

# Country report: results from 2019 field season and future planning

JAPAN



Shigeto Nishino

# Japanese Arctic cruise in 2019



Arctic Challenge for Sustainability

- R/V *Mirai* (MR19-03C)

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

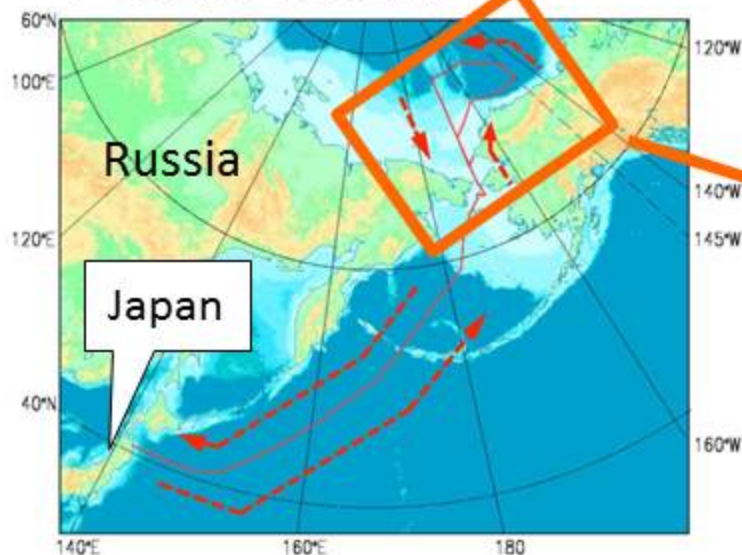
PI: Kazutoshi Sato, Kitami Institute of Technology





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

## Pacific sector



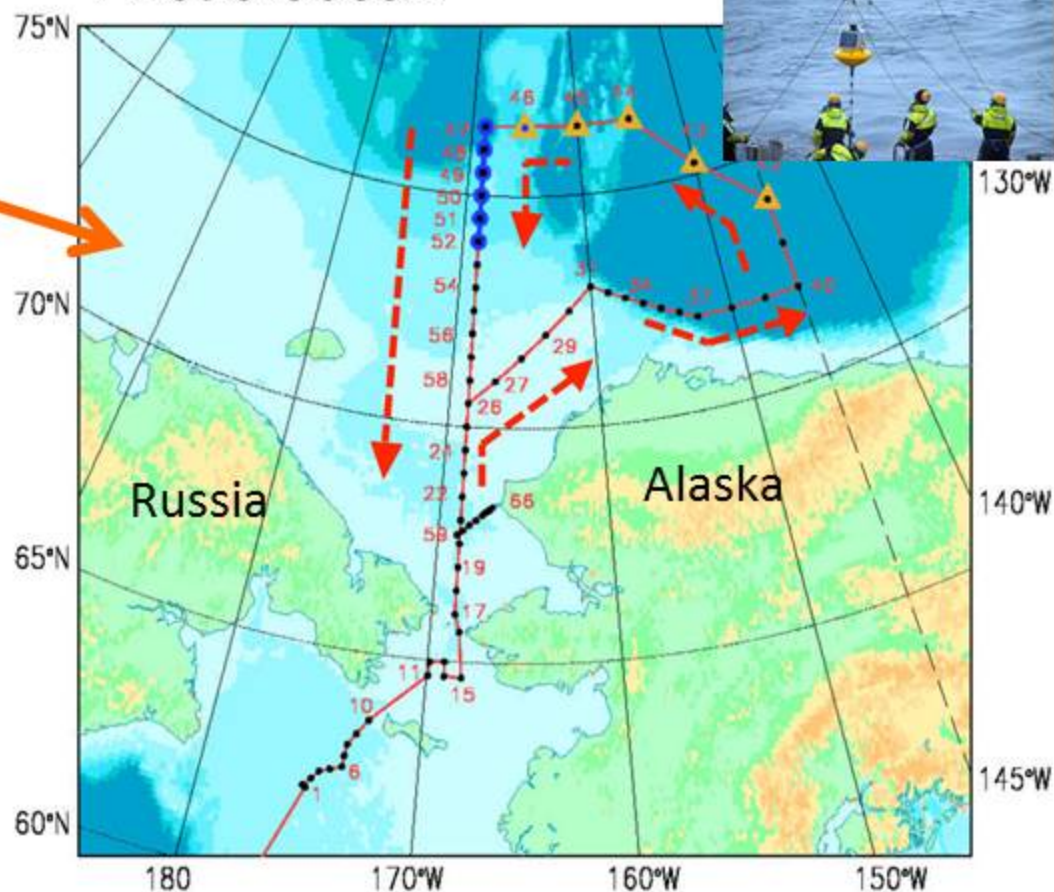
CTD profiler

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

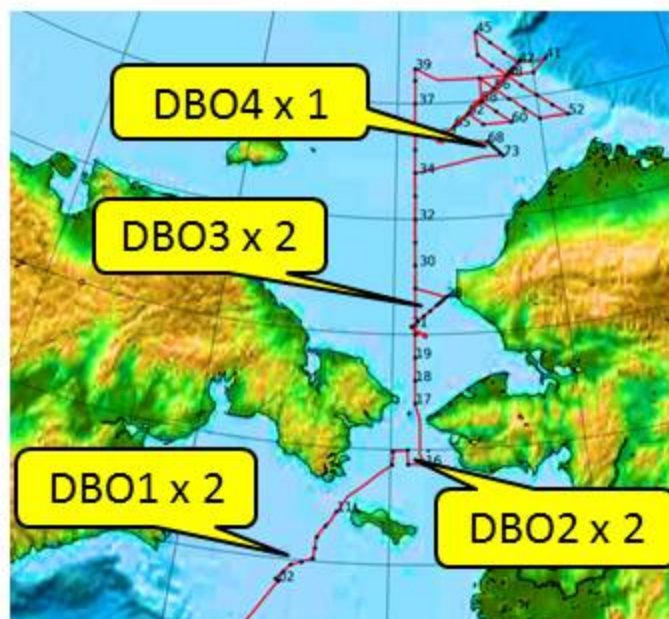
## Research themes of the R/V *Mirai* Arctic cruise in 2019

- 1) Predictability study on weather and sea-ice forecasts linked with user engagement (PI: Dr. Jun Inoue, NIPR)
- 2) Physical oceanographic surveys in marginal ice zone of the western part of the Arctic Ocean (PI: Dr. Yusuke Kawaguchi, AORI)
- 3) Short-term changes on the plankton community in the Pacific sector of the Arctic Ocean during autumn (PI: Kohei Matsuno, Hokkaido Univ.)
- 4) Assessment of impacts of declining sea ice on terrestrial water cycle (PI: Dr. Hotaek Park, JAMSTEC)
- 5) Ship-based observations of trace gases and aerosols over the Arctic Ocean, Bering Sea, and Northwestern Pacific Ocean (PI: Dr. Fumikazu Taketani, JAMSTEC)
- 6) Ship-board observations of atmospheric greenhouse gases and related species in the Arctic Ocean and the western North Pacific (PI: Dr. Yasunori Tohjima, NIES)
- 7) Spatial and temporal changes of seawater CO<sub>2</sub> and CH<sub>4</sub> in the western Arctic Ocean (PI: Dr. Akihiko Murata, JAMSTEC)

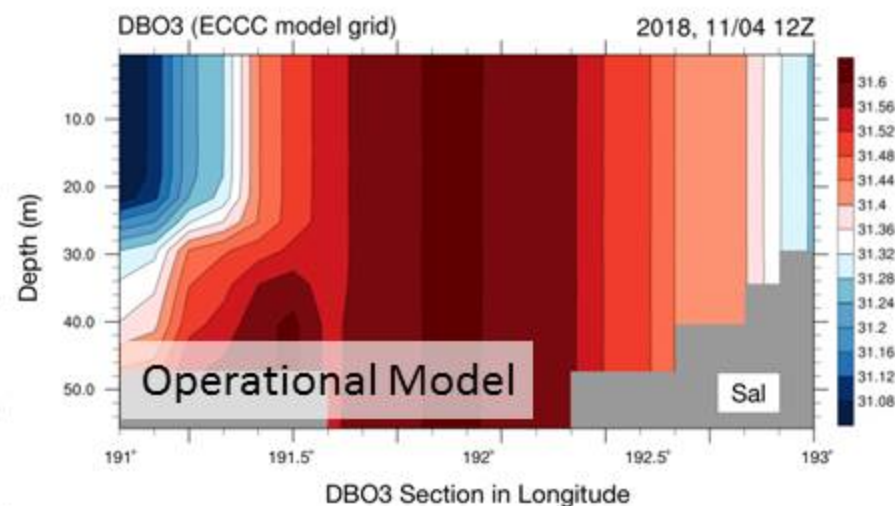
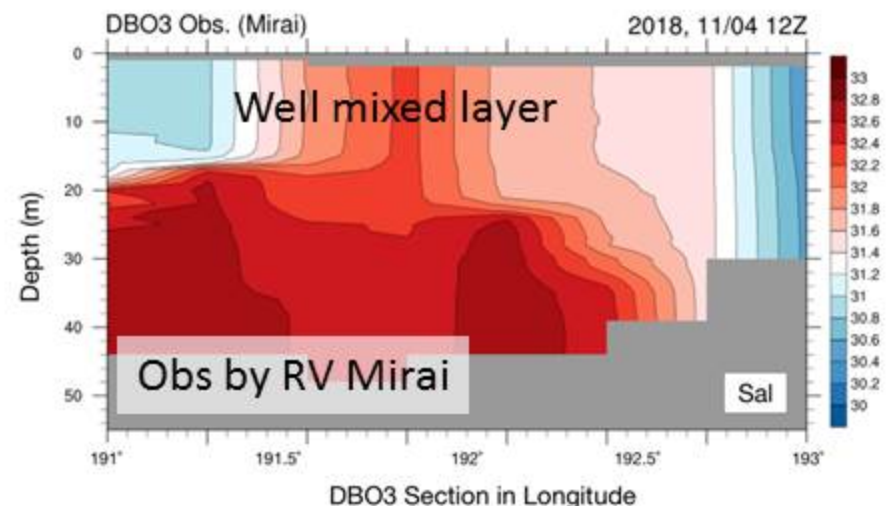


# DBO 3 on 4<sup>th</sup> Nov 2018: RV Mirai vs ECCC model (YOPP activity)

*Prepared by J. Inoue (NIPR)*



2018 RV Mirai cruise track

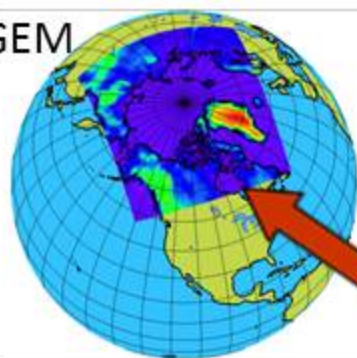


Plots: M. E. Hori (NIPR)

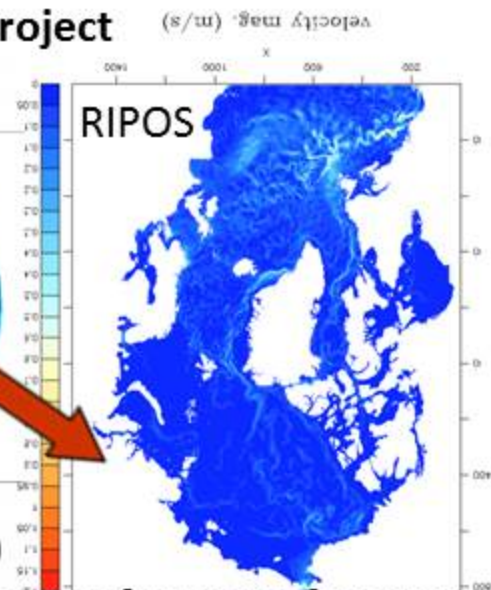
WMO Polar Prediction Project



GEM



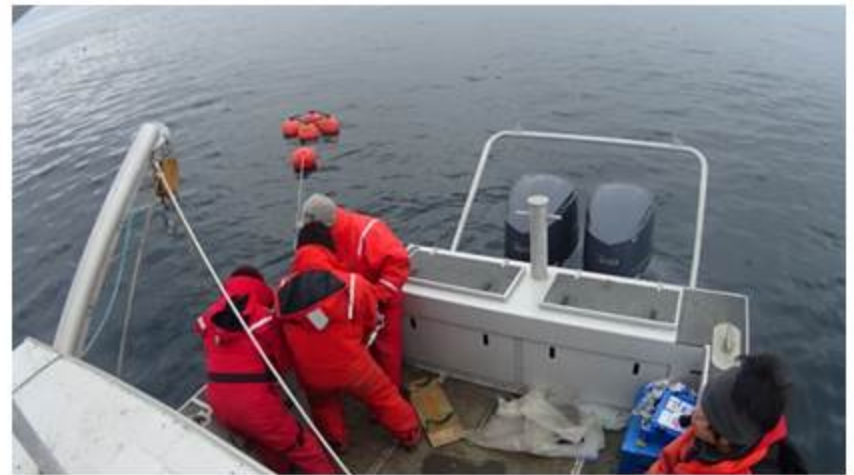
RIPOS



Model: G. Smith (ECCC)

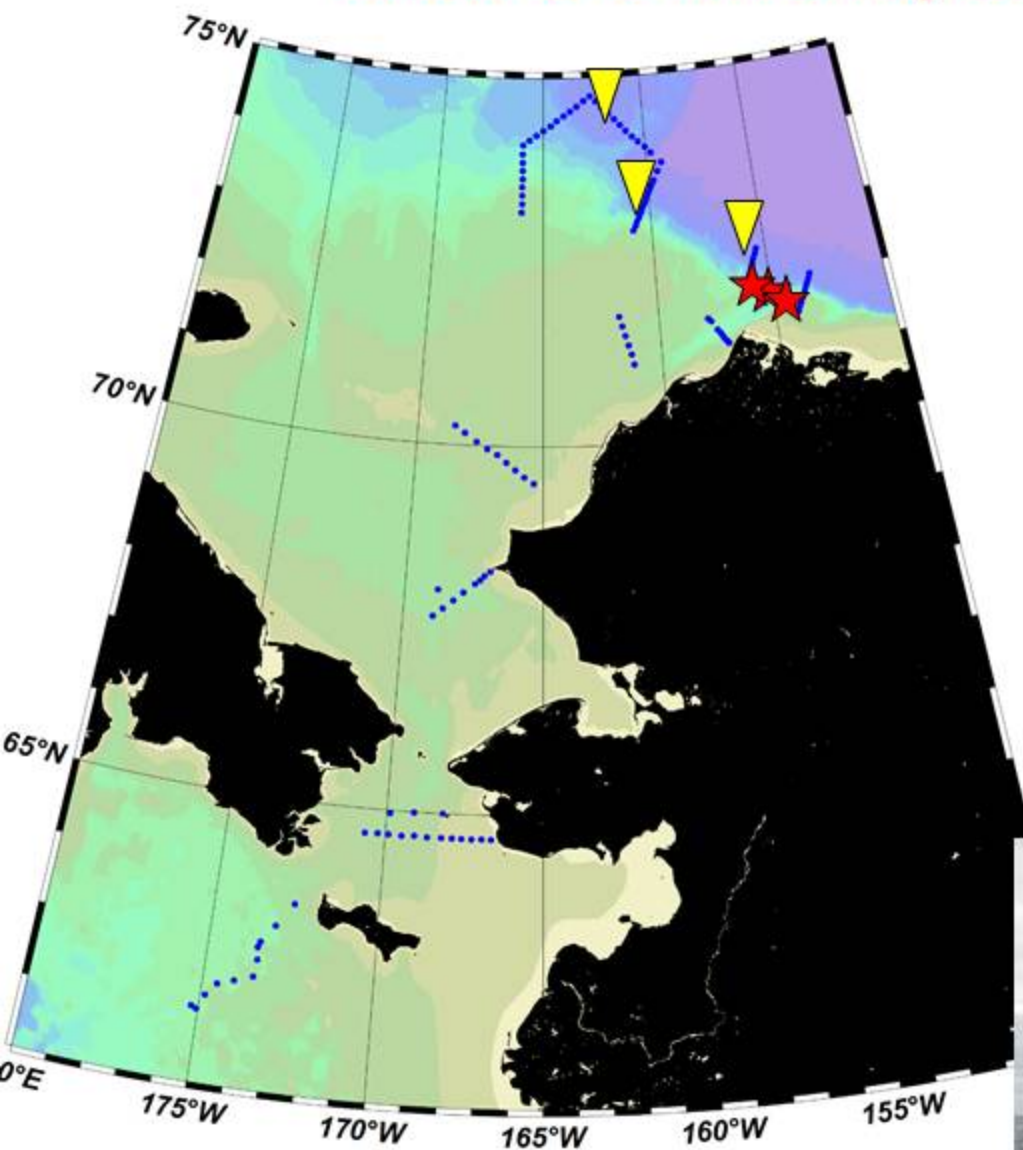
48-hour weather and sea-ice forecasts for supporting navigations

# Other activities





# JAMSTEC's mooring activities under the collaboration with NOAA and WHOI by USCGC Healy in 2019



## HY1901

August 4th to August 23th  
(Nome to Nome)

Chief Sci. : Dr. R. Pickart

Co-Chief Sci. : Dr. J. Grebmeier

## JAMSTEC's activity

- ★ Turn-around three Barrow Canyon moorings. (PI: M. Itoh)
- ▼ Recover three sediment trap moorings. (PI: J. Onodera)



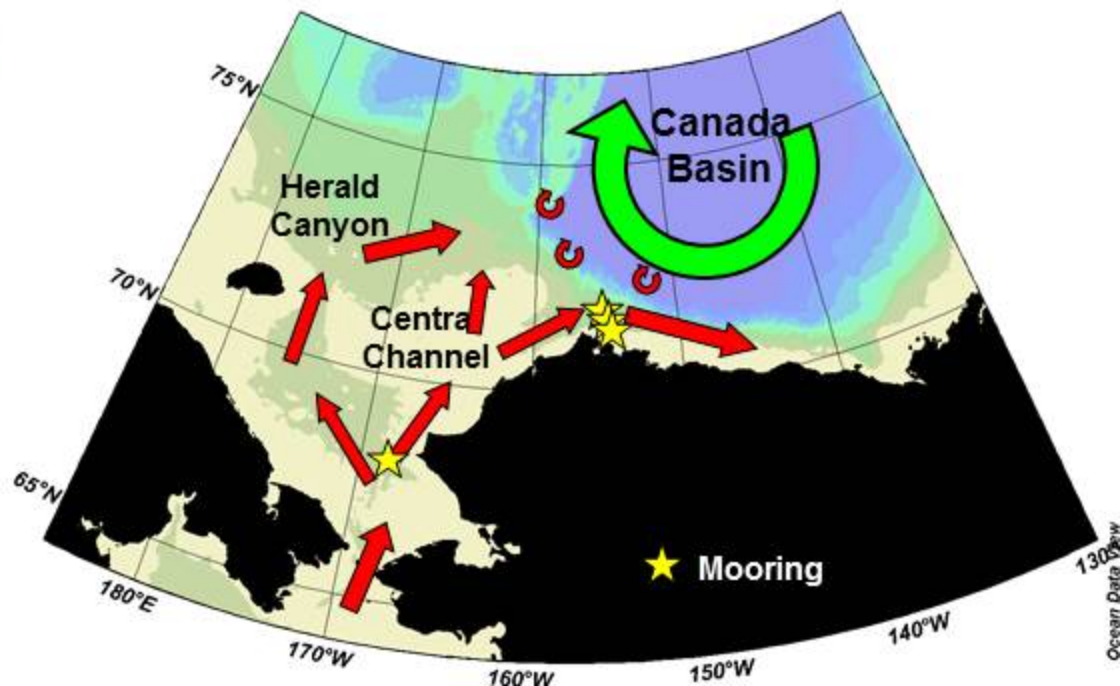
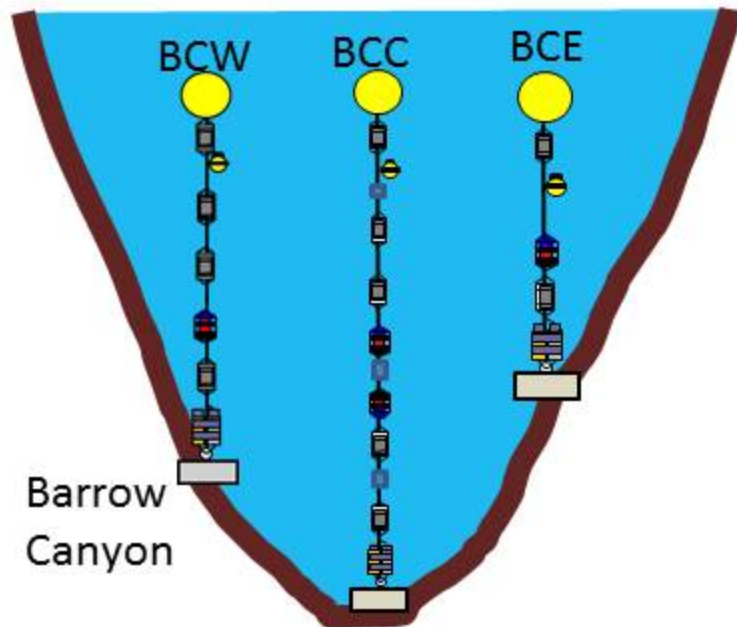
# JAMSTEC mooring activities collaborated with NOAA and WHOI by US Coast Guard Cutter *Healy*

USCGC *Healy*



## <Objectives>

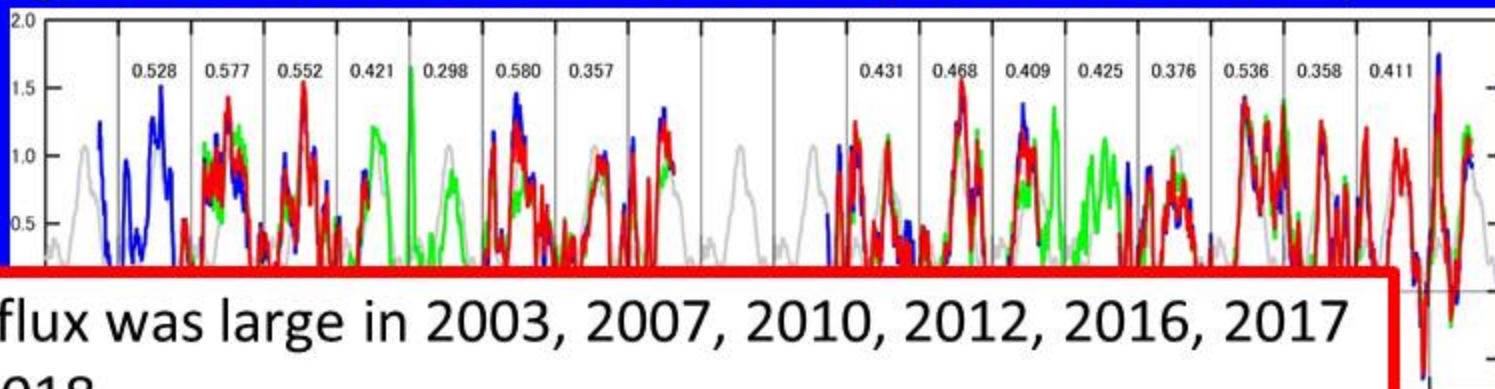
The goal of this monitoring efforts is to detect and quantify on-going changes in flows, temperature and salinity of waters, phyto- and zooplanktons from the Pacific to the Arctic Ocean.





# Barrow Canyon volume, fresh water and heat fluxes

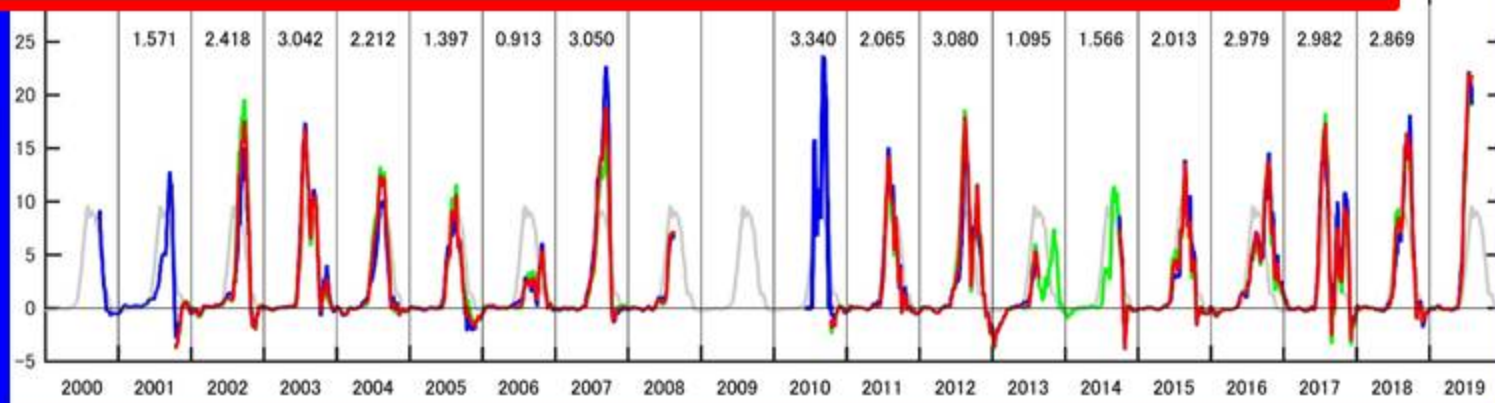
**Volume flux**  
**0.46 Sv**  
(error 13%)



**Fresh**  
(ref. 30°C)  
(error 13%)

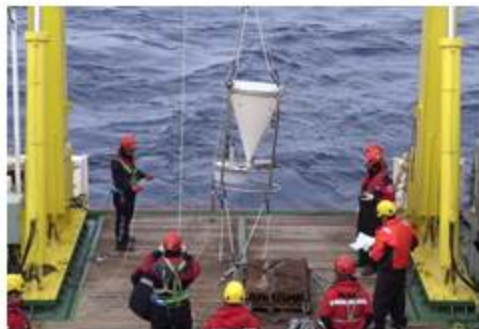
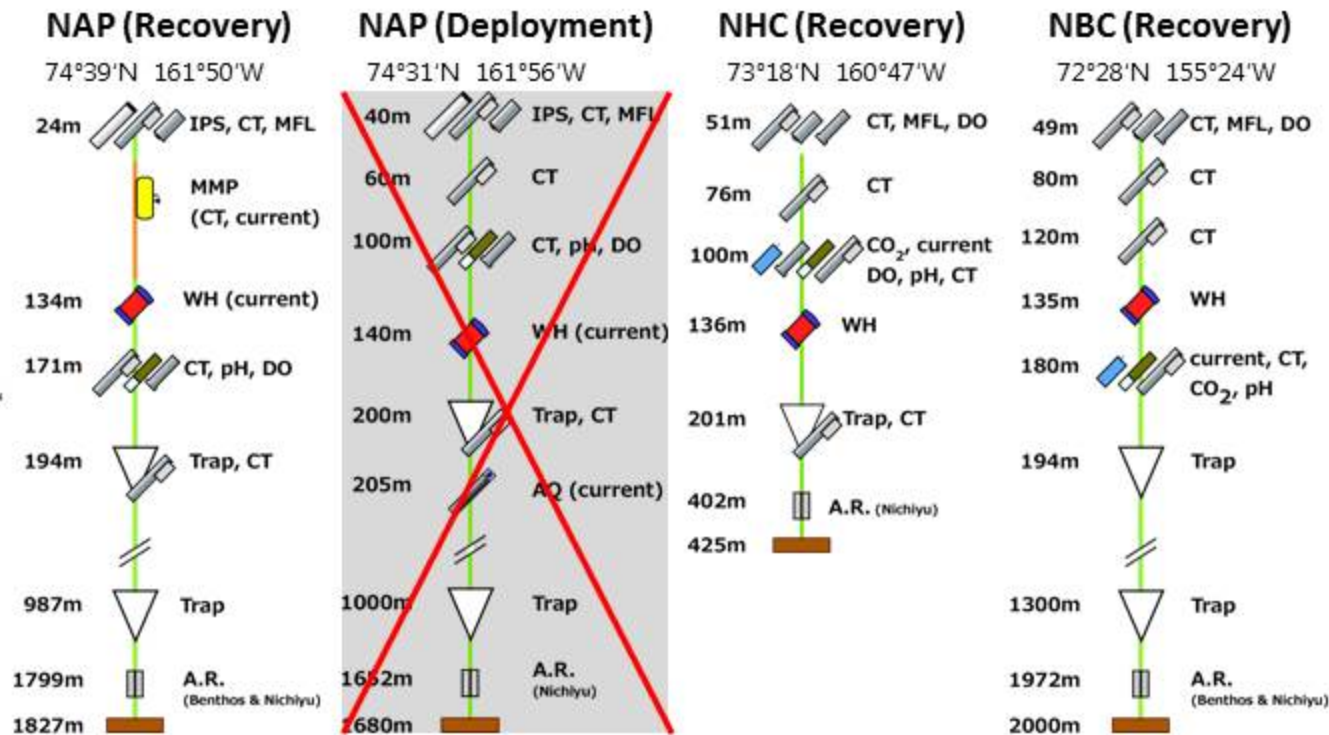
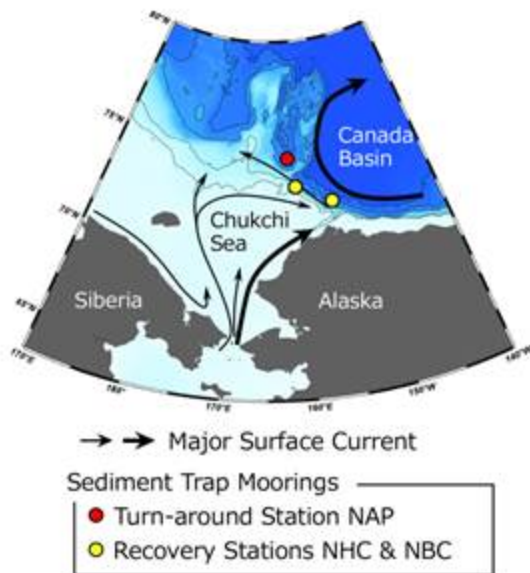
- ✓ Heat flux was large in 2003, 2007, 2010, 2012, 2016, 2017 and 2018.
- ✓ Large heat input through the Barrow Canyon into the Canada Basin occurs more frequently in 2010s comparing with 2000s.
- ✓ Anomalous warm water (10 degree) was observed in 2019, probably due to less sea ice in the Chukchi Sea.

**Heat flux**  
(ref. freezing temp)  
**2.39 TW**  
(error 8%)



Updated from Itoh et al., (JGR, 2013) and Itoh et al., (DSRI, 2015)

# Turn-around of Sediment trap NAP, and recoveries of NBC and NHC in USCGC Healy Cruise



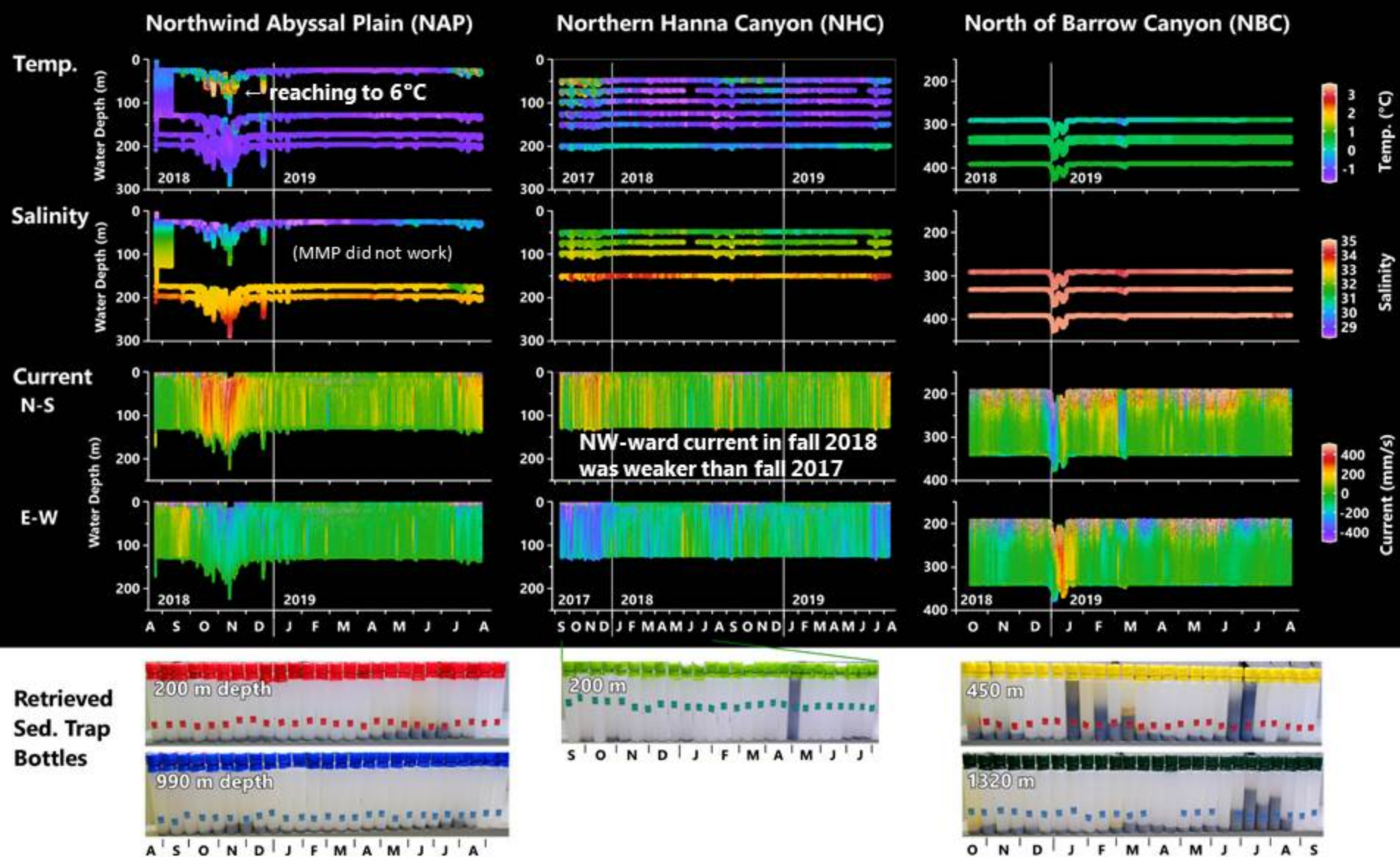
Deployment of NAP trap in Araon 2018 cruise

## Objectives on sediment trap deployment

- Study on ice algae production and their role in biogeochemical cycles
- Monitoring of ocean acidification and pteropod shell density
- Transportation of Chukchi shelf materials to basin
- Cooperative research on marine ecosystems with KOPRI
- Obtaining validation data for developing numerical model



# Recovery of JAMSTEC Sediment Trap Moorings

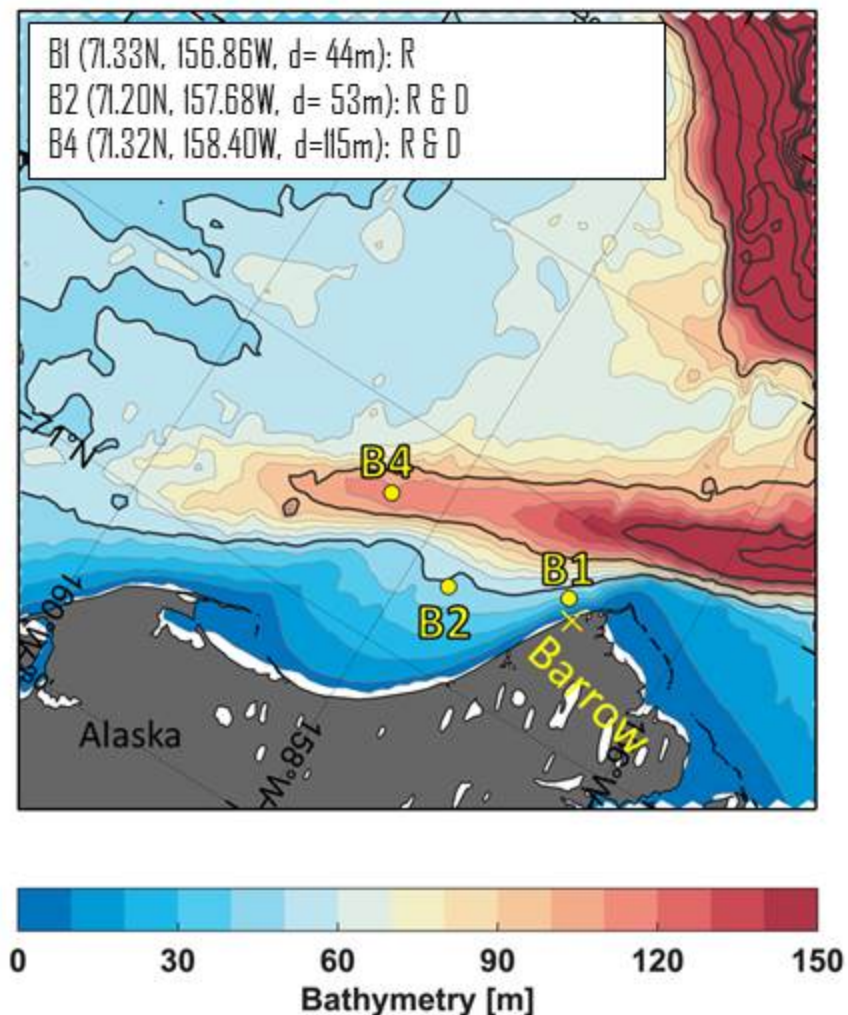
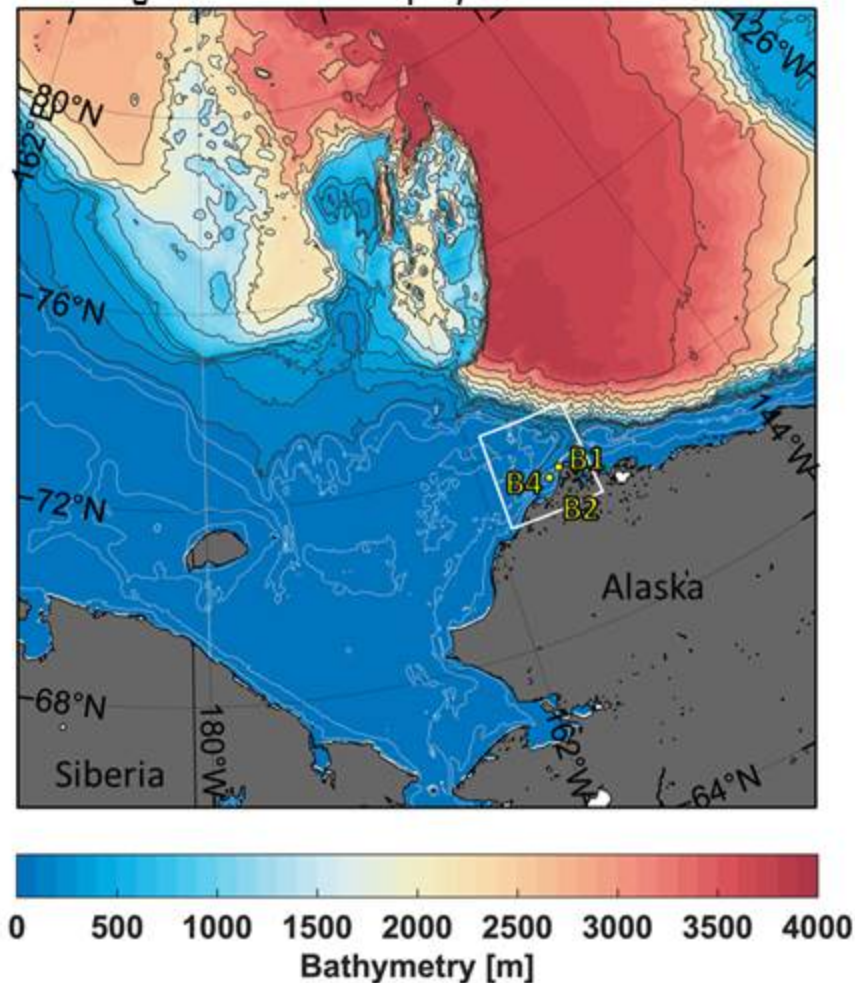


No deployment of sediment trap this year. We will deploy one sediment trap mooring next year.  
 Hydrographic row data at these moorings obtained by ArCS project will be opened to public in the Arctic Data System (ADS) this fall/winter

# Sea-ice and oceanographic mooring operations by Hokkaido Univ./UAF in August 2019

Hokkaido Univ.: Y. Fukamachi, K. I. Ohshima, D. Hirano, and M. Ito  
UAF: A. R. Mahoney, H. Eicken, and J. Jones

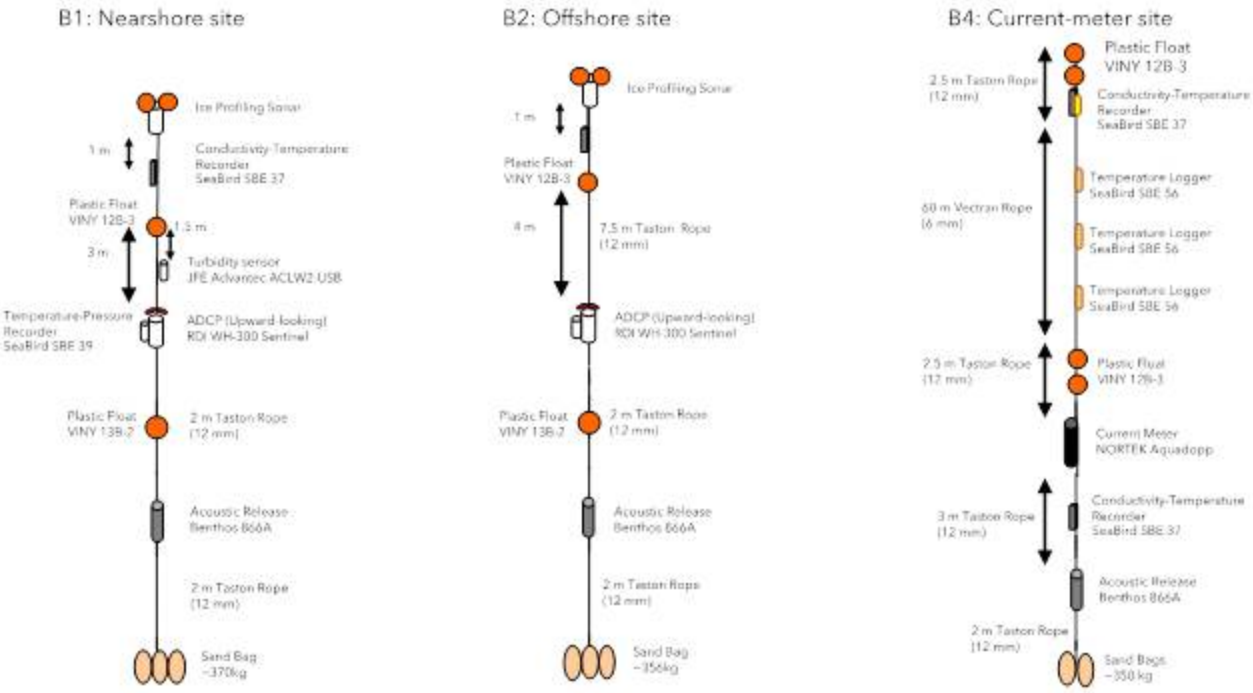
## Mooring recoveries/deployments off Pt. Barrow





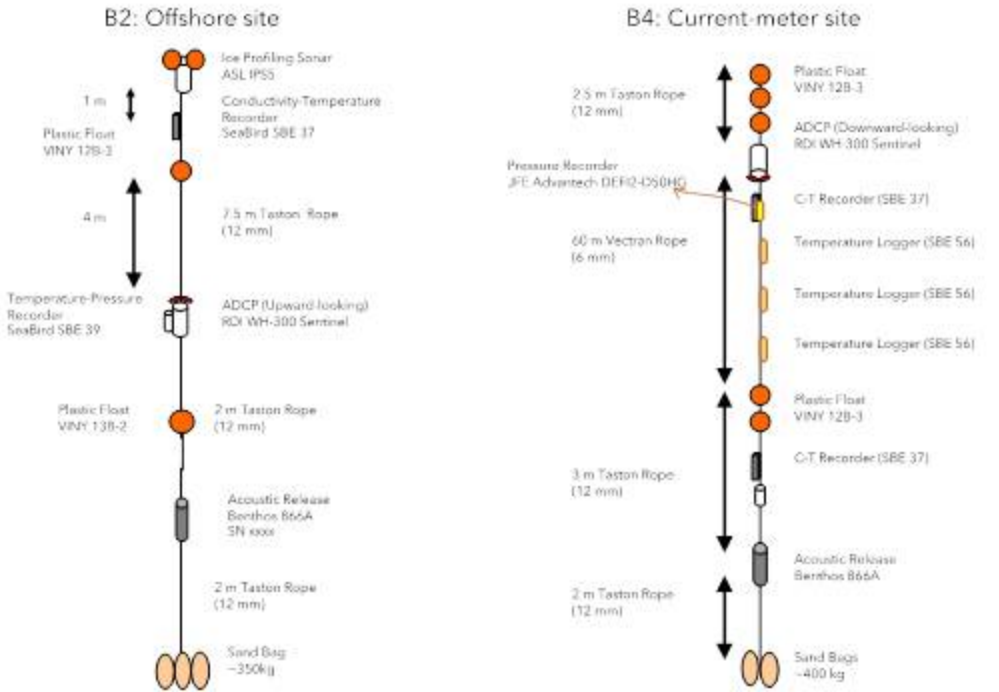
○ **3 mooring recoveries**  
**(August 2017 ~ August 2019)**

**<Objectives>**  
 To measure ice thickness by ice-profiling sonars and estimate the ice production/heat loss at DBO-5, off Pt. Barrow.



○ **2 mooring deployments**  
**(August 2019 ~ August 2021)**

- ❖ We tried to recover three moorings deployed in Aug. 2017. Moorings B1 and B2 were successfully recovered, but B4 was not recovered without known cause.
- ❖ Two moorings at B2 and B4 were successfully deployed.



**CCGS Louis S. St-Laurent**

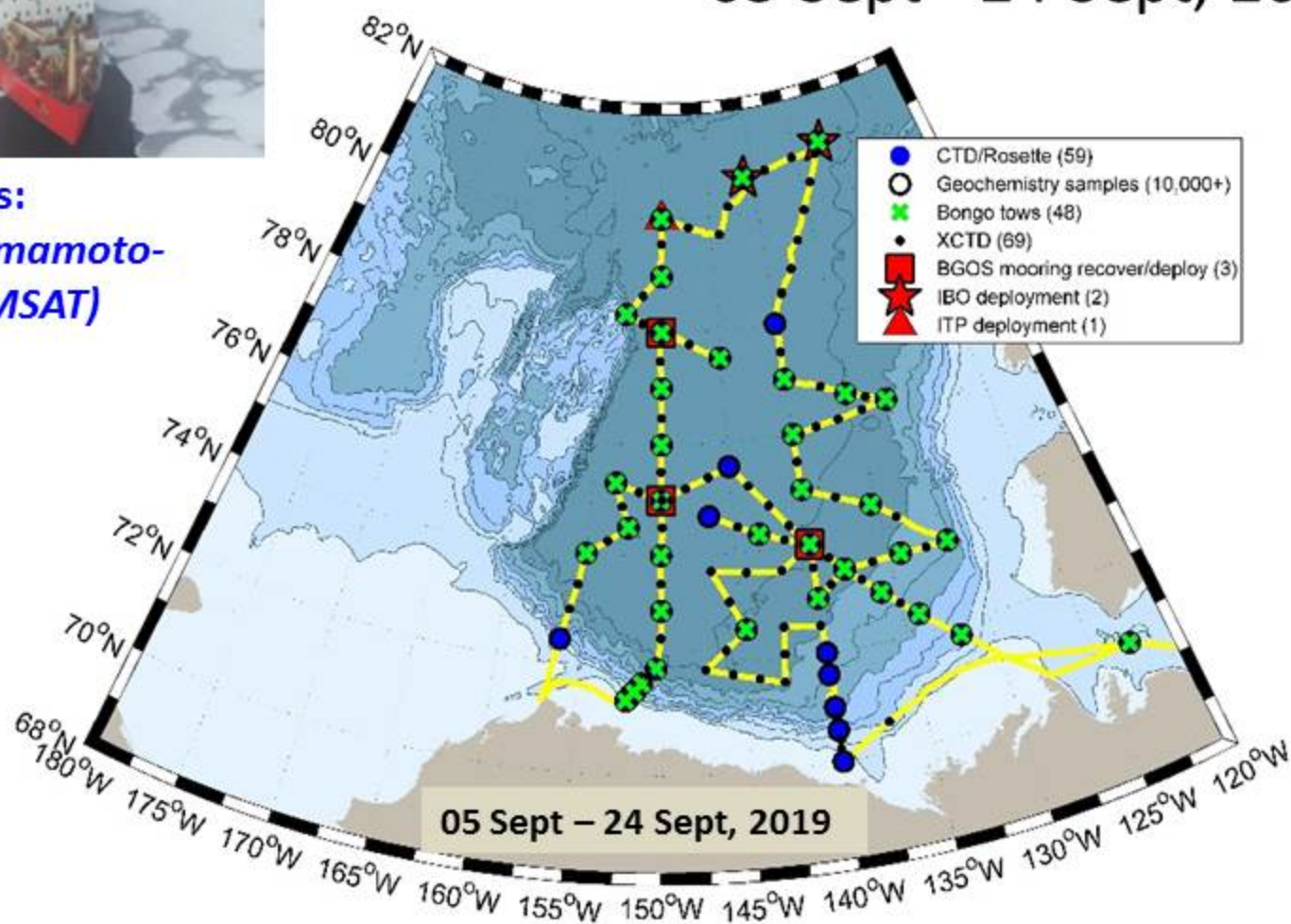


**Participants:**  
**Michiyo Yamamoto-**  
**Kawai (TUMSAT)**

**ArCS+JSPA & JOIS**

**Canada Basin**

**05 Sept - 24 Sept, 2019**







## <Objectives>

Interannual variations in FW sources & ocean acidification

## <Observation items>

### 1. Water sampling

$\delta^{18}\text{O}$  (freshwater tracer)

DIC and TA (freshwater tracer & acidification index)

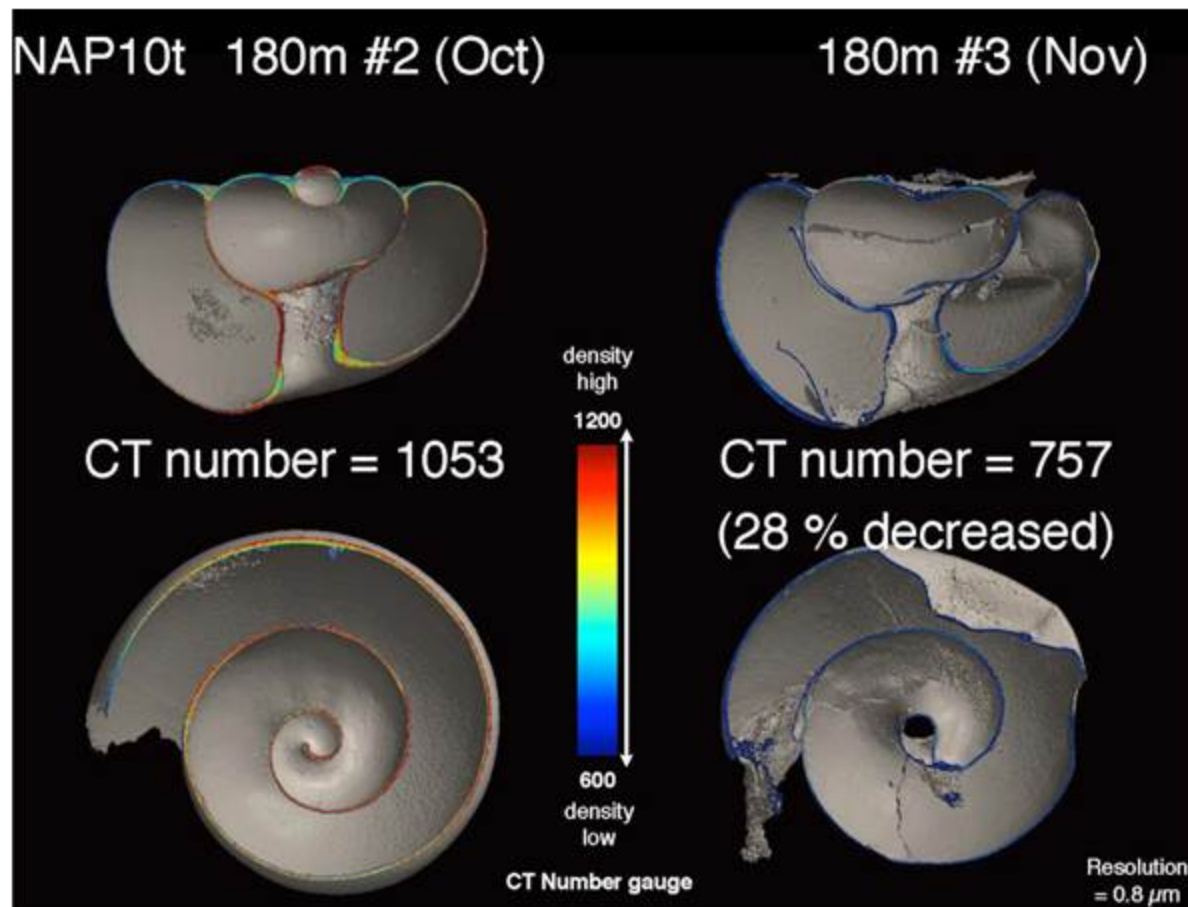
### 2. Plankton net towing

collect pteropods from several layers  
(0-50, 50-100, and 100-200m layers)  
analyze shell density using MXCT

- No RAS recovery/deployment this year.



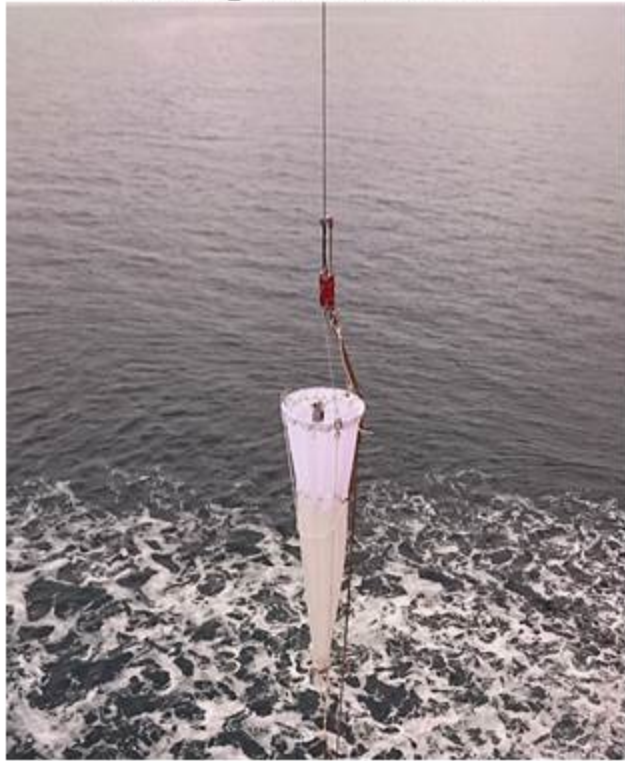
# MXCT: Micro X-ray Computed Tomography



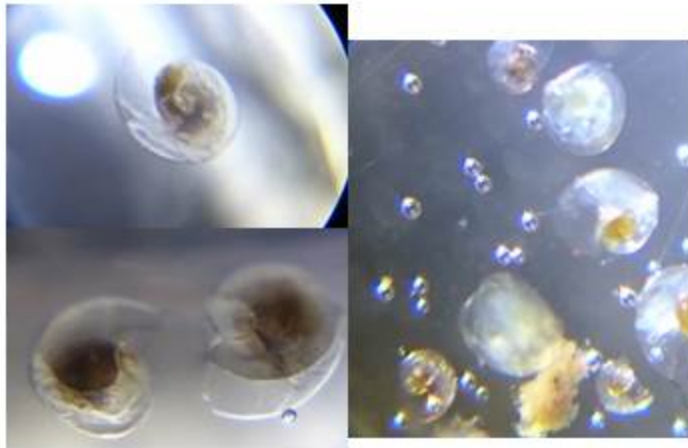
(photos by Dr. Kimoto, K., JAMSTEC)



Closing NORPAC net

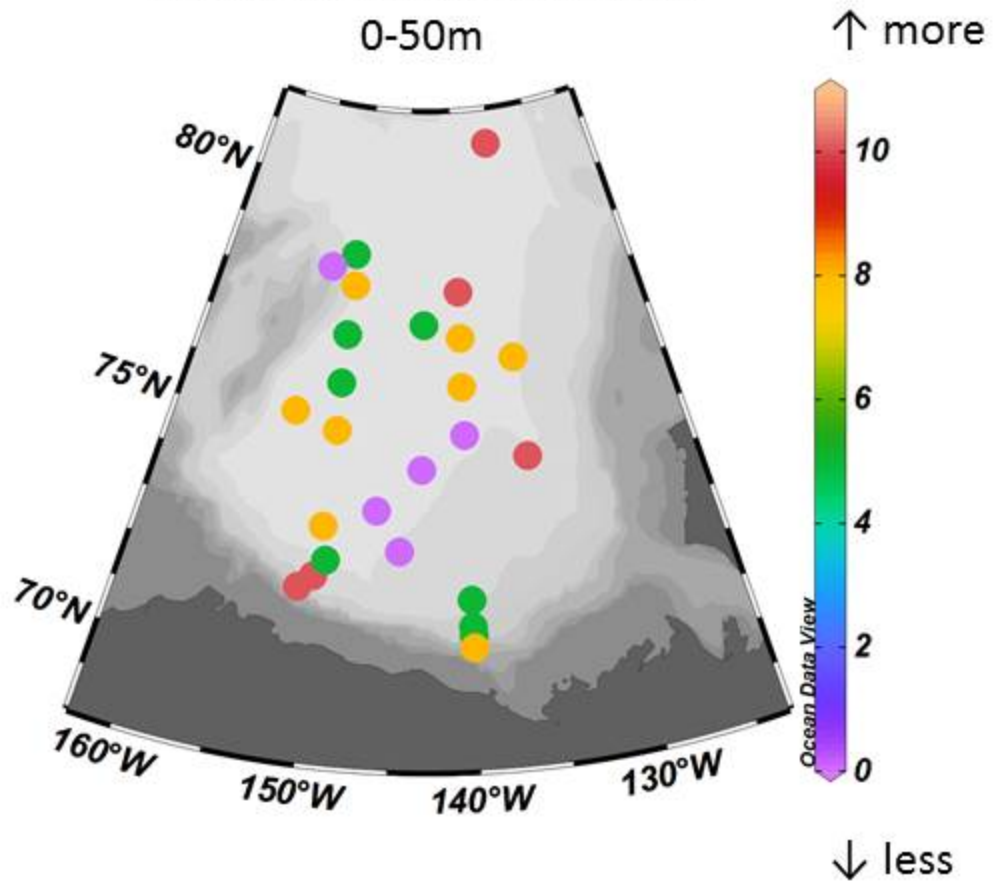


*Limacina helicina*



# Result 1

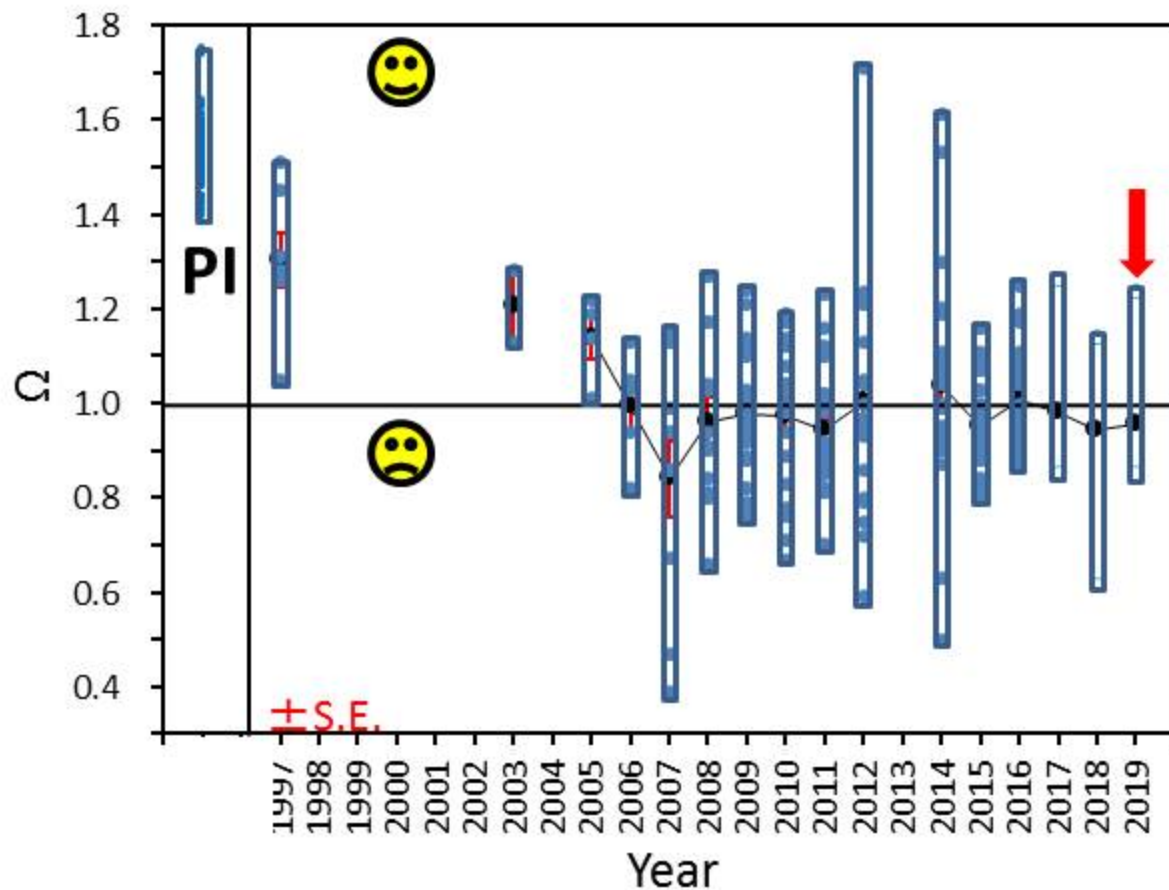
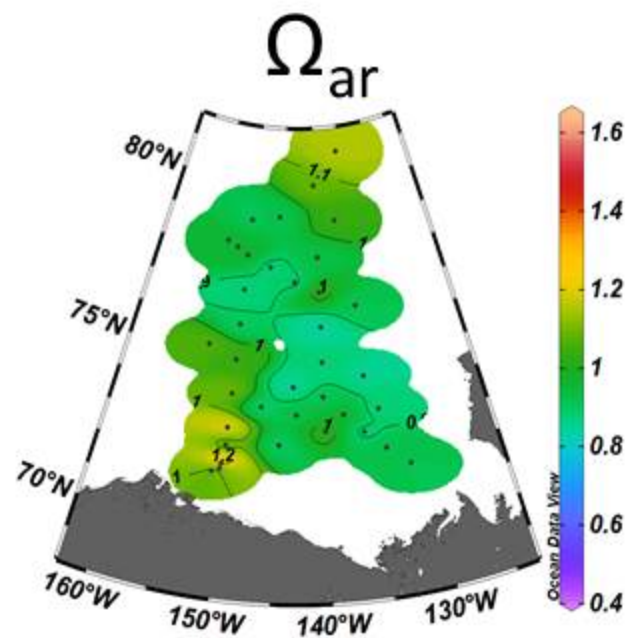
*L. helicina* abundance index  
0-50m



# Result 2

Mean and range of surface  $\Omega$  in C. B.

2019





# SGLI/GCOM-C was launched!

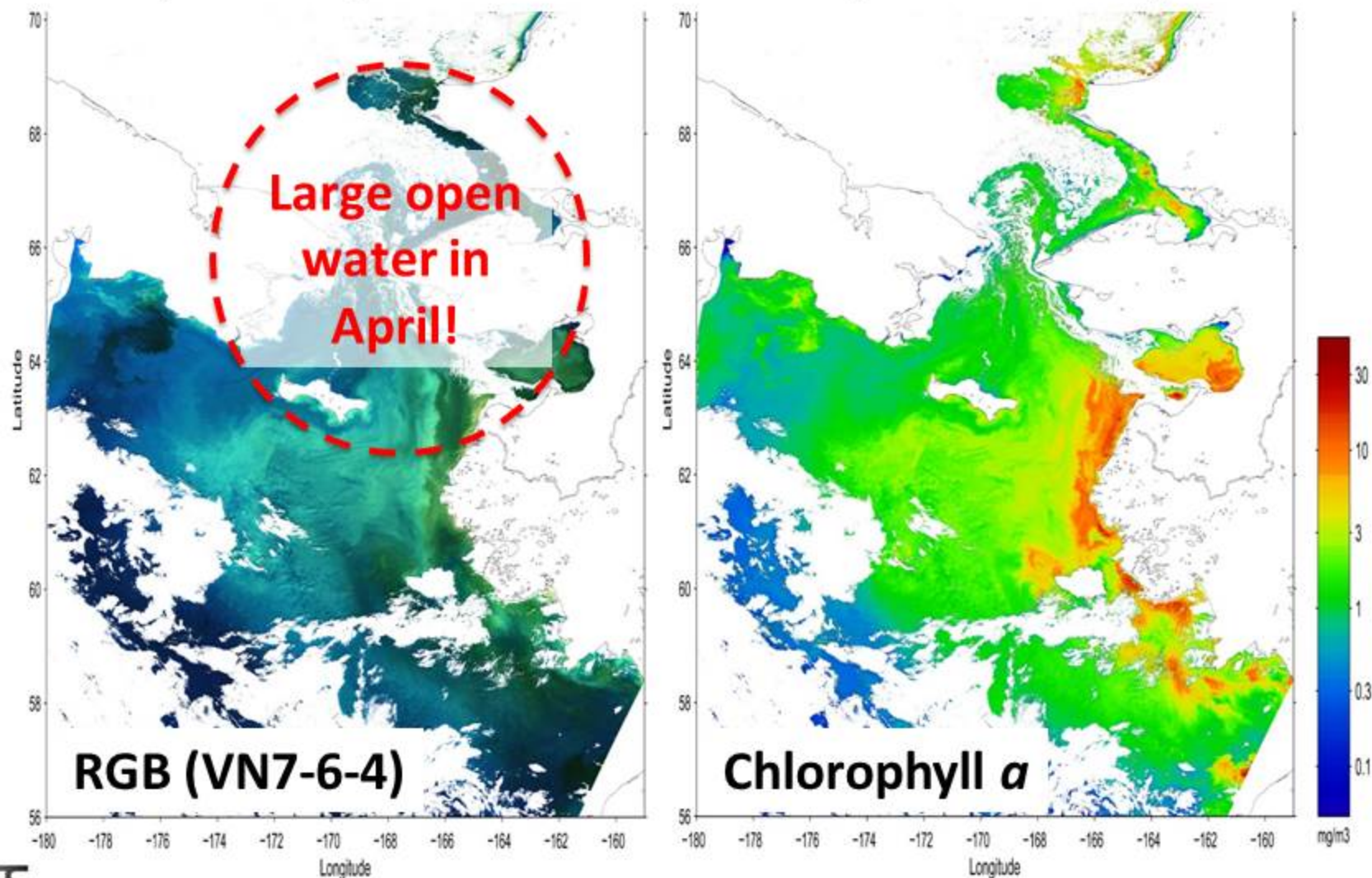
## December 23 2017



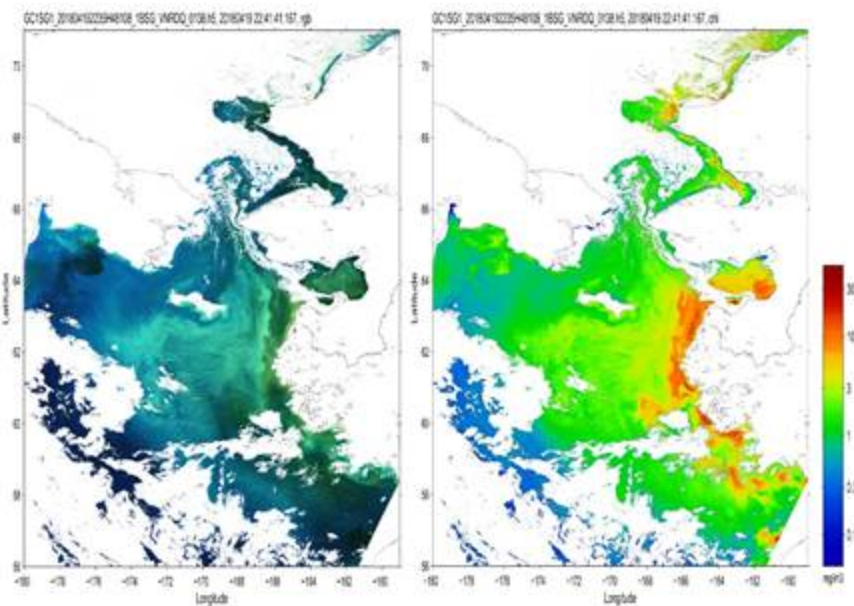
[http://suzaku.eorc.jaxa.jp/GCOM\\_C/index.html](http://suzaku.eorc.jaxa.jp/GCOM_C/index.html)

# Scientific achievements

**Bering and Chukchi Seas from SGLI/GCOM-C in spring  
(250 m spatial resolution on April 19<sup>th</sup> 2018)**







Ocean color and SST data of SGLI/GCOM-C  
JAXA is freely available from G-Poral site:

<https://gportal.jaxa.jp/gpr/index>