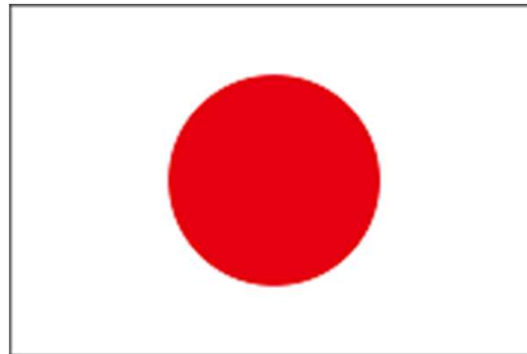


Country report: results from 2020 field season and future planning

JAPAN



Shigeto Nishino

Japanese Arctic field activities in 2020

- R/V *Mirai* cruise (MR20-05C)
19 Sep (Shimizu, Japan) – 2 Nov (Shimizu, Japan)
- Mooring recovery August 2020 by CCGS *Sir Wilfred Laurier*
7 Aug – 17 Aug
- MOSAiC (Leg 5)
Aug – Oct



Summary of the R/V Mirai Arctic Ocean cruise in 2020 (MR20-05C)

Shigeto Nishino (PI), Amane Fujiwara (Co-PI), Motoyo Itoh,
Jonaotaro Onodera, Akihiko Murata, and Takashi Kikuchi
(JAMSTEC)

Research themes of MR20-05C

This cruise was conducted under the project of
Arctic Challenge for Sustainability II (ArCS II)



1. Synoptic Arctic Survey (SAS): A coordinated multi-ship, multi-nation pan-Arctic ship-based sampling campaign (JAMSTEC)
2. Observation of wave-ice-ocean-atmosphere interaction in the marginal ice zone (The University of Tokyo)
3. Study of oceanic and sea-ice variability off the northern coast of Alaska (Hokkaido University)
4. Observational study of eddy, waves and turbulence in the sea-ice shrinking Arctic Ocean (The University of Tokyo)
5. Changes in nitrogen cycle in the Arctic Ocean (The University of Tokyo)
6. Study on the dynamics of methane and DMSP in the Arctic Ocean (Hokkaido University)
7. Relationship between sea-ice reduction and horizontal distribution on zooplankton community in the pacific sector of Arctic Ocean (Hokkaido University)

Photo: M. Muramatsu (JAMSTEC)

Research themes of MR20-05C

This cruise was conducted under the project of
Arctic Challenge for Sustainability II (ArCS II)

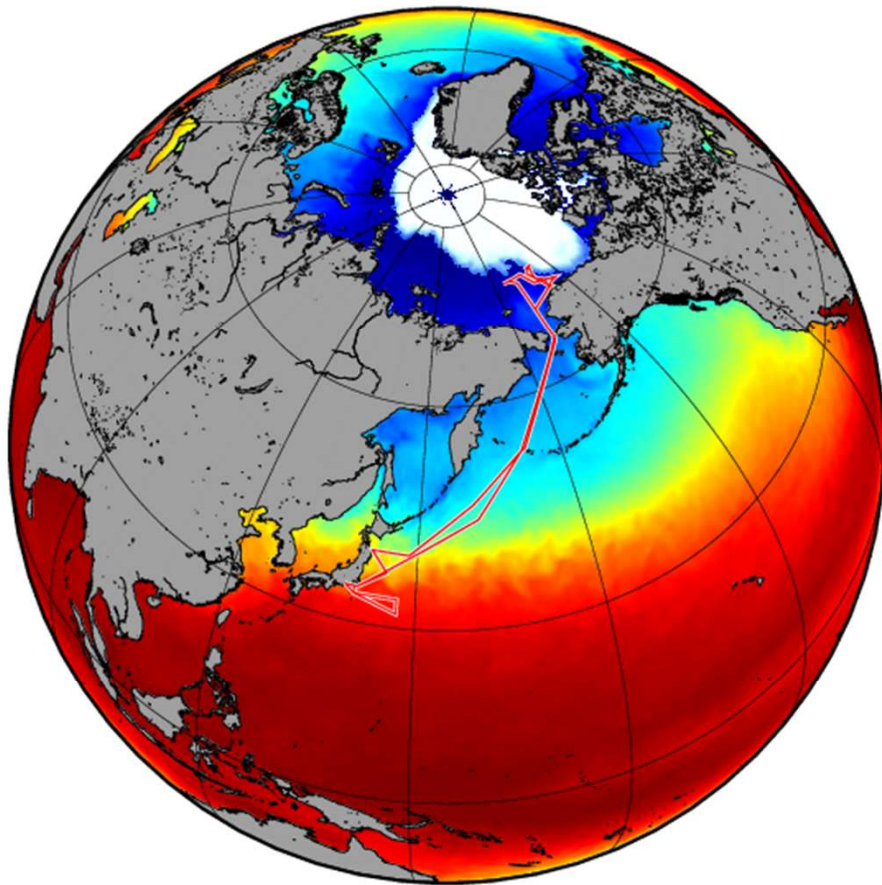


8. Ship-based observations of trace gases and aerosols over the Arctic Ocean, Bering Sea, and North Western Pacific Ocean (JAMSTEC)
9. Observations of atmospheric greenhouse gases and related species in the Arctic Ocean and the western North Pacific (National Institute for Environmental Studies)
10. Observation of water vapor isotope in the Arctic (JAMSTEC)
11. Onboard news gathering by media (Japan Broadcasting Corporation, NHK)

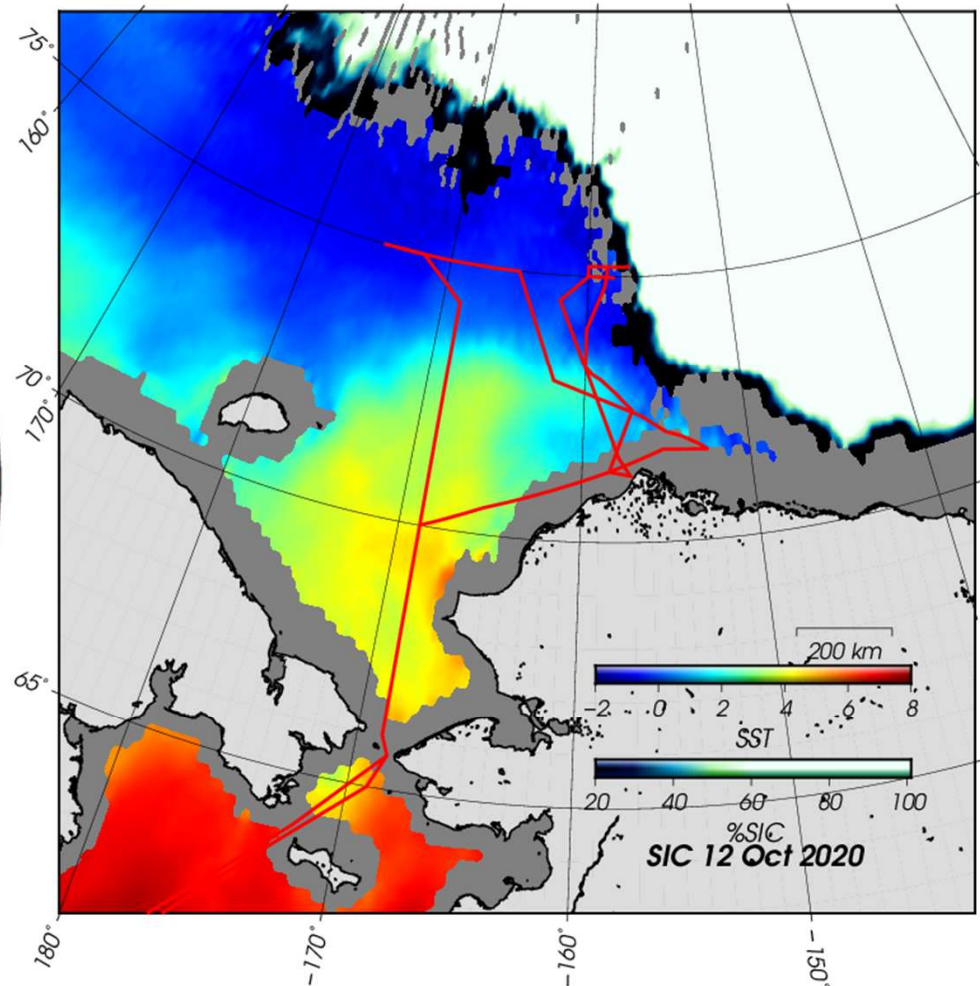
Photo: M. Muramatsu (JAMSTEC)

Cruise track, sea surface temperature and sea ice concentration

19 Sep: Shimizu, Japan -> Quarantine near the coast of Japan (14 days) ->
6 Oct: Bering St. -> Arctic Ocean (16 days) -> 21 Oct: Bering St. -> 2 Nov: Shimizu, Japan



Provided by A. Fujiwara
(JAMSTEC)

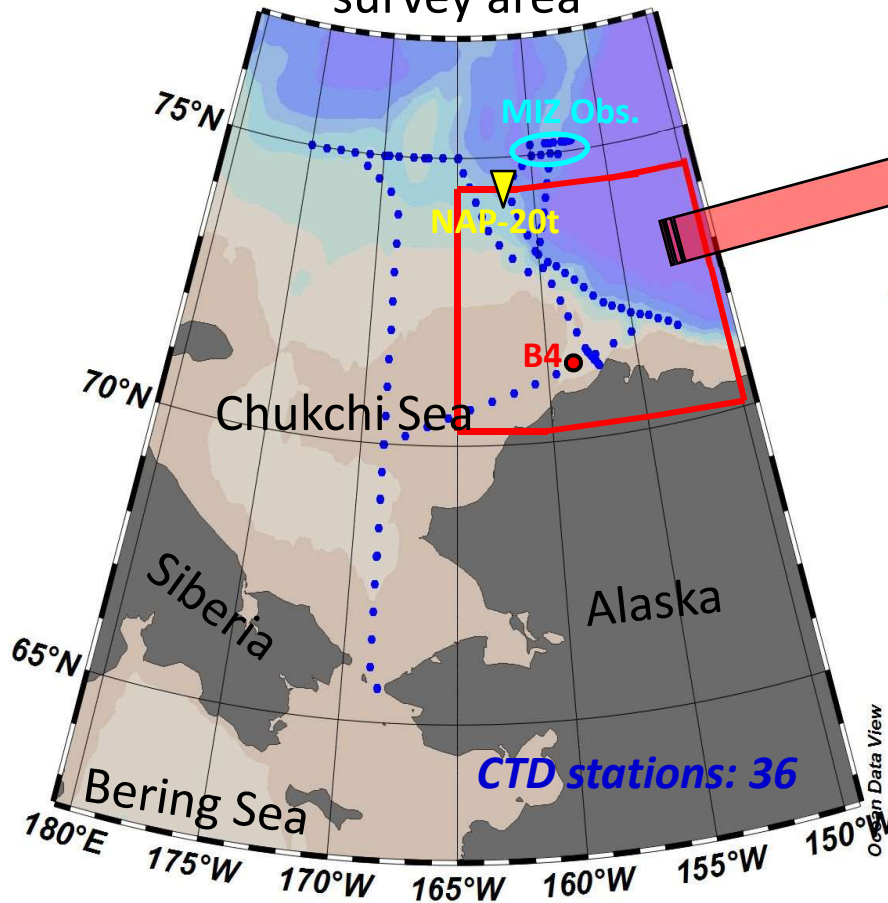


Sea ice concentration on 12 October 2020 and sea surface temperature averaged over the period of observation.

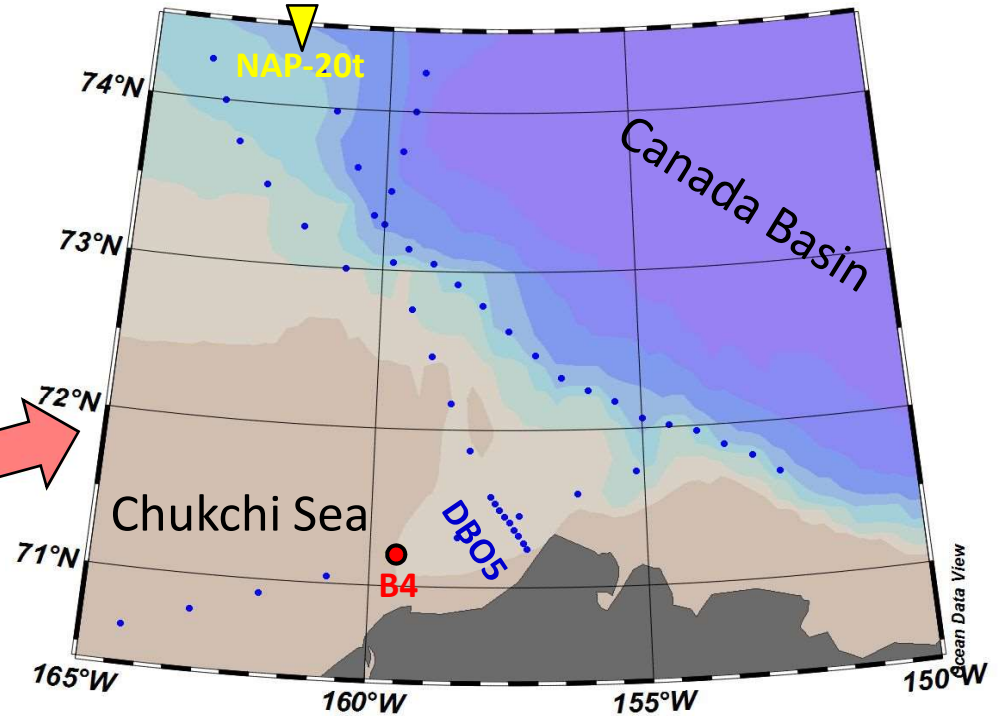


Maps and stations of the R/V Mirai cruise in 2020

Map of the whole survey area



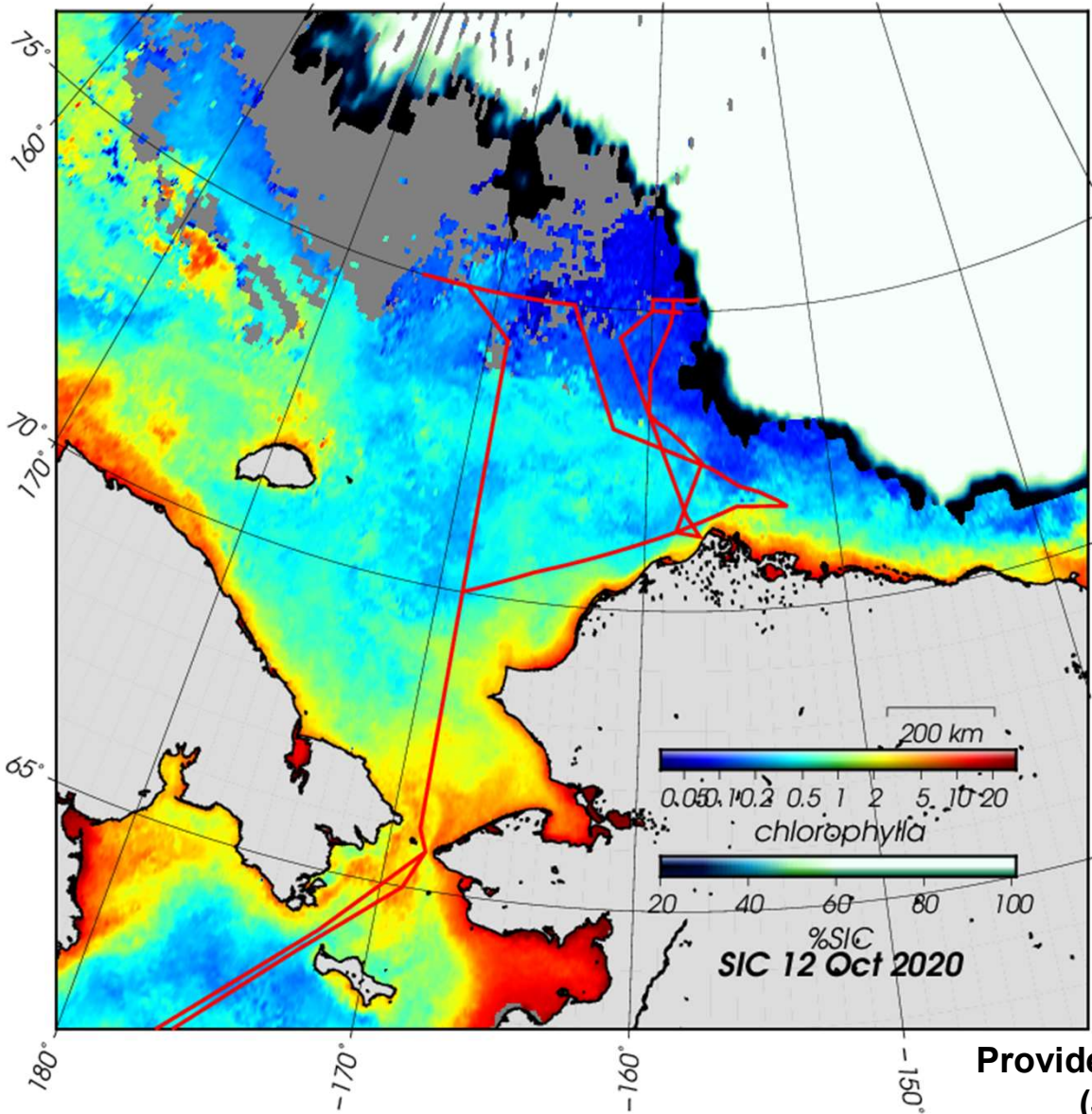
Enlarged map of the slope area



Activities

- : CTD/XCTD, TurboMAP, Plankton net, S&M grab, Bio-optics observation
- : Mooring
- ▼ : Sediment trap
- : Marginal Ice Zone observation
- DBO: Distributed Biological Observatory

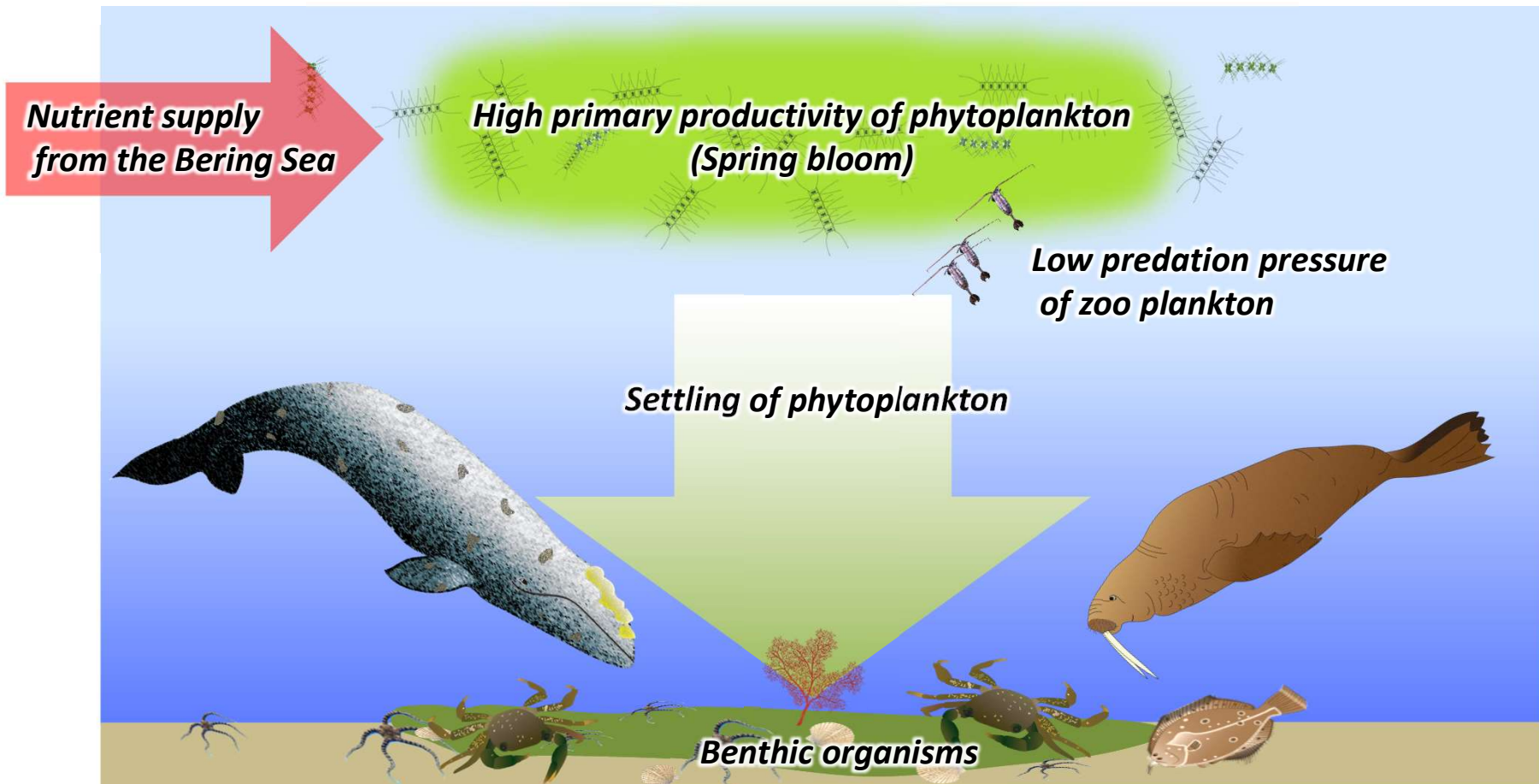
Biological hotspot in the southern Chukchi Sea



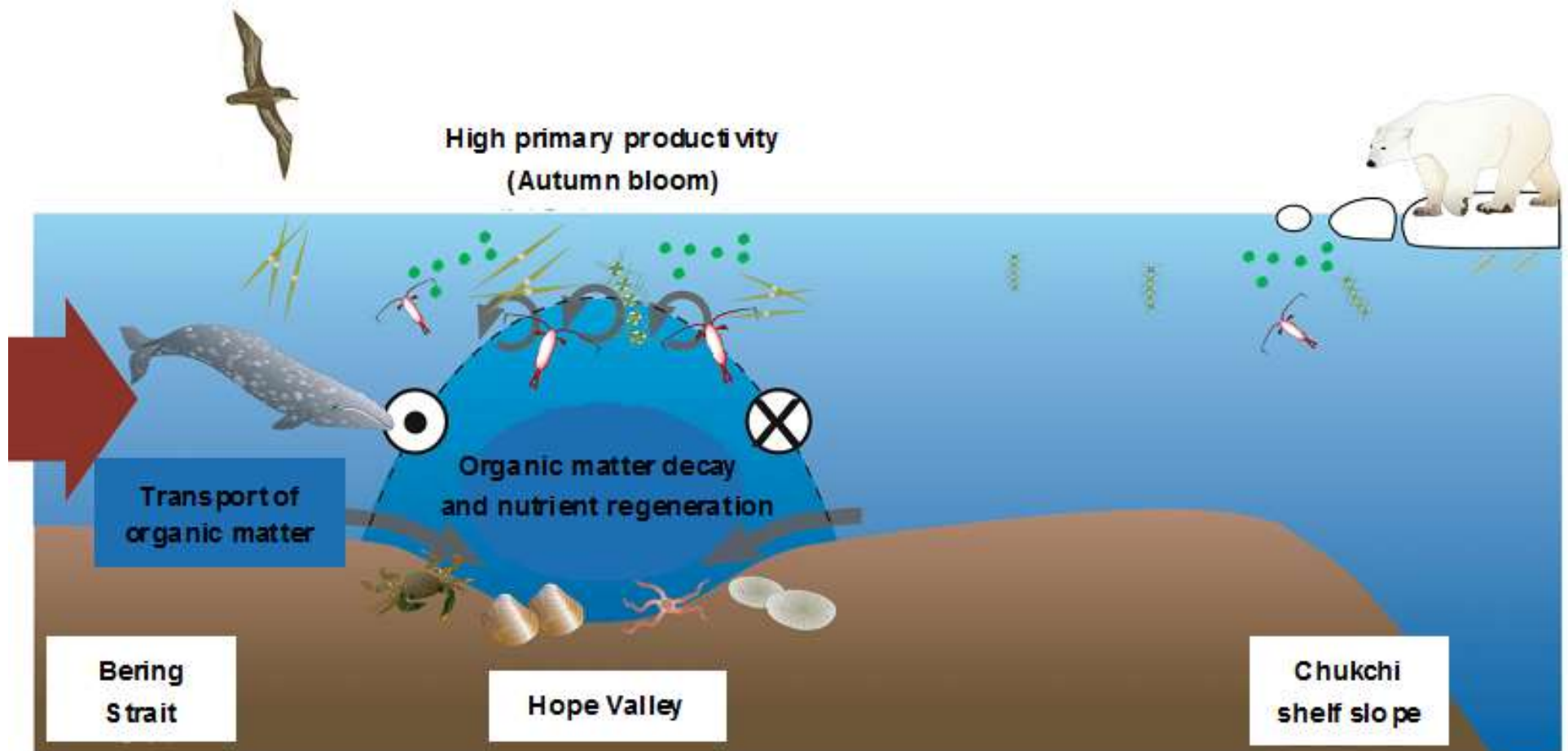
Provided by A. Fujiwara
(JAMSTEC)

Sea ice concentration on 12 October 2020 and chlorophyll-*a* in October averaged over 2015-2019.

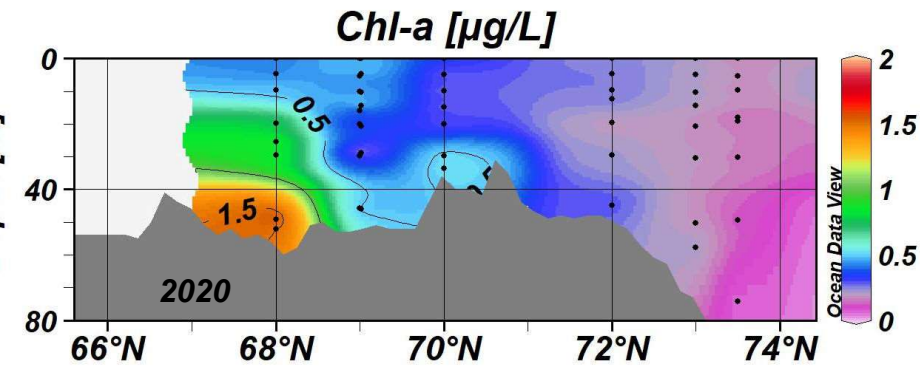
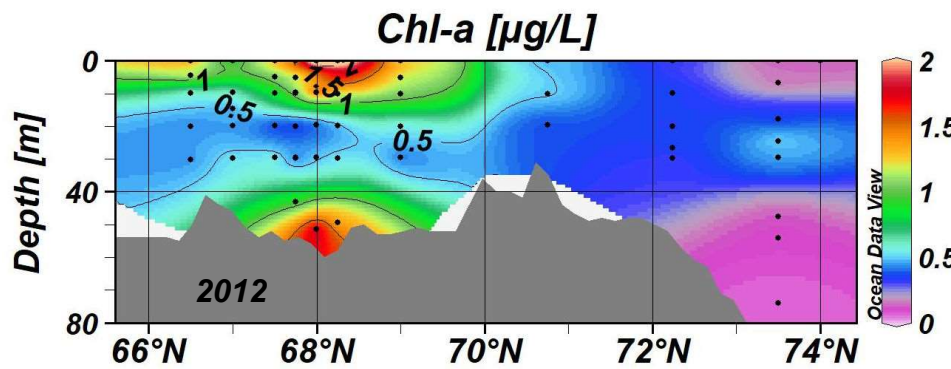
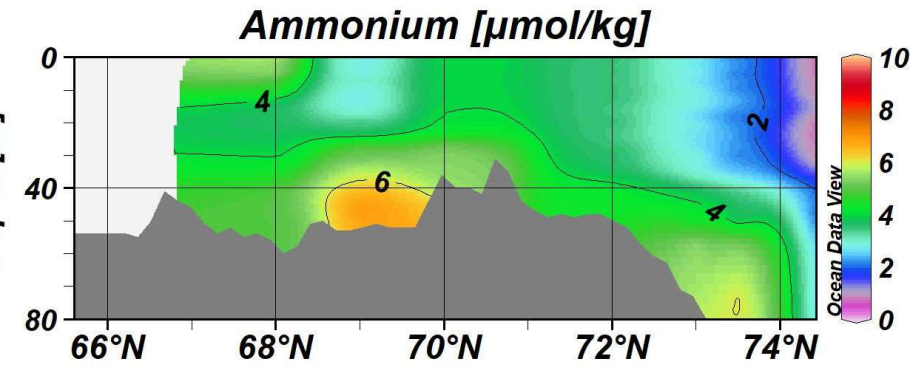
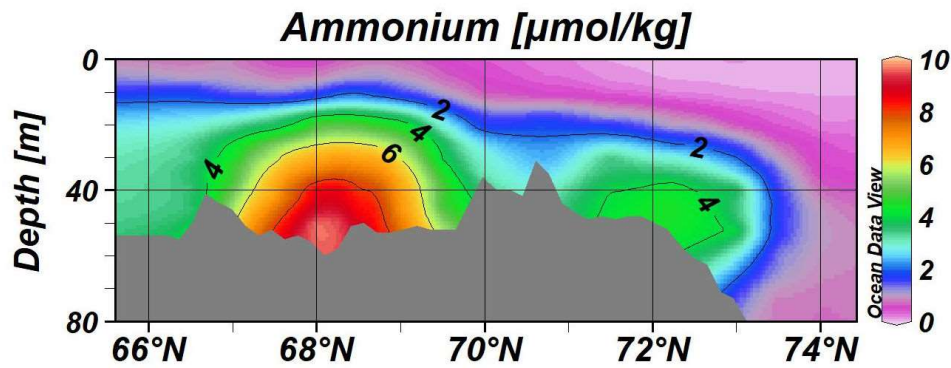
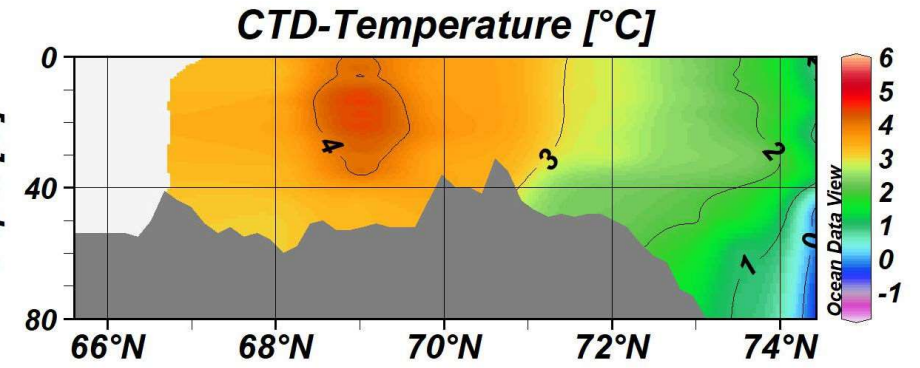
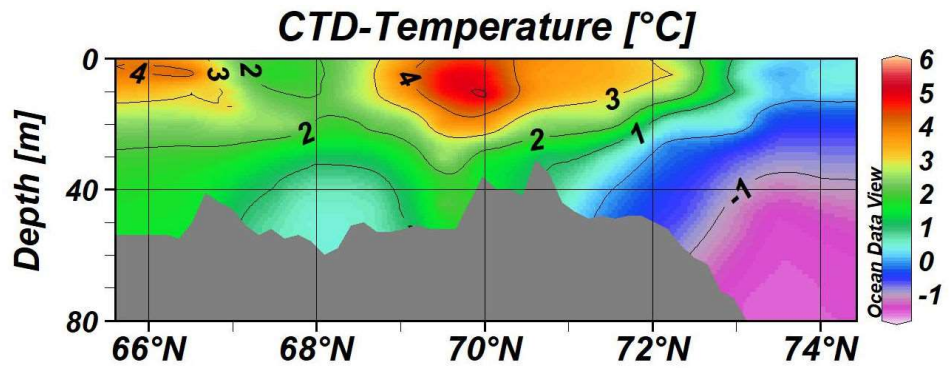
Biological hotspot in the southern Chukchi Sea



Schematic of fall bloom in Hope Valley in the southern Chukchi Sea

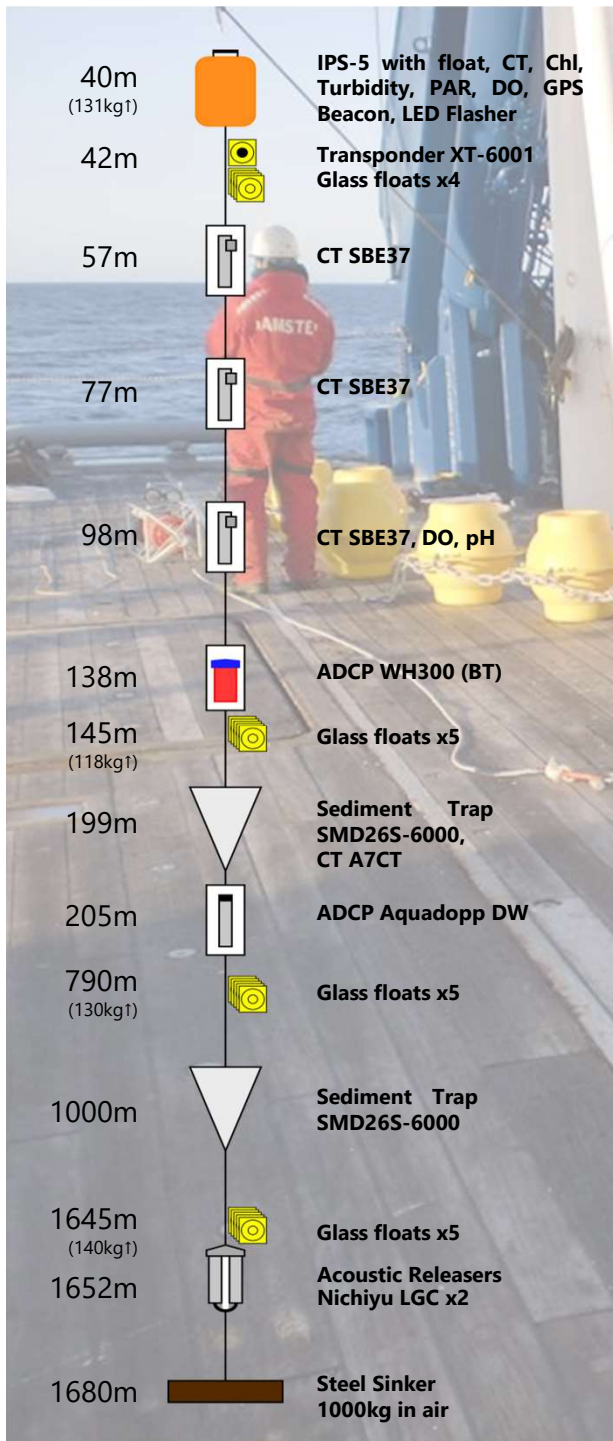


Comparison of biological hotspot between 2012 and 2020



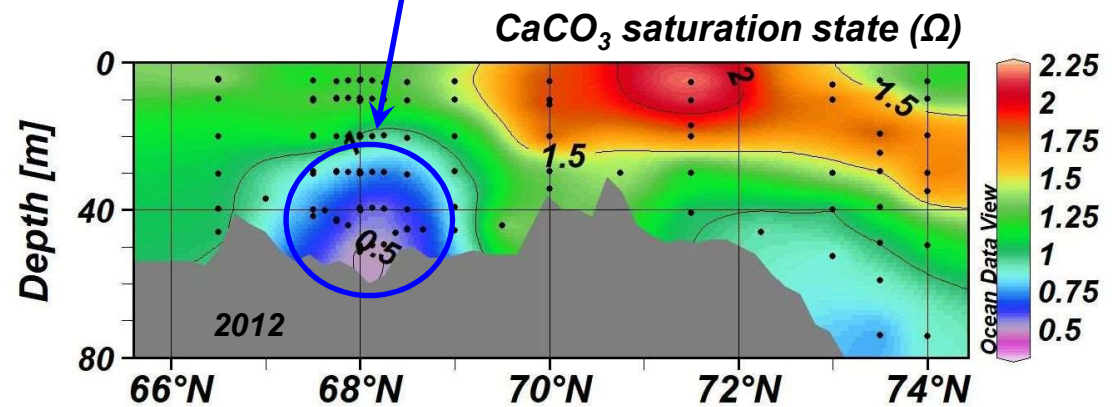
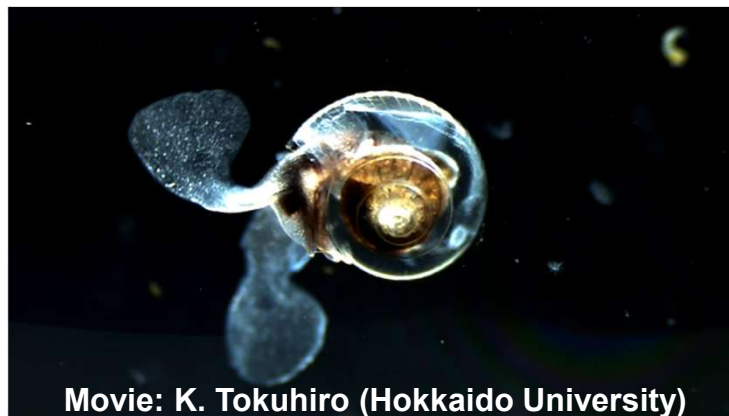
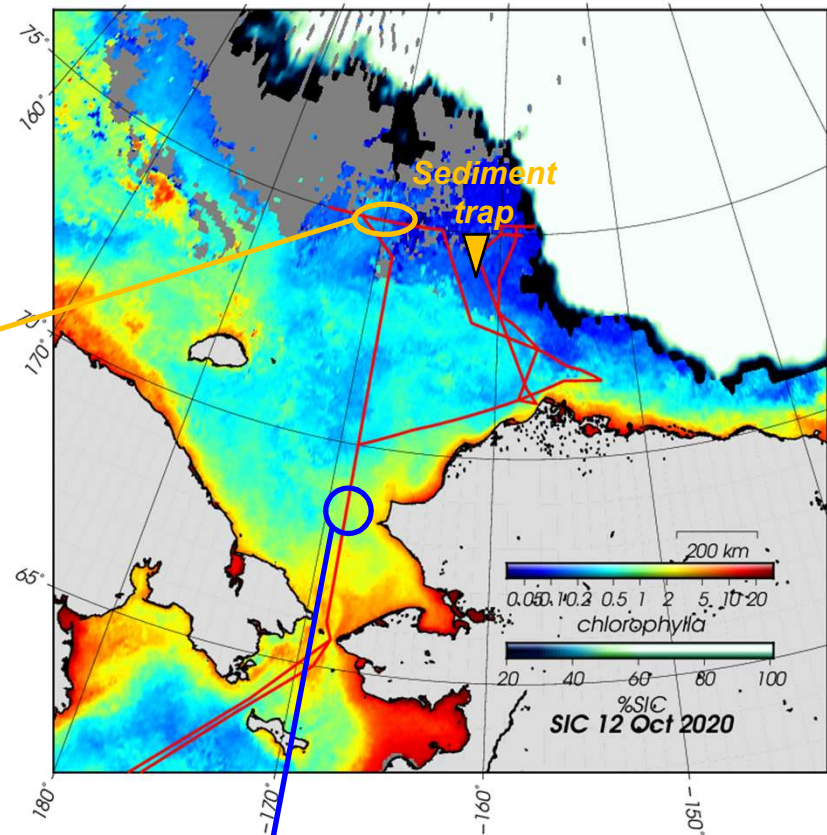
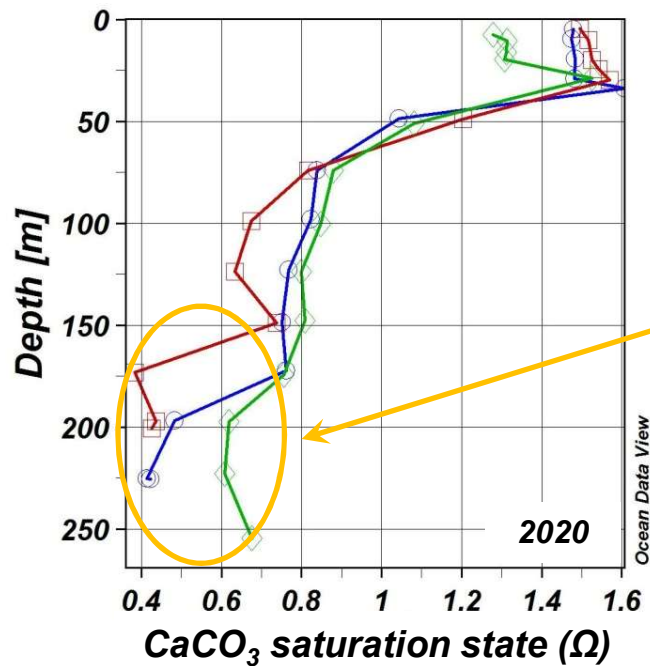
[Nishino et al., 2016]

[Observations in 2020]



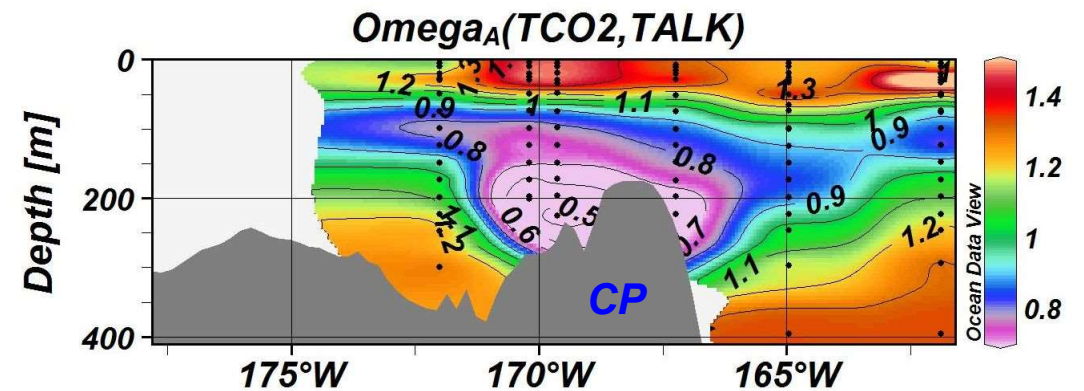
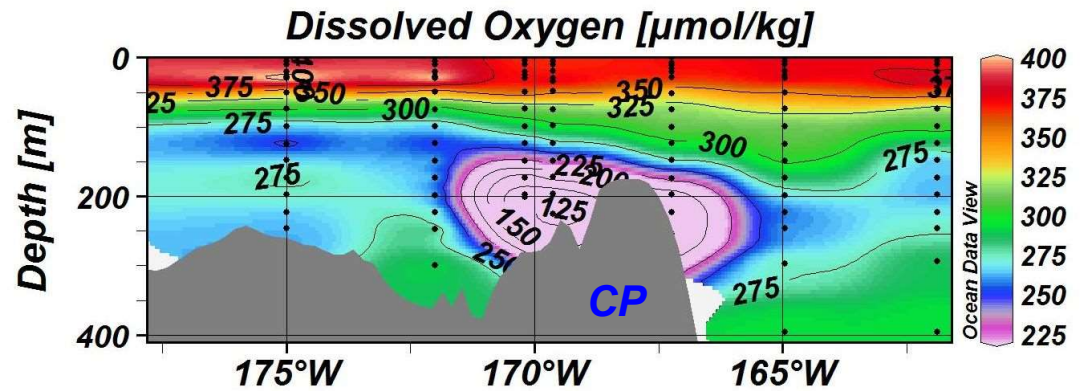
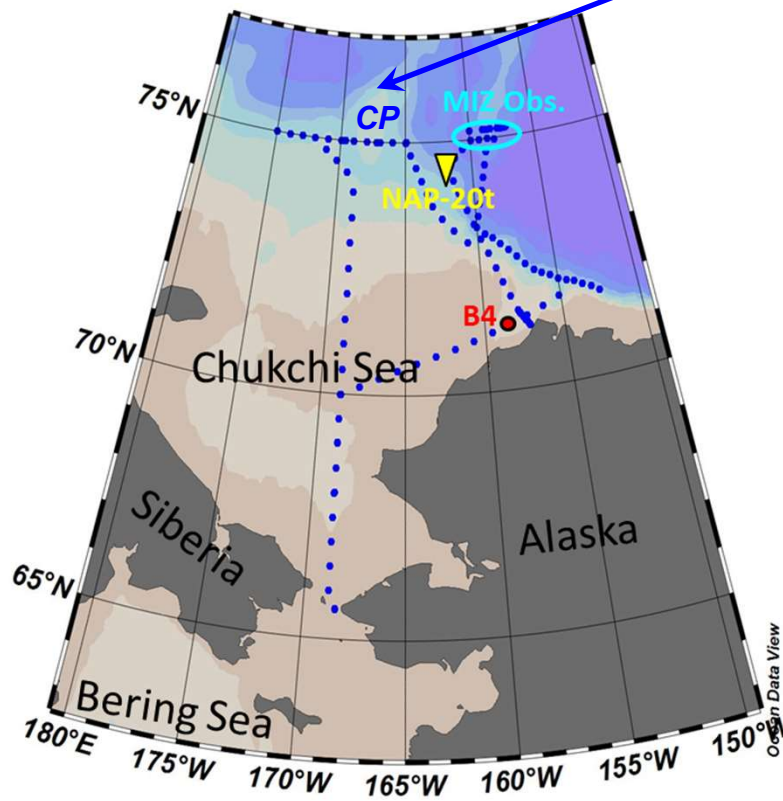
Sediment trap

Aragonite super-corrosive water near the sediment trap site

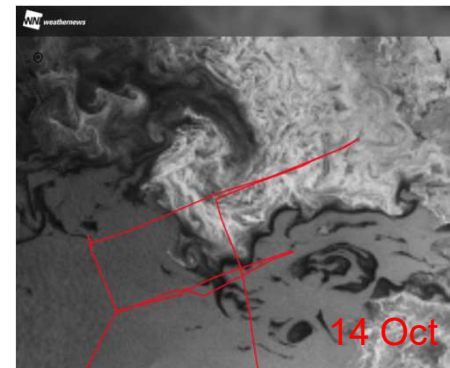
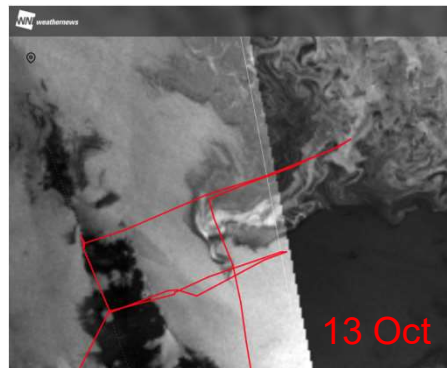
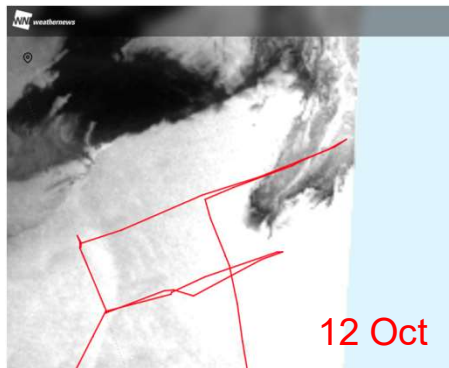
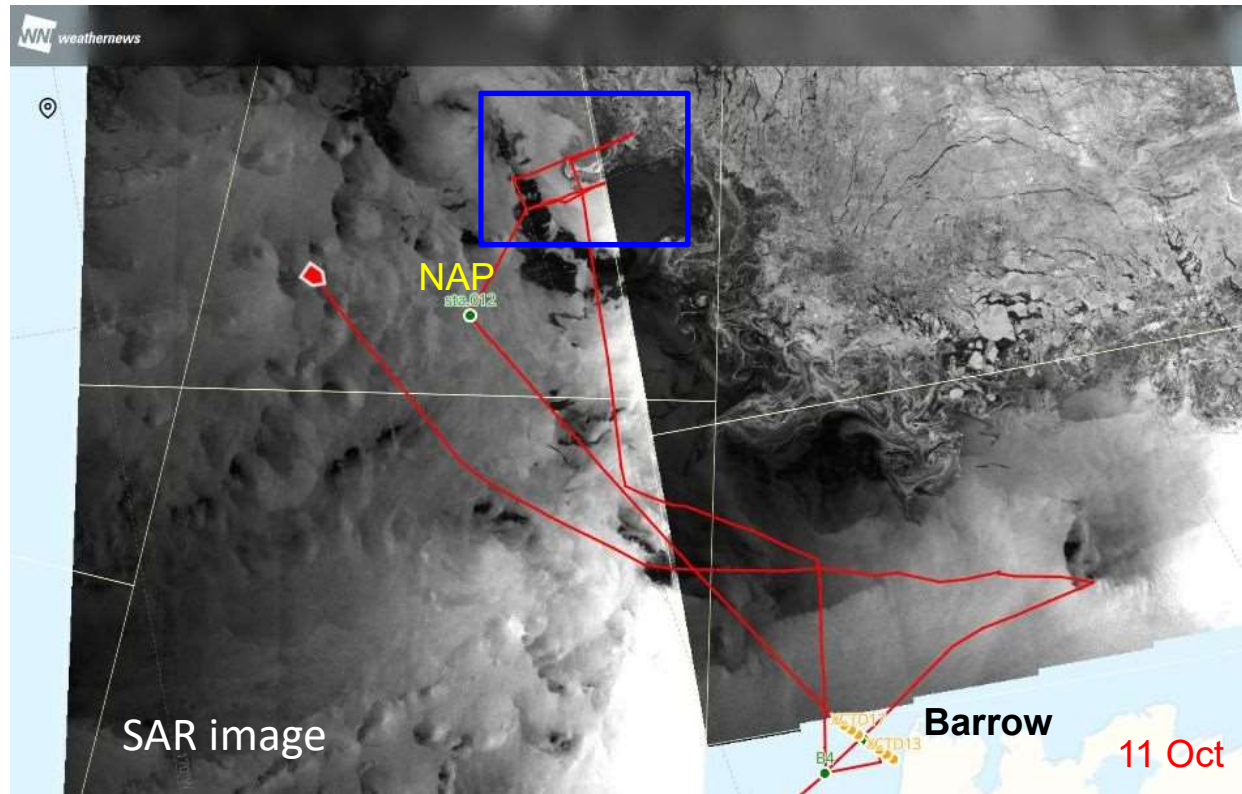


Aragonite super-corrosive water near the sediment trap site

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

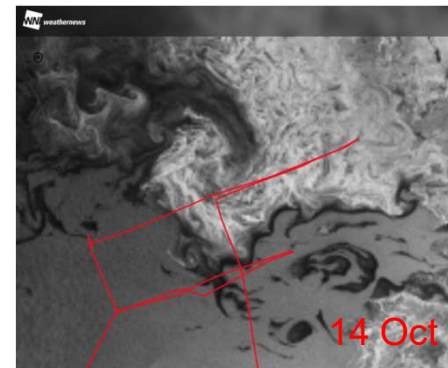
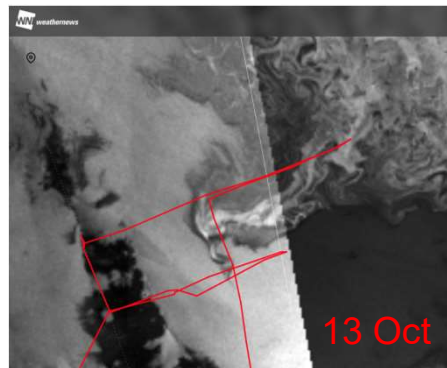
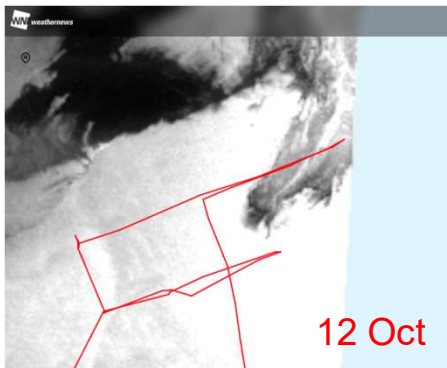
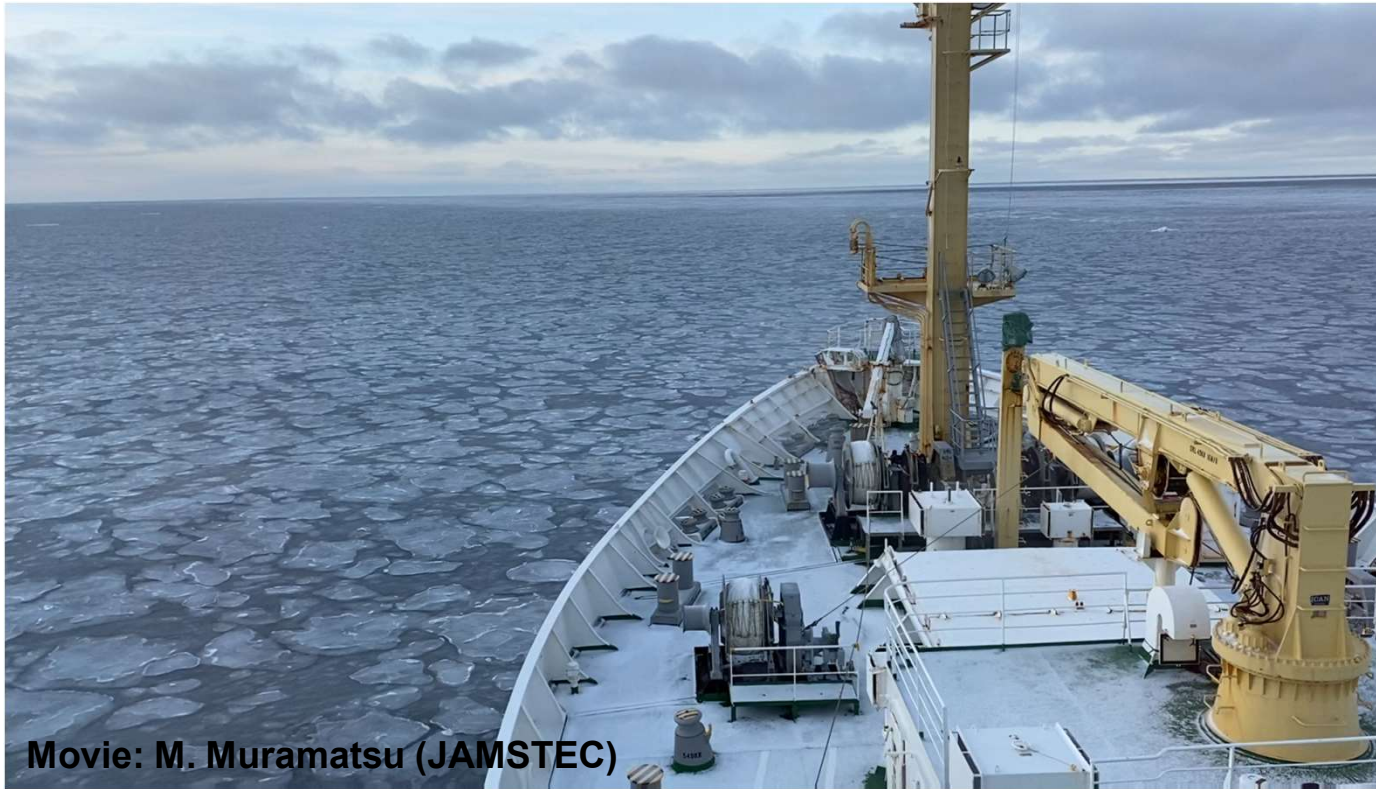


Marginal ice zone observation



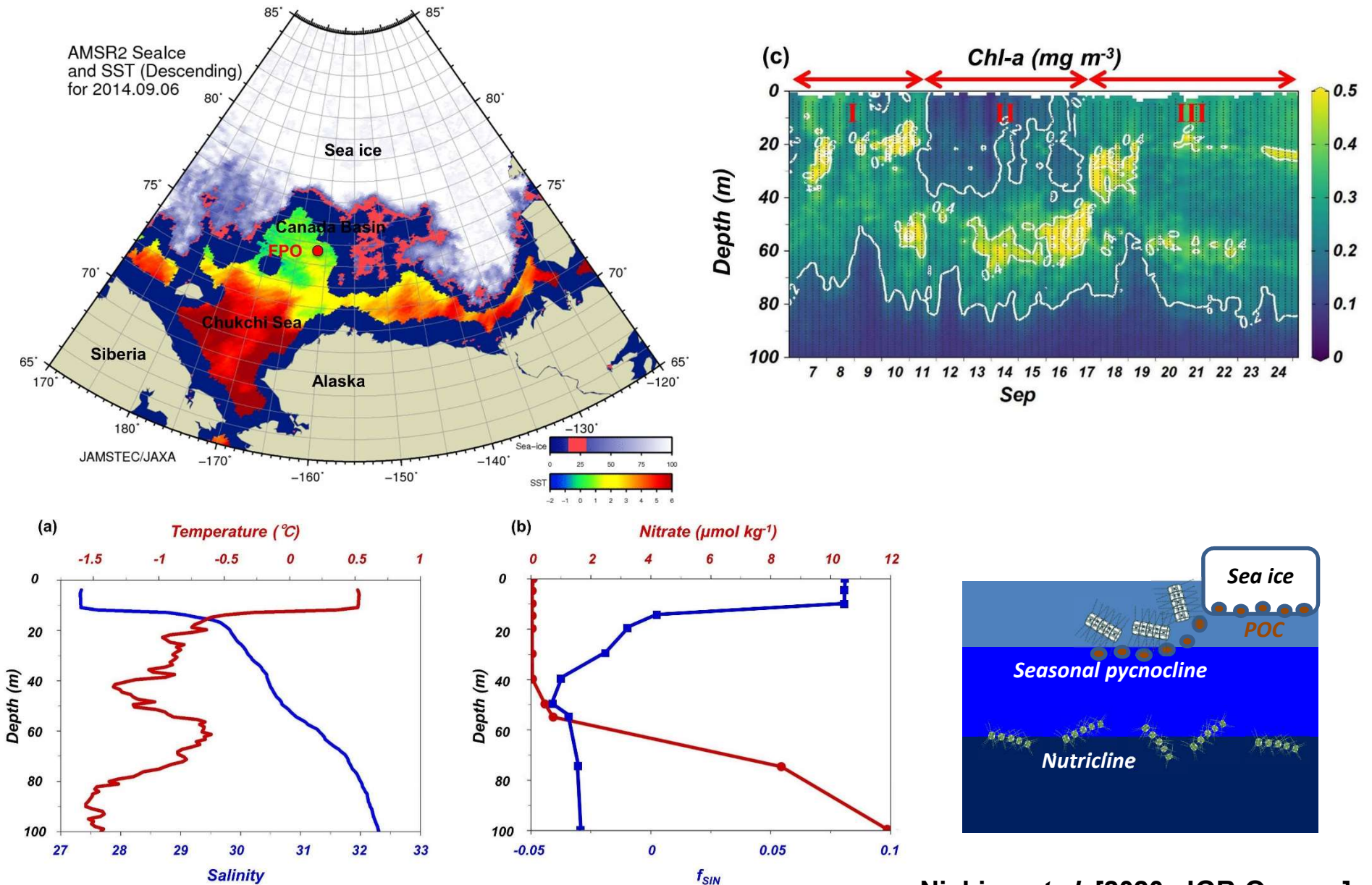
Provided by W. Arampath (Weathernews Inc.)

Marginal ice zone observation



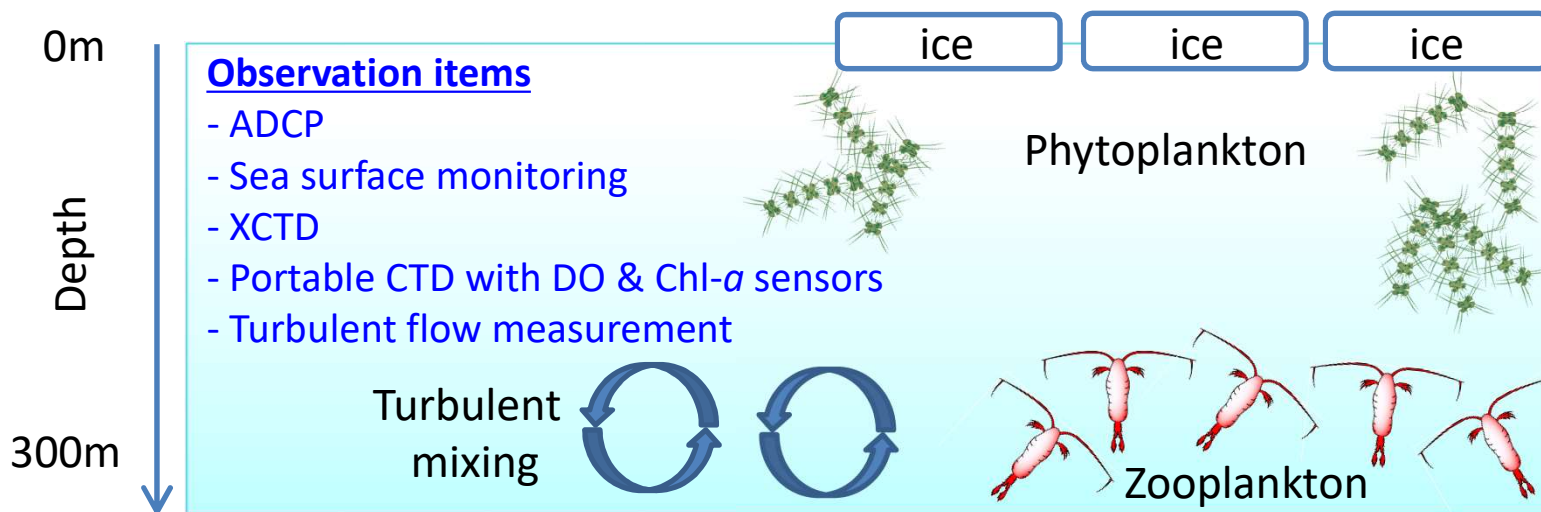
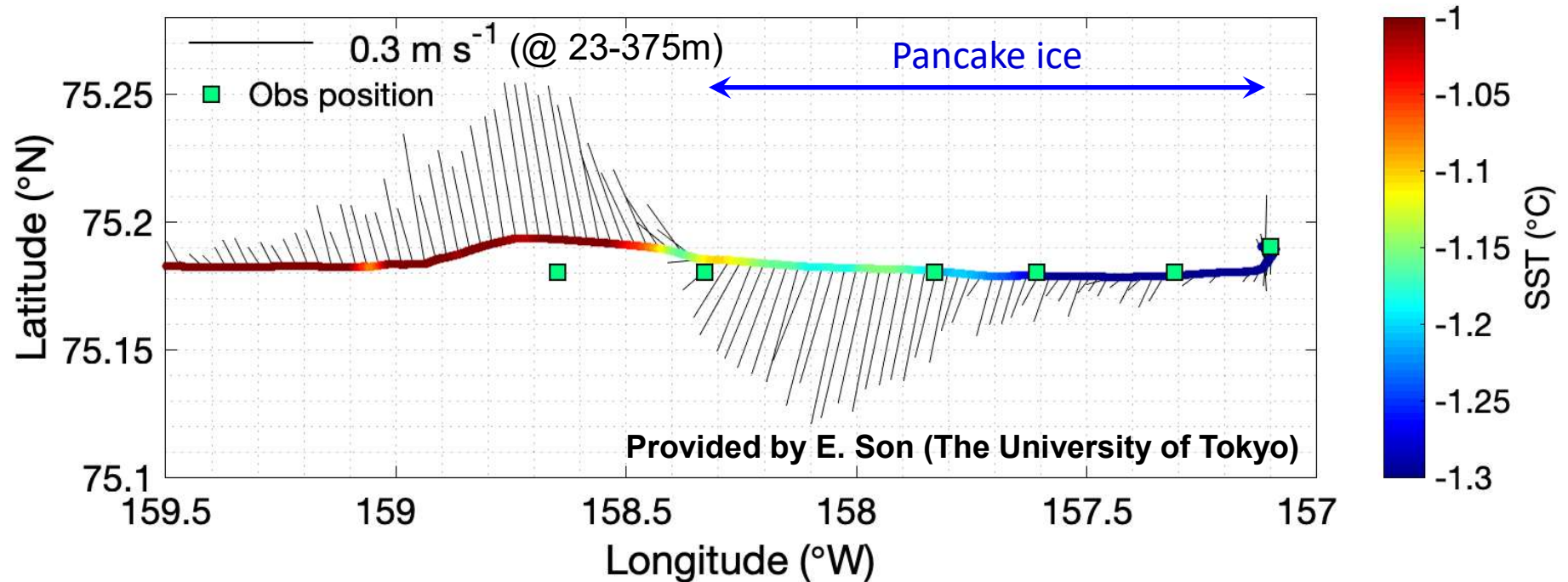
Provided by W. Arampath (Weathernews Inc.)

Results from the 2014 R/V Mirai cruise near the marginal ice zone

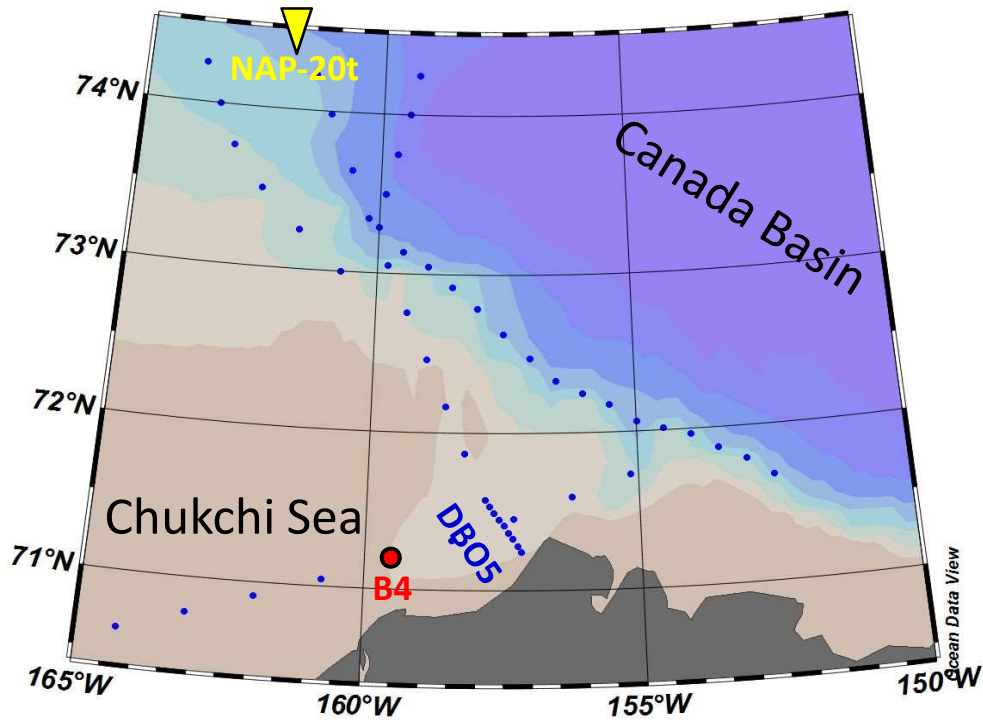


Nishino et al. [2020; JGR-Oceans]

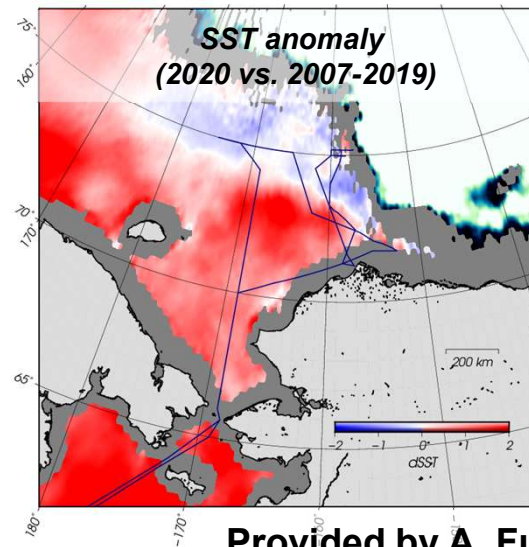
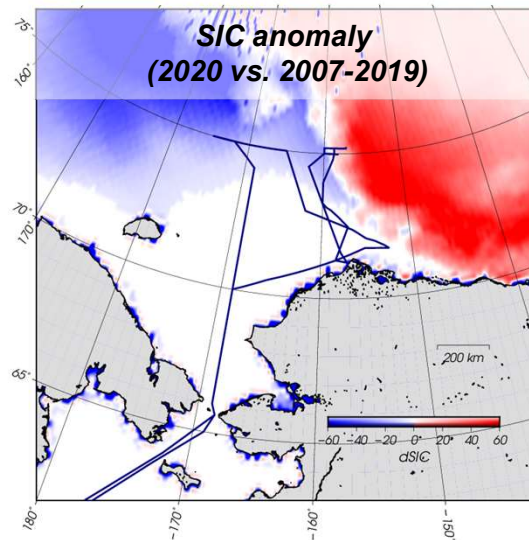
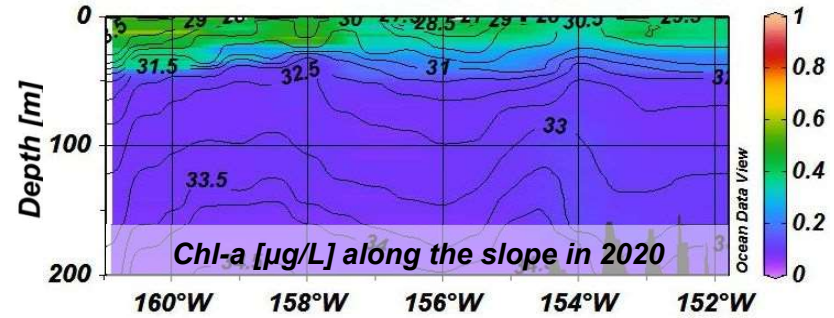
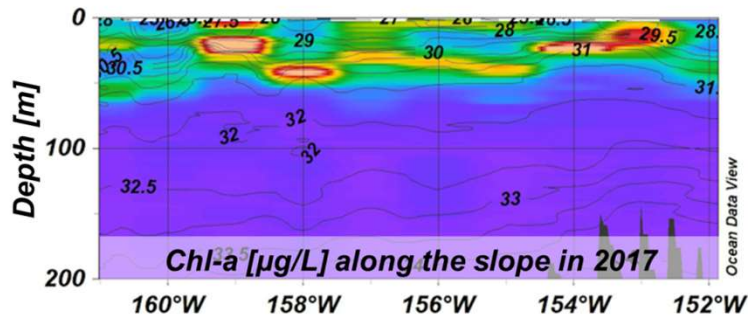
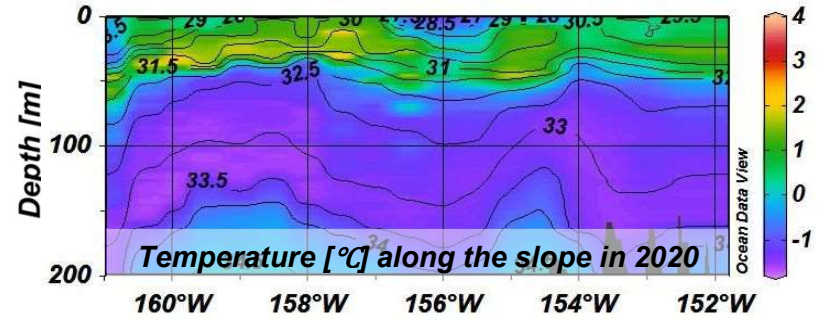
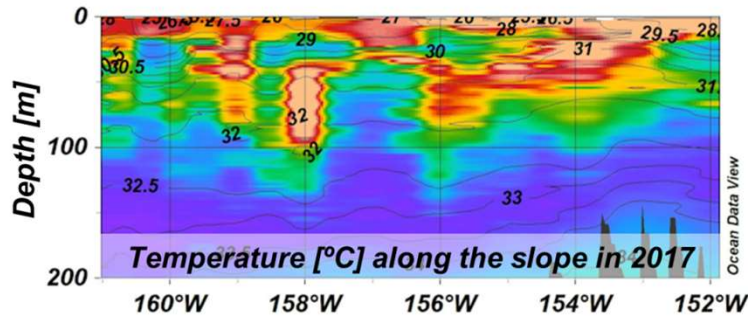
Marginal ice zone observation



Chukchi shelf slope observation

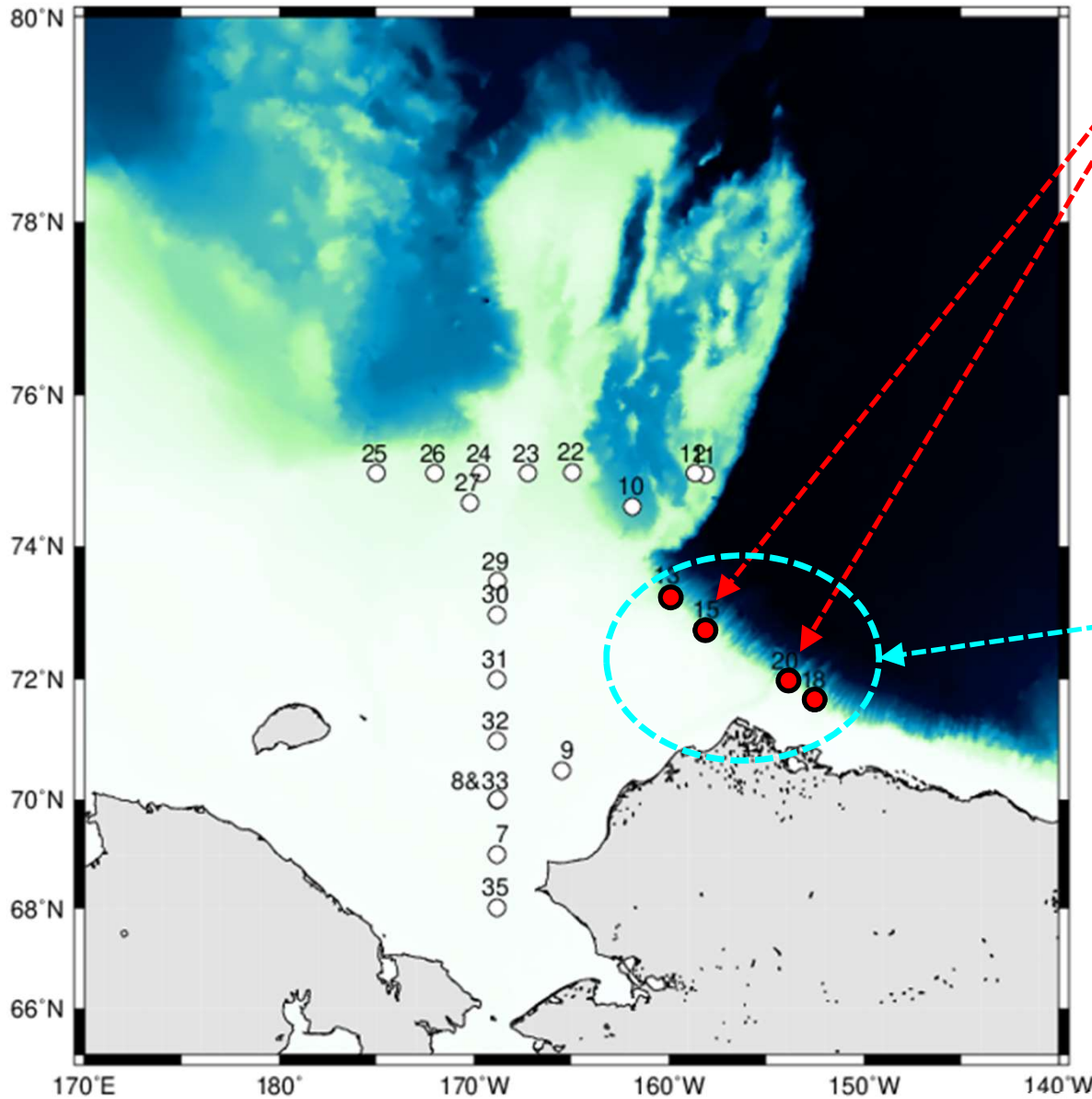


Comparison between 2017 and 2020 along a 500-m isobath



Provided by A. Fujiwara (JAMSTEC)

Preliminary results on zooplankton study



Pacific copepods

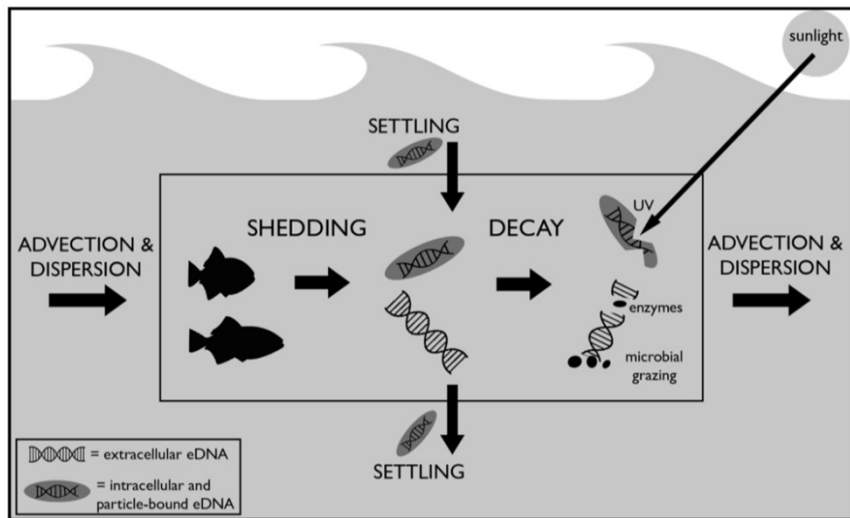


**In each station:
Appendicularia, Ostracoda,
and Copepoda**

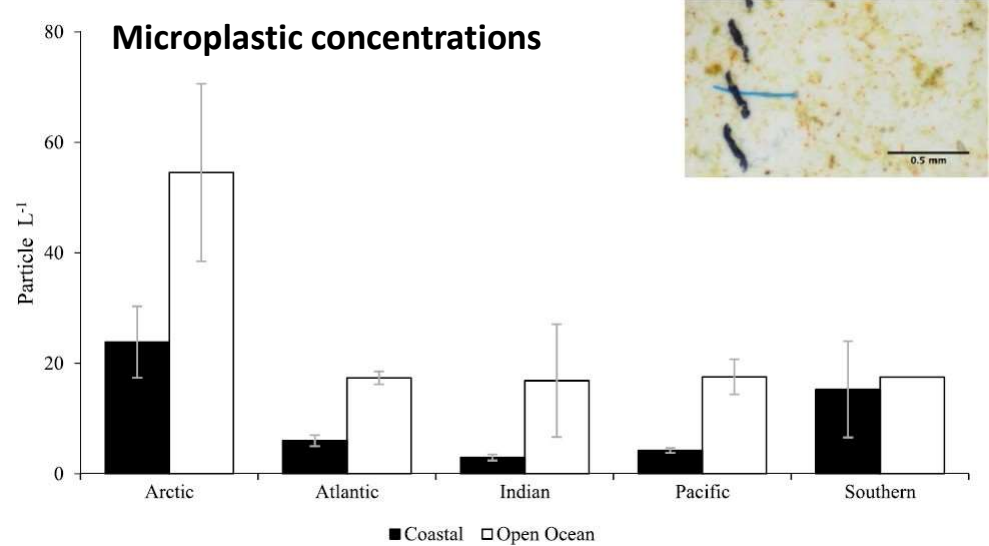


Provided by K. Tokuhiro (Hokkaido University)

Challenges for new observations: Environmental DNA (eDNA) and microplastics



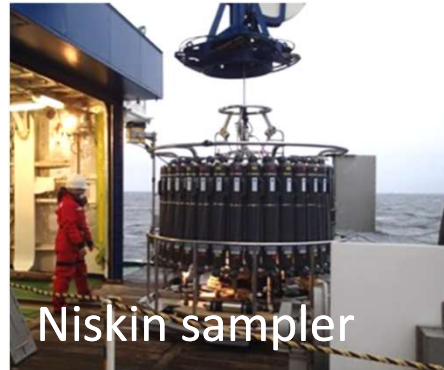
Sassoubre *et al.* [2016]



Barrows *et al.* [2018]

eDNA collection

Water collection

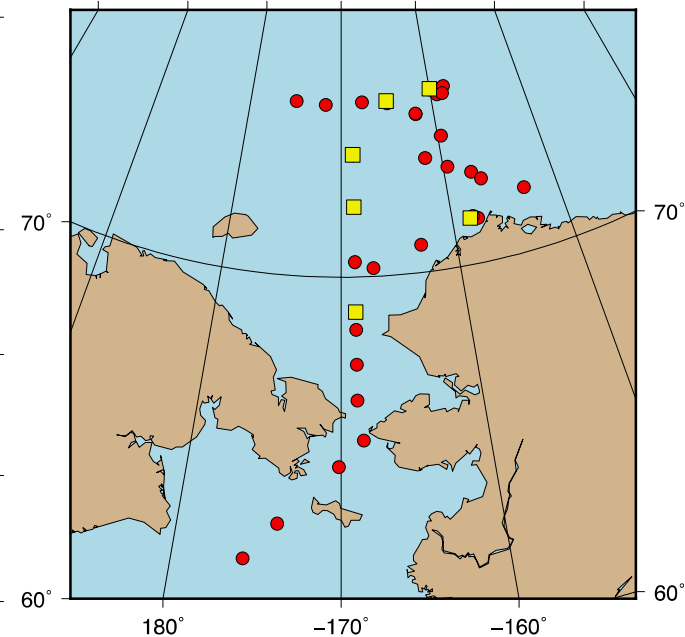
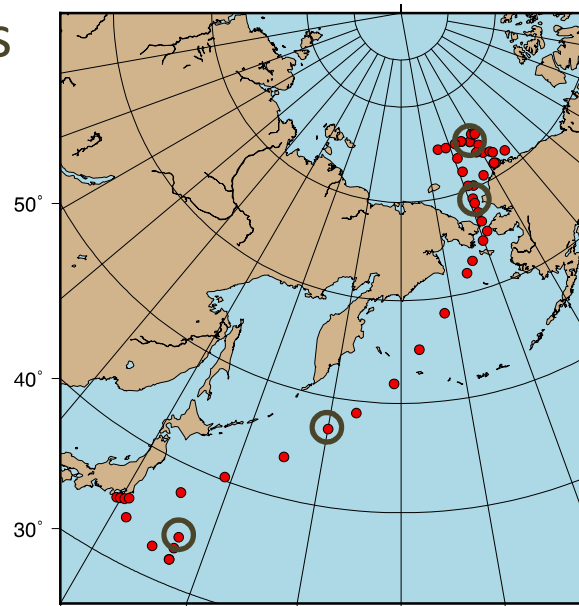


Filtration



Collection sites

- Surface
- Surface + water column
- Mass filtration

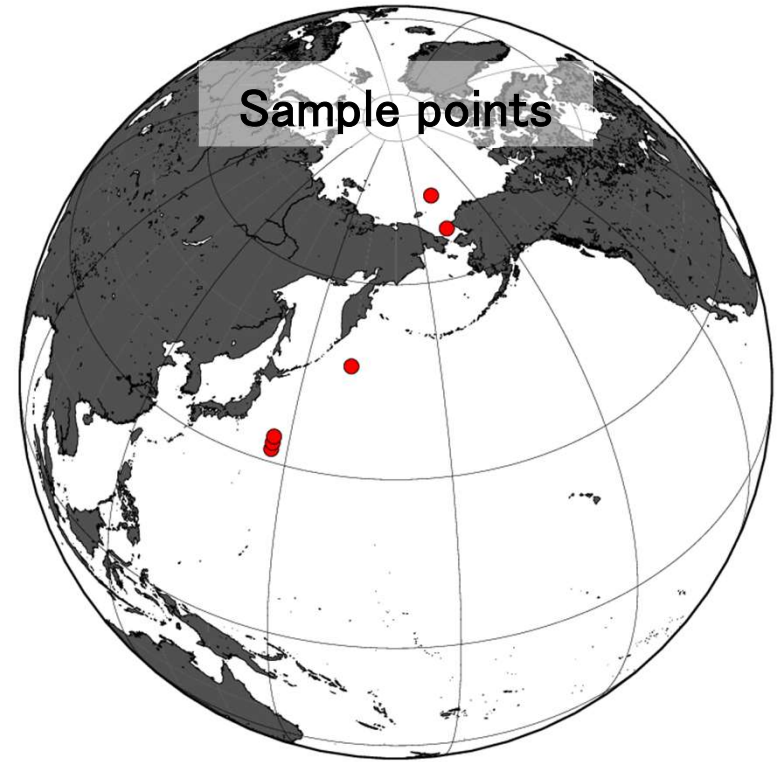


eDNA has been collected at over 50 sites across 32–75°N

Provided by T. Kawakami (Hokkaido University)

Microplastic sampling

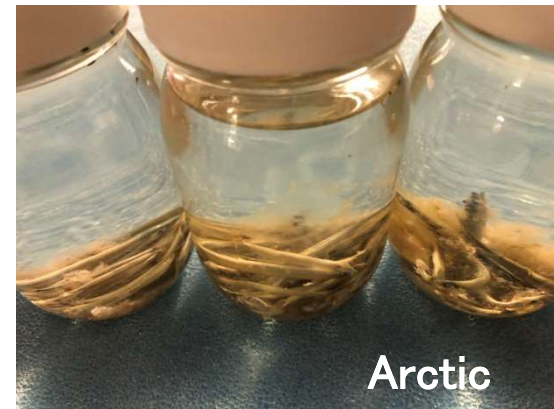
Neuston net and whale shark



Subtropical North Pacific



Subarctic North Pacific



Arctic

Provided by A. Fujiwara (JAMSTEC)

SAS-Mirai 2020



Movie: T. Yasuda (TIMELESS VISION PRO. INC.)

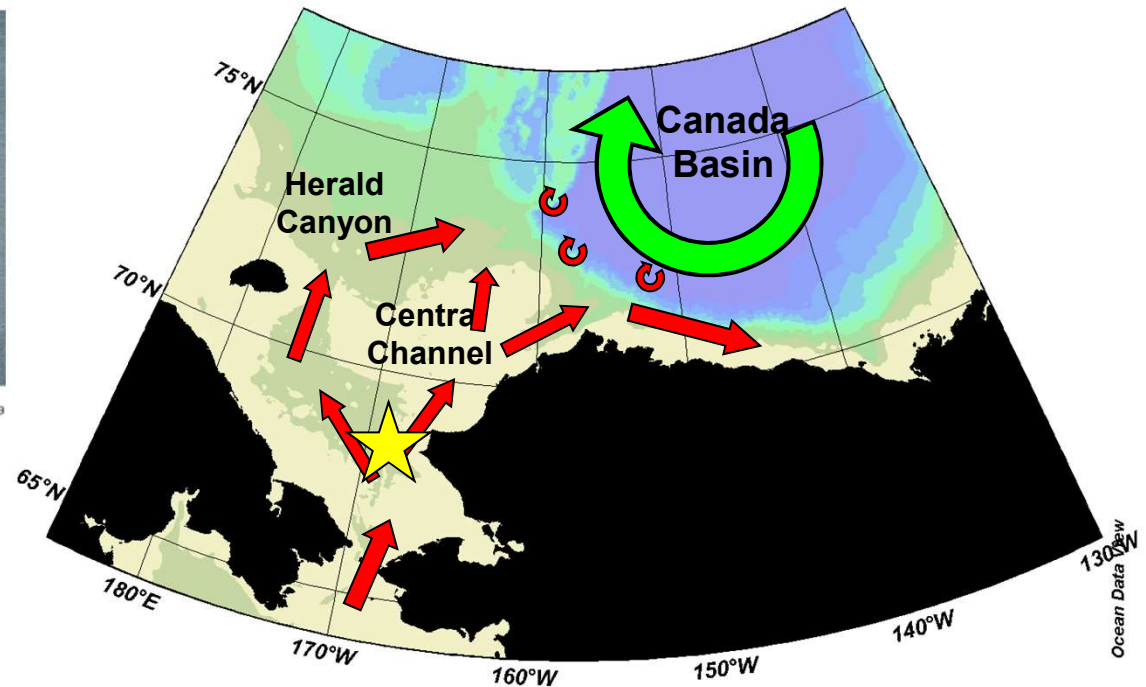
Thank you for your attention.

Mooring recovery August 2020 by CCGS Sir Wilfred Laurier



CCGS Sir Wilfred Laurier
Photo: K. MacGregor - CO 579

*Period: Aug 7th – Aug 17th
No JAMSTEC scientist on board,
due to Covid-19 constraints.*

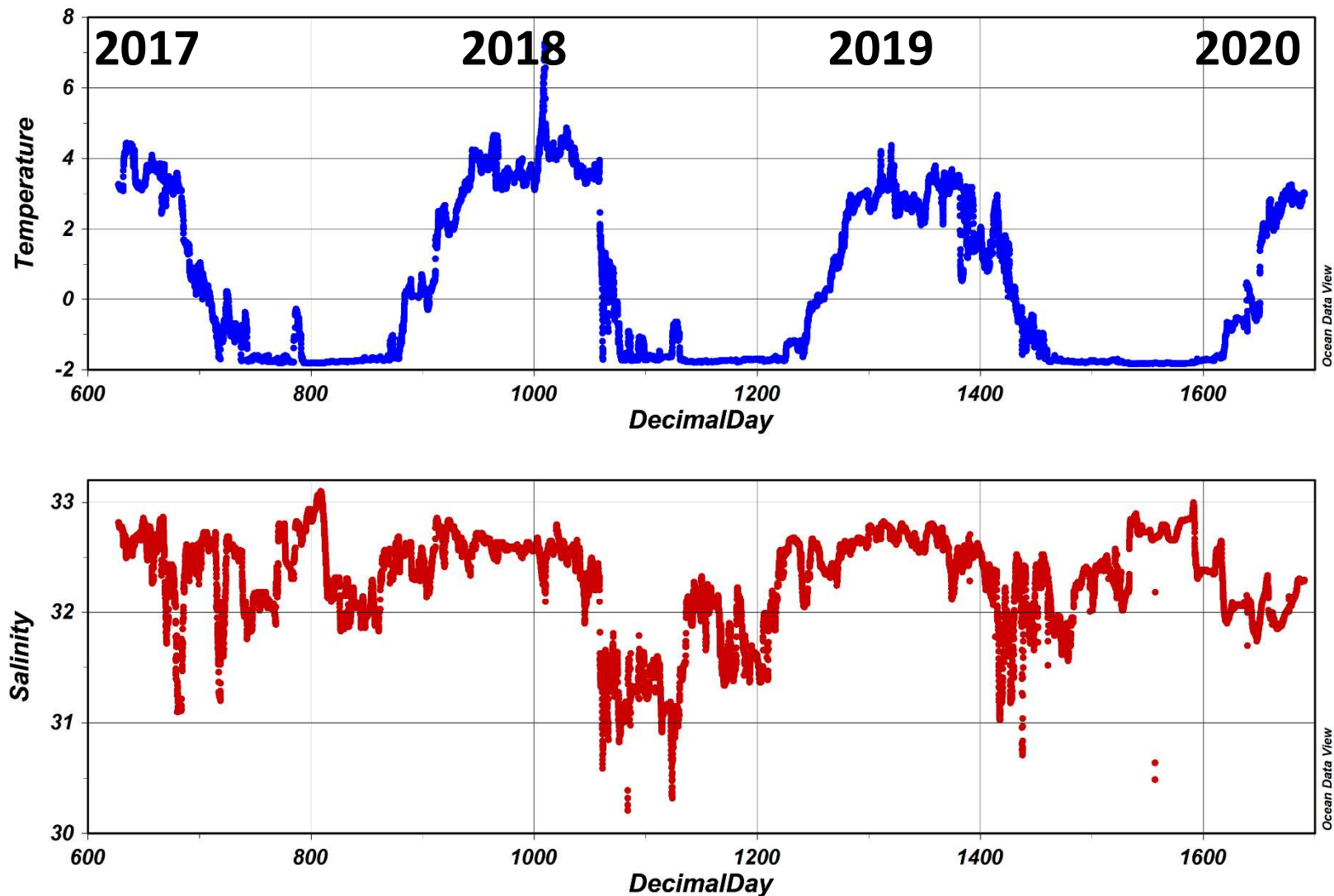


A mooring near by DBO3 off Pt. Hope (SCH-17) placed in 2017, was recovered in mid-August by SWL.

We greatly appreciated Captain D. Gibson, the crew of SWL, Ms. J. Eert, Dr. H. Melling, Dr. T. Janzen and Dr. A. Wickens for all the supports.



Temperature and Salinity time series at SCH-17



It is fortunate to obtain three-year time series data from 2017 September to 2020 August.

MOSAiC

An entire year trapped in
the Arctic sea ice 2019-2020



Daiki Nomura (Hokkaido Univ.) (on board, Leg 5: Aug – Oct 2020)

Jun Inoue (Nat. Inst. Polar Res.) (not on board)

Yusuke Kawaguchi (Univ. Tokyo) (not on board)

Takenobu Toyota (Hokkaido Univ.) (not on board)

Photo: Daiki Nomura





Gas flux measurement

Melt ponds and leads absorb significant amount of CO_2 from the atmosphere.

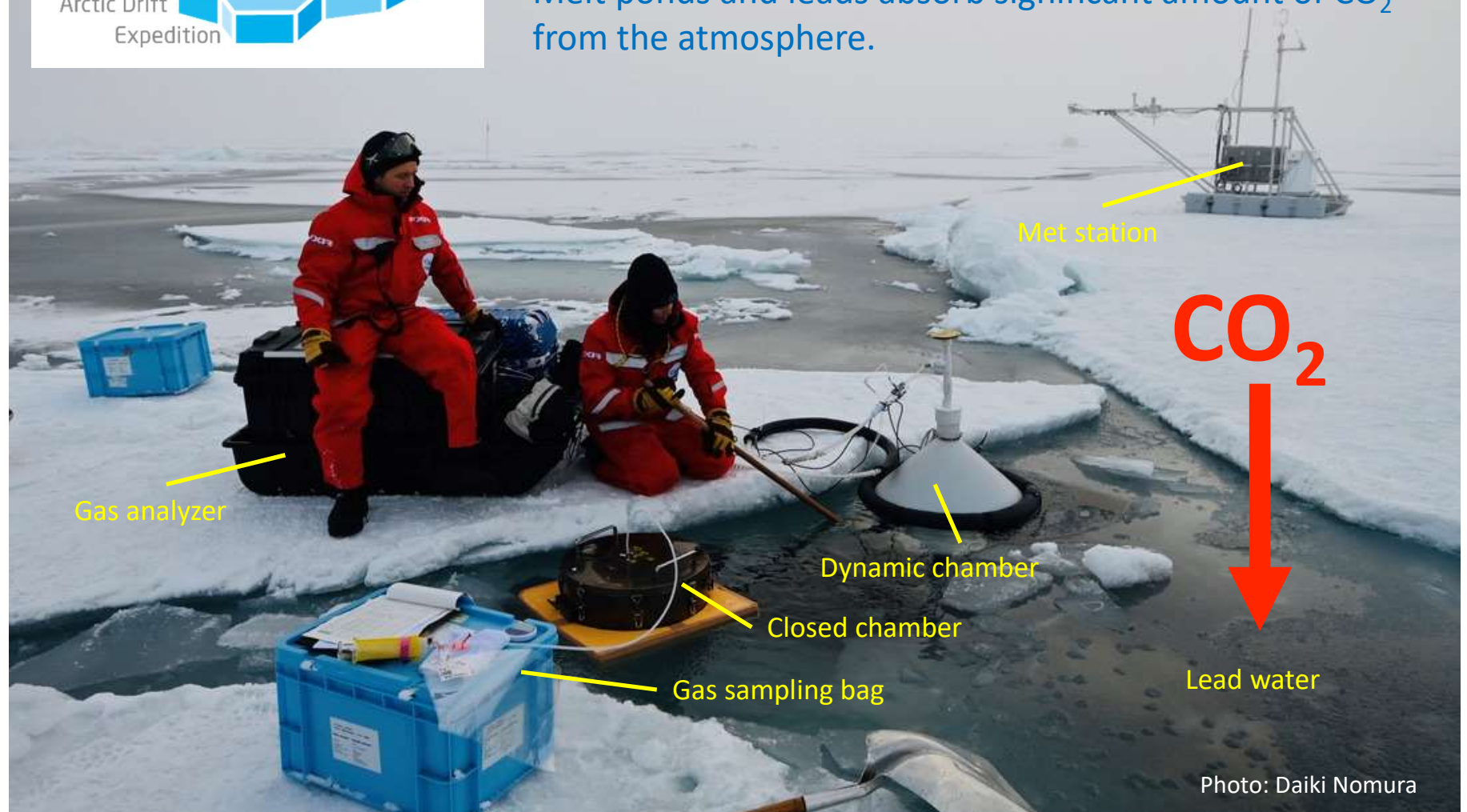


Photo: Daiki Nomura

R/V Mirai Cruise Plan in 2021

Schedule

- 5 Sep: Departure (Dutch Harbor)
10–12 Sep: BC Mooring
Recovery/Re-Deployment
- Chukchi Shelf Slope–75°N Line
East Siberian Sea
Ice Edge Challenges/77°N Line
(COMAI/Ice Edge)
Canada Basin 150°W Line
75°Line/NAP Sediment Trap
Chukchi 168W Line
- 5 Oct: Bering Strait
Bering Shelf Sites (DBO1/2)
18 Oct: Arrival (Hachinohe)

