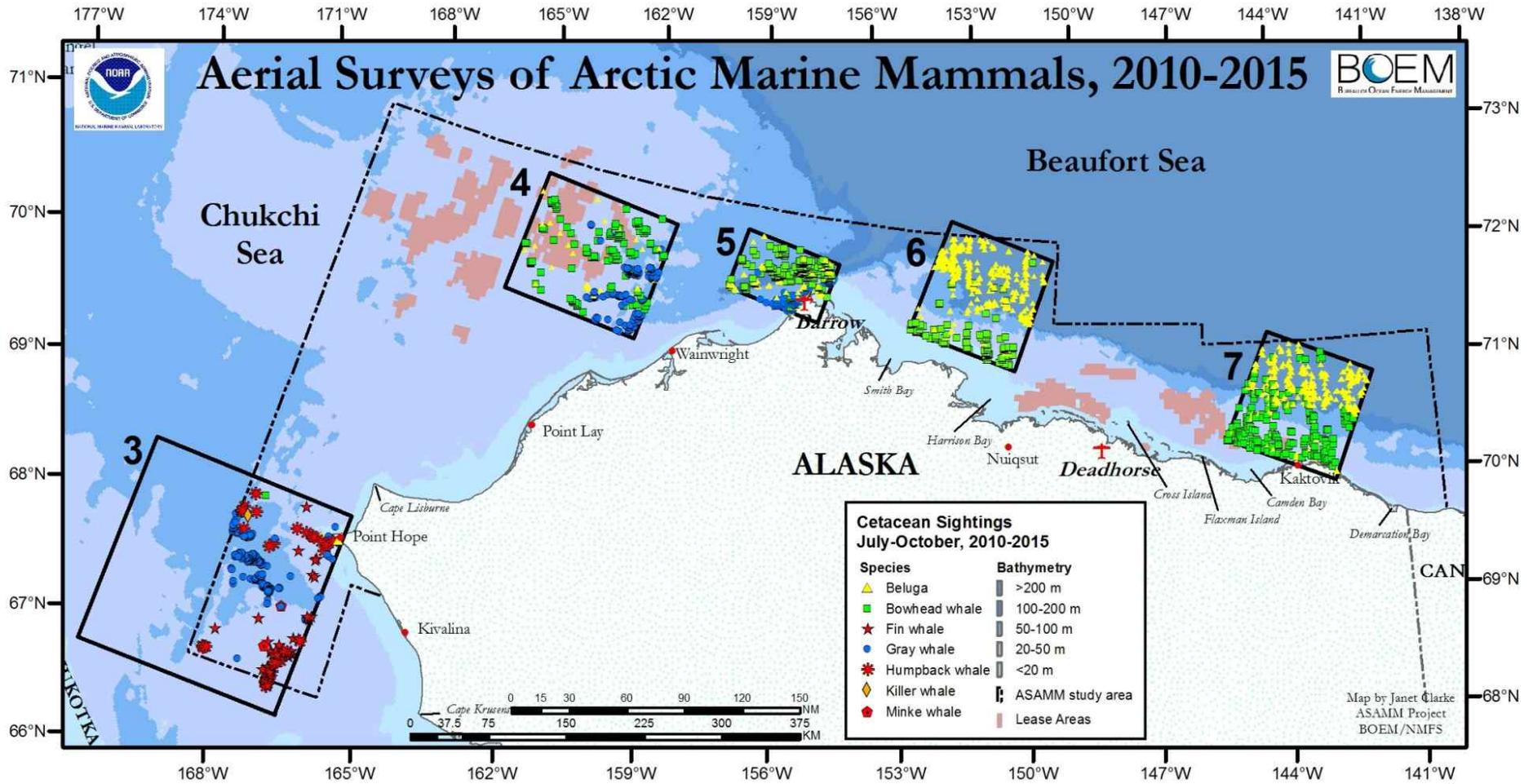


<http://oceanexplorer.noaa.gov/explorations/16arctic/welcome.html>

- Ocean Exploration funding (NOAA)
 - ~28 days in work area USCGC Healy
- 3 major projects:
 - Plankton, Benthos, Sea ice
- ROV, traditional tools, molecular analyses
- Mammal & (likely) seabird observer
- Media & Teacher-at-sea



DBO 3, 4, 5, 6, and 7



DBO-3 – gray whale hot spot, subarctic cetaceans
 DBO-4 and DBO-5 – bowhead whales, gray whales, belugas
 DBO-6 and DBO-7 – bowhead whales, belugas

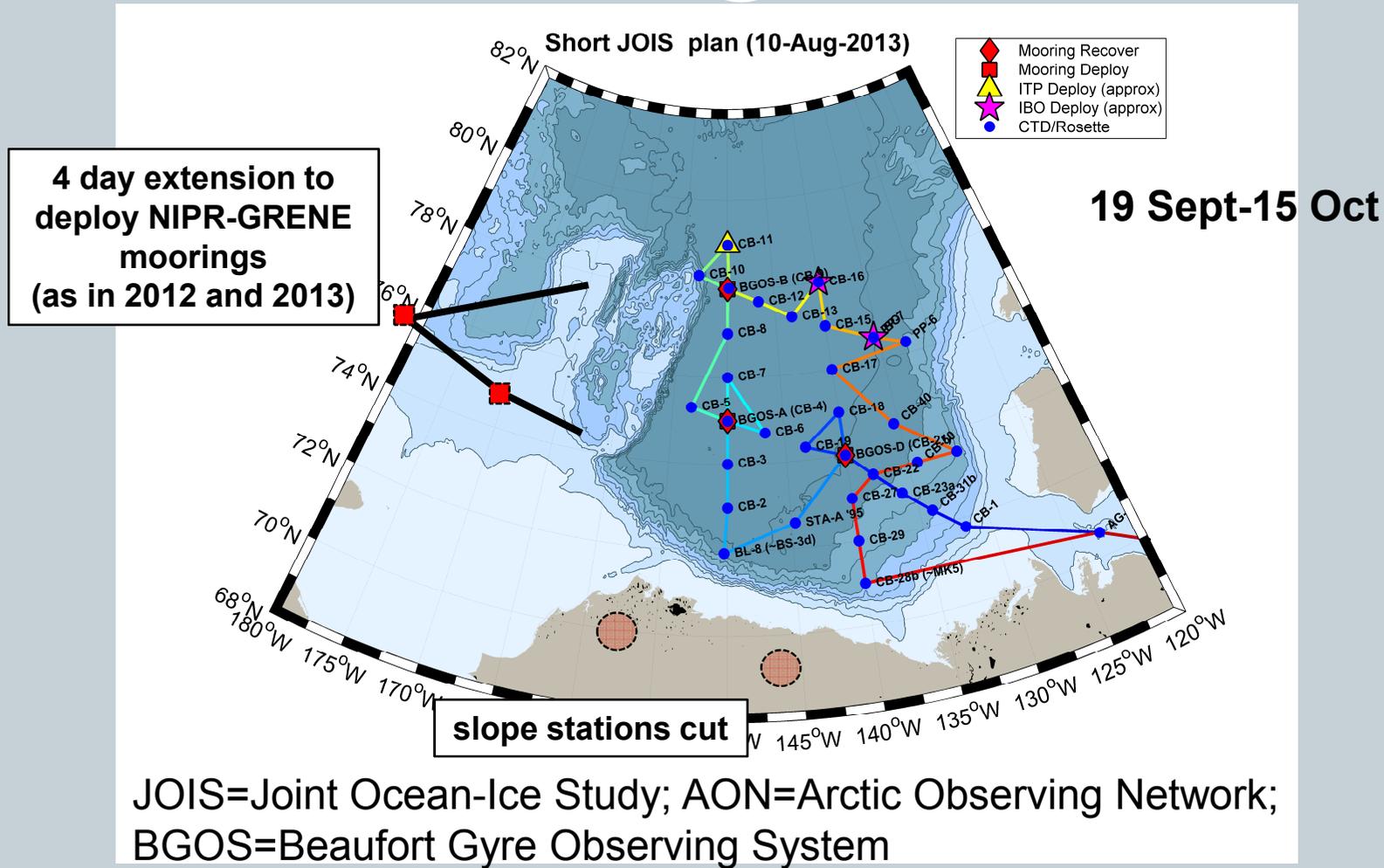


<http://www.afsc.noaa.gov/NMML/cetacean/bwasp/>



[Janet Clark]

SCIENCE-Basin JOIS/AON BGOS (Canada-USA-Japan)

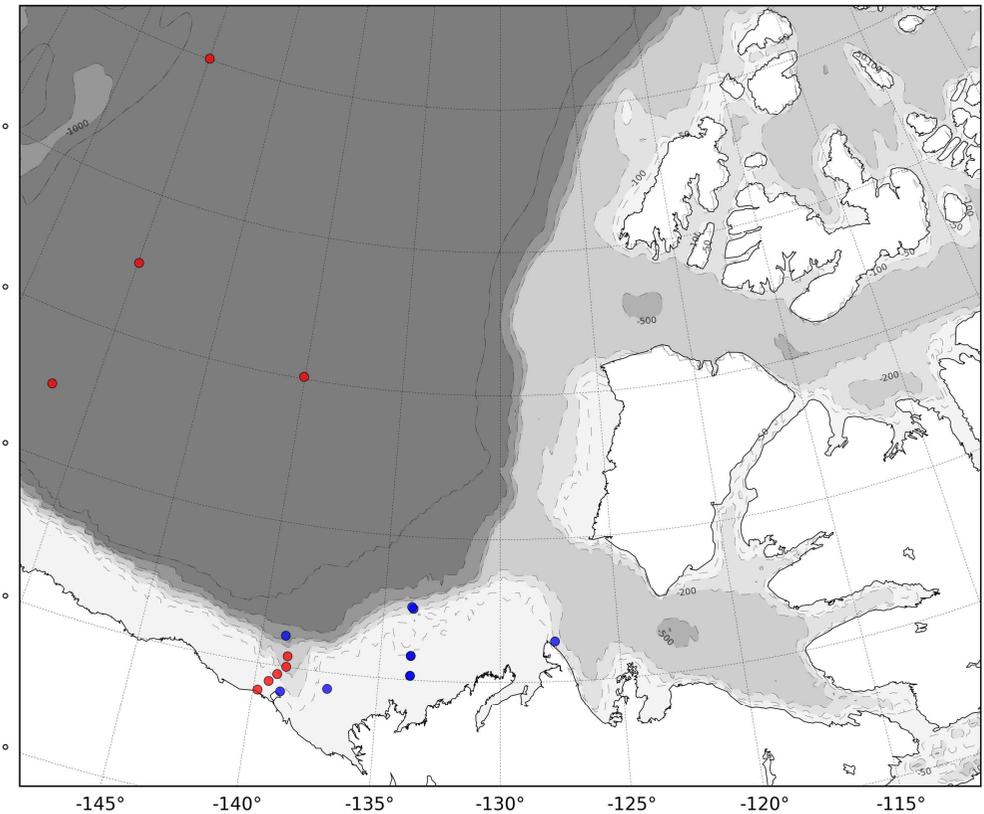
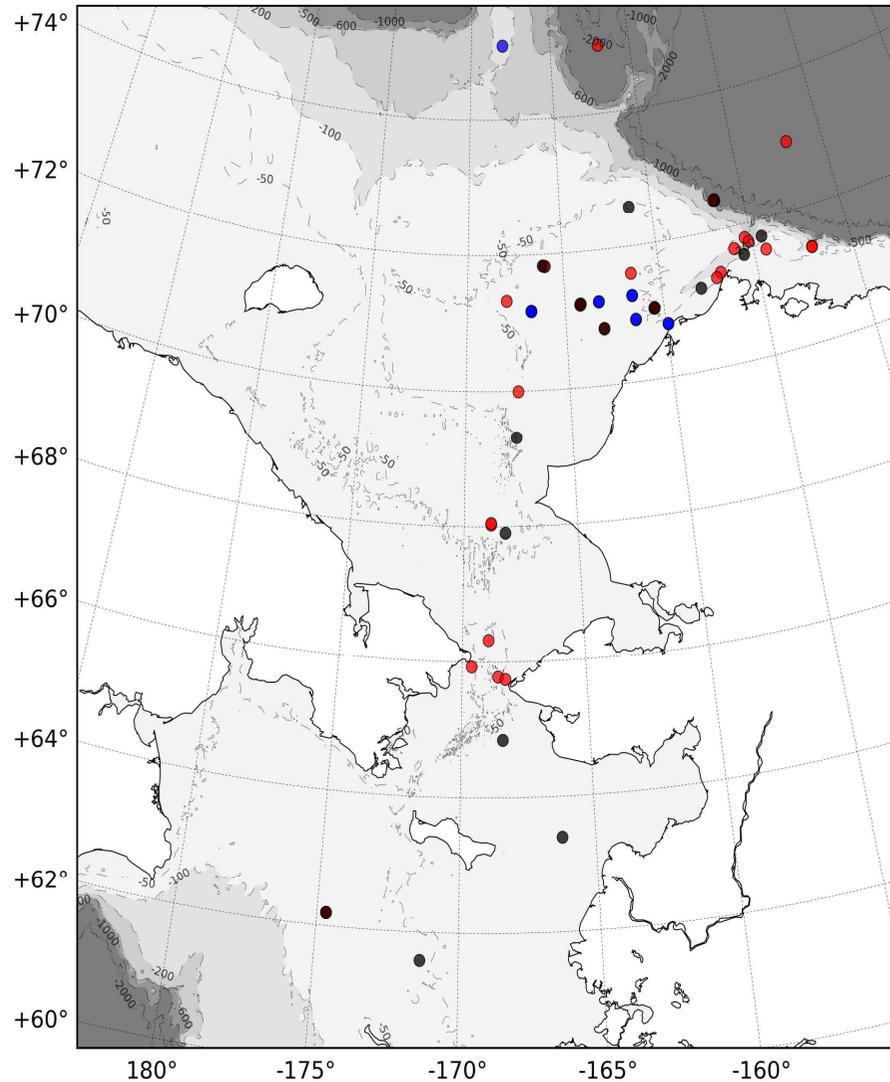


(courtesy Bill Williams, IOS)

Arctic Moorings - 2016

Number of moorings: ~80

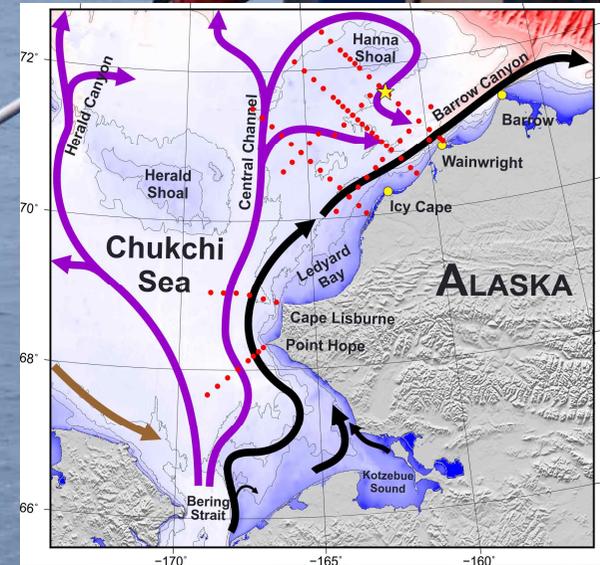
- Different dot color=various projects
- Further details and excel sheet via PAG website



[courtesy Phyllis Stabeno/NOAA]

NE Chukchi Ecosystem Observatory (CEO) 2015-2016 Measurements:

- Pressure, Temperature, Salinity
- Significant Wave Height & Direction
- Directional Wave Spectra
- Ice Draft (level ice thickness & keels)
- Passive acoustic recordings
- Acoustic Backscatter: 38, 125, 200 & 455 KHz
- Chlorophyll a fluorescence
- Optical Backscatter, PAR
- CDOM, NO₃, DO
- Webcam
- 24-bottle Sediment Trap (Catherine Lalonde, Canada):
 - Chlorophyll a
 - Phytoplankton identification
 - Total particulate matter (dry weight)
 - Particulate organic carbon
 - Particulate nitrogen
 - Zooplankton species
 - Zooplankton fecal pellets



[AOS support]

[Seth Danielson, UAF]

Seabird Surveys

PI: Kathy Kuletz (USFWS)

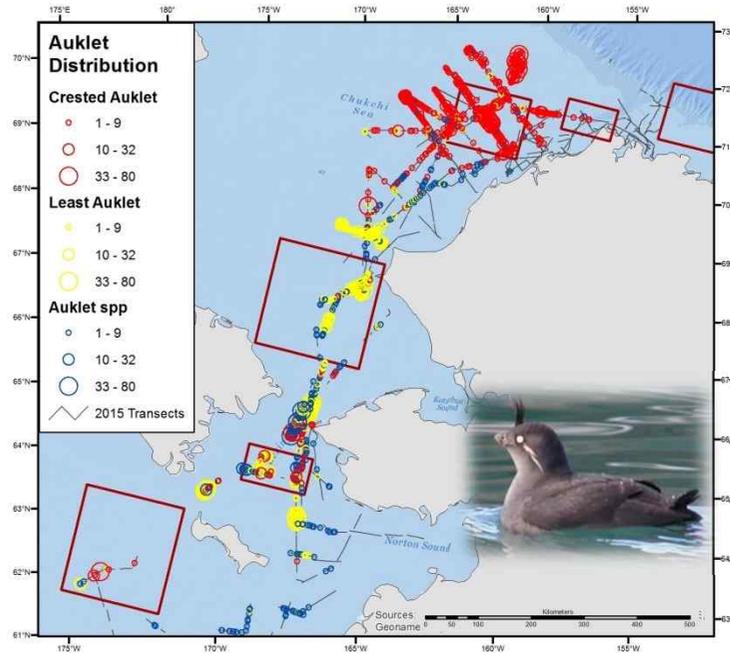
Funding: BOEM, NPRB, USFWS

Collaborators:

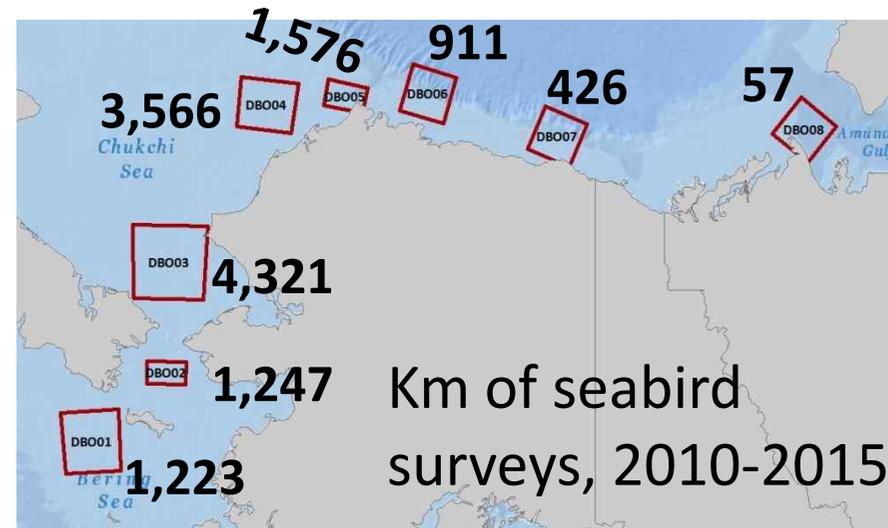
NOAA, U.Alaska, U.Mass, USCG,
Environment Canada, ABR Inc., others



- Join 3-8 cruises / year in Arctic
- **Goals:**
- Describe spatial/seasonal distribution & spp composition
- Influence of physical & biological factors on seabird distribution & abundance



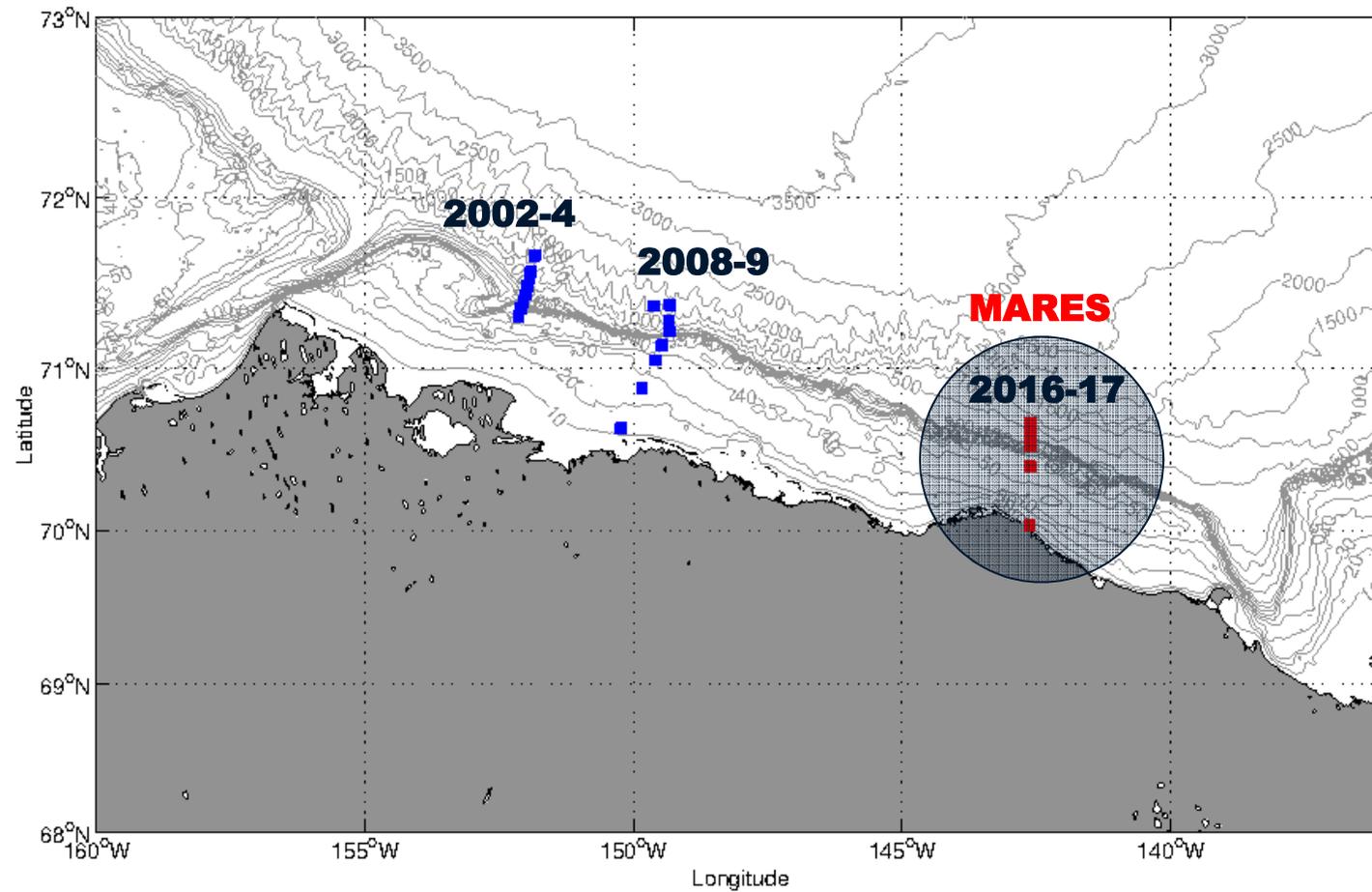
Example:
2015
Transects
Auklet
distribution



Best focus for analysis:
Aug-Sept, DBOs 2,3,4,5

Mooring component of MARES

Mooring arrays across the Beaufort shelf/slope



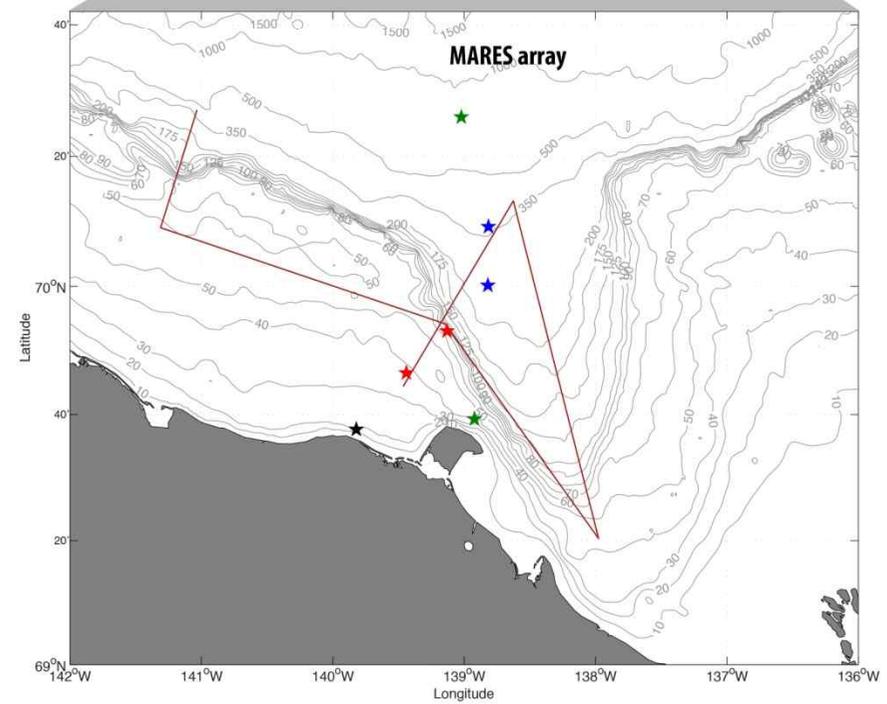
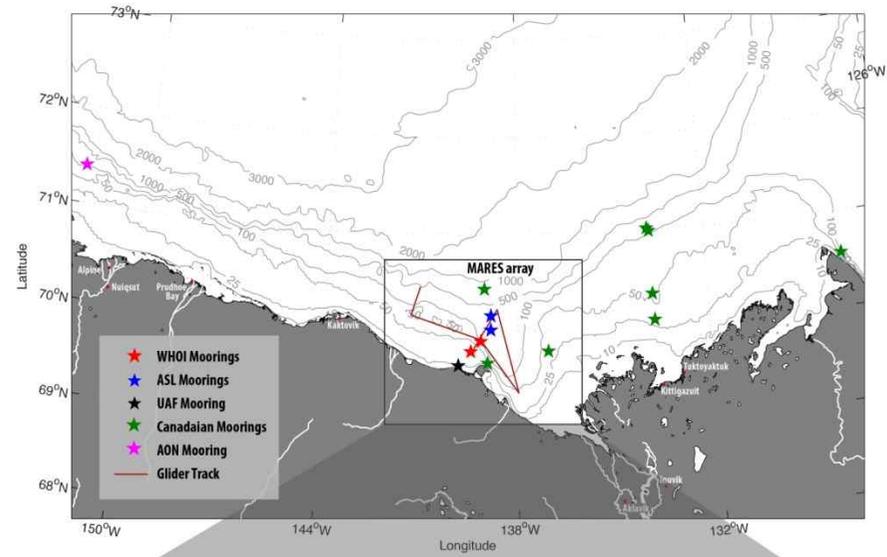
**Marine Arctic Ecosystem Study
(MARES)-Robert Pickart (WHOI)**



Overall Goal of MARES

To better understand the relationship between the physical forcing (ocean, ice, atmosphere) and the trophic structure and function of the marine ecosystem in the Canadian Beaufort Sea

MARES mooring array



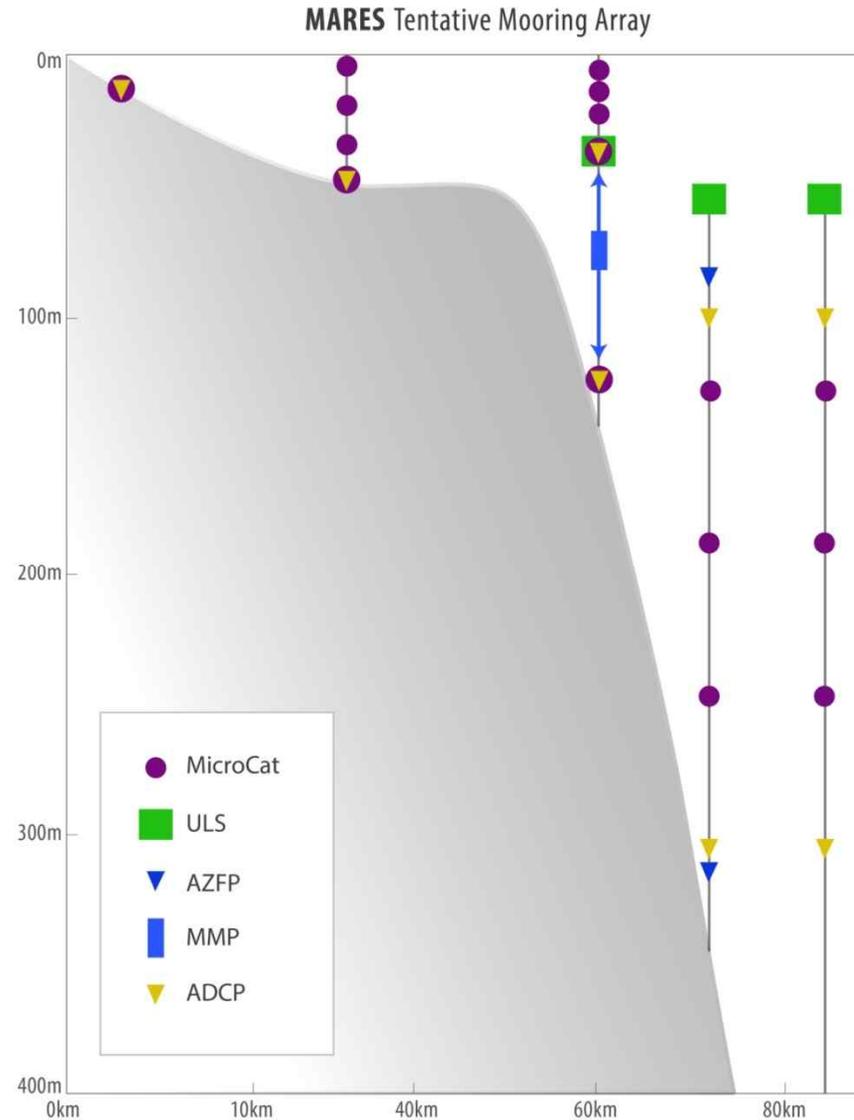
Cross-section view of the MARES array

Measured parameters

- Temperature
- Salinity
- Water column velocity
- Ice thickness
- Ice velocity



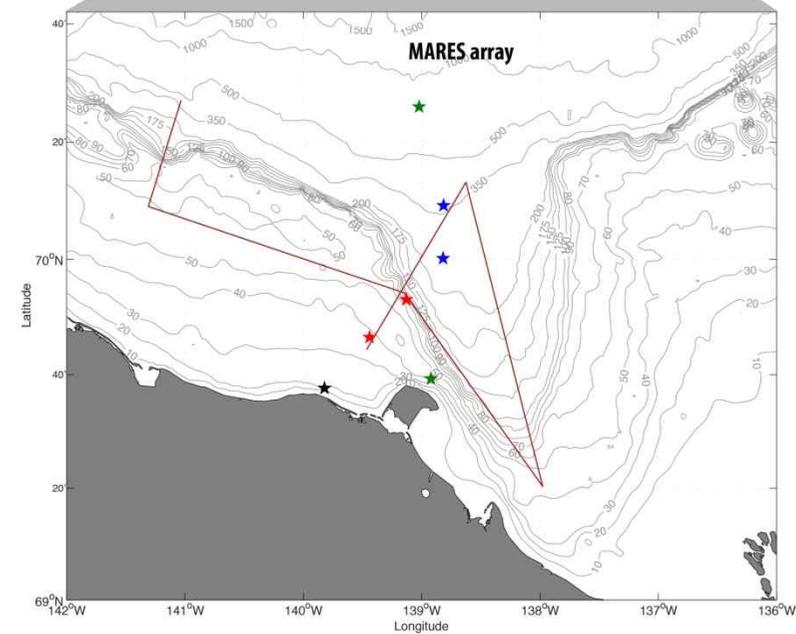
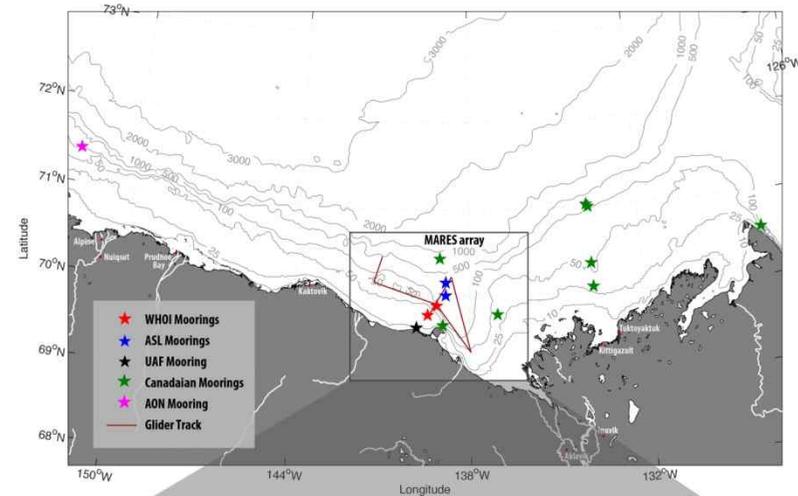
*Lots of emphasis on
biology and chemistry*



Operational Plan

- Moorings were deployed on the CCGC *Laurier* in early October
- Hydrographic and benthic sampling during the cruise
- Glider deployed in mid August from Prudhoe Bay, recovered by the *Laurier* in October

Recovery cruise will take place in October 2017, more hydrography and sediment work



**Monitoring the western Arctic
boundary current in a warming climate
(Arctic Observing Network)
Robert Pickart (WHOI)**



Overall Goal of the mooring program

**To understand the impact of changing physical drivers
on the flux of Pacific water into the Arctic Ocean
and the mechanisms of shelf-basin exchange**

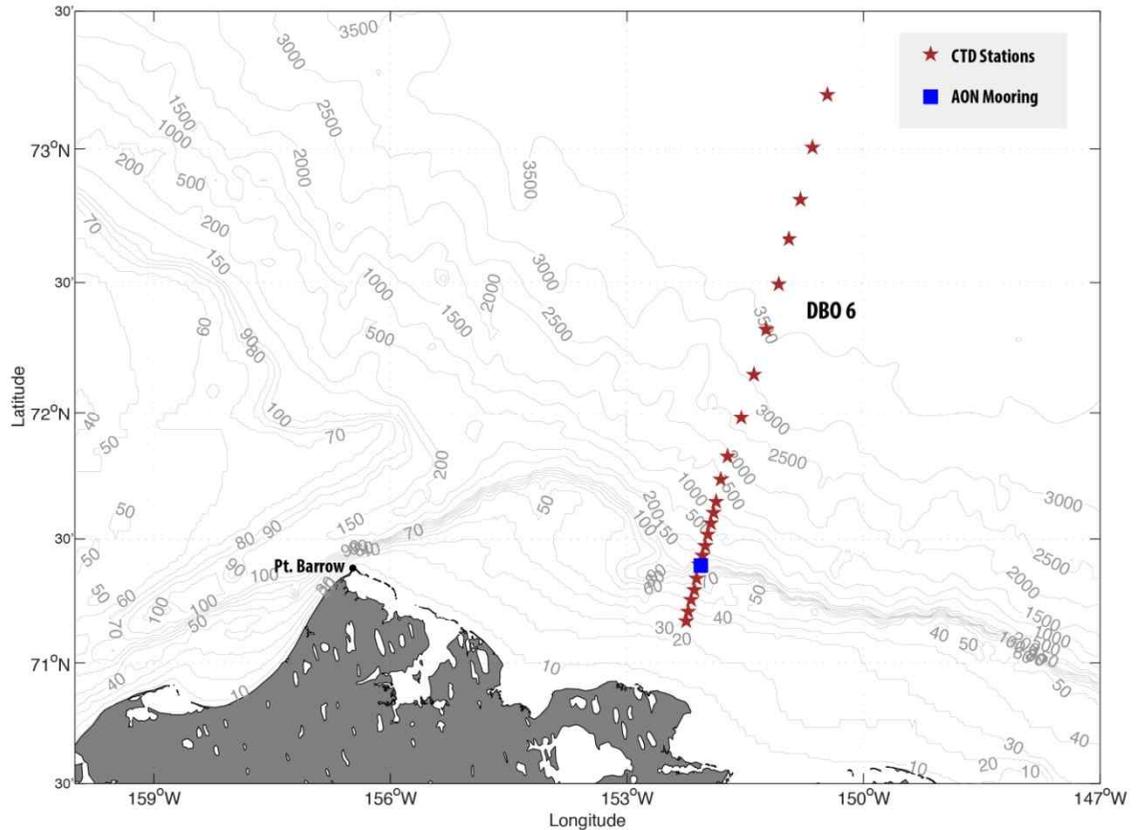
The latest deployment will extend the timeseries to 13 years

The mooring is located on the DBO-6 line

Operational plan

- The mooring was turned around on the *Sikuliaq* in early September
- The extended DBO-6 line was occupied

The mooring will be serviced in 2018, with an extended hydrographic survey of the boundary current system

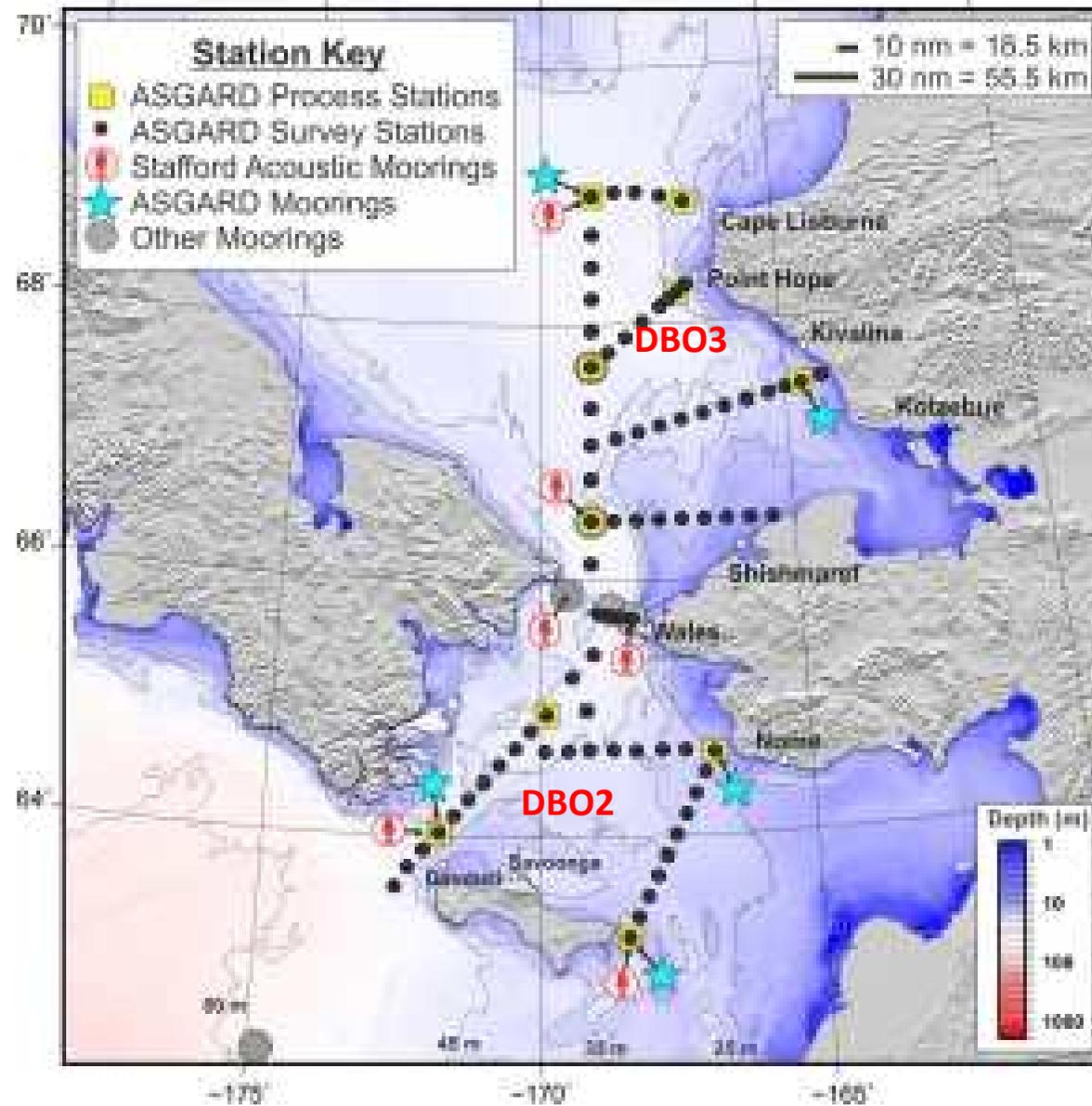


2017 PAG and DBO Field Plan-DRAFT v1

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May-June	Sikuliaq	2, 3	ASGARD	Seth Danielson	Seth Danielson
July (Nome-Nome)	Norseman II	3	Bering Strait Mooring Project/AON	Rebecca Woodgate woodgate@apl.washington.edu	Rebecca Woodgate woodgate@apl.washington.edu
July 1-22 (Victoria, BC-Barrow)	Sir Wilfrid Laurier	1,2,3,4,5	C30/DBO (AON)	Jackie Grebmeier jgrebmei@umces.edu	Svein Vagle Svein.Vagle@dfo-mpo.gc.ca
August	TBD	3, 4	ArcticEIS2	Jackie Grebmeier jgrebmei@umces.edu	Ed Farley ed.farley@noaa.gov
Aug 5-25	Araon	3+Chukchi Borderland+ East Siberian Sea	Korean Expedition (KOPRI) ocean and Sea-ice researches	Sung-Ho Kang shkang@kopri.re.kr	Leg 1 - Eun-Jin Yang ejyang@kopri.re.kr
Aug 27-Sept 10		Chukchi Borderland	Geophysical/paleoceanographic researches	-same	Leg 2 - Young Ken Jin ykjin@kopri.re.kr
Sept 1-14	Healy	3,4,5	ARP DBO and SBE	Jackie Grebmeier jgrebmei@umces.edu	Robert Pickart rpickart@whoi.edu
Sept 16-Oct 15	Healy	-	Navy	-NA	Navy
Aug 22-Oct 5	Mirai	3,5+Arctic Basin	Japanese ArCS	Takashi Kikuchi takashik@jamstec.go.jp	Shigeto Nishino nishinos@jamstec.go.jp
August	TBD	3,4,5	NOAA/PMEL	Phyllis.Stabeno@noaa.gov	Phyllis.Stabeno@noaa.gov
August-Sept	Sikuliaq	3,4,5,6	Arctic N Fixation Arctic Productivity/	rcrain@nsf.gov	ljuraneck@coas.oregonstate.edu ; Rachel Sipler
Aug 24-Oct 4	Oscar Dyson F/V Cape Flattery	1 2	NOAA/AFSC/EMA/FOCI	jeanette.gann@noaa.gov	lisa.eisner@noaa.gov
Oct 3-11	Sir Wilfrid Laurier	4,8	C30	Bill.Williams@dfo-mpo.gc.ca	Humfrey.Melling@dfo-mpo.gc.ca
Oct-Nov	Sikuliaq	Arctic Basin	ONR Acoustics	M. Badley/Arctic Shelf-Basin/Sonar Performance	Navy/ONR

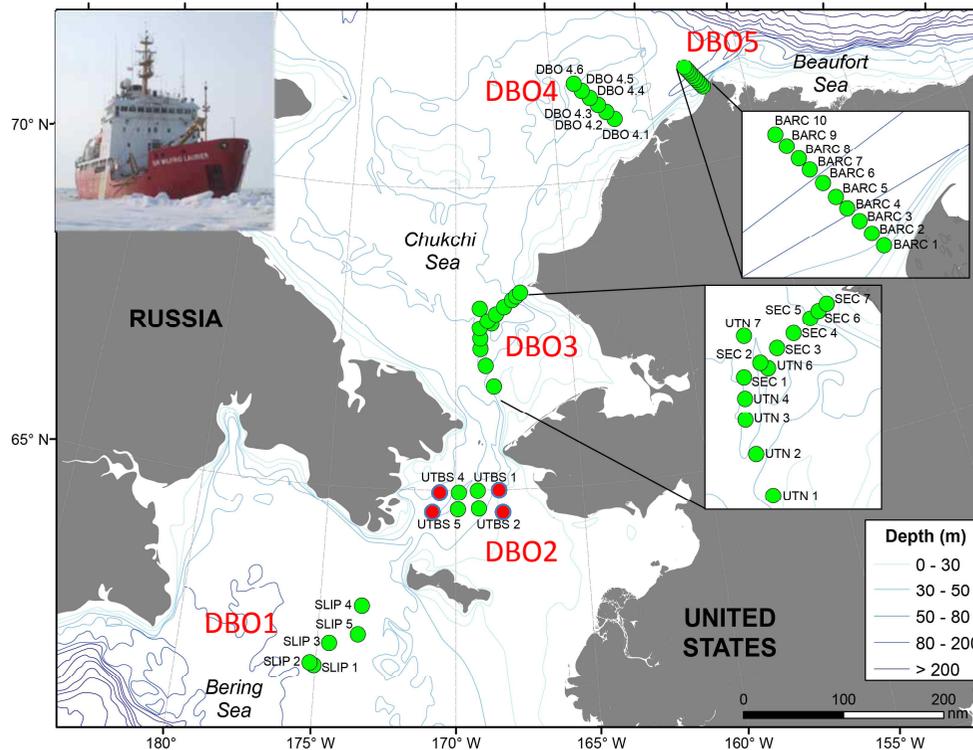
Arctic Shelf Growth, Advection, Respiration and Deposition Rate Experiment (ASGARD): UAF (Lead: Seth Danielson): June 2017 and 2018 (NPRB)





Canada's Three Oceans (C30) and the Distributed Biological Observatory (DBO): *CCGS Sir Wilfrid Laurier*, July 10-22, 2017

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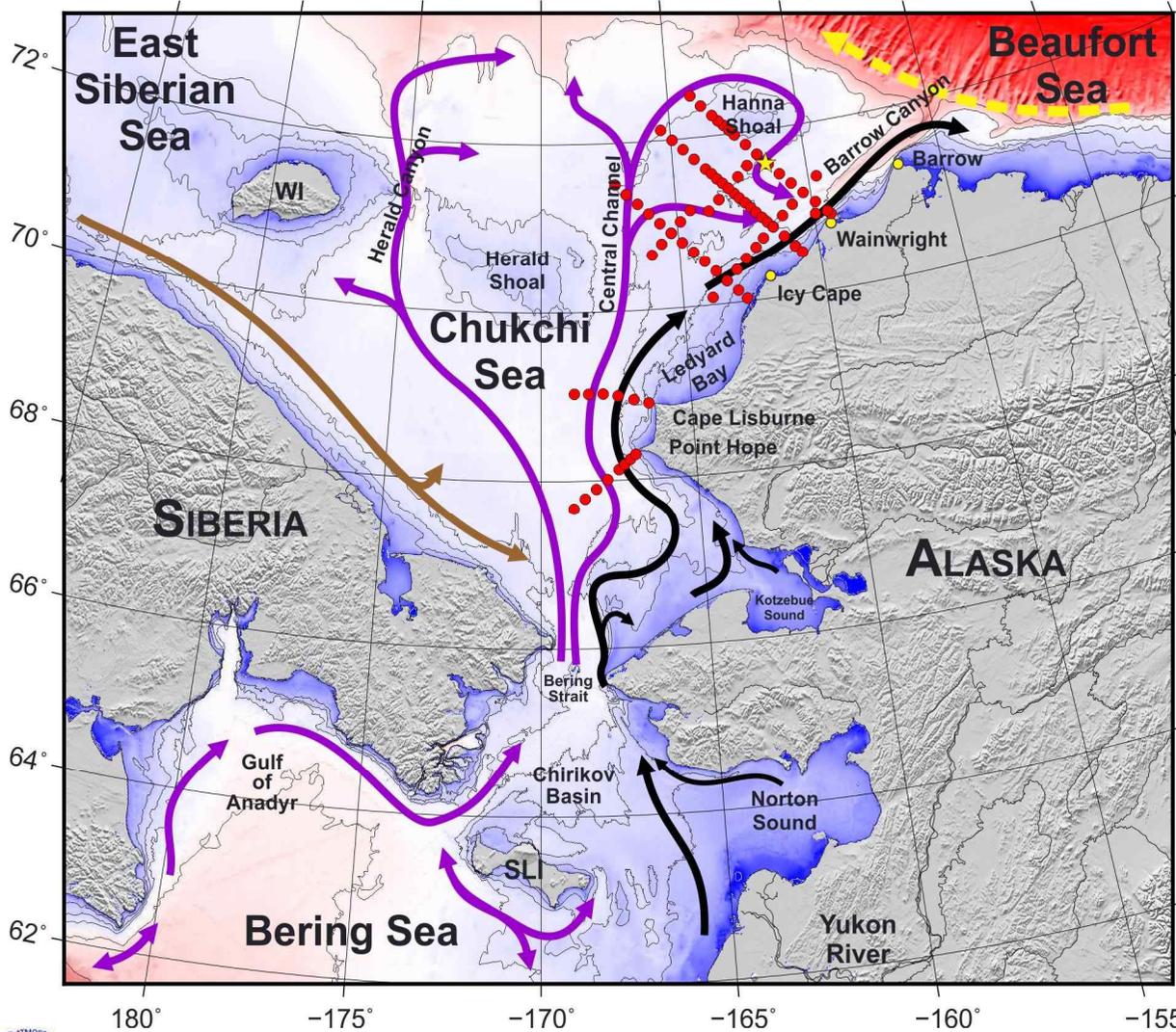
DBO data collections

- Seawater temperature and salinity; velocity measurements
- Nutrients, chlorophyll, carbon products, CDOM
- Phytoplankton, zooplankton and macrobenthic abundance, biomass, community structure
- Marine mammal and seabird surveys

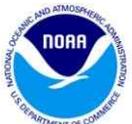
Contact: Dr. Svein Vagle,
Canadian Chief Scientist, Jackie
Grebmeier,
UMCES and PAG,
jgrebmei@umces.edu



Arctic Marine Biodiversity Observing Network (AMBON); NOAA/BOEM/Shell August 2017 (either Sikuliaq or Norseman II)-occupy DBO3 and 4

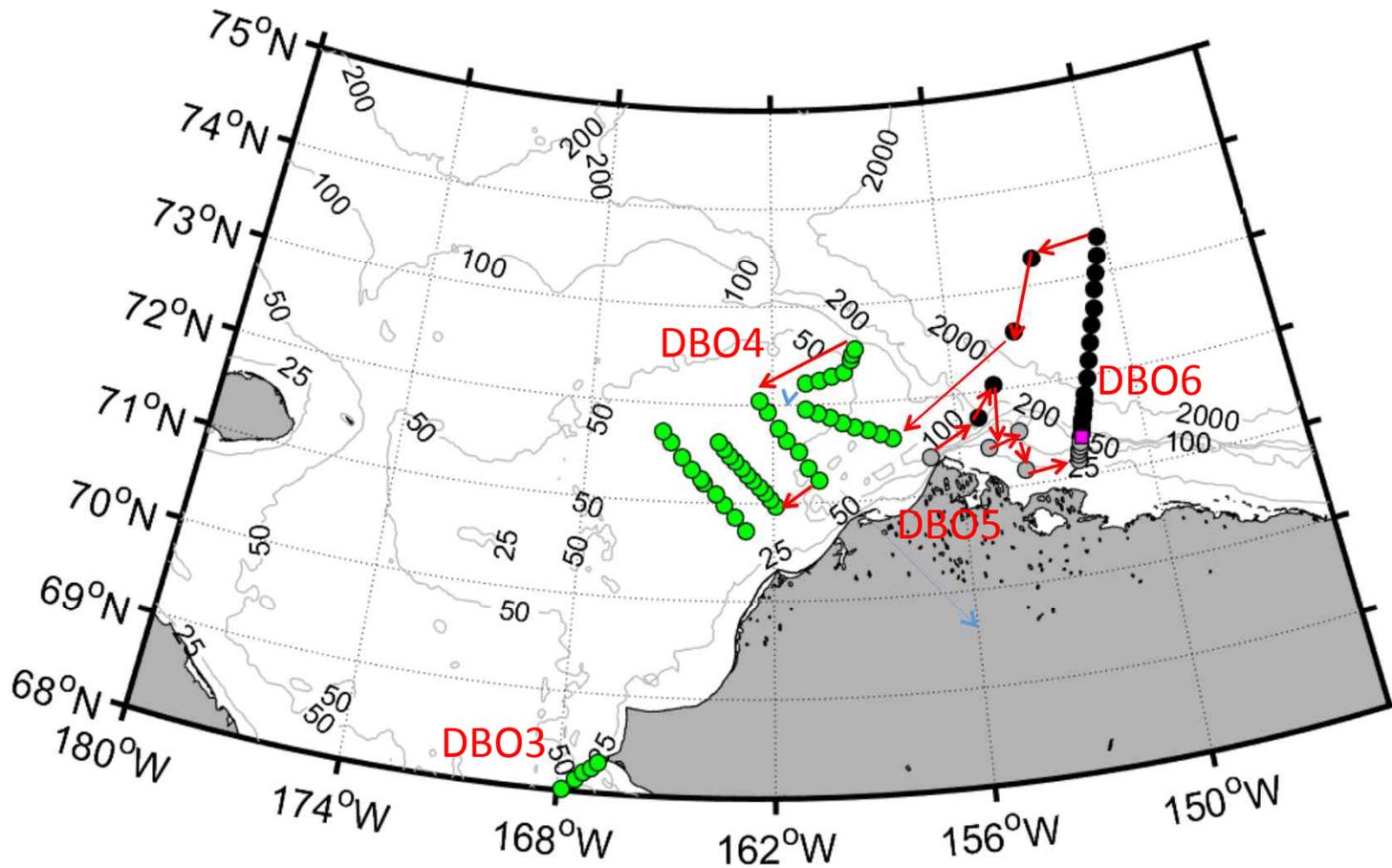


- Lead Katrin Iken (UAF); Co-PIs: Seth Danielson, Eric Collins, Russ Hopcroft, Franz Mueter
- co-PIs: Jackie Grebmeier, Lee Cooper (CBL/UMCES)
- Sue Moore (NOAA), Kathy Kuletz (USFWS)
- T/S
- Chlorophyll, nutrients
- Phytoplankton and zooplankton composition
- Macrofauna and epifauna
- Fishes
- Marine mammal and seabird surveys

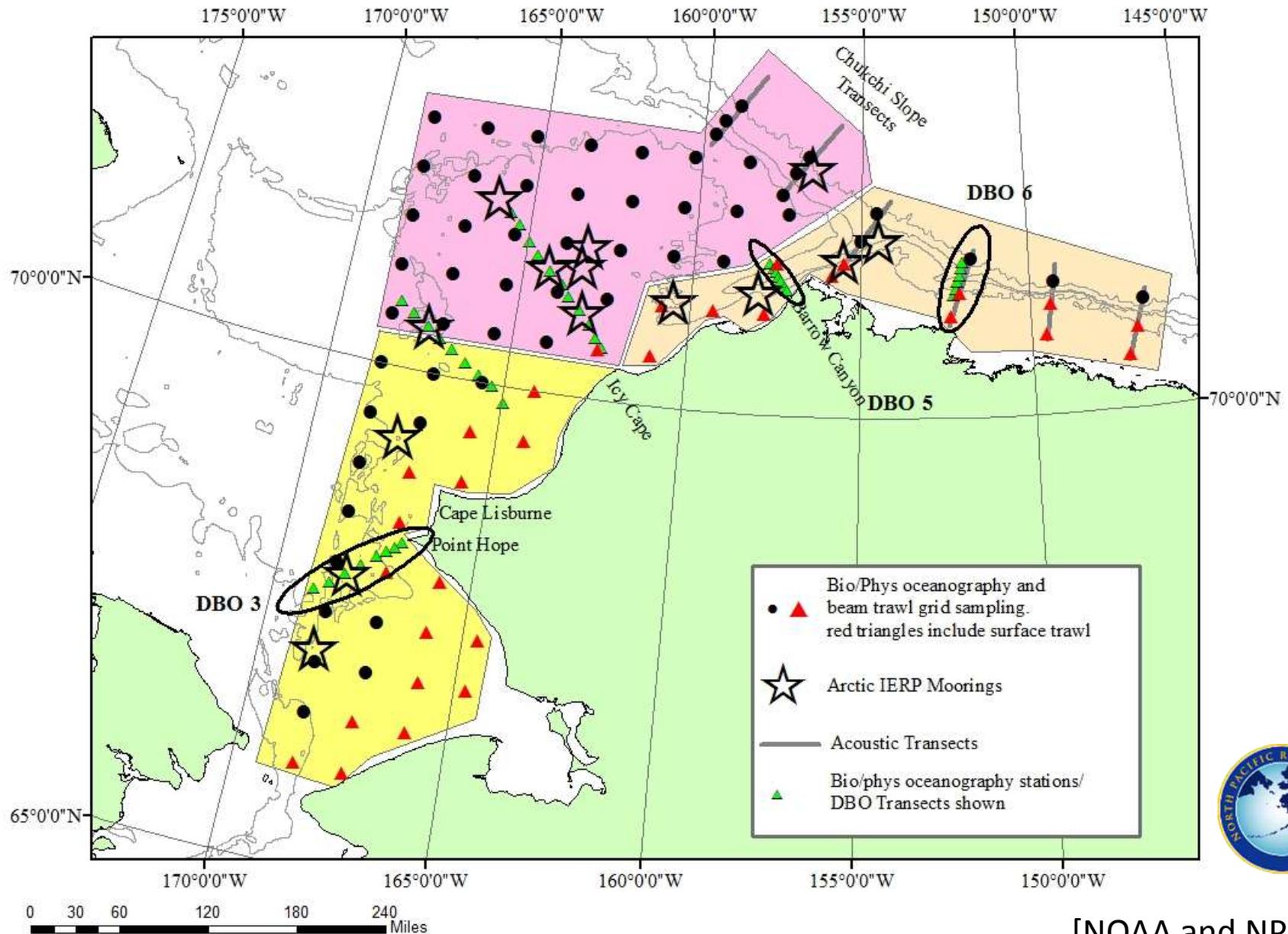


[from S. Danielsen map 2015]

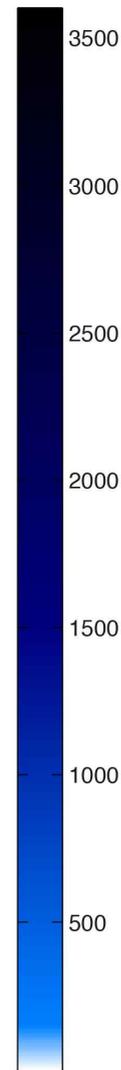
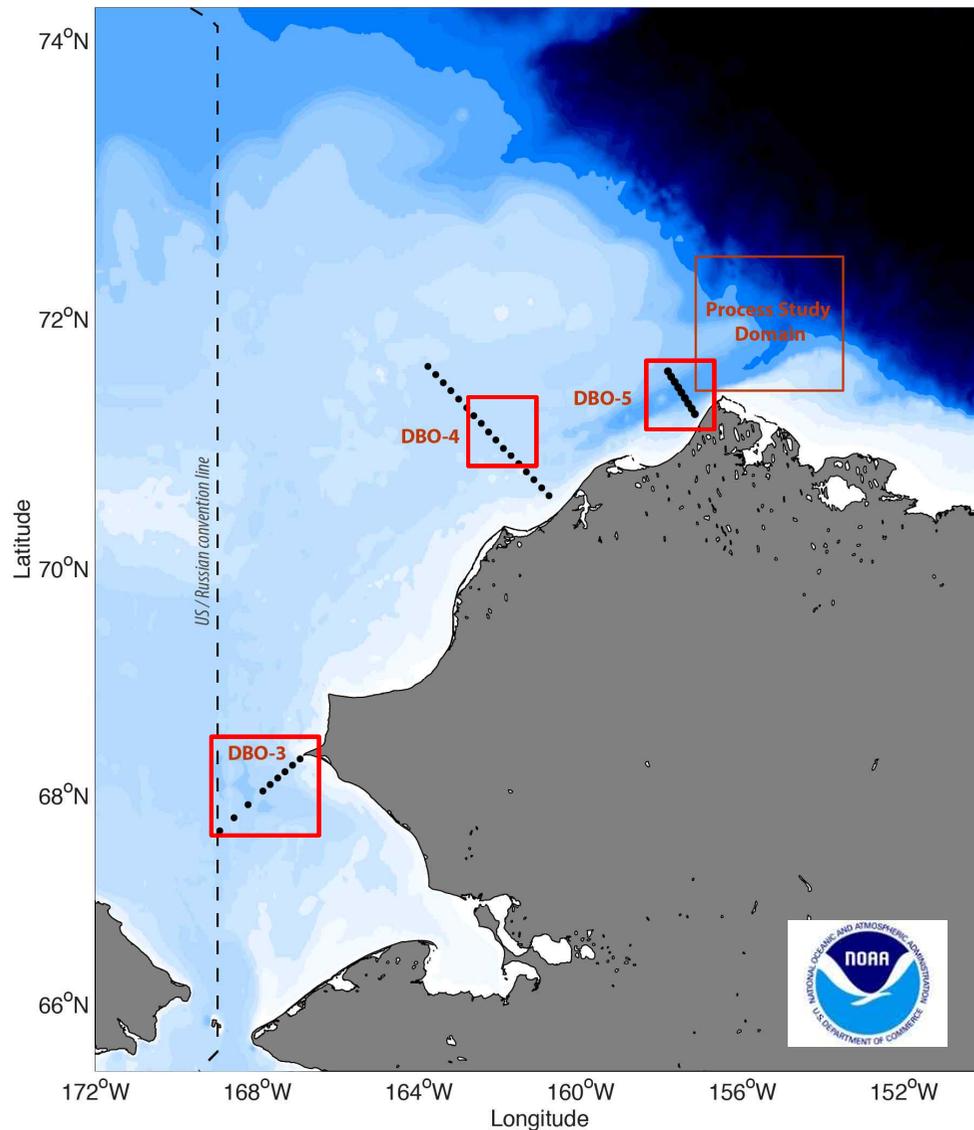
Laura Juranek (OSU) 2016 August cruise (DBO 3,4,5,6)



Arctic Ecosystem Integrated Survey: ArcticEIS2 (NOAA)-August/Sept 2017 and 2019



2017 DRAFT Plans DBO and Northern Chukchi Sea Shelf-Basin Exchange Study-NOAA Arctic Research Program (WHOI, UMCES and NOAA PMEL)

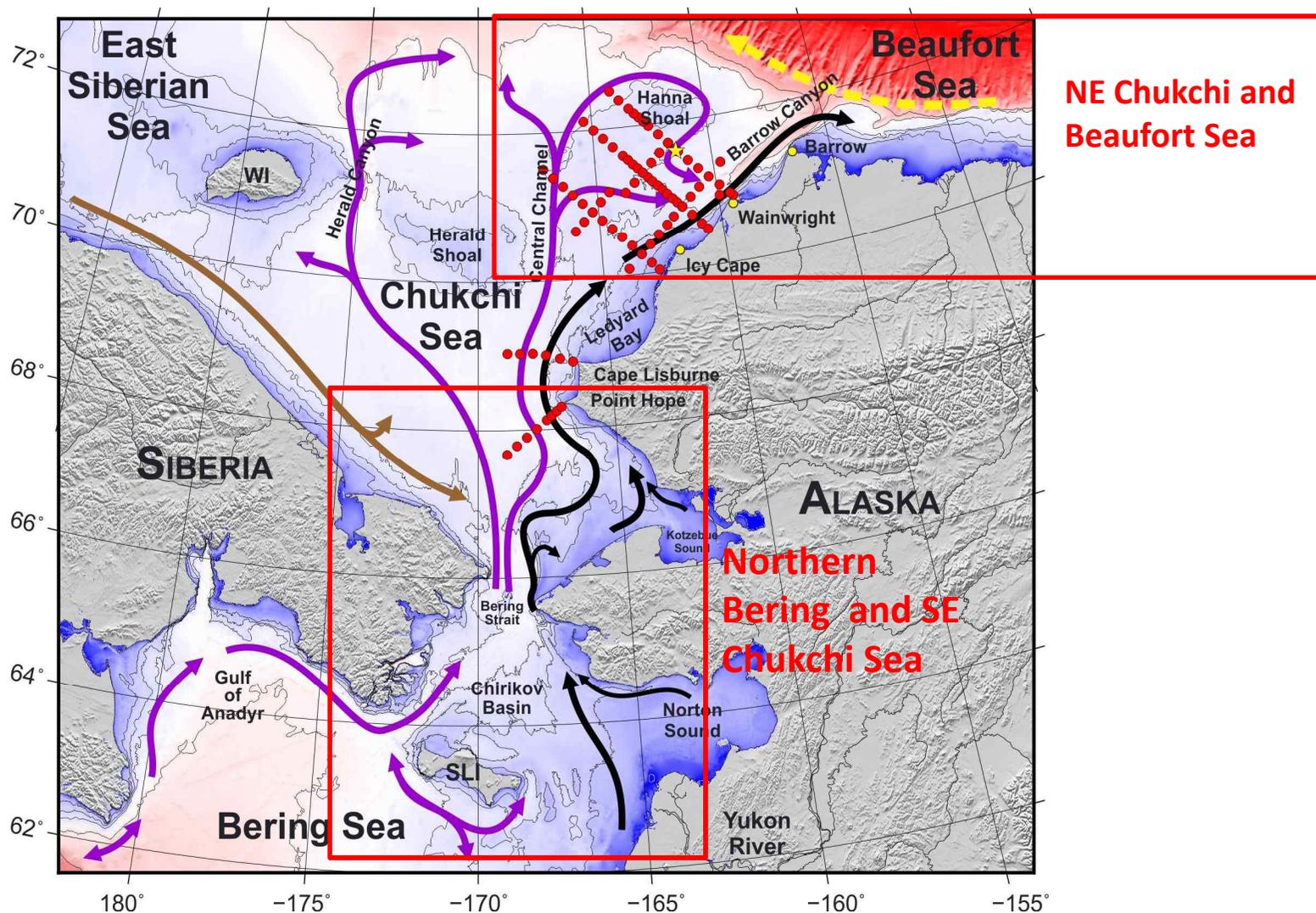


Field Measurements: Standard DBO measurements and process studies (DBO and Barrow Canyon region):

- Physical: CTD and lowered ADCP
- Chemical: nutrients, oxygen-18, chlorophyll-a (Chl a), carbon components
- Biological: zooplankton (abundance and biomass, growth rates)
- Benthos: macrobenthos abundance, biomass and population structure,
- Sediment: organic carbon/nitrogen content, chl a content, grain size, Cs-137 and Pb-210 content; benthic oxygen uptake and nutrient exchange
- Upper trophic levels: marine mammal shipboard surveys

Science access during subsistence whaling: April-May and Sept-Oct periods

-need to interface with coastal communities, contact Alaska Eskimo Whaling Commission, Eskimo Walrus Commission, and new Arctic Waterways Safety Committee



[modified from S. Danielsen map 2015]

Thank you for your
attention.

Any questions?

