

Arctic Science Summit Week 2019
22-30 May, Arkhangelsk, Russia

Update of PAG activities — to FARO

Jianfeng HE (Chair of PAG)
Polar Research Institute of China

Online

- What's PAG?
- Projects
- Cruises in 2019
- Other activities

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What is Pacific Arctic Group (PAG)



Pacific Arctic Group (PAG) is a group of institutes and individuals having a Pacific perspective on Arctic science.

Organized under the International Arctic Science Committee (IASC), the PAG has as its mission to serve as a Pacific Arctic regional partnership to plan, coordinate, and collaborate on science activities of mutual interest.

Online

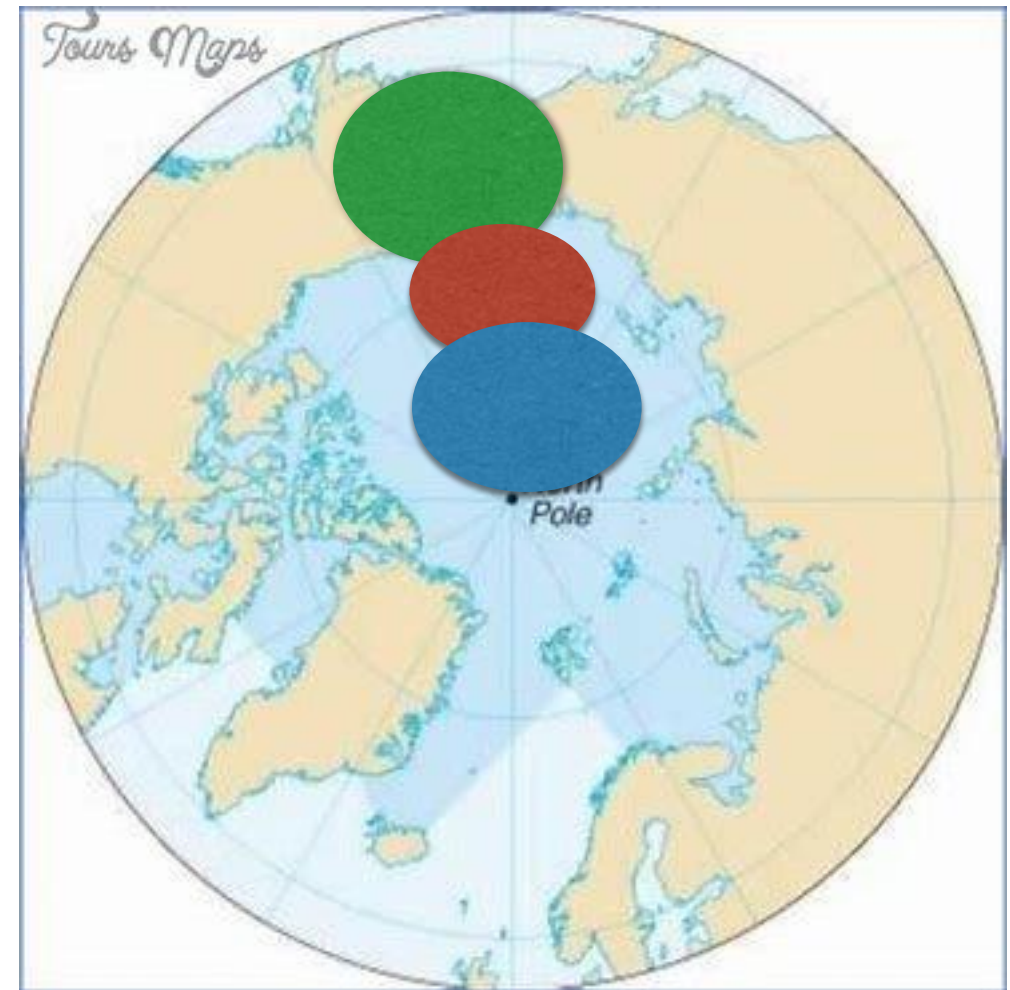
- What's PAG?
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PAG's projects

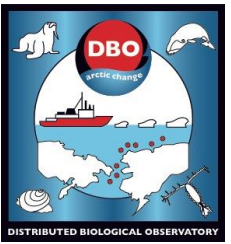
DBO (Distributed Biological Observation)(2008-

PACEO (Pacific Arctic Climate and Ecosystem Observation)(2014-

CAO (Central Arctic Ocean)



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



[updated from Moore and Grebmeier 2018]

Ship-based sampling:

- CTD and ADCP
- Chlorophyll, nutrients, carbon products
- Plankton (size, biomass and composition)
- Benthos (size, biomass and composition)
- Seabird and marine mammal surveys
- Fishery acoustics
- Bottom trawling (every 3-5 years)

Autonomous sensor sampling:

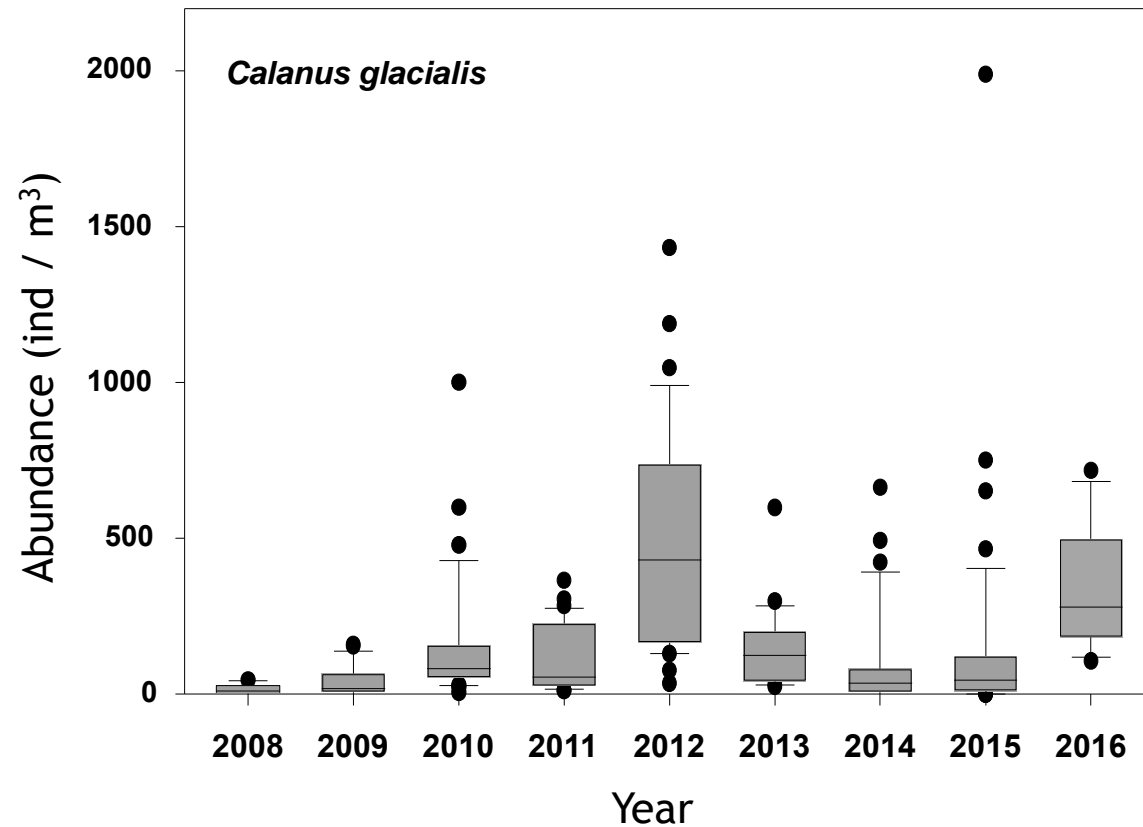
- Gliders, moorings, saildrone
- Satellite observations

DBO lines also embedded in process cruises

- DBO sites (red boxes) are regional “hotspot” transect lines and stations, based on high productivity, biodiversity, and/or overall rates of change
- DBO serves as a change detection array for consistent monitoring of biophysical responses
- Sites occupied by national and international entities with shared data plan

DBO3-Adding to long-term time series

Zooplankton



Relate copepod abundance to hydrographic conditions

= warm years dominated by small *Pseudocalanus*

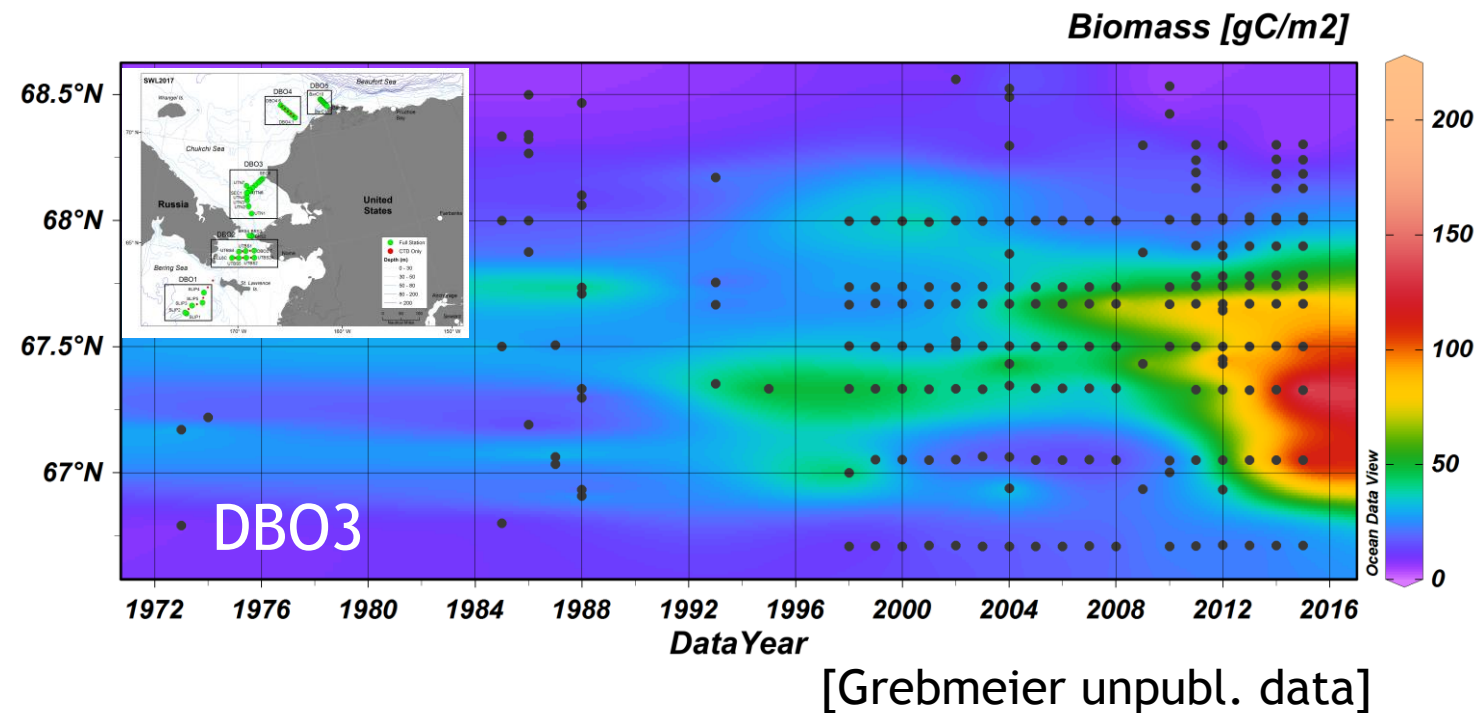


= lipid-rich *Calanus* more abundant in cold years



[R. Hopcroft]

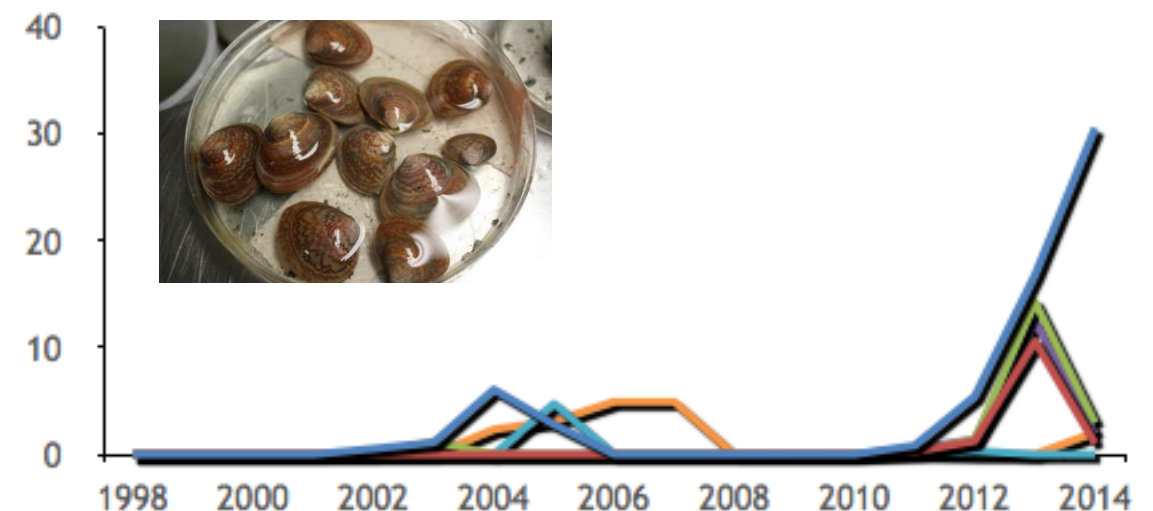
Macrofaunal Biomass



[Grebmeier unpubl. data]

Example Data

UTN 2 UTN 3 UTN 4 UTN 5 UTN 6 UTN 7
Biomass of *Serripes groenlandicus* in DBO 3



[Goethel unpubl. data]

Pacific Arctic Climate Ecosystem Observatory (PACEO)

A joint effort from the PAG countries to gather synoptic observations in the high Pacific Arctic (Central Arctic Ocean, CAO) where sea-ice loss has been a maximum.

Collaborating internationally to design and implement repeat transects (integrated long-term observations) in the northern slope to basin areas.



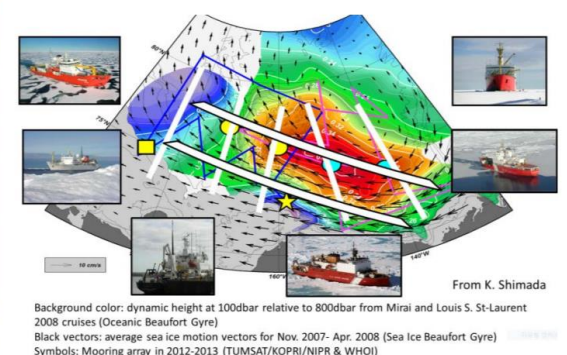
Pacific Arctic Group (PAG) joint activities

- PAG continues to develop and implement long-term monitoring activities such as
 - ✓ Distributed Biological Observatory (DBO) and
 - ✓ Pacific Arctic Climate Ecosystem Observatory (PACEO)

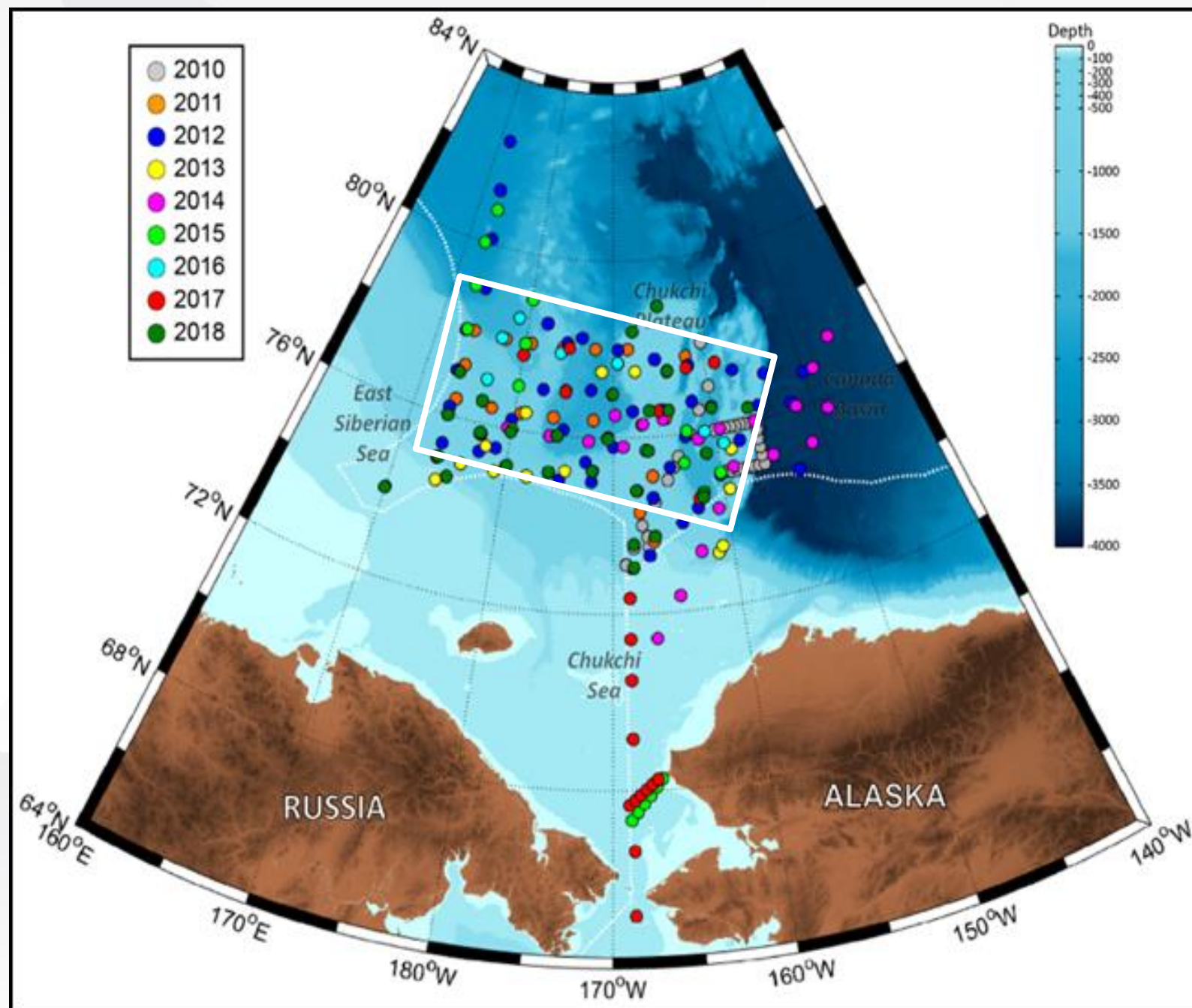
Distributed Biological Observatory (DBO)



Pacific Arctic Climate Ecosystem Observatory (PACEO)



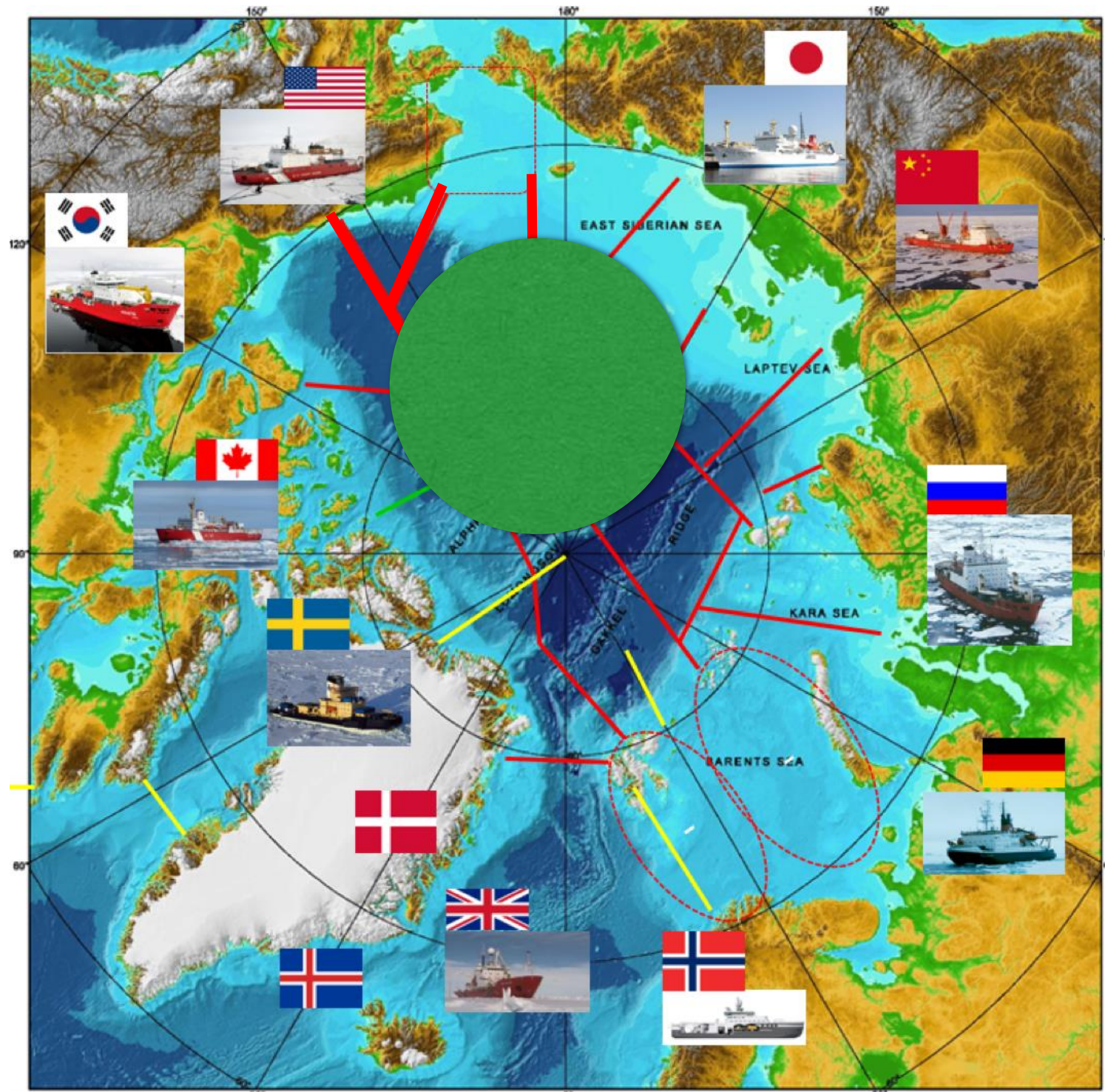
IBRV *Araon* PACEO Observations (2015~2018)



- We promote to facilitate a connected, collaborative, and comprehensive long-term Arctic Ocean observing system.
- Our observing system will be sustained in open cooperation.
- We promote contributions of all types of ocean observations including but not limited to in situ, remotely sensed, and the infrastructure such as IBRV *Araon* supporting them.

	2010	2011	2012	2013	2014	2015	2016	2017	2018
CTD	38	18	44	16	32	42	34	35	25
XCTD	*	33	48	36	51	61	38	30	30
Period	07/20~08/10	08/02~08/16	08/04~09/06	08/24~09/01	08/01~08/23	08/01~08/21	08/05~08/21	08/06~08/24	08/04~08/25

Central Arctic Ocean(CAO)



Discussed in
2018 Fall
meeting

Will discuss in
2019 Fall
Meeting

Online

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2019 DBO (Distributed Biological Observatory)-NCIS (Northern Chukchi Sea Integrated Study)

Aug 2-23, 2019 (Nome-Nome, Alaska)

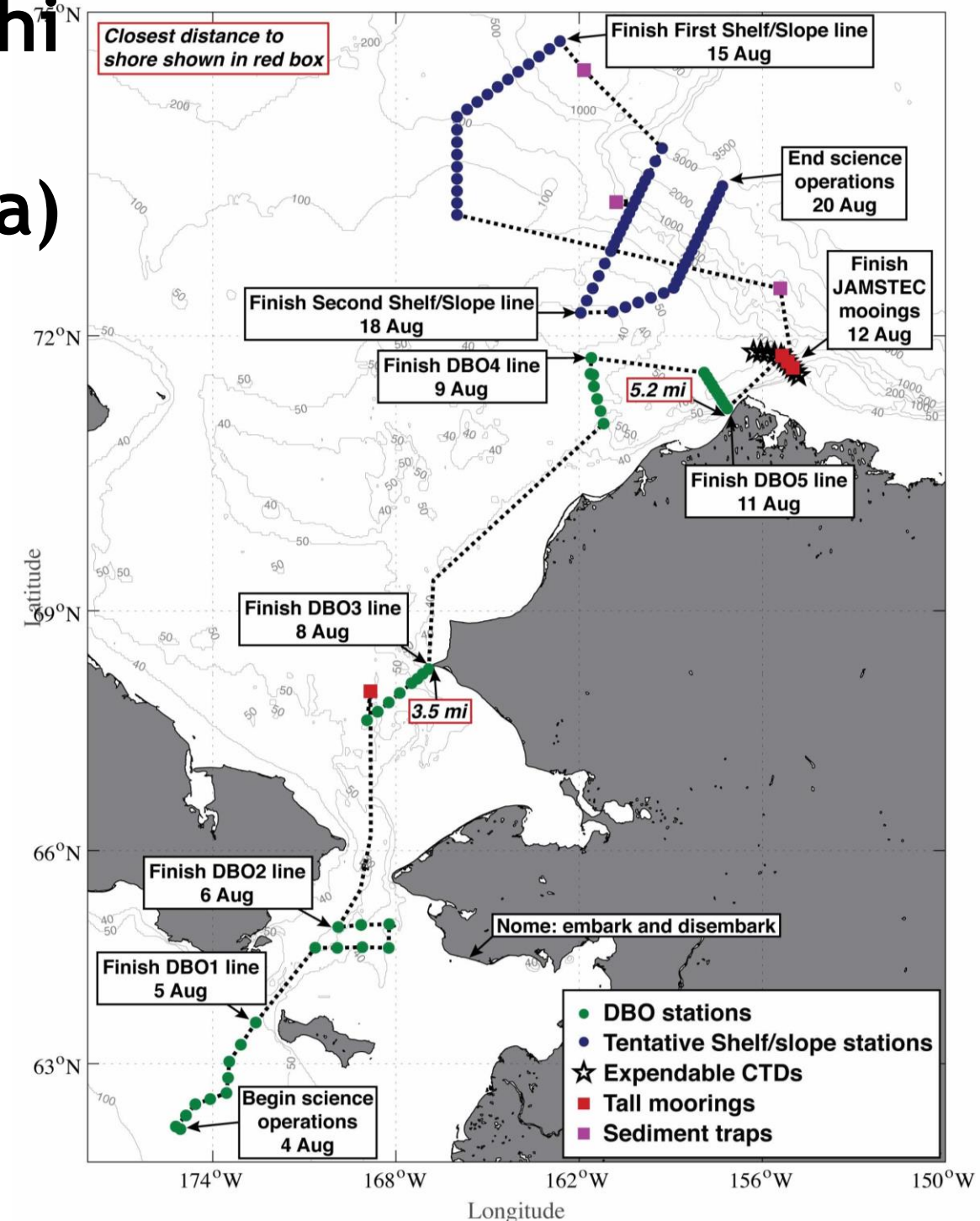
Standard measurements and process studies (DBO1,2,3,4,5), Barrow Canyon,

- Physical: CTD and ADCP, mooring retrieval and replacement (JAMSTEC and NOAA)
- Chemical: nutrients, oxygen-18,
- Chlorophyll-a, carbon components, Harmful Algal Bloom (HAB) components
- Biological: Zooplankton and larval fish abundance and biomass
- Benthos: macrobenthos abundance, biomass and population structure
- Sediment: organic carbon/nitrogen content, chl-a content, grain size, radioisotopes, HABs
- Benthic oxygen uptake and nutrient exchange
- Marine mammal and seabird surveys

USCGC Healy cruise 1901

2 - 23 August, 2019

Draft as of April 1, 2019



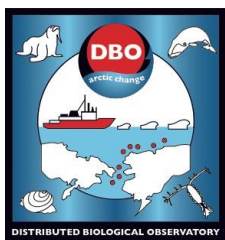
Chief Scientist: Robert Pickart (WHOI)
and co: Jackie Grebmeier/UMCES:
jgrebmei@umces.edu



EcoFOCI

Ecosystems & Fisheries-Oceanography Coordinated Investigations

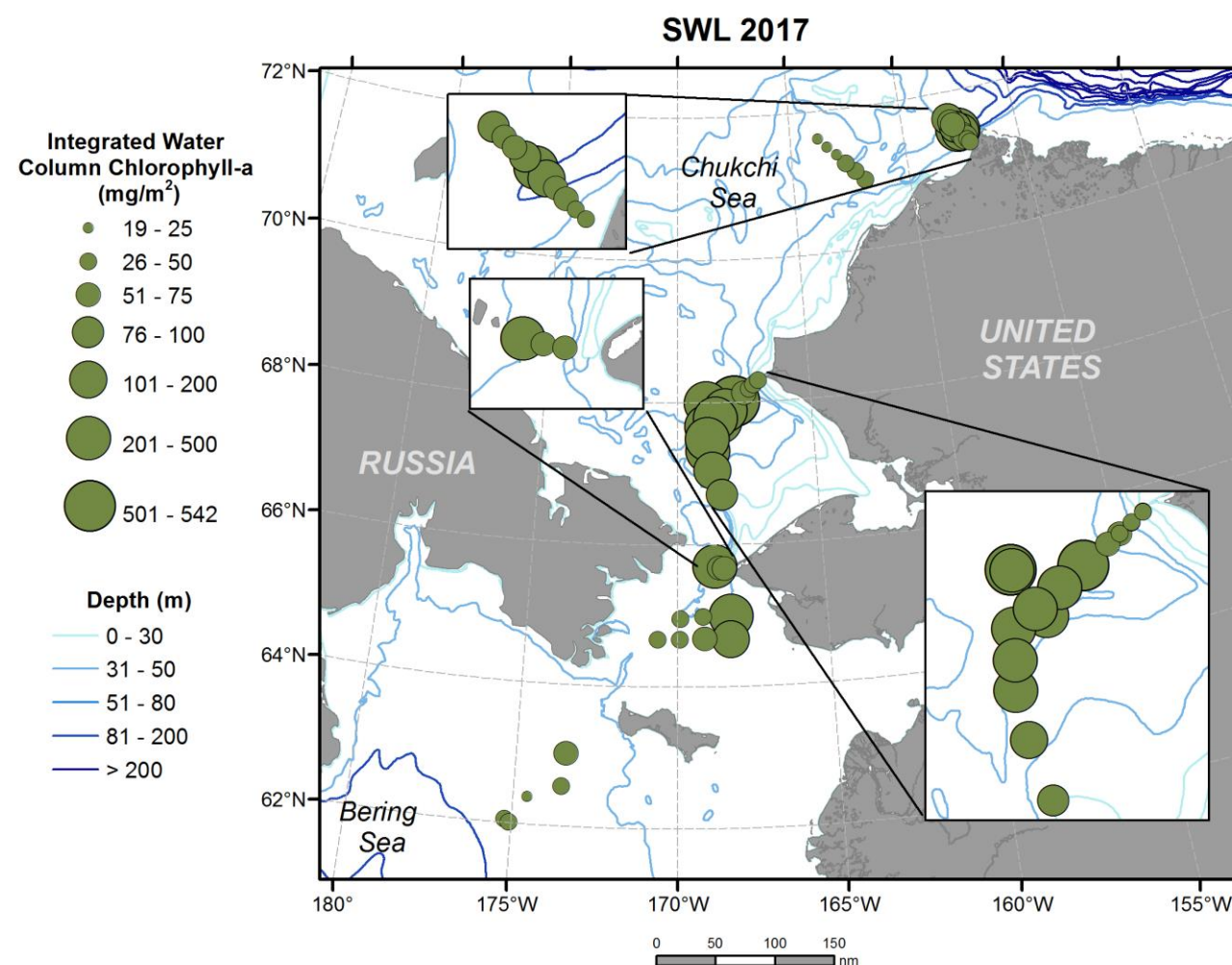
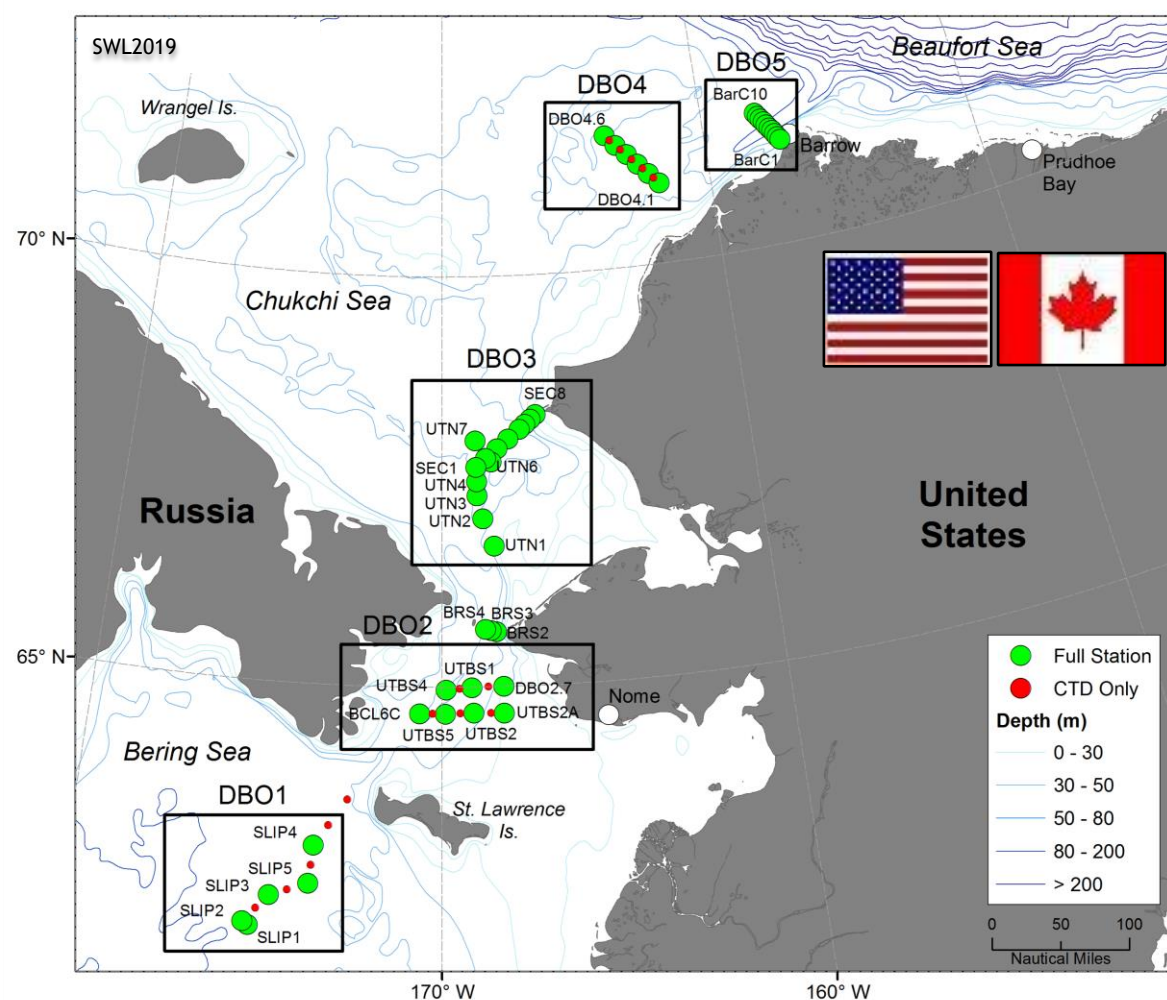
Contact: Phyllis Stabeno/NOAA:
phyllis.stabeno@noaa.gov



Canada's Three Oceans (C30) and the DBO: CCGS Sir Wilfrid Laurier, July 11-23, 2019



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



Contacts: John Nelson
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Jackie Grebmeier
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DBO data collections

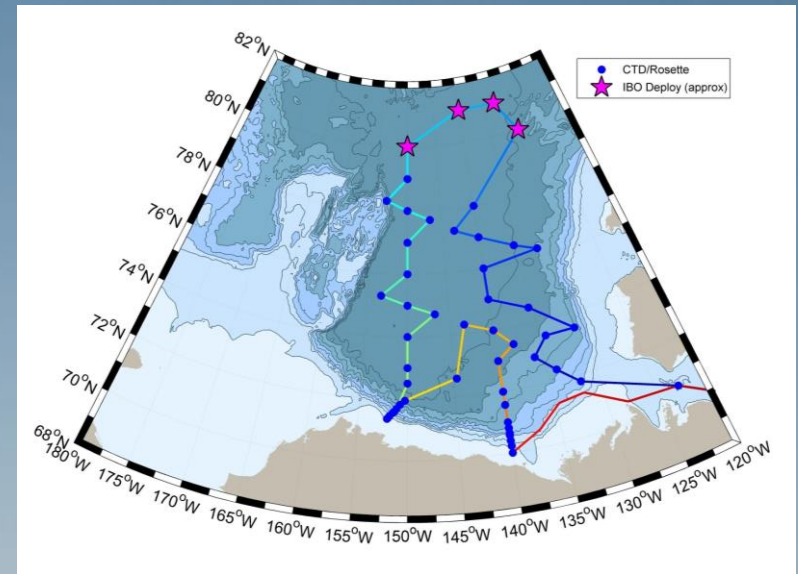
- Seawater temperature and salinity; velocity measurements
- Nutrients, chlorophyll, carbon products, CDOM
- Phytoplankton, zooplankton and macrobenthic abundance, biomass, community structure
- Marine mammal and seabird surveys



CCGS *Louis S. St-Laurent*

Joint Ocean Ice Studies (JOIS) - Arctic Observing Network - Beaufort Gyre Observing System (AON-BGOS)

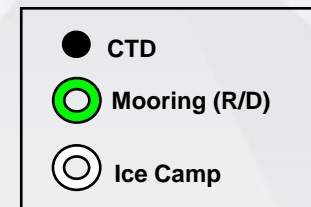
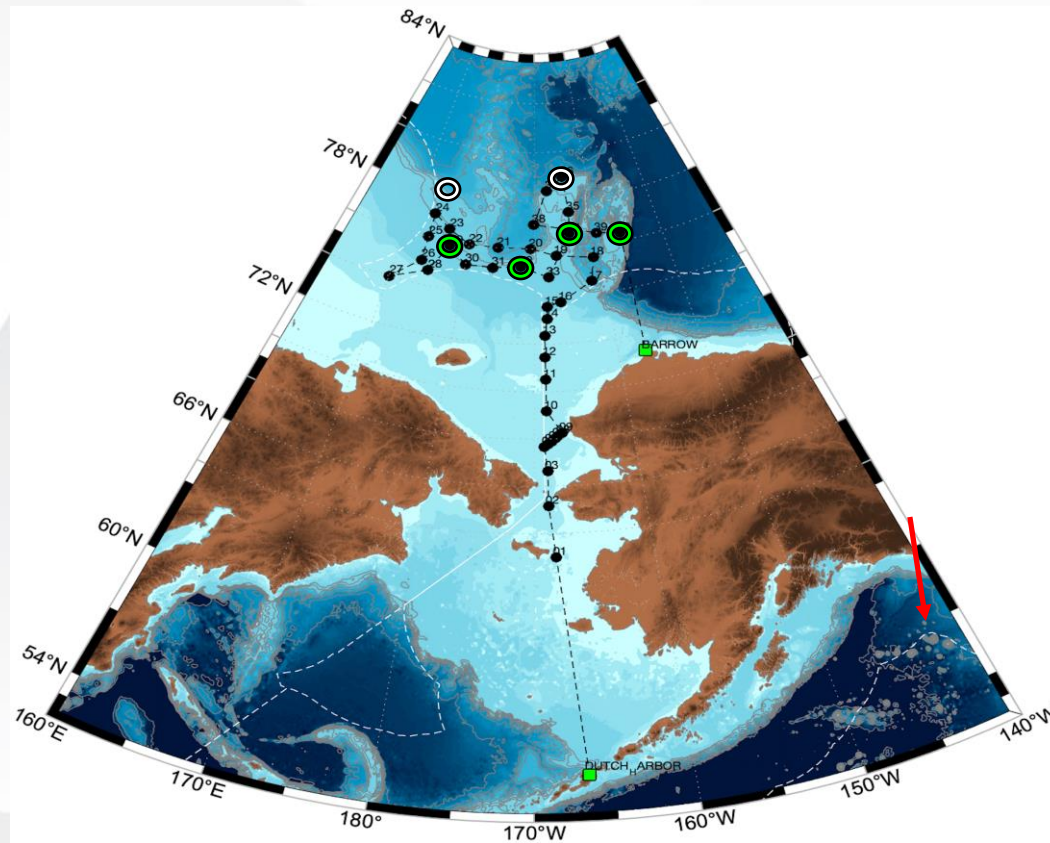
- Chief Scientist: Bill Williams / Sarah Zimmermann
- Collaborators: WHOI, JAMSTEC, TUMSAT, KIT ...
- Supported by: NSF, DFO, KIT
- 10 Sept - 02 Oct, 2019 (20 days)
- Kugluktuk - Canada Basin - Kugluktuk
- 27 participants
- CTD/rosette profiles + biogeochemical sampling
- Vertical net casts for zooplankton
- XCTD casts
- *No mooring recovery or deployment (WHOI)*
- Underway measurements
- Ice Observations (ship, ice and helicopter)
- Deploy 4 Ice Tethered Profilers, 2 Seasonal Ice Mass Balance Buoys



(Photo: Jeffrey Charters)

2019 Arctic Ocean Expedition-ARAON

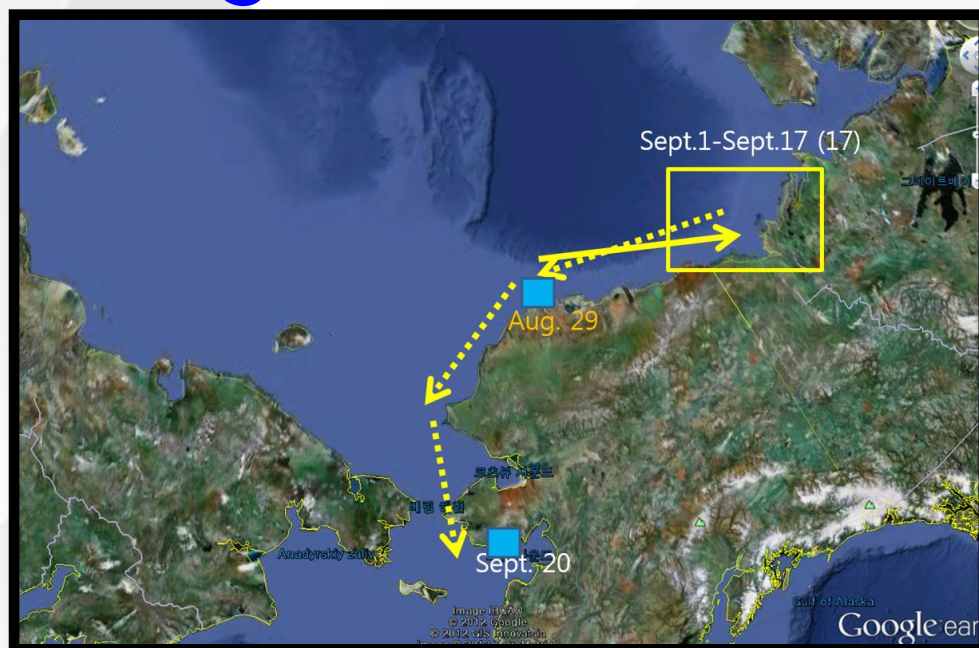
1st Leg (ocean-sea ice-atmosphere)



2019.8.3-8.27

- North of Bering strait
- Chukchi shelf
- Chukchi Borderland to East
- Siberian Sea
- DBO line 3
- Sea Ice stations
- Ocean mooring stations (4 stations)

2nd Leg 2019.8.29-9.20

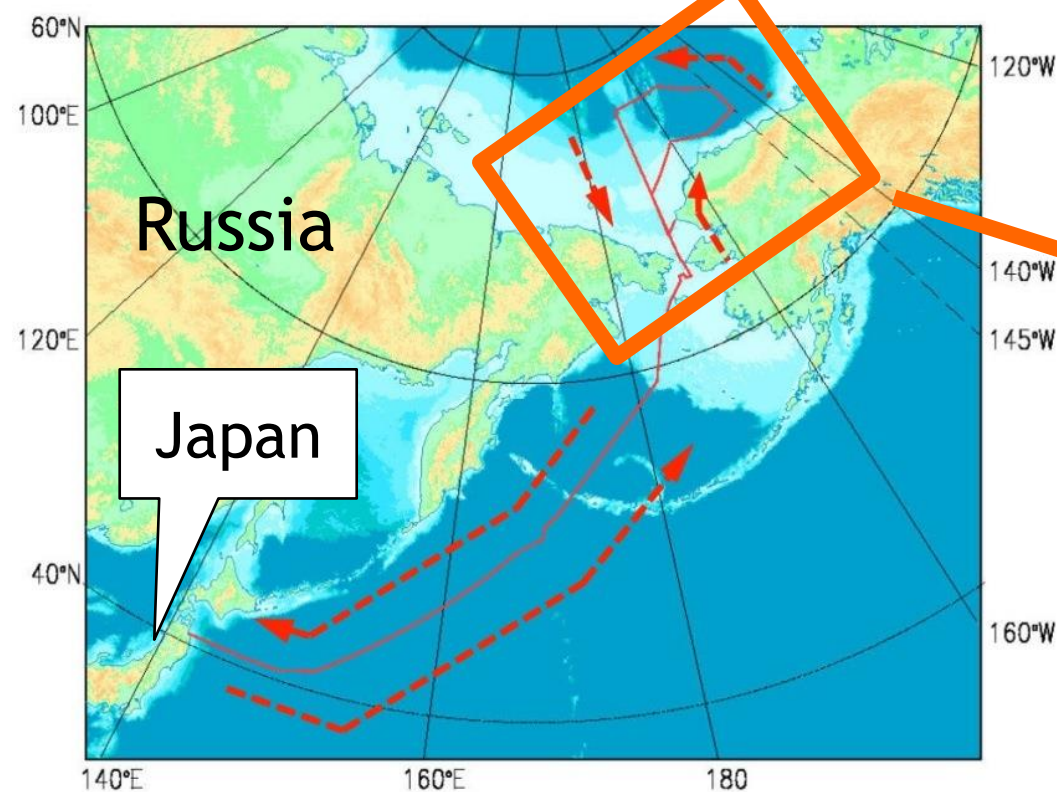


Research items;

- Multichannel seismic survey
- OBS survey
- Sub-bottom profiling
- bathymetric mapping
- Sediment coring
- Heat flow measurements
- Water column study
- Methane flux study
- Microbiological study

Plans during the R/V *Mirai* Arctic cruise in 2019

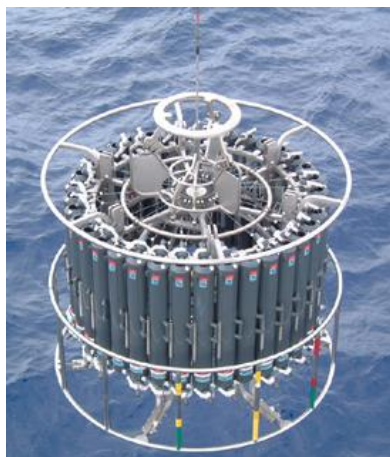
Pacific sector



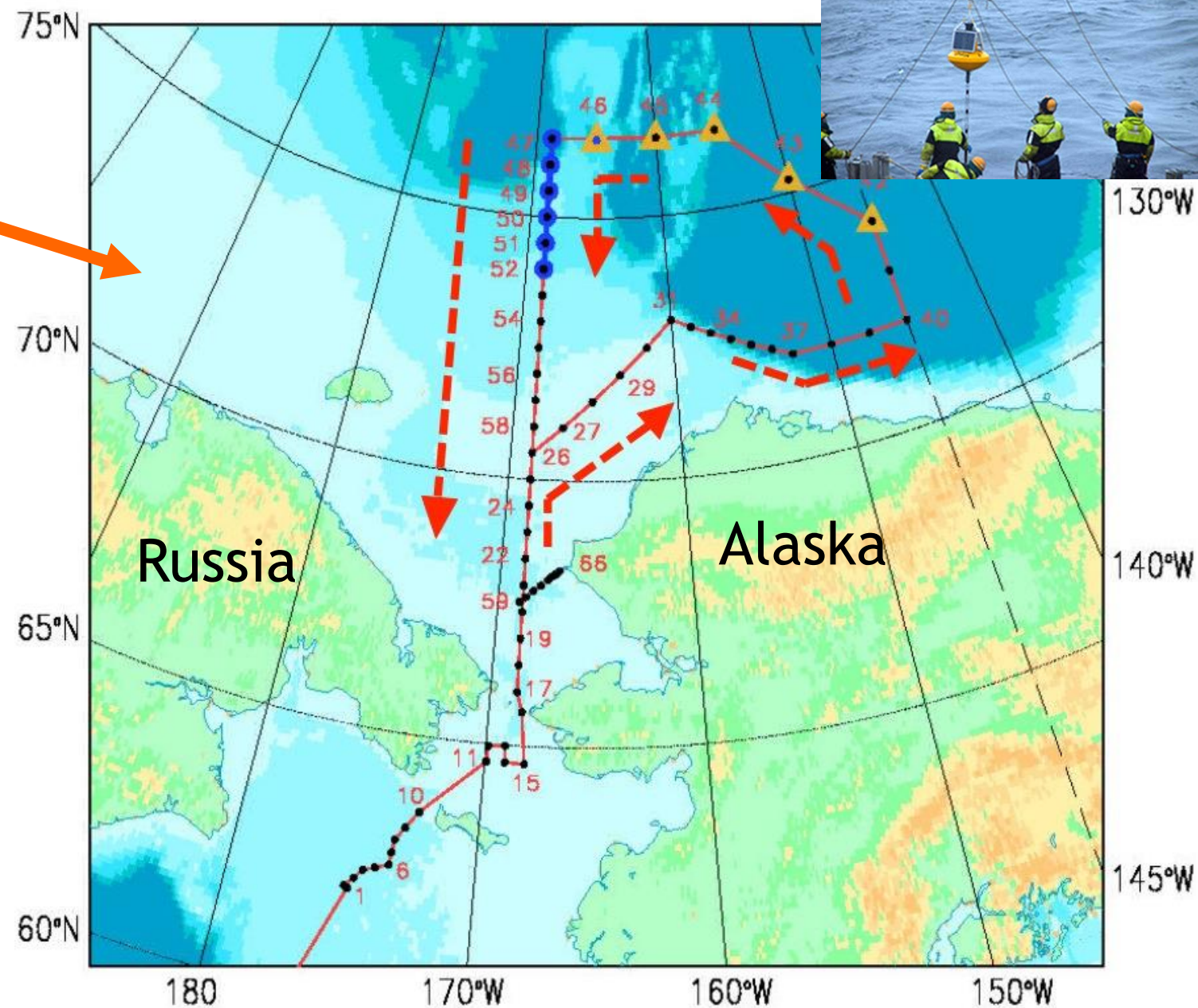
CTD profiler

NORPAC nets

Radiosonde



Arctic ocean



Black dots: CTD stations including DBO lines

Yellow deltas: Wave buoy launch positions

Blue dots: Iterative observation stations
(make a round trip every day)

Mirai cruise will be conducted in Chukchi and Beaufort seas during October 2019 for atmospheric and ocean observations

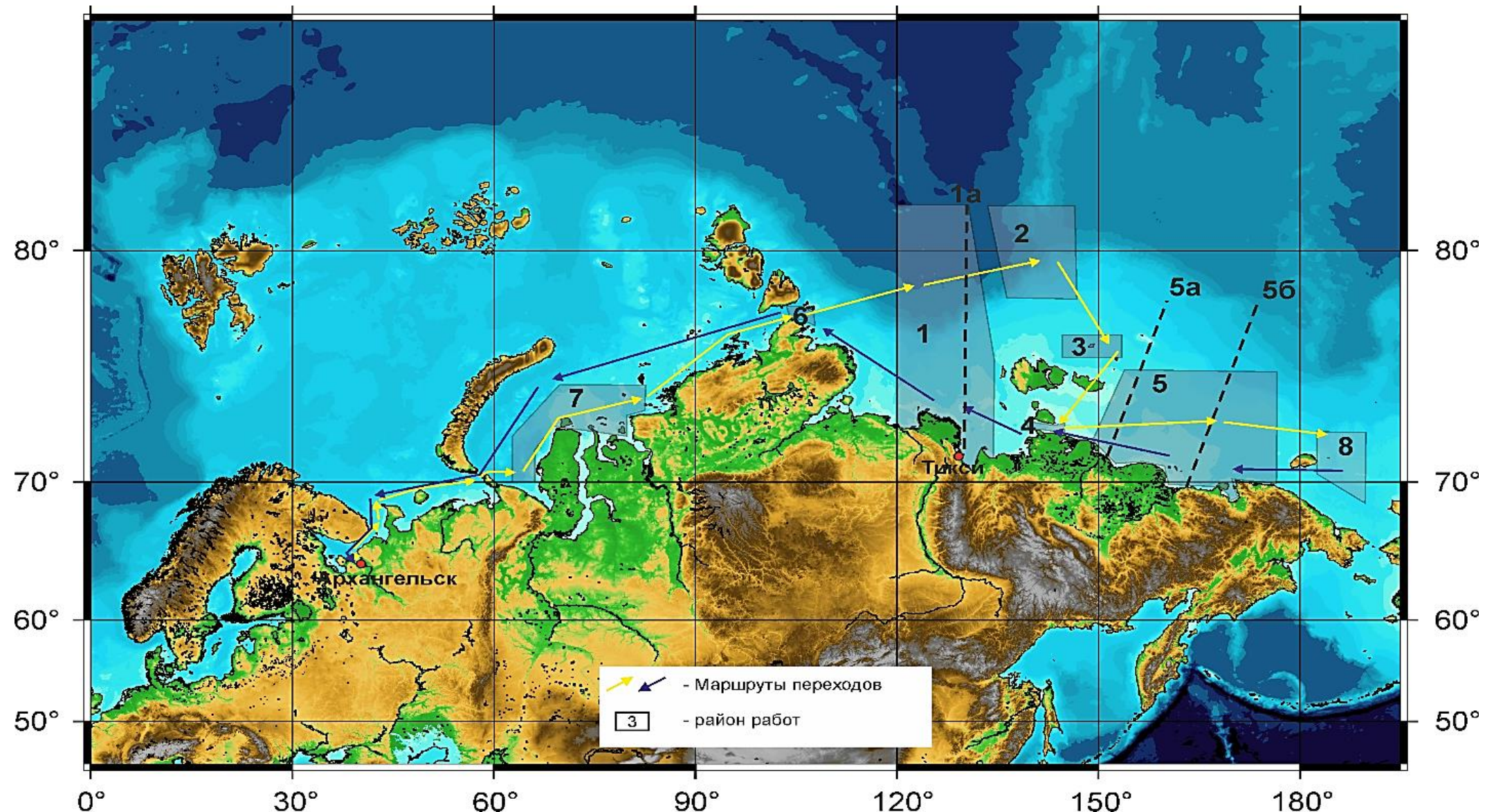
27 Sep (Sekinehama, Japan) - 10 Nov (Hachinohe, Japan)

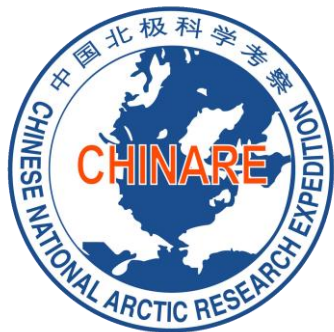
East Siberian Arctic Shelf (ESAS)

- 2019: 35 days cruise onboard RV "Academician Keldish"

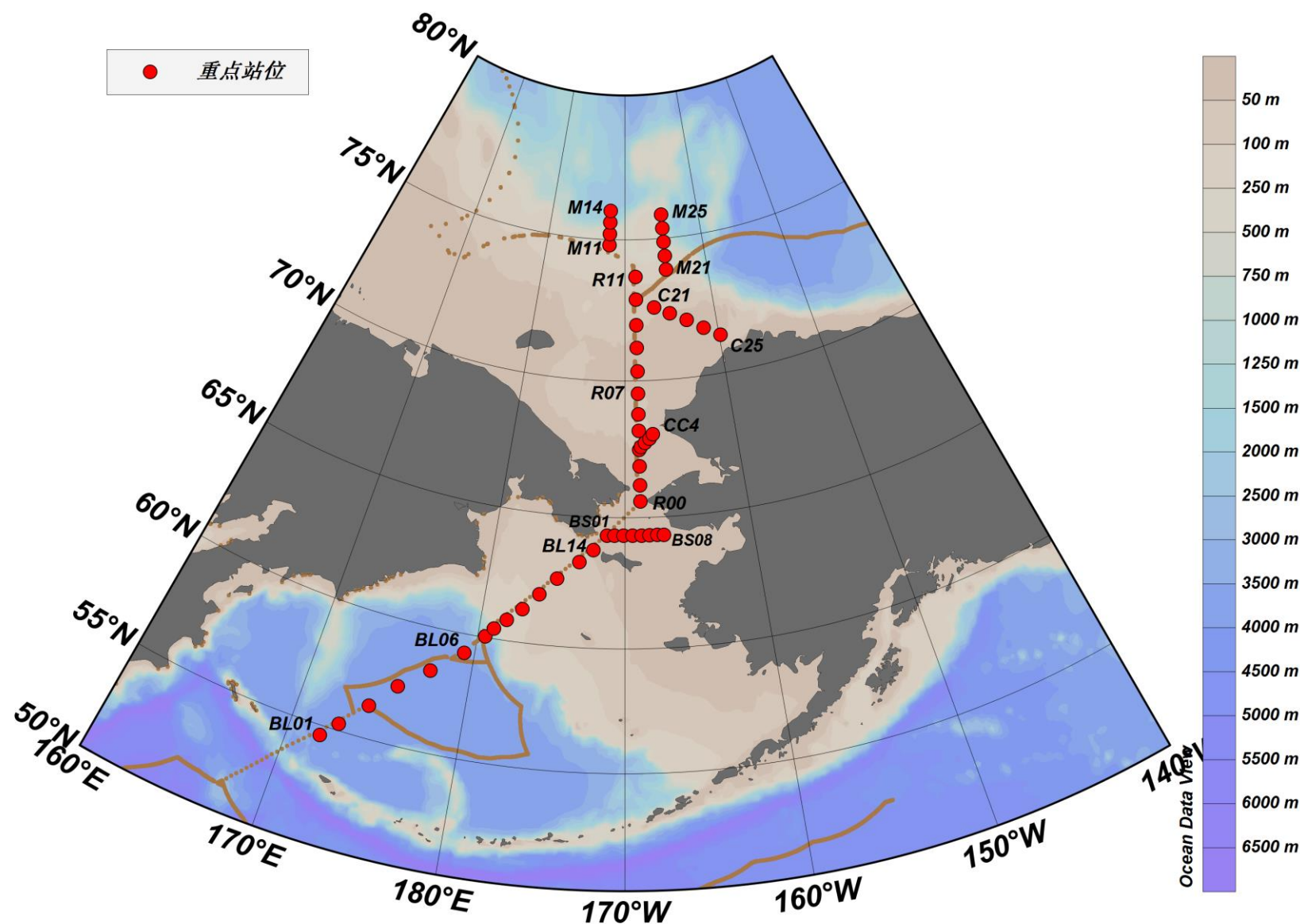
To the ESAS from Archangelsk

(plus 11 days steaming from Archangelsk to Kaliningrad with continuous measurements in air and surface water)





CHINARE-10 (Aug. 10th-Sept. 30th, 50 days)



R/V Xiangyanghong-01

CTD Stations: 52

Sediment sampling: 45 st.

Plankton sampling: 25 st.
Benthos sampling: 15 st.

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PAG fall meeting: Oct. 2019 / Hangzhou, China

