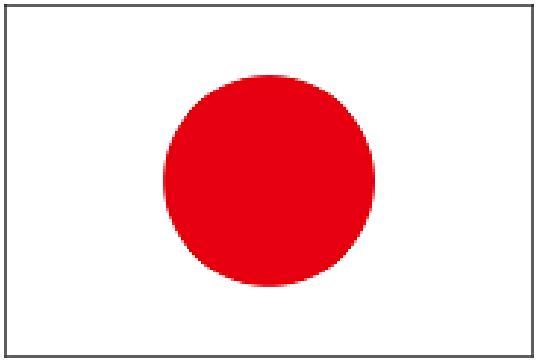
Pacific Arctic Group 2019 Spring Meeting
May 23rd, 2019 (9:00 – 15:30)
Northern (Arctic) Federal University
Arkhangelsk, Russia

# Japan CAO research cruise plan



Shigeto Nishino

# SAS Japan's national team

ISAR-5

Fifth International Symposium on Arctic Research

18:30-20:30 on January 17 (Wed.), 2018
Rm. Chu1, 2nd floor,
Hitotsubashi Hall, Tokyo, JAPAN

Synoptic Arctic Survey

## SAS night session at ISAR-5

### "to assemble SAS Japan's national team"

# Informed Japanese research community of SAS

JpGU2018
日本地球惑星科学連合 2018 年大会
May 20- 24, 2018
Makuhari Messe
Chiba, Japan

- **A coordinated multi-ship, multi-nation pan-Arctic ship-based sampling campaign**
- This could allow for a synoptic view of the totality of hydrographic and ecosystem changes taking place in the Arctic Ocean
- Hydrographic measurements: T, S, Oxygen, Nutrients, Inorganic Carbon Chemistry, Organic Carbon (POC and DOC), age tracers (CFCs), C-isotopes, $CH_4$
- Ecosystem characteristics: Viruses, Bacteria, Phytoplankton, micro, meso, and macro zooplankton, benthos, acoustics, primary production


(Courtesy of Drs. Are Olsen, Leif Anderson, and Øyvind Paasche)

# SAS session in ISAR-6

**Conveners:**

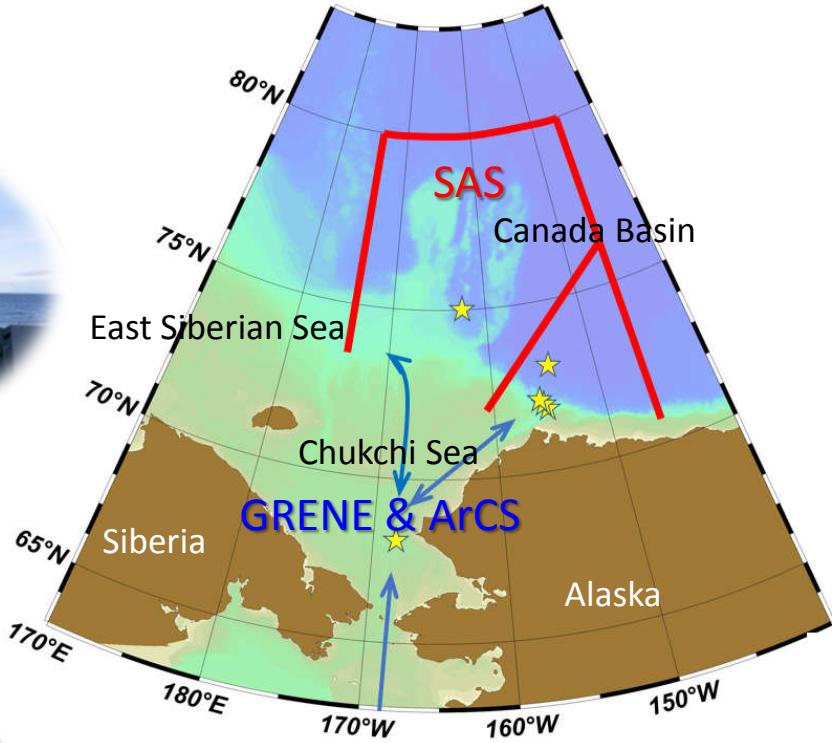
Shigeto Nishino, Are Olsen, Øyvind Paasche, Michiyo Yamamoto-Kawai, Sung-Ho Kang, Jianfeng He, Carin Ashjian, Jacqueline Grebmeier, Kumiko Azetsu-Scott, William Williams

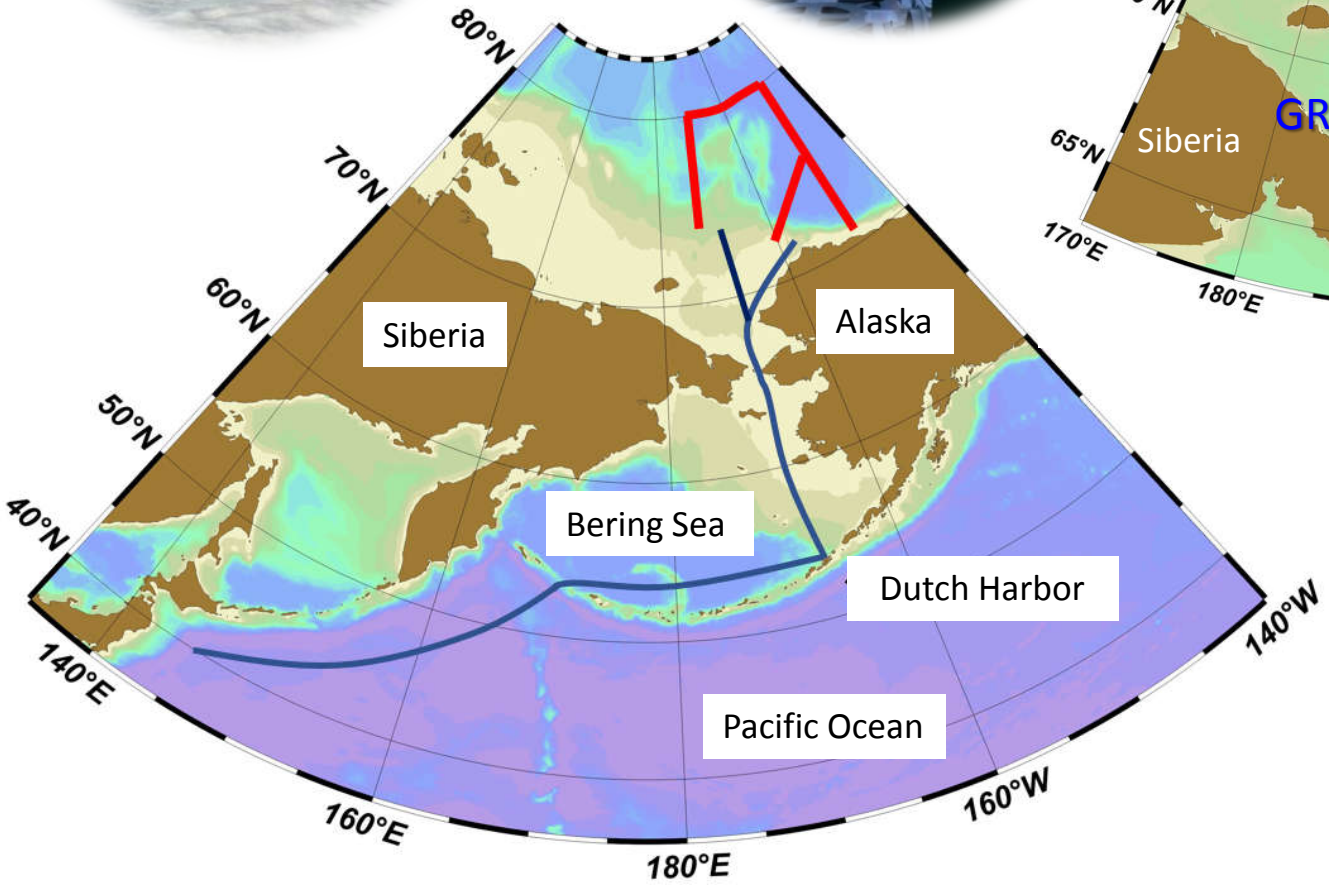

*In this session, we will discuss confirmed and developing cruise plans and cross-disciplinary scientific issues in preparation for the 2020/2021 SAS cruises. We encourage presentations that include the present understandings and/or expected results for the key parameters in the SAS regions, including the Pacific Arctic region (northern Bering, Chukchi, Beaufort seas, and Canada Basin) and high Arctic regions.*

# R/V Mirai SAS cruise in 2020

R/V Mirai is not an icebreaker.
Escorts will be needed in the sea-ice area!

R/V *Mirai* (JAMSTEC)



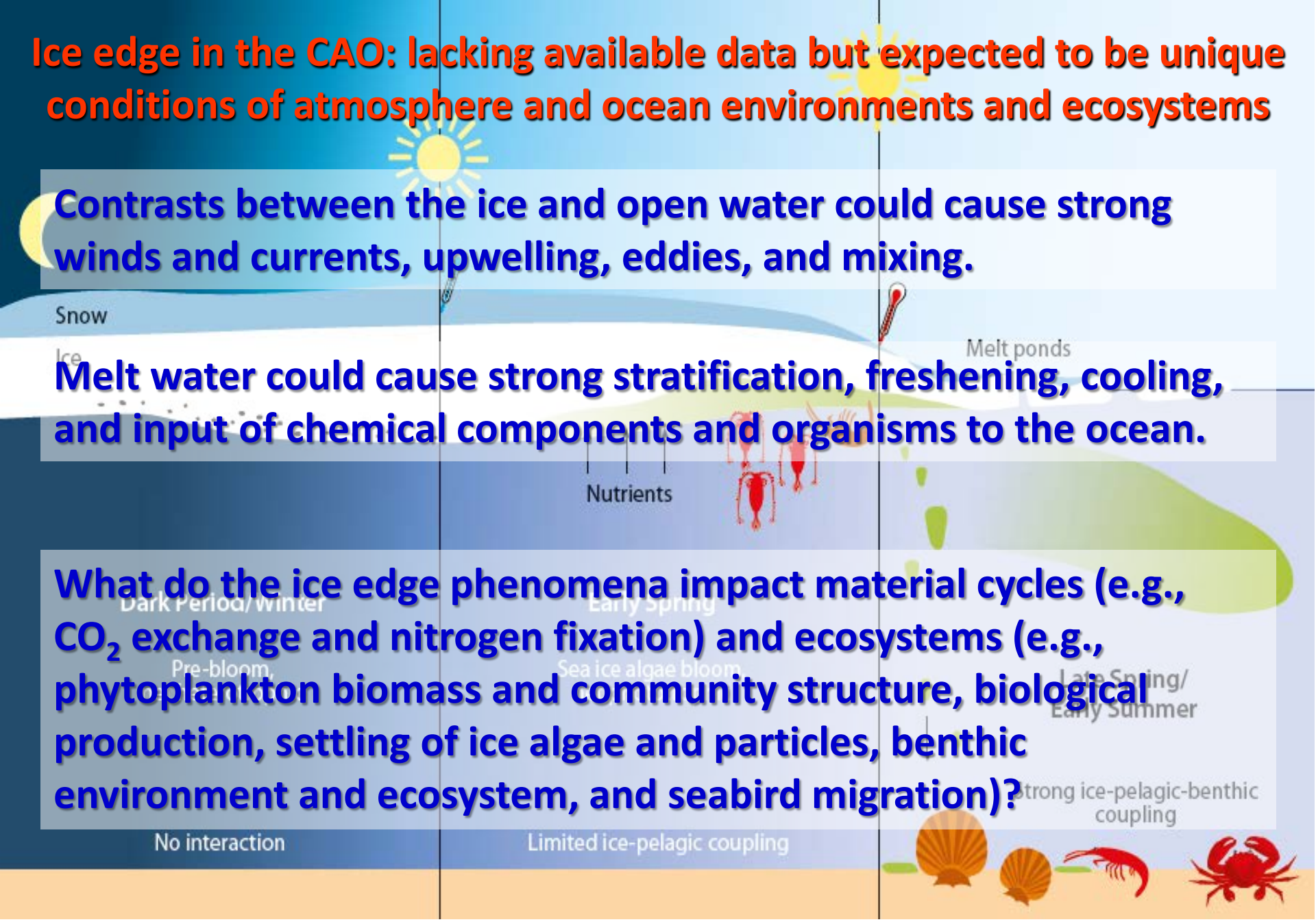




# Ice edge in the CAO: lacking available data but expected to be unique conditions of atmosphere and ocean environments and ecosystems

**Contrasts between the ice and open water could cause strong winds and currents, upwelling, eddies, and mixing.**

**Melt water could cause strong stratification, freshening, cooling, and input of chemical components and organisms to the ocean.**

**What do the ice edge phenomena impact material cycles (e.g., $CO_2$ exchange and nitrogen fixation) and ecosystems (e.g., phytoplankton biomass and community structure, biological production, settling of ice algae and particles, benthic environment and ecosystem, and seabird migration)?**

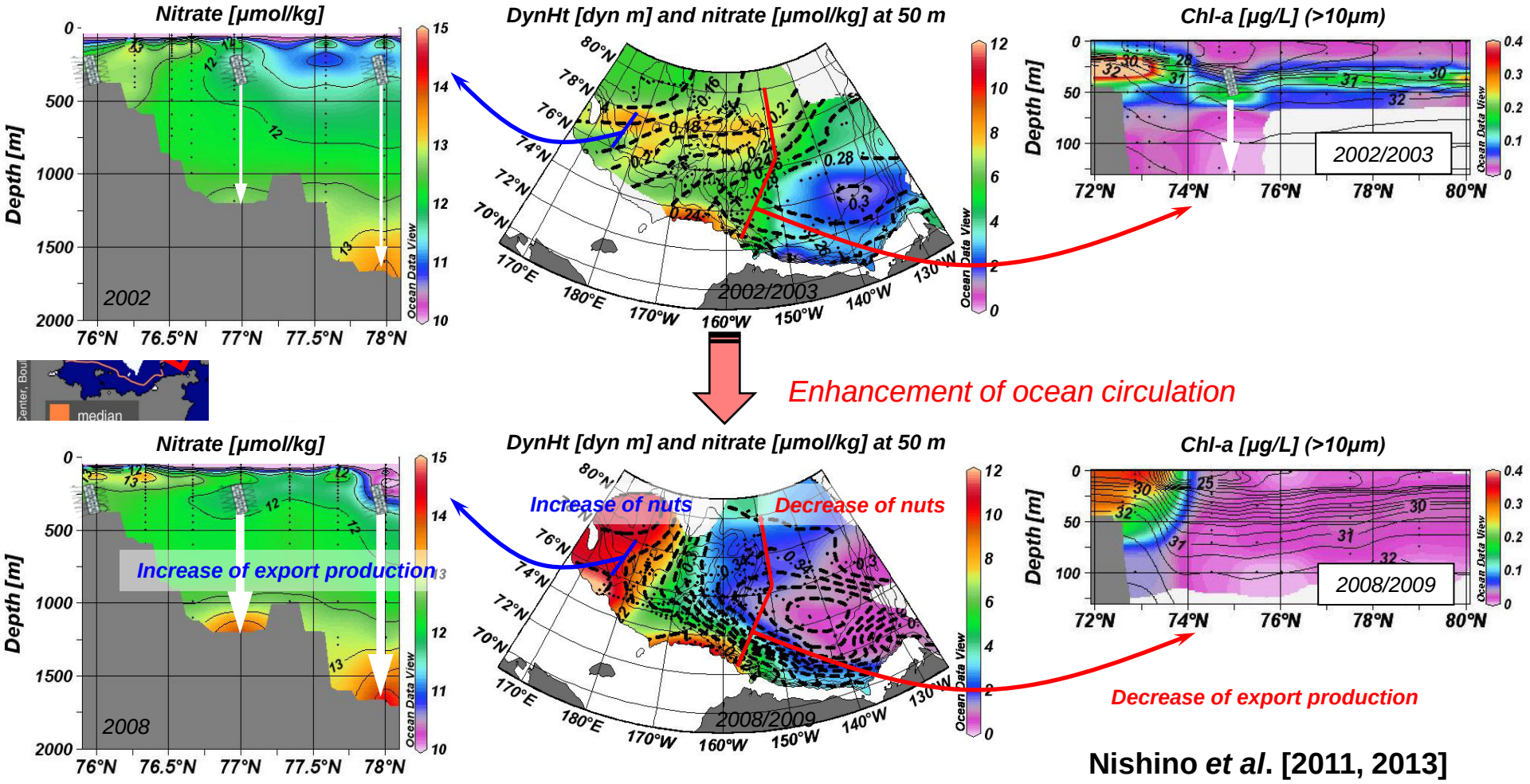



[SWIPA, 2017]


Snow
Ice
Nutrients
Dark
Pre-bloom,
net heterotrophic
No interaction
Limited ice
Late Spring/
Early Summer
Strong ice-pelagic-benthic
coupling

[SWIPA, 2017]

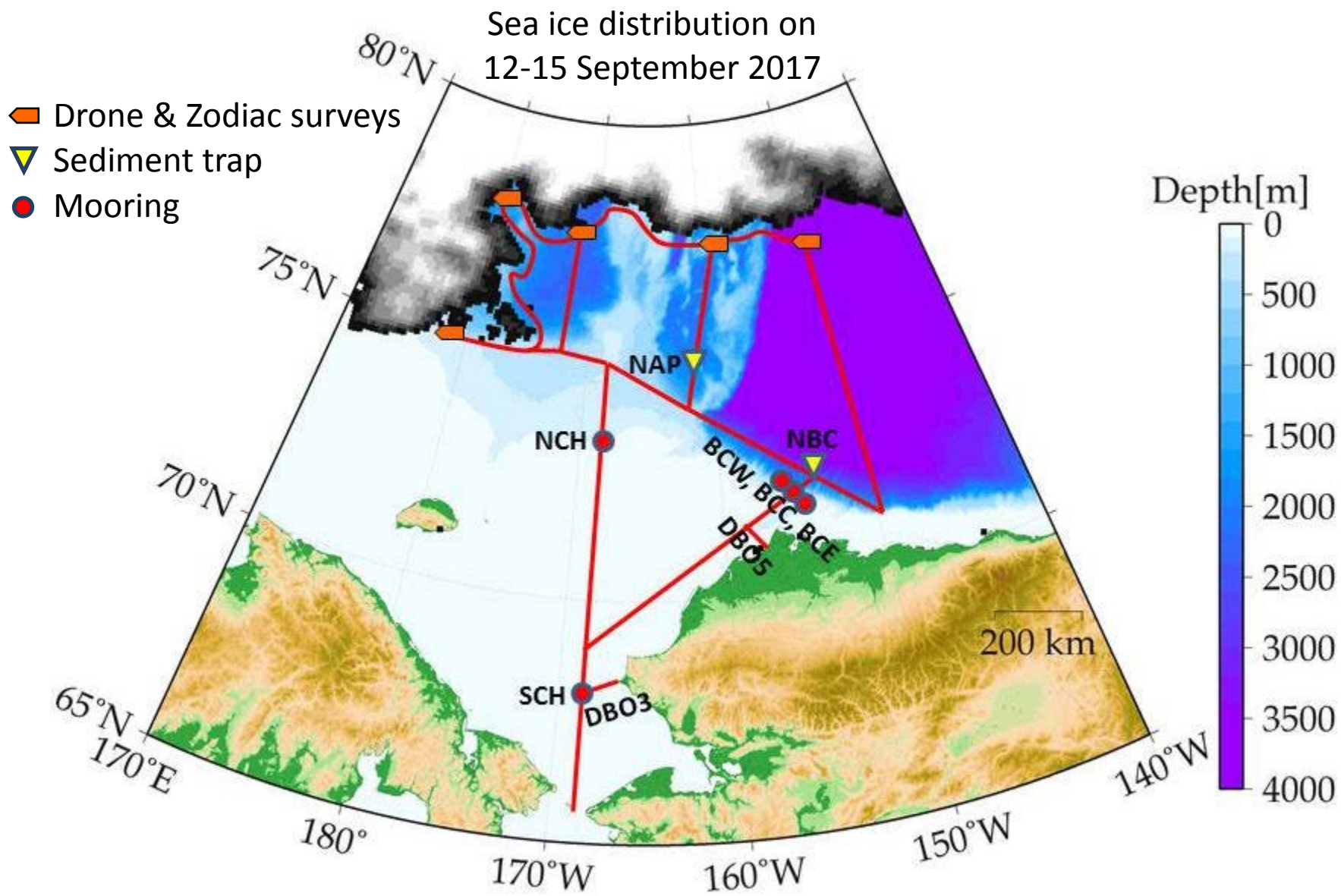
# Changes in biological production caused by the enhancement of ocean circulation




Nishino *et al*. [2011, 2013]

- In the Canada Basin (within the Beaufort Gyre), deepening of nutricline may result in the decrease of export production.
- In the Makarov Basin (outside of the Beaufort Gyre), shoaling of nutricline may result in the increase of export production.

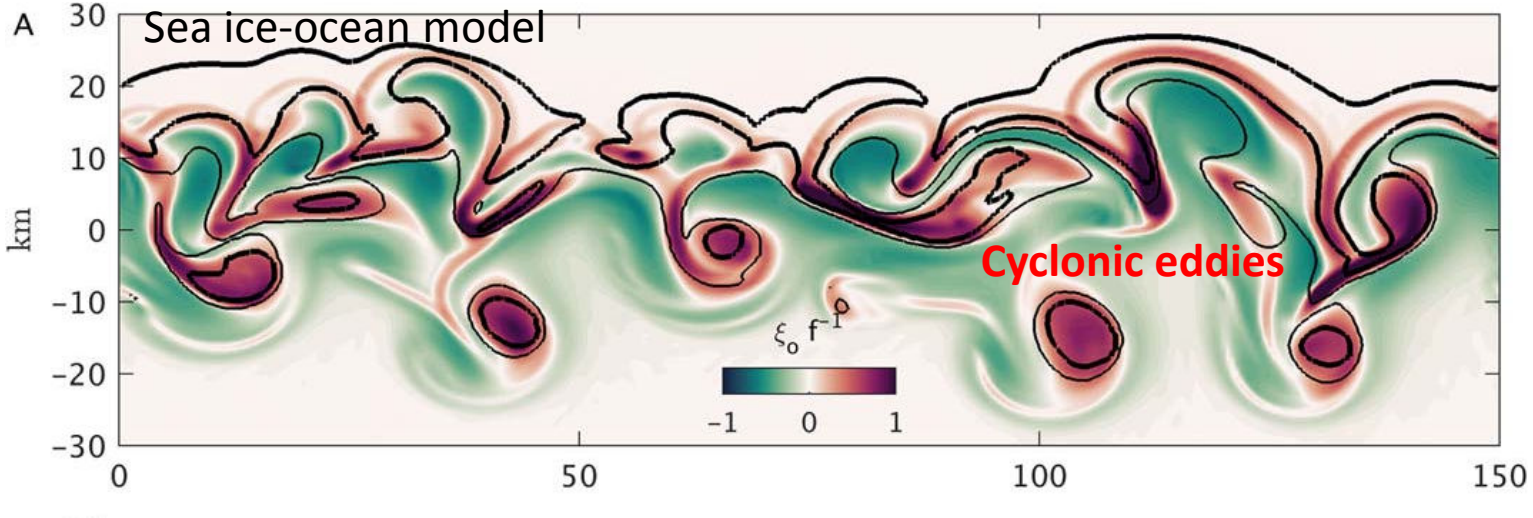
# R/V Mirai Arctic Ocean cruise in 2021



# Examples of research topics in marginal ice zones

# Submesoscale sea ice-ocean interactions in marginal ice zones

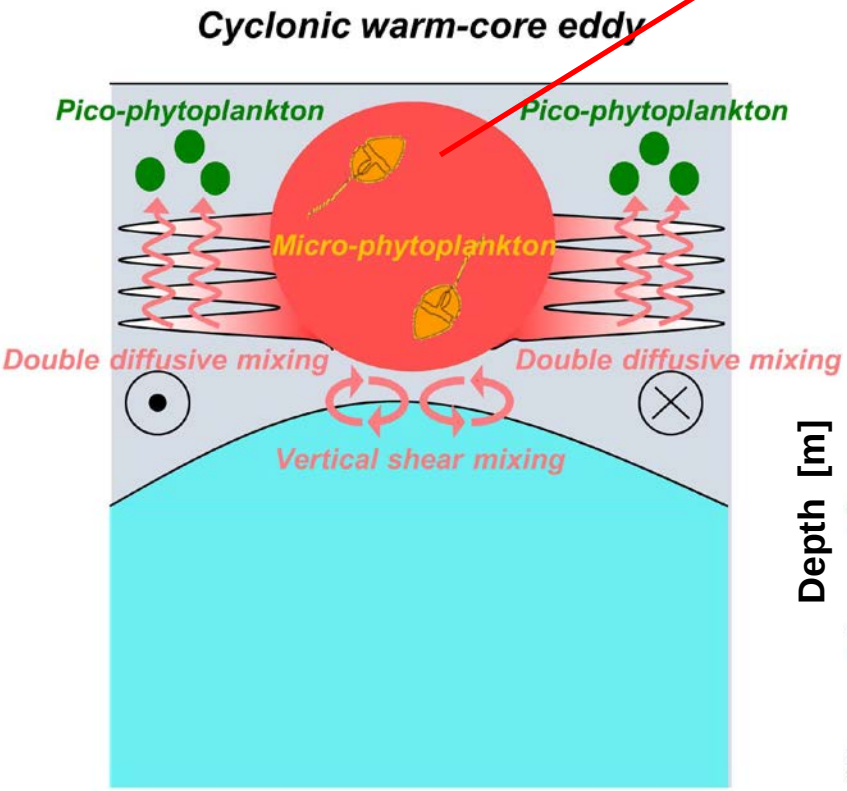
Signatures of ocean eddies, fronts, and filaments are commonly observed within marginal ice zones.

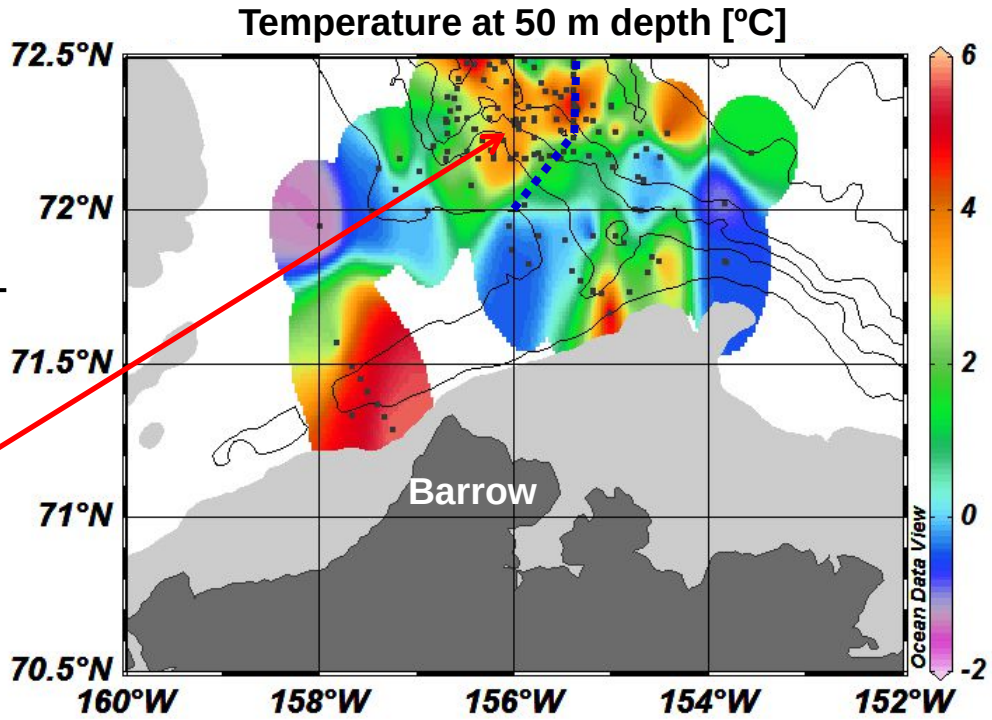



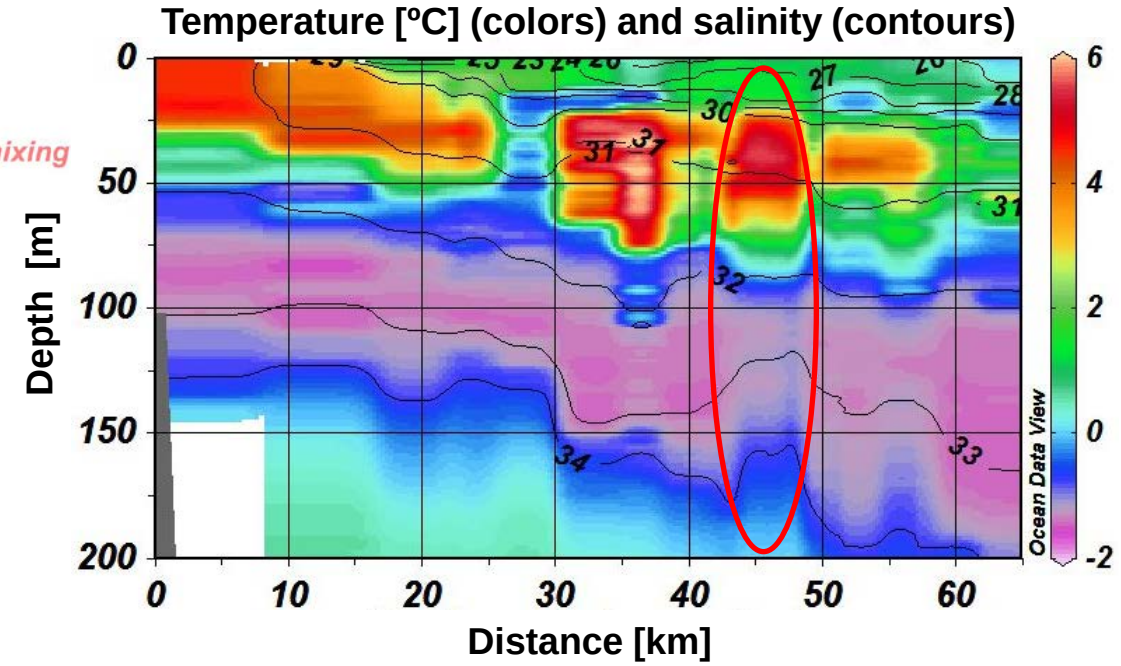

Manucharyan and Thompson [2017; JGR-Oceans]

# Cyclonic warm-core eddy and its impact on the Arctic marine ecosystem

Nishino *et al*. [2018; GRL]



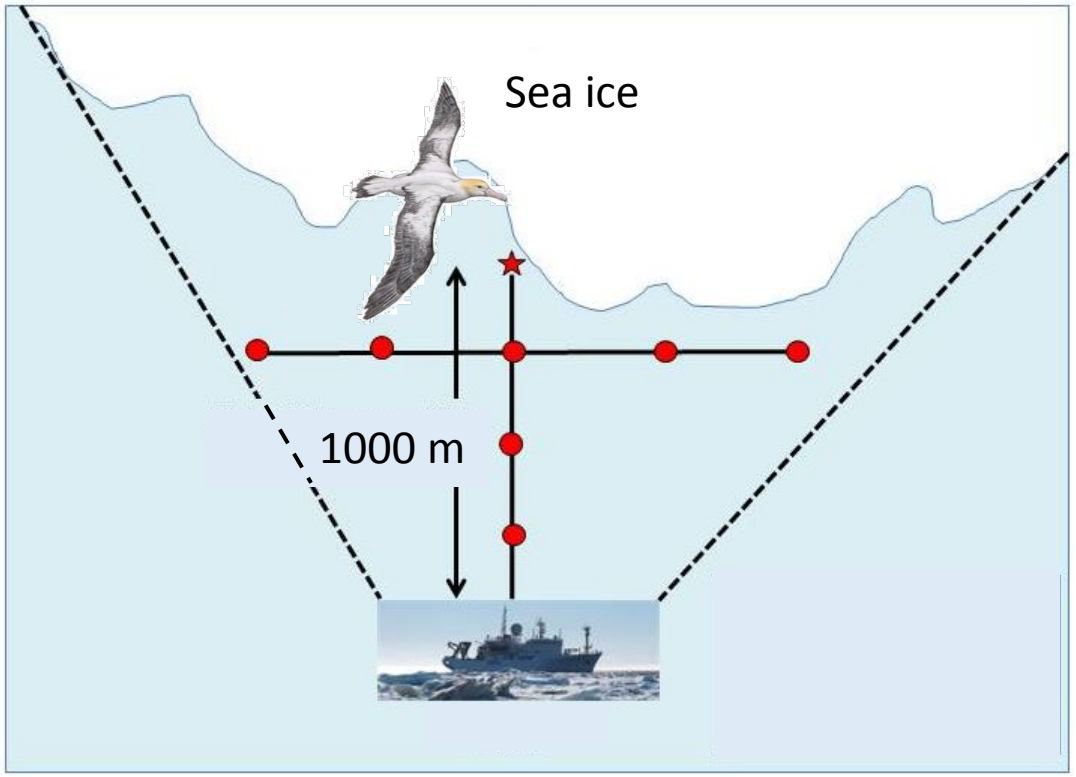



# Alignment of seabirds with sea ice floes in an ice-edge area

In the 2016 R/V *Mirai* cruise, Dr. Nishizawa found that seabirds aligned with floating sea ice floes. Why? Something like a rip current? Foods from sea ice floes? To answer the questions we will carry out small scale surveys using a Zodiac boat.

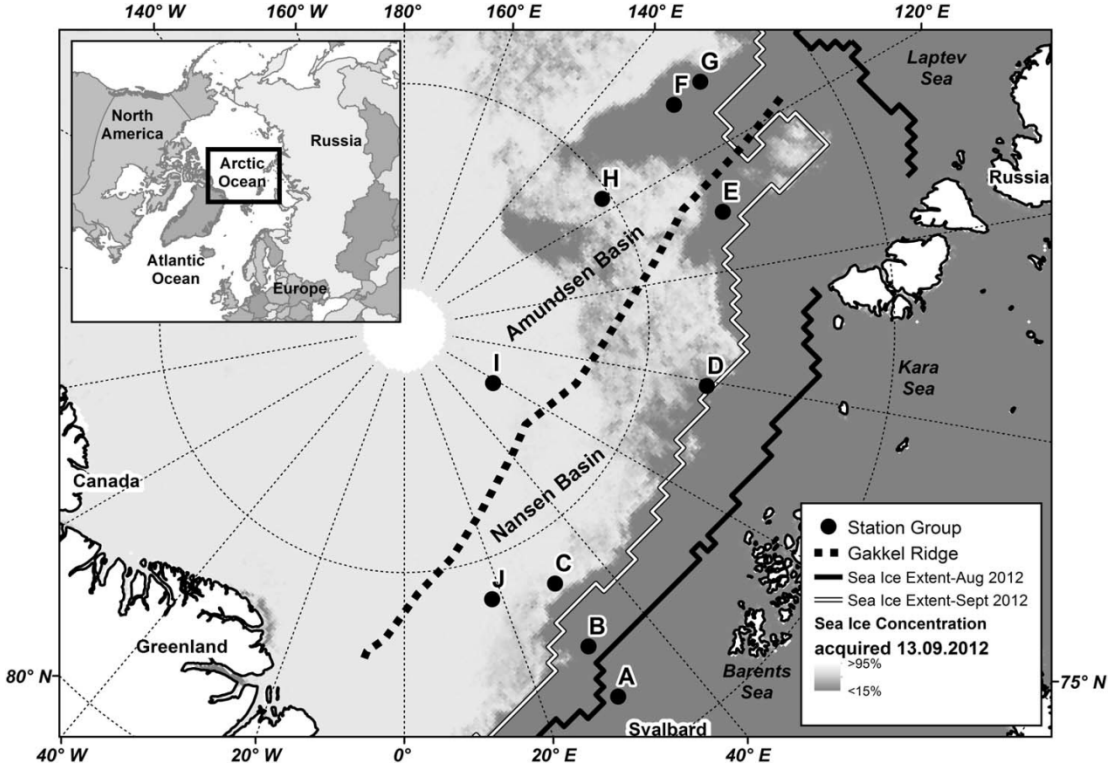
Zodiac boat

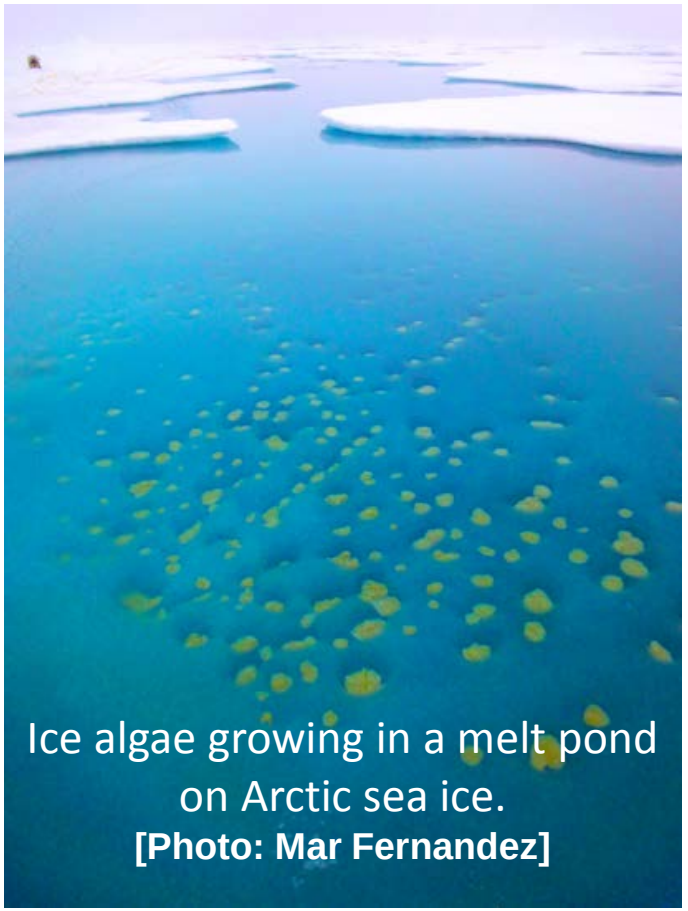

Observation plan using a Zodiac boat



# Ice algae: The engine of life in the central Arctic Ocean

Ice algae play a much more important role for the pelagic food web than previously assumed (Dr. Doreen Kohlbach @ AWI).



Ice algae growing in a melt pond on Arctic sea ice.
**[Photo: Mar Fernandez]**

Estimated carbon from the ice algae:

Ice-associated animals: 60 – 90 %

Animals living at greater depths: 20 – 50 %

**Kohlbach *et al*. [2016; Limnology & Oceanography]**

# Ice algae sink onto seafloor as the Arctic warms

Melting ice on the surface was affecting conditions down to a depth of 4,000 meters (Prof. Antje Boetius @ AWI).

Green carpet on the ocean floor


Found on the sea floor, the sea cucumber is one species that feeds on the algae.

The Synoptic Arctic Survey (SAS)
International Planning and Coordination Workshop
15–16 May 2019
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts, USA

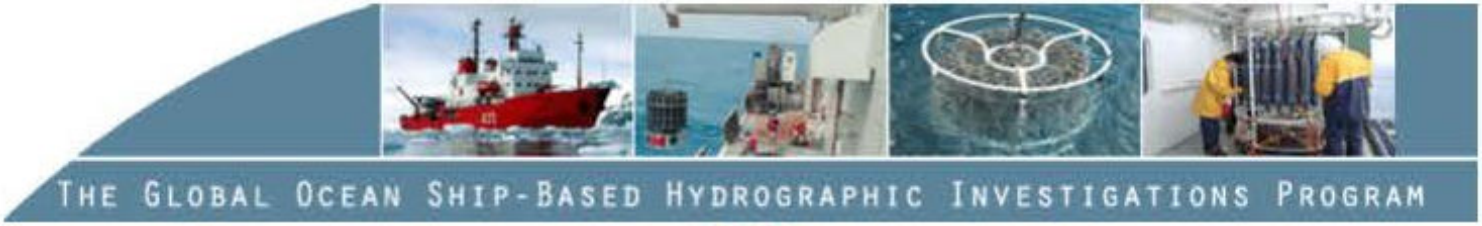
# Thank you!

T. Kikuchi[1], S. Nishino[1], M. Yamamoto-Kawai[2]
A. Murata[1], K. Matsuno[3], E. Watanabe[1]
(SAS Japan's national team)

[1] JAMSTEC
[2] Tokyo University of Marine Science and Technology
[3] Hokkaido University

# GO-SHIP Hydro Manual for Sal, Nuts, DO, CO2, etc.

WWW.GO-SHIP.ORG

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The Global Ocean Ship-based Hydrographic Investigations Program

www.go-ship.org

**GO-SHIP Repeat Hydrography Manual: A Collection of Expert Reports and Guidelines.**

IOCCP Report No. 14
ICPO Publication Series No. 134

*Version 1, 2010*

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

International Council for Science SCOR Scientific Committee on Oceanic Research

Climate Variability & Predictability CLIVAR World Climate Research Programme

# Standards for Sal, Nuts, $CO_2$


IAPSO Standard Seawater

SCOR-JAMSTEC CRM

Certified reference materials provided by Dr. Dickson of the Scripps Institute of Oceanography

# Data Policy

## Things everyone must know

### 5. Data

Please submit the Data obtained by JAMSTEC cruises to IMD according to the instructions below.

| | From the end of the cruise |
|---|---|
| Submit raw Data | within one month |
| Submit processed Data | within Two years |
| PMP of Data | two years* |

*Routine Observation Data have no Publication Moratorium Period except as otherwise requested by the Chief Scientist. They are opened as soon as processed.

The word "Data" includes theses kinds of data here.

Data
- i . Routine Observation Data (navigation data, shipboard ADCP, gravimeter, magnetometer etc.)
- ii . Data from instruments fixed onboard (except for Routine Observation Data)
- iii. Data, photographs and videos from Submersibles or Vehicles
- iv . Observation Data (ex. CTD data, data obtained by Mochikomi type instruments (see, p.8), etc.)

# Data Site (DARWIN)

Data and Sample Research System for Whole Cruise Information in JAMSTEC

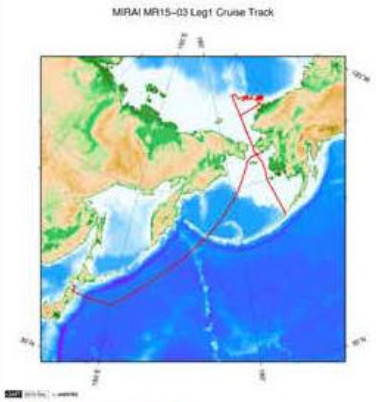
http://www.godac.jamstec.go.jp/darwin/e

## MIRAI MR15-03 Leg1 Cruise Data

### Cruise Information

| | |
|---|---|
| Ship Name | MIRAI |
| Cruise ID | MR15-03 Leg1 |
| Period | 2015-08-23 – 2015-10-06 |
| Chief Scientist | Shigeto Nishino (JAMSTEC) |
| Project Name | [Arctic Ocean Climate System Reaserch] |
| Cruise Title | Observational studies on the Arctic Ocean climate and ecosystem variability |
| Proposal Title | Observational studies on the Arctic Ocean climate and ecosystem variability |

Cruise Track




Enlarge Image

**Ports of call**

2015-08-23 22:50 Departure from Sekinehama
2015-08-24 06:20 Arrival at Hachinohe
2015-08-26 08:50 Departure from Hachinohe
2015-09-05 15:50 Arrival at Nome
2015-09-05 16:10 Departure from Nome
2015-10-06 18:50 Arrival at Dutch Harbor

**Research area**

Arctic Ocean

### Data List

| Observation Data | Quality Level |
|---|---|
| Cruise Summary | |
| Cruise Report | |
| Navigation | Processed (DMO)-QCed |
| Bathymetry (MBES) | - |
| Gravity | Processed (DMO)-Corrected |
| Shipboard Three Component Magnetometer (STCM) | Processed (DMO)-Corrected |
| Marine Meteorology | Processed (DMO)-Corrected |
| Sea-surface Photosynthetically Active Radiation (PAR) | Raw |
| Cloud Ceiling | Raw |
| Radiosonde | Processed (DMO)-Corrected |
| Doppler Radar | Raw |
| Shipboard Acoustic Doppler Current Profiler (ADCP) | Processed (DMO)-Corrected |
| Conductivity-Temperature-Depth Profiler (CTD) | Processed (PI) |
| Expendable Conductivity-Temperature-Depth Profiler (XCTD) | Processed (DMO)-QCed |
| Underway Thermosalinograph | Processed (DMO)-QCed |
| Bottle Sampling Water Chemical Analysis | Processed (PI) |
| Primary Production | Processed (DMO)-QCed |