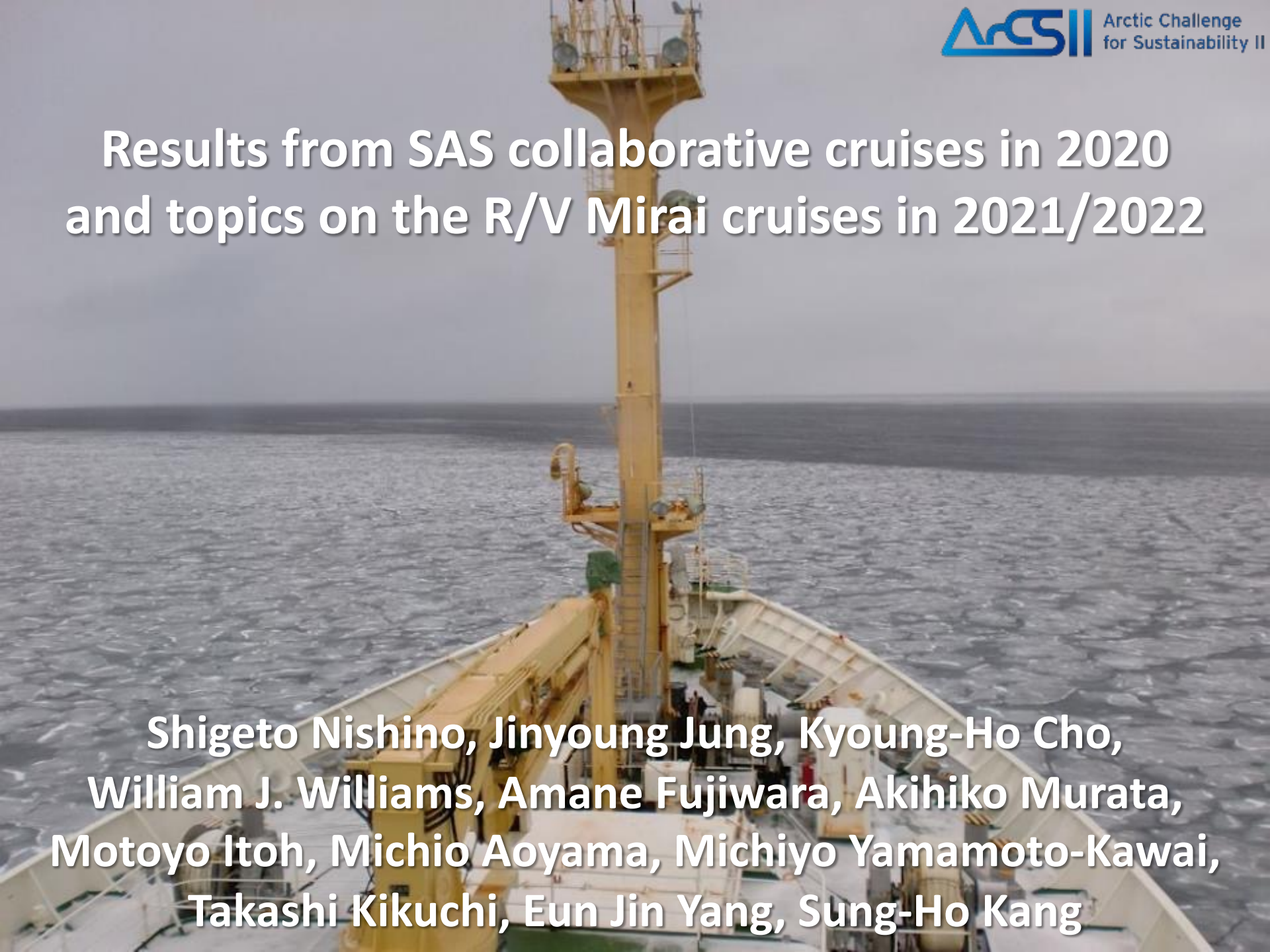
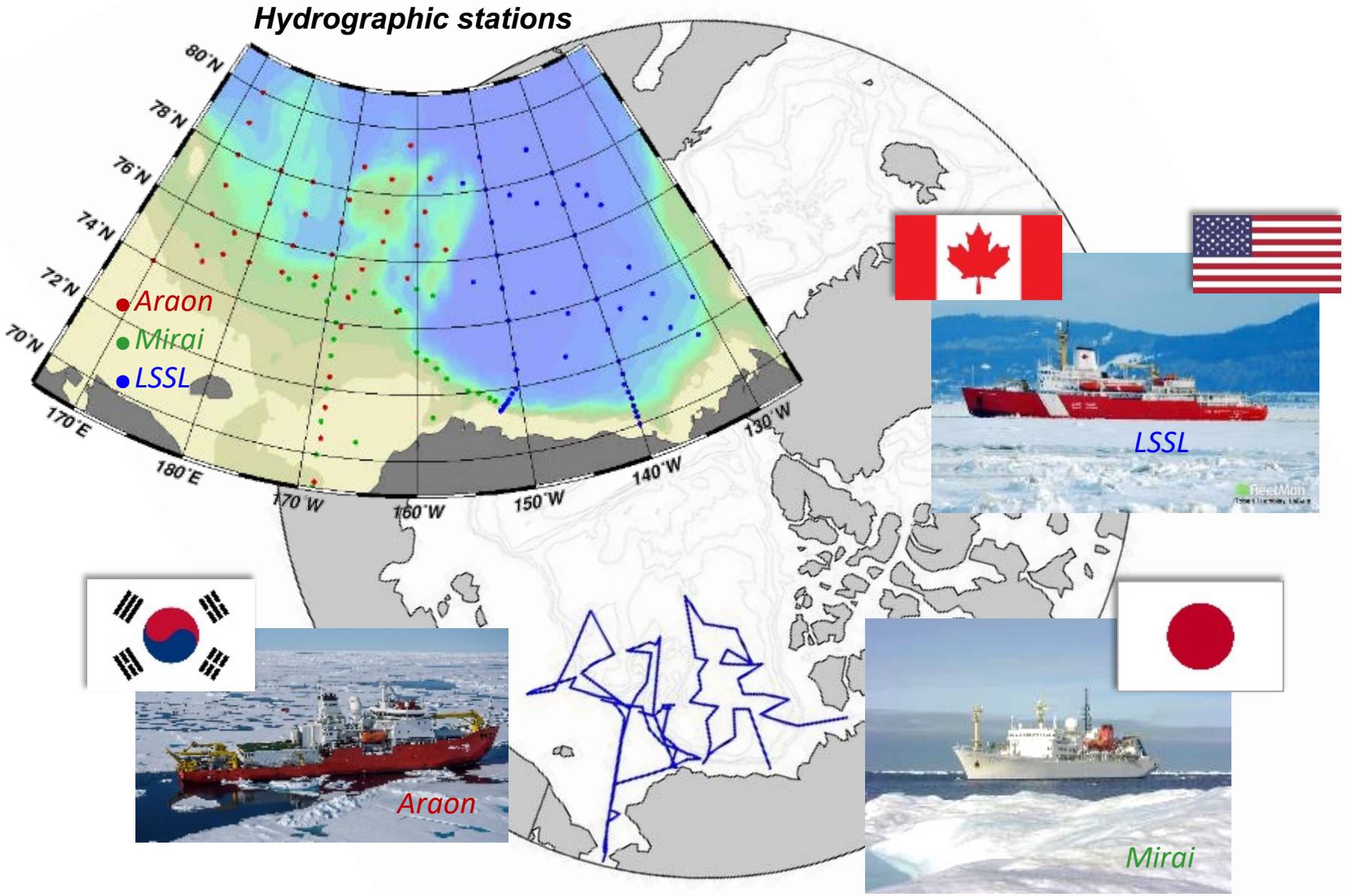


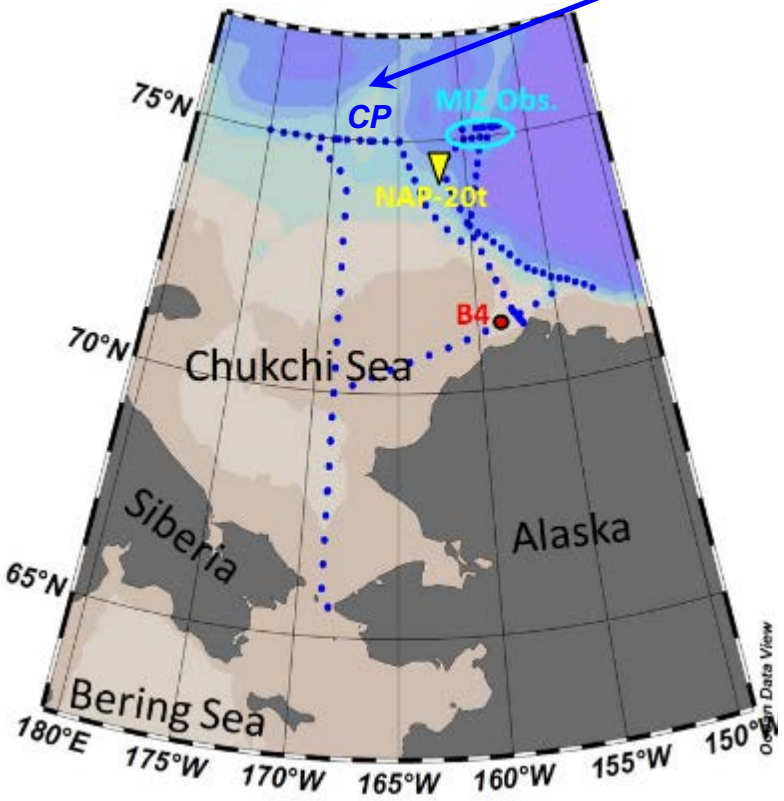
Results from SAS collaborative cruises in 2020 and topics on the R/V Mirai cruises in 2021/2022

Shigeto Nishino, Jinyoung Jung, Kyoung-Ho Cho, William J. Williams, Amane Fujiwara, Akihiko Murata, Motoyo Itoh, Michio Aoyama, Michiyo Yamamoto-Kawai, Takashi Kikuchi, Eun Jin Yang, Sung-Ho Kang

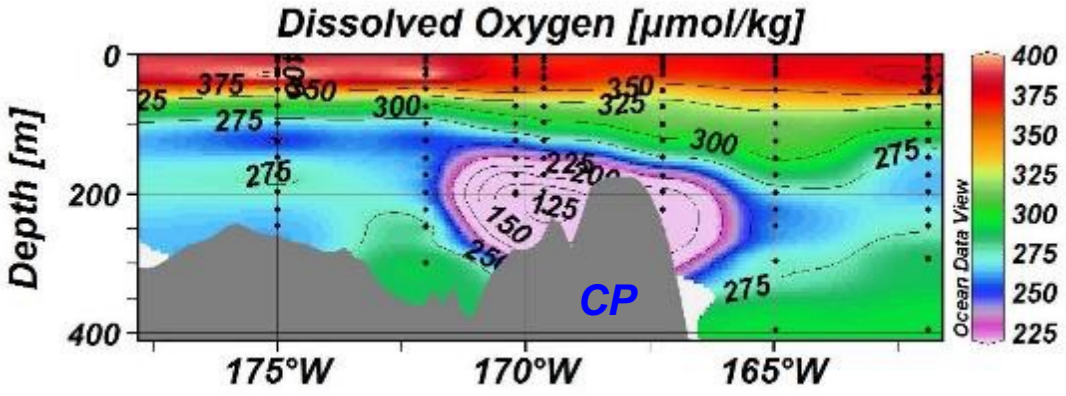
SAS collaborative cruises in 2020 by Canada/US, Japan, and Korea



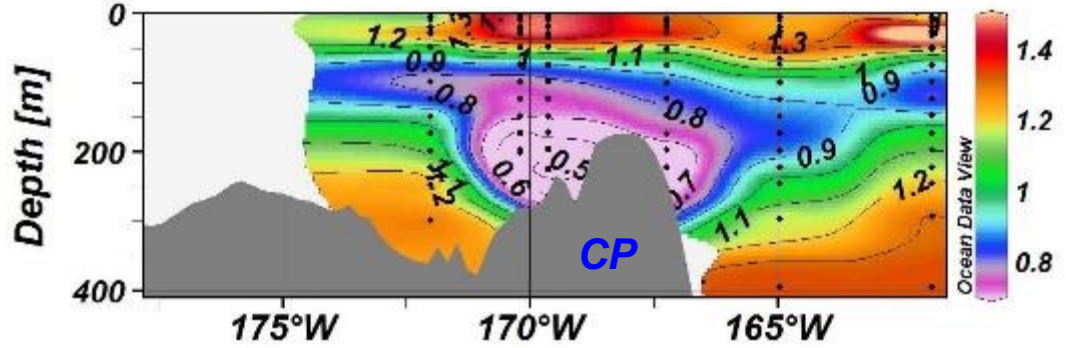
Low DO and highly acidified water on the Chukchi Plateau



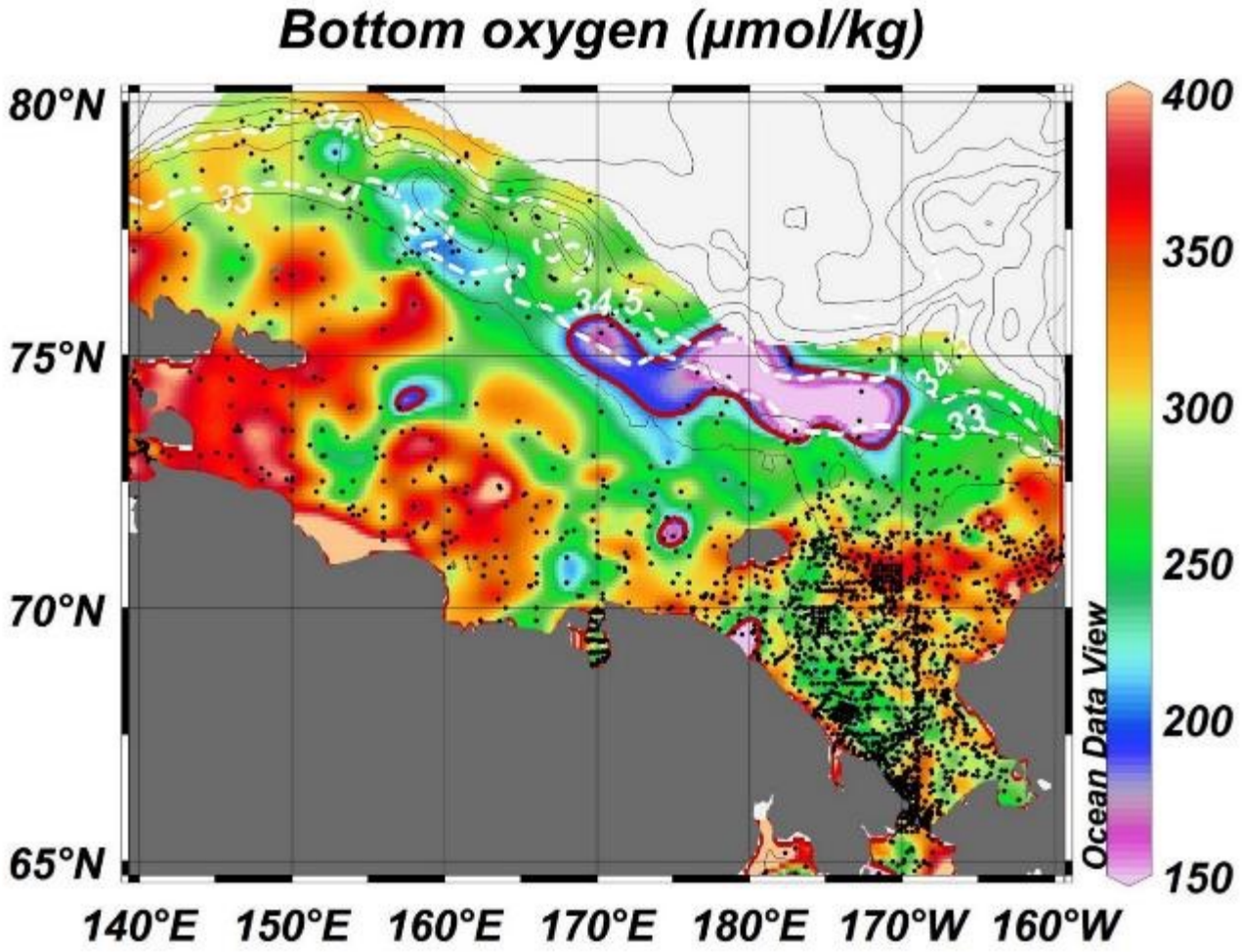
75˚N-line across the Chukchi Plateau (CP)



Aragonite saturation state Ω_{Ar}



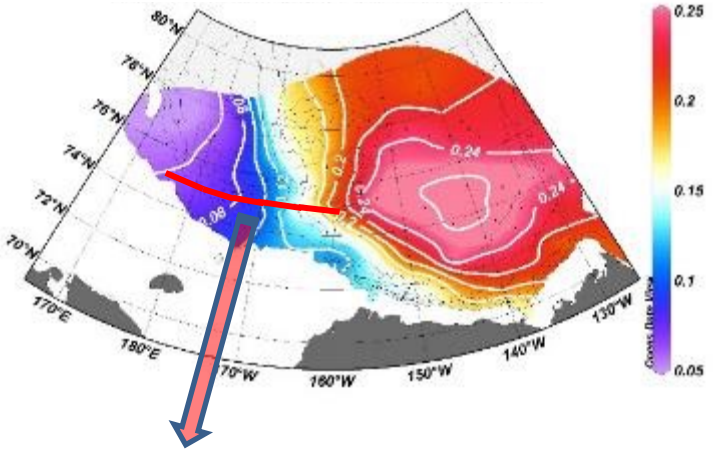
Possible origin of the low DO and highly acidified water



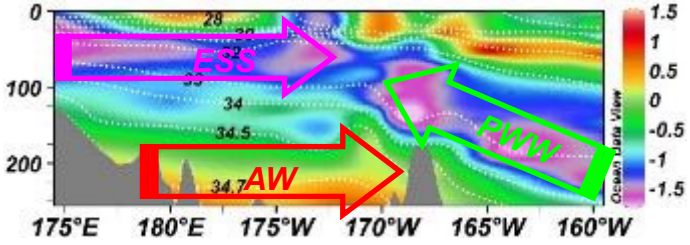
Hydrochemical Atlas of the Arctic Ocean

Beaufort Gyre extent and Atlantification determine DO distribution

A *Dynamic height at 100 m (2020)*

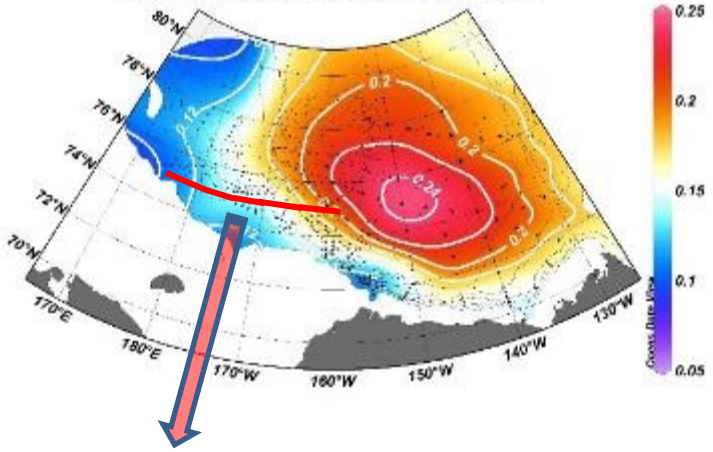


B *Temperature (colors) and salinity (contours) along 75ºN (2020)*

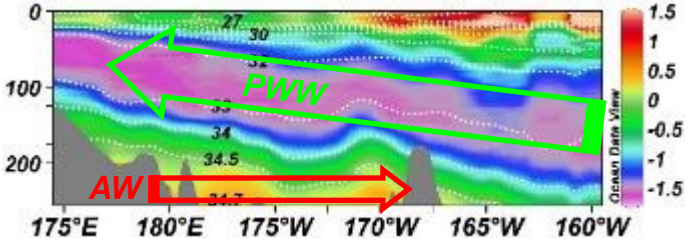


- *PWW and AW encountered over CP*
- *A frontal structure appeared over CP*
- *A frontal northward flow was formed along CP*

D *Dynamic height at 100 m (2008-2016)*



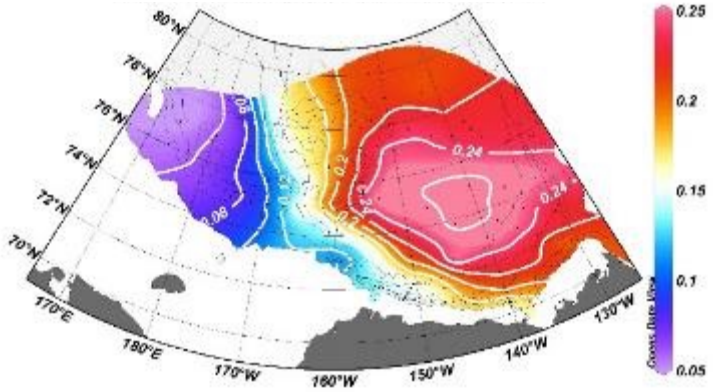
E *Temperature (colors) and salinity (contours) along 75ºN (2008-2016)*



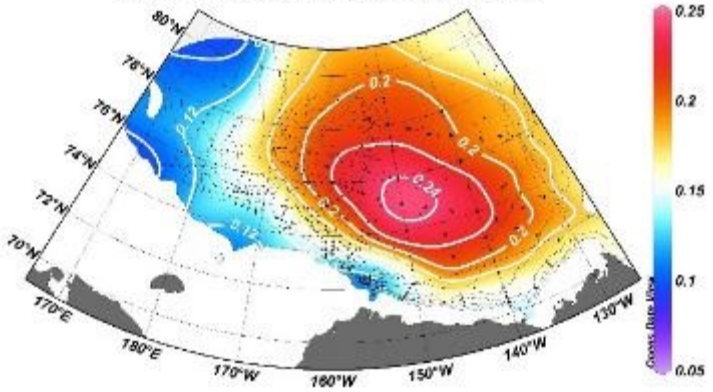
- *PWW overshot CP toward the west*
- *A frontal structure disappeared from CP*
- *A frontal northward flow was not found*

Beaufort Gyre extent and Atlantification determine DO distribution

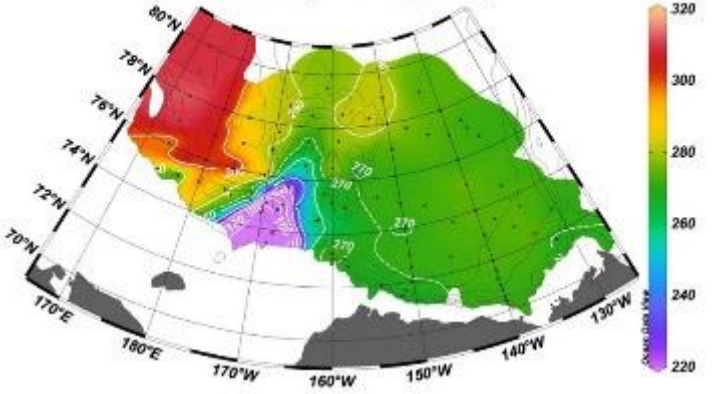
Dynamic height at 100 m (2020)



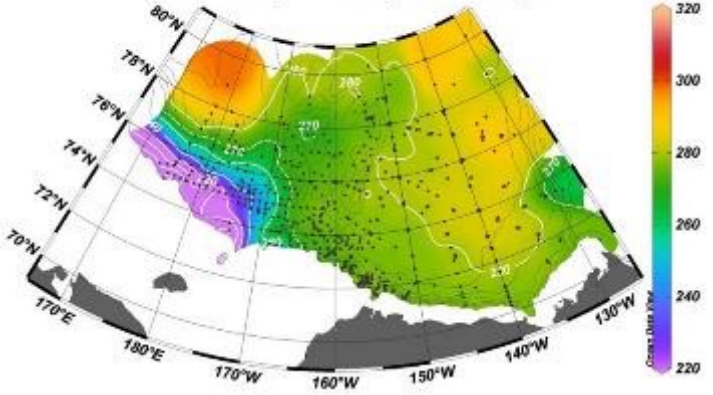
Dynamic height at 100 m (2008-2016)



Dissolved oxygen on salinity = 34.5 (2020)



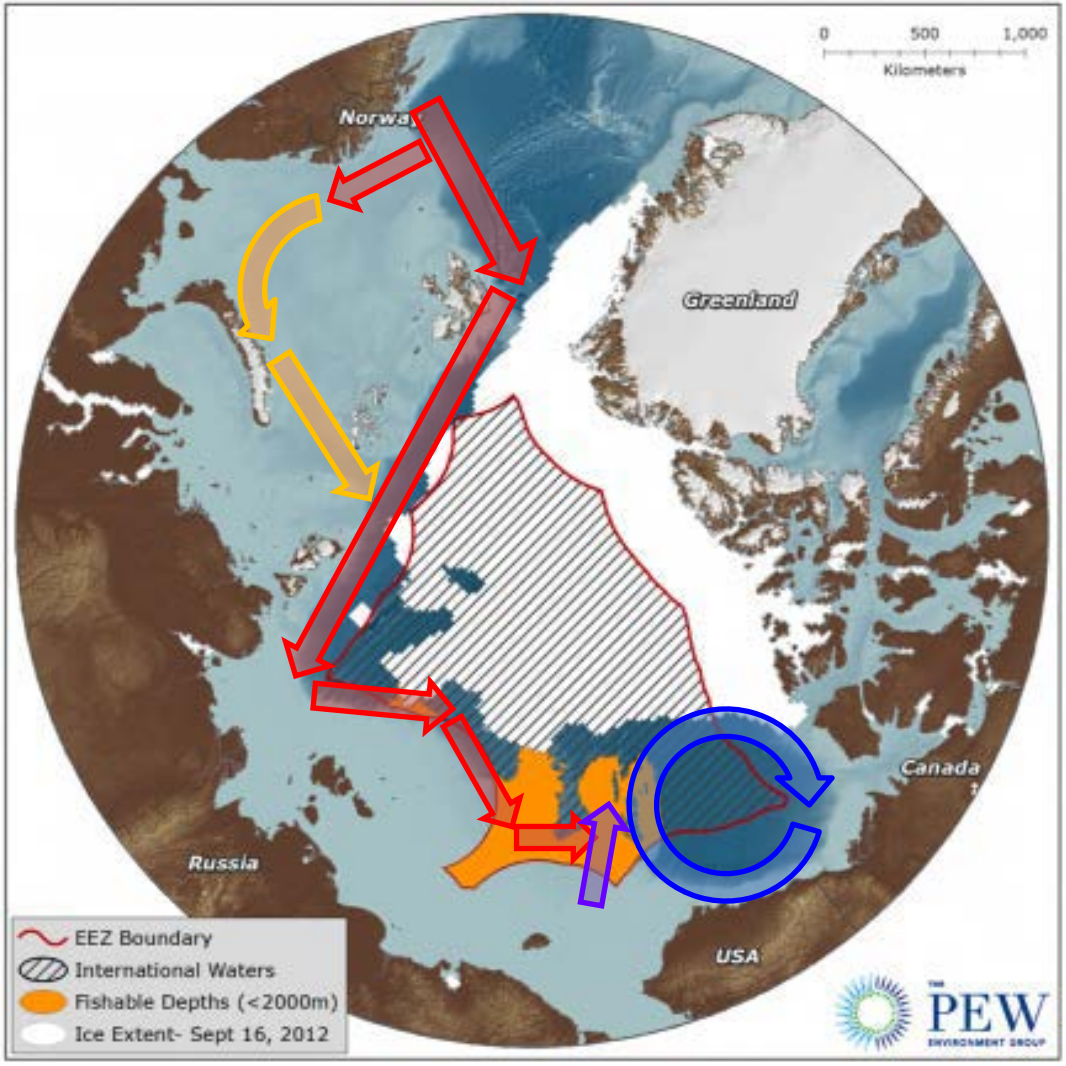
Dissolved oxygen on salinity = 34.5 (2008-2016)



- ***Low DO water was washed by DO-rich AW***
- ***A frontal northward flow carried the low DO water toward the north along CP***

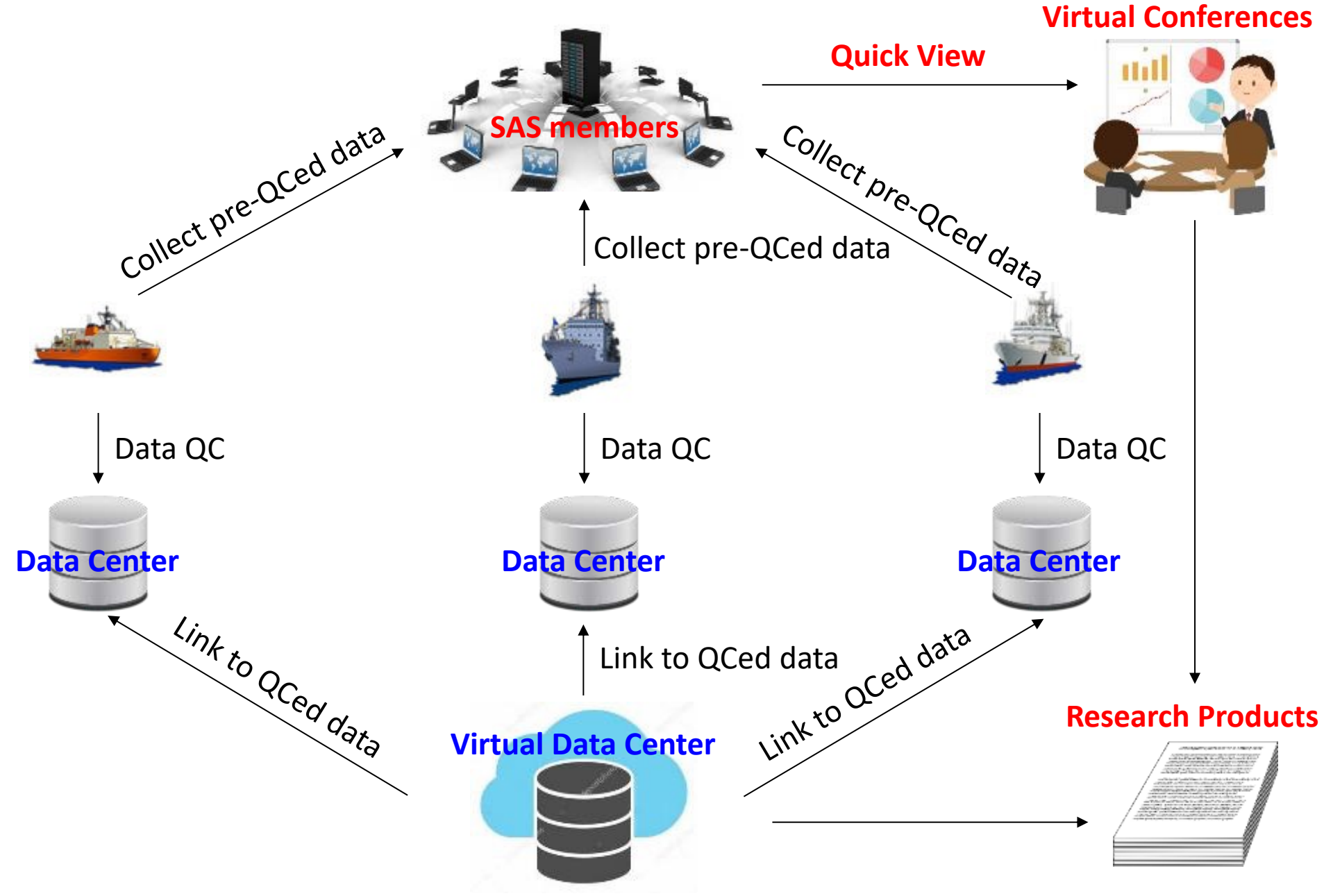
- ***Low DO water occupied outside BG (shadow zone)***
- ***Low DO water was not ventilated by PWW and AW***

Shrink of a gyre in the Pacific Arctic and Atlantification open a door of low DO water spreading from the ESS shelf slope to the Canada Basin



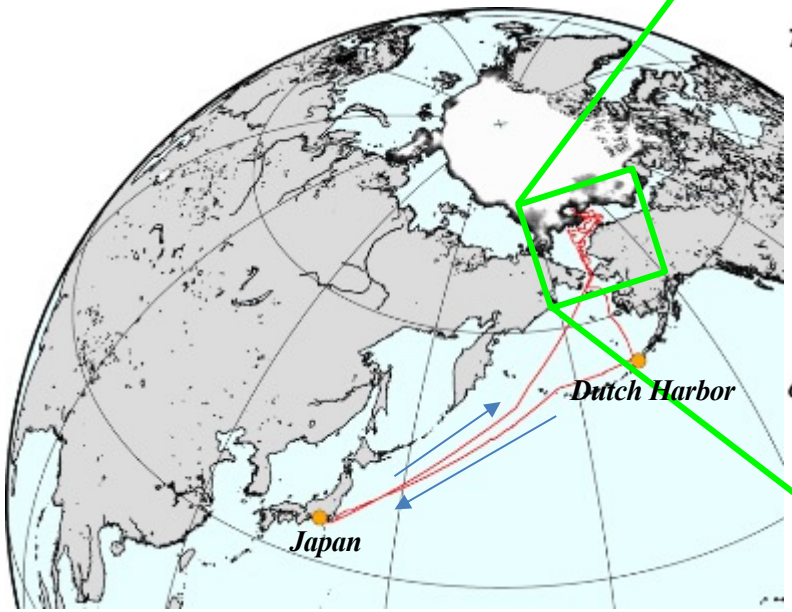
The low DO and acidified water may impact the marine ecosystem in the fishable area, and thus, monitoring of marine environment and ocean acidification in that area would be important.

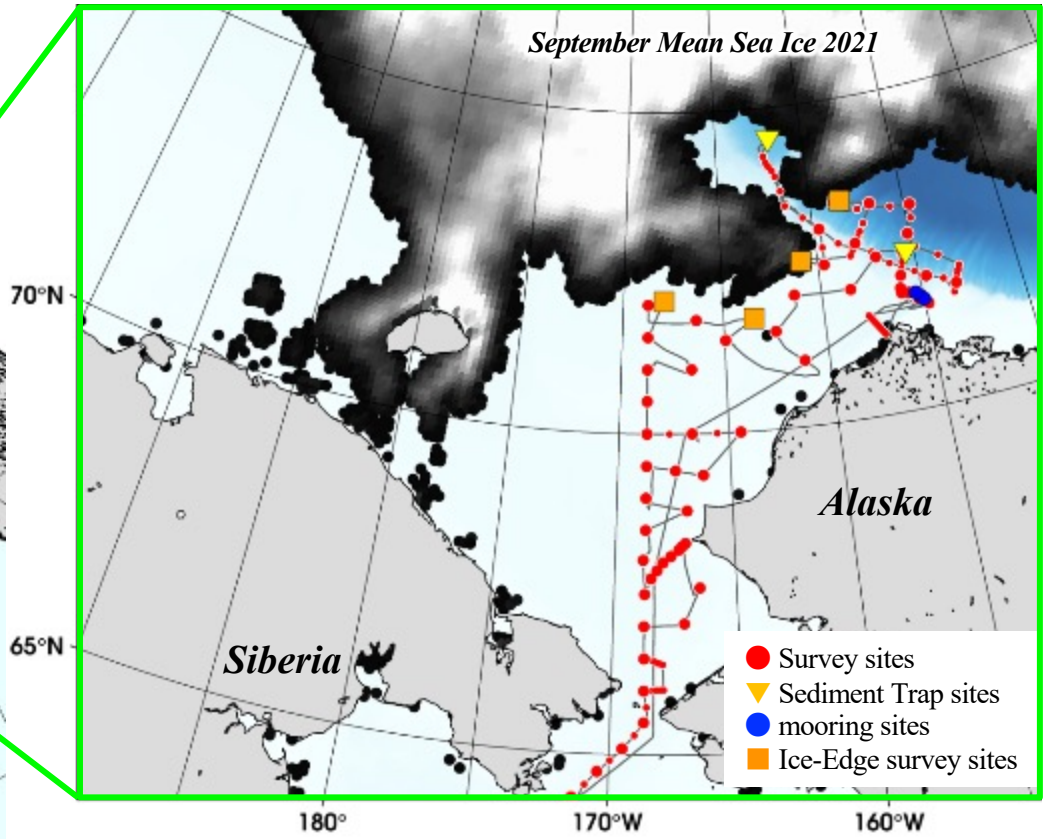
Quick View for SAS members to promote integrated studies



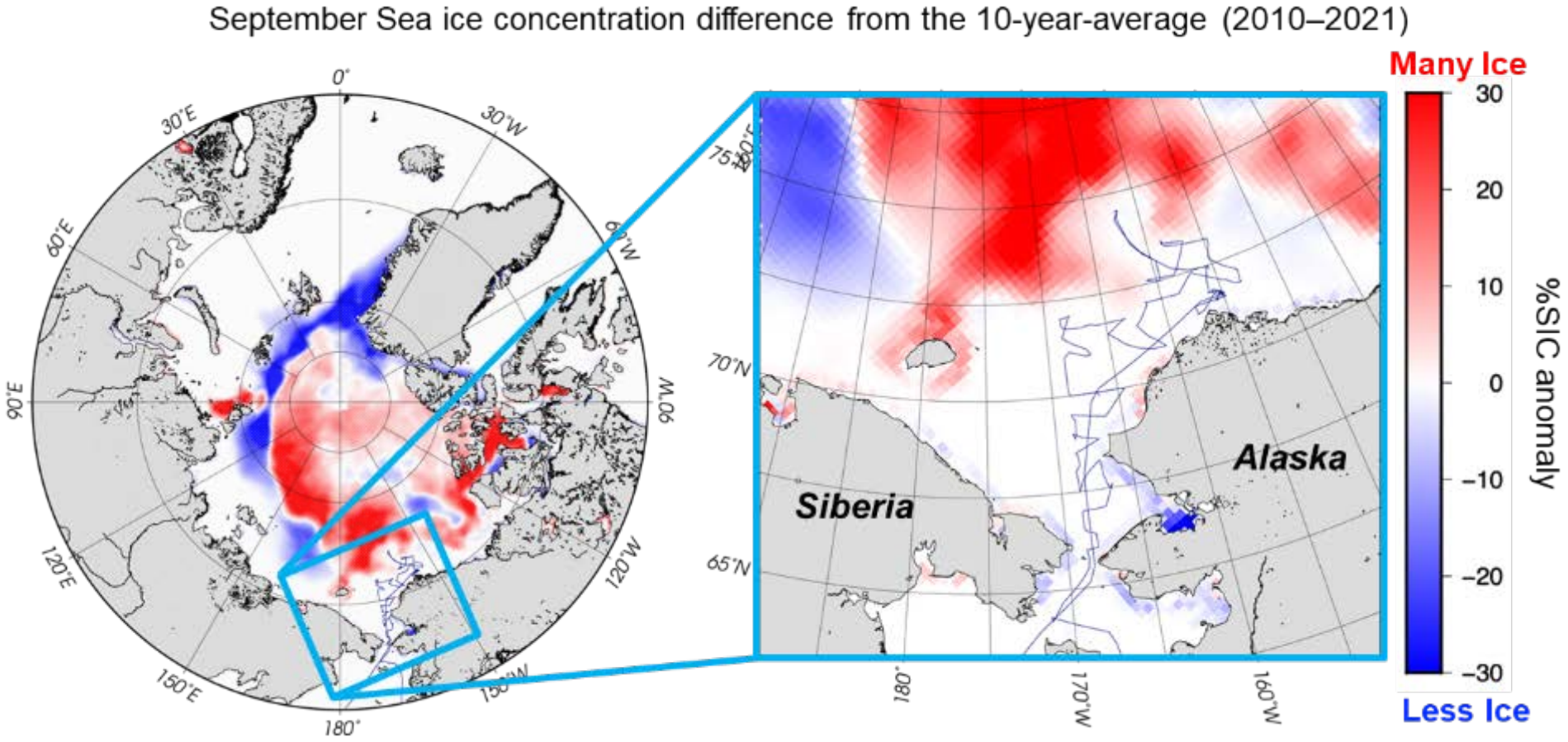
R/V Mirai Cruise in 2021

Aug 31 Departed Japan
Sep 9 Bering St.
Oct 2 Bering St.
Oct 5–6 Dutch Harbor
Oct 22 Arrived Japan





2021 the anomalously icy year



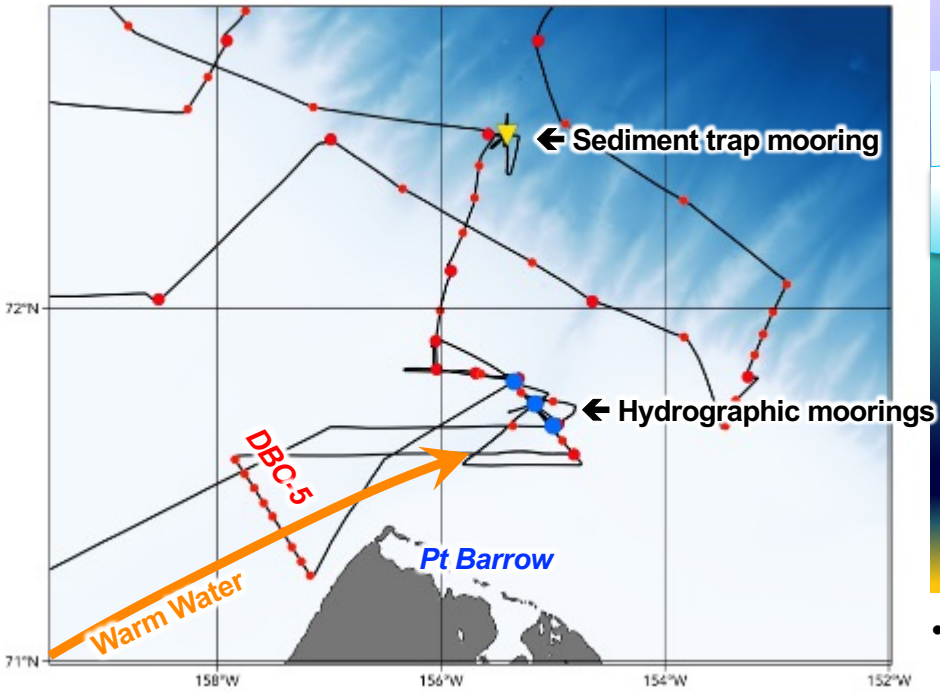
Research activities of the cruise

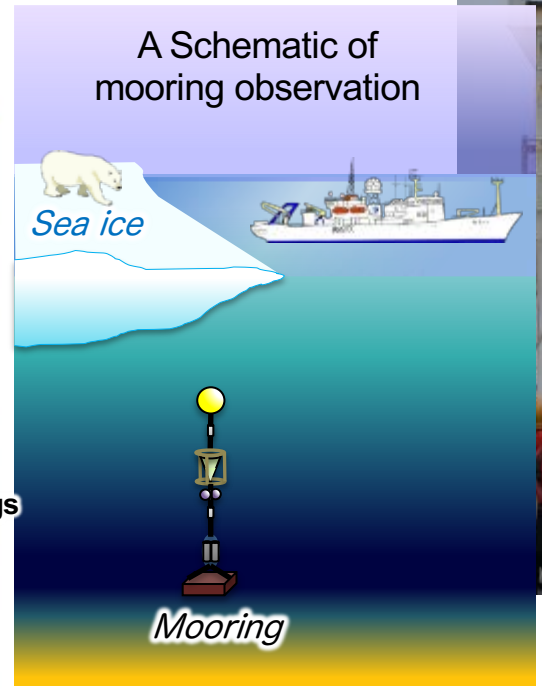
Basic hydrographic research

Water sampling

Sampled water & measured temperature, salinity, oxygen, CO_2, methane, phytoplankton, etc.

Recovery/redeployment of moorings

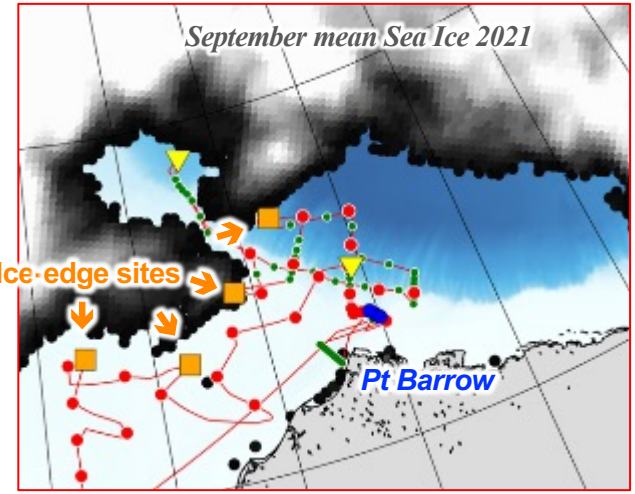




- We recovered 3 hydrographic moorings and a sediment trap mooring → redeployed (Sep 10–12)
- BC mooring recorded anomalously fresh “summer water” in 2021

Ice-edge observation

Objectives
- Observation of the unique & complex oceanographic feature in the marginal ice zone
- Understanding sea ice-wave interaction
- Comprehend biogeochemical properties of the sea ice and its impact on ocean biogeochemical cycles



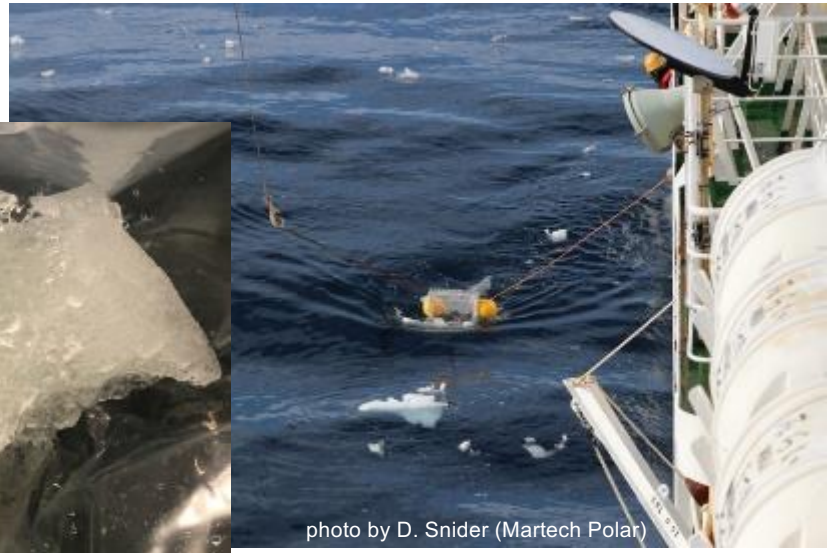
Measuring temperature/salinity etc

Sea ice sampling

Investigation of the Plastic Pollution

Plastics in the sediment

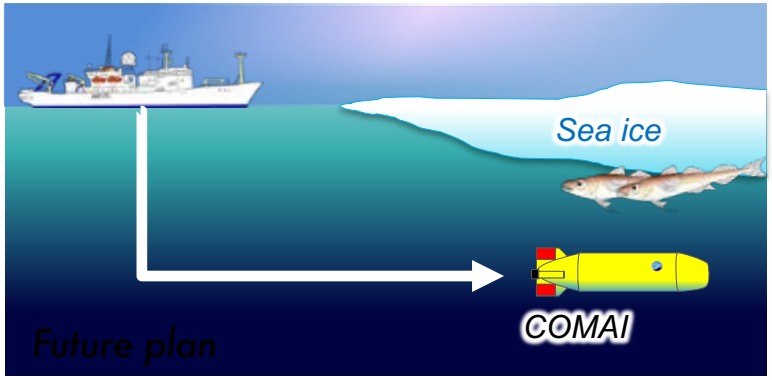
Plastics in the Sea-ice



Floating micro-plastic

Comprehend the current status of plastic pollution in the Arctic Ocean

Trials of the in-water drone “COMAI”



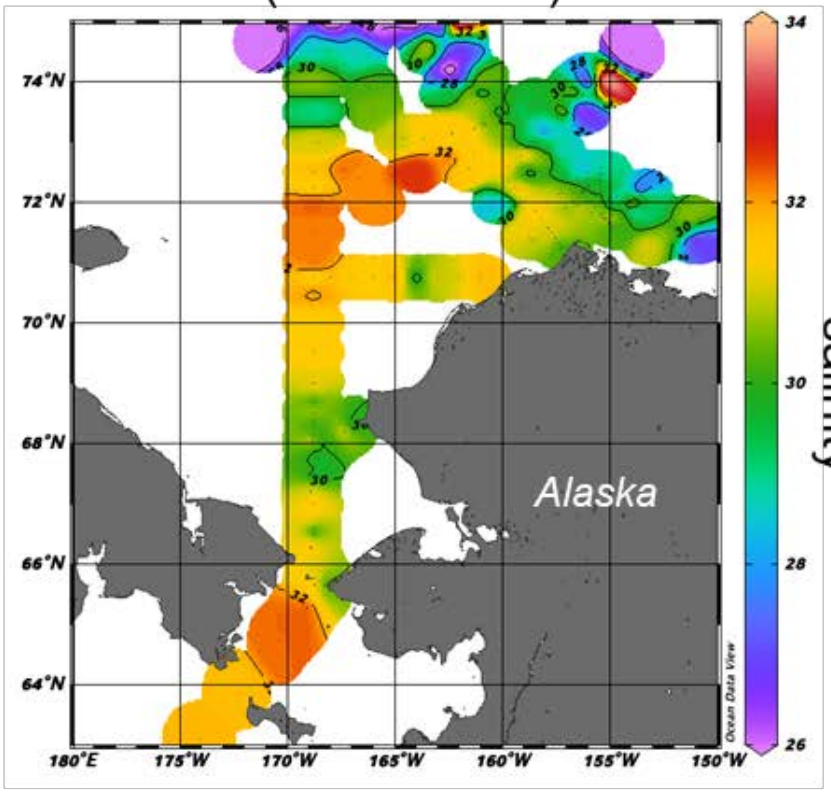
“COMAI” is designed to investigate under-ice hydrographic and biogeochemical properties autonomously <u>in the future</u>

Tested

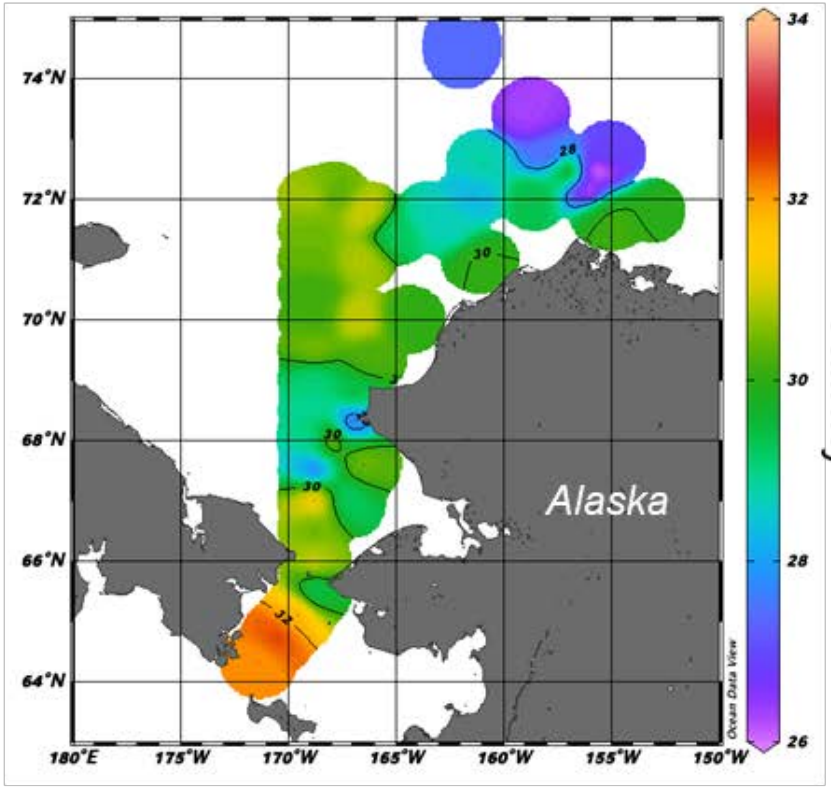
- Performance of inertial navigation system at high latitude
- Cruise performance
- Communication performance

Preliminary Result: Spread of anomalously fresh water

General September surface salinity (2008–2017)



September surface salinity 2021



Significantly fresher summer-water covered the surface in 2021

1. How did this change in water property occur? (ice melt? river discharge?)
2. How this less saline water impact on ocean circulation and ecosystem?

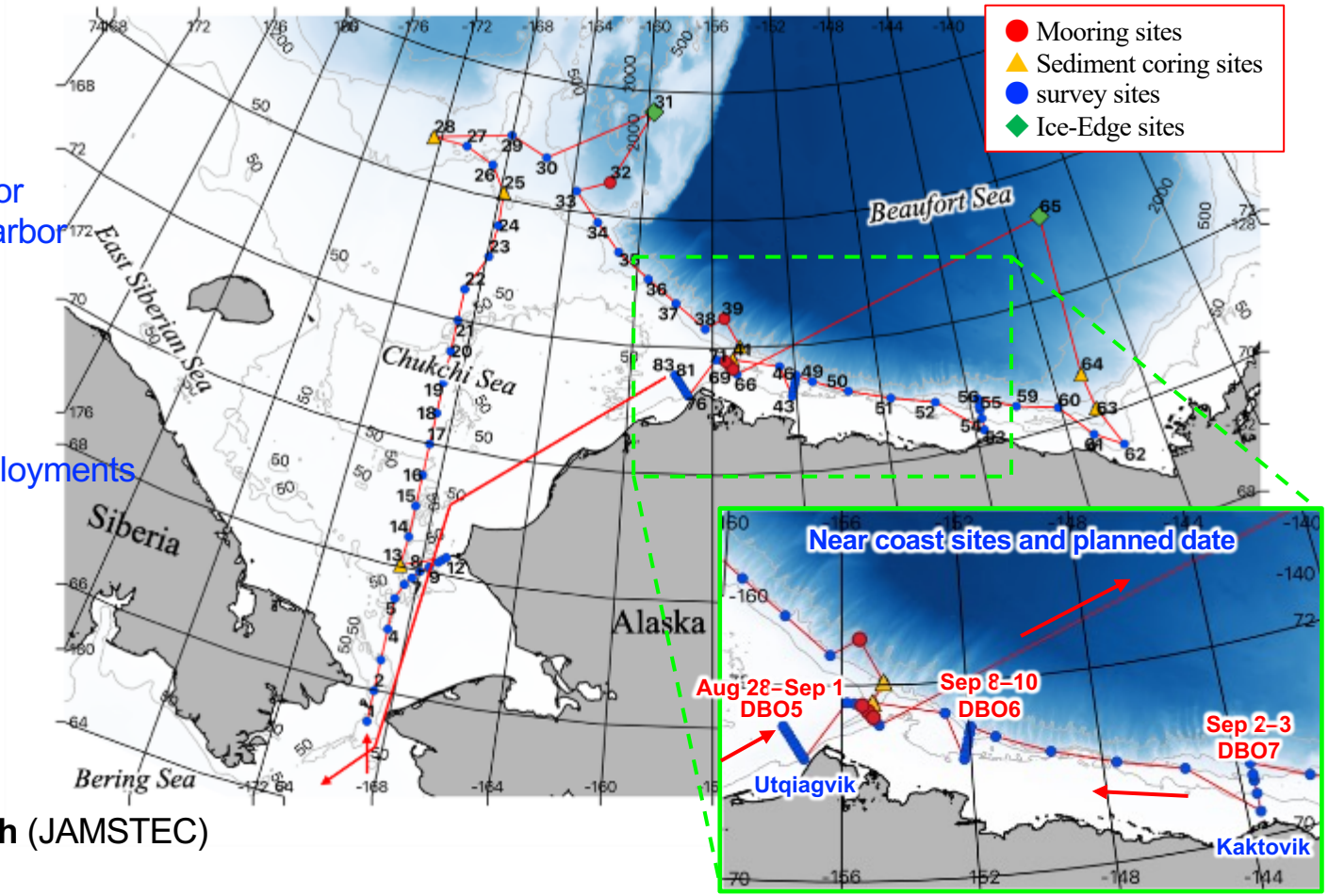
R/V Mirai cruise plan for 2022

Tentative Cruise Schedule

Aug 12	Depart Japan
Aug 21	Call Dutch Harbor
Aug 22	Depart Dutch Harbor
Aug 24	Bering St.
Sep 24	Bering St.
Oct 6	Arrive Japan

Planned Activities

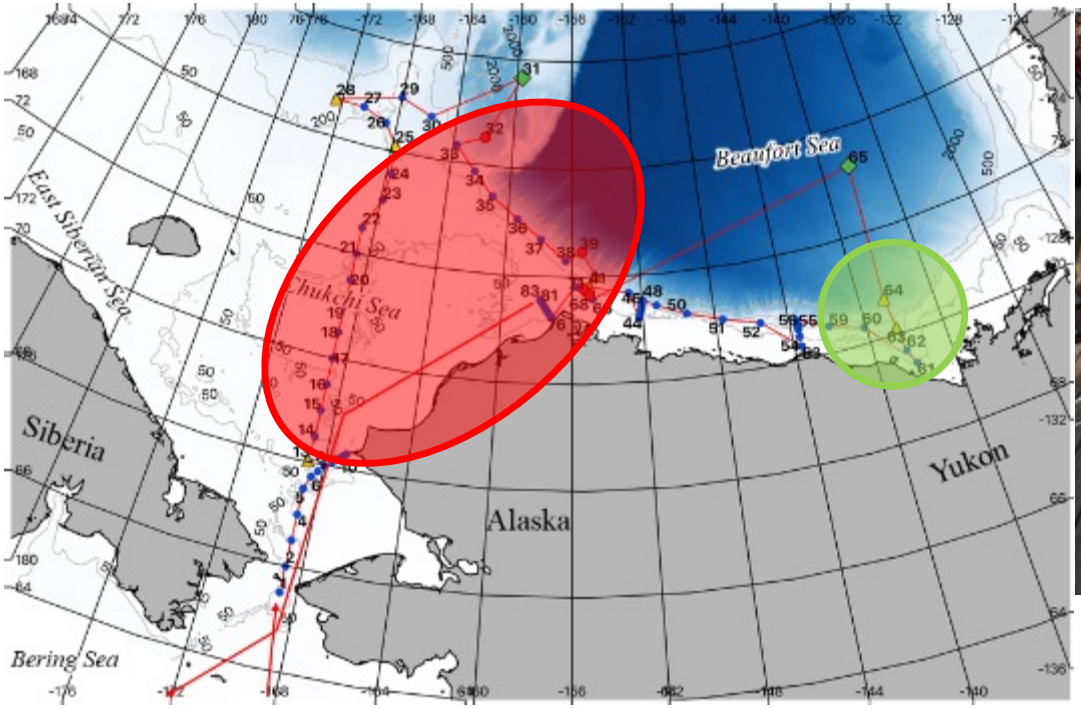
- Mooring recoveries/redeployments
- Sediment core samplings
- Hydrographic surveys
- In-water Drone trials
- Wave & Ice surveys etc.



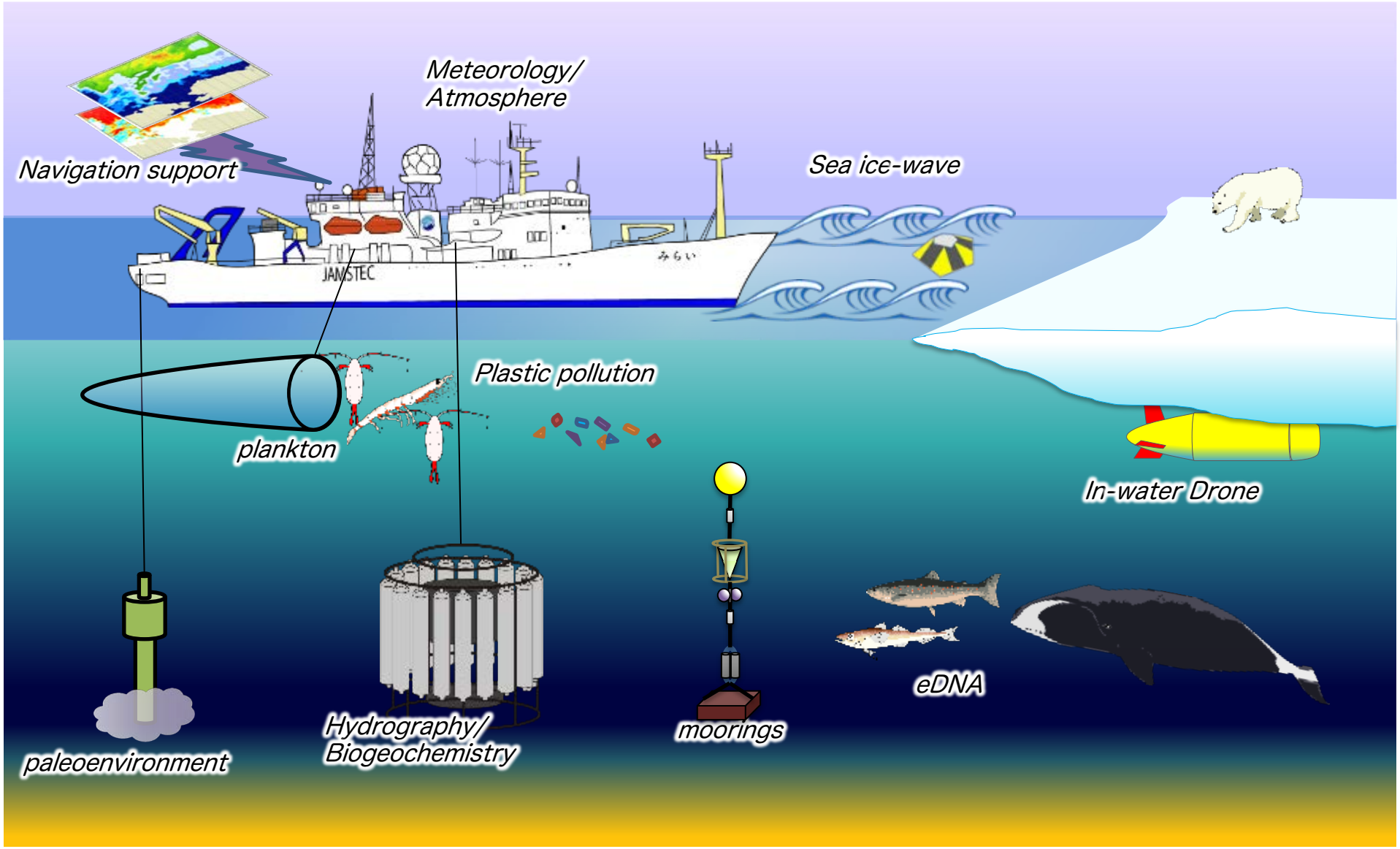
Chief scientist: Motoyo Itoh (JAMSTEC)
motoyo@jamstec.go.jp

HAPPI (Holocene Arctic Palaeoclimatology and Palaeoceanography Investigation)

Piston core and multiple core samplings in the Chukchi and Beaufort seas to study the variations of the Bering Strait throughflow and Mackenzie river flows in the past 2000 years.



Planed activities in 2022



ISAR-7

Seventh International Symposium on Arctic Research

March 6-10, 2023
Tokyo, Japan

Transdisciplinary studies on a rapidly changing Arctic toward a sustainable society

Call for Special Sessions

Proposal Deadline: May 16, 2022

www.jcar.org/isar-7/session/

1st Circular, February 2022

www.jcar.org/isar-7/

ISAR
International Symposium on Arctic Research

Transdisciplinary studies on a rapidly changing Arctic toward a sustainable society

You are cordially invited to participate in the 7th International Symposium on Arctic Research (ISAR-7), which will take place in Tachikawa, Tokyo from March 6 to 10, 2023. We plan to hold ISAR-7 as in-person meeting. But we will observe the COVID-19 pandemic situation carefully, and may need to change it to online. Please see the 2nd circular which will be announced in August.

Although the rapid warming of the Arctic is widely known, the prediction of the future development of climate and environment is still uncertain. On the other hand, resource development and economic activities are rapidly growing. The ISAR is aimed at presenting and discussing scientific results with researchers on the Arctic from all-over the world, extracting and sharing issues to solve, and exploring the future of the Arctic. In ISAR-7, we will discuss how we can find the solutions from studies of various disciplines to the challenge of a rapidly changing Arctic for building a sustainable society.

ISAR-7 will consist of General Sessions and Special Sessions. General Sessions will address the following topics: Atmosphere; Ocean and sea ice; Rivers, lakes, permafrost and snow cover; Ice sheets, glaciers and ice cores; Terrestrial ecosystems; Marine ecosystems; Geospace; Laws, politics and economy; Language, culture and health; Engineering for sustainable development.

Special Sessions will address cross cutting themes. Special Session proposals are now solicited and the designated form must be submitted to ISAR-7 Secretariat (ISAR-secretariat@nipr.ac.jp) by May 16, 2022. Please visit our website (www.jcar.org/isar-7/). A discounted registration fee is applied to young scientists and students who are encouraged to attend the symposium. Papers presented at ISAR-7 are eligible for submission as peer-reviewed full papers to a special issue of "Polar Science" (to be announced).

Important Dates

May 16, 2022	Session proposals deadline, Session coordination starts
Early August, 2022	Abstract submission/Registration starts, Second Circular
Mid-October, 2022	Abstract submission deadline
Late December, 2022	Program Open, Third Circular
Early February, 2023	Registration deadline

For the latest information, please visit our web site!!
www.jcar.org/isar-7/

Venue

National Institute of Polar Research

10-3, Midori-cho, Tachikawa-shi, Tokyo 190-8518, Japan

Organizers

As of February, 2022

Japan Consortium for Arctic Environmental Research (JCAR)
National Institute of Polar Research (NIPR)

JCAR NiPR ARC ISEE JOGMEC

Secretariat: JCAR, and Arctic Environment Research Center (AERC) , NIPR
Contact us: ISAR-secretariat@nipr.ac.jp