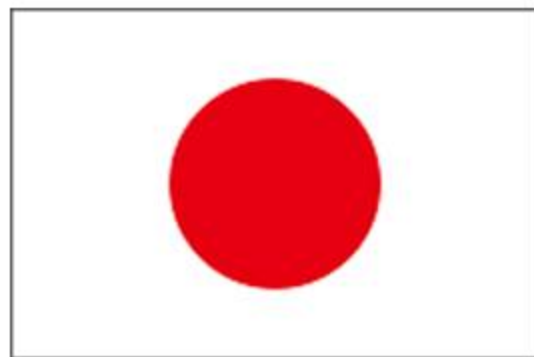


Updates on the recent Synoptic Arctic Survey activities and results

JAPAN



Shigeto Nishino

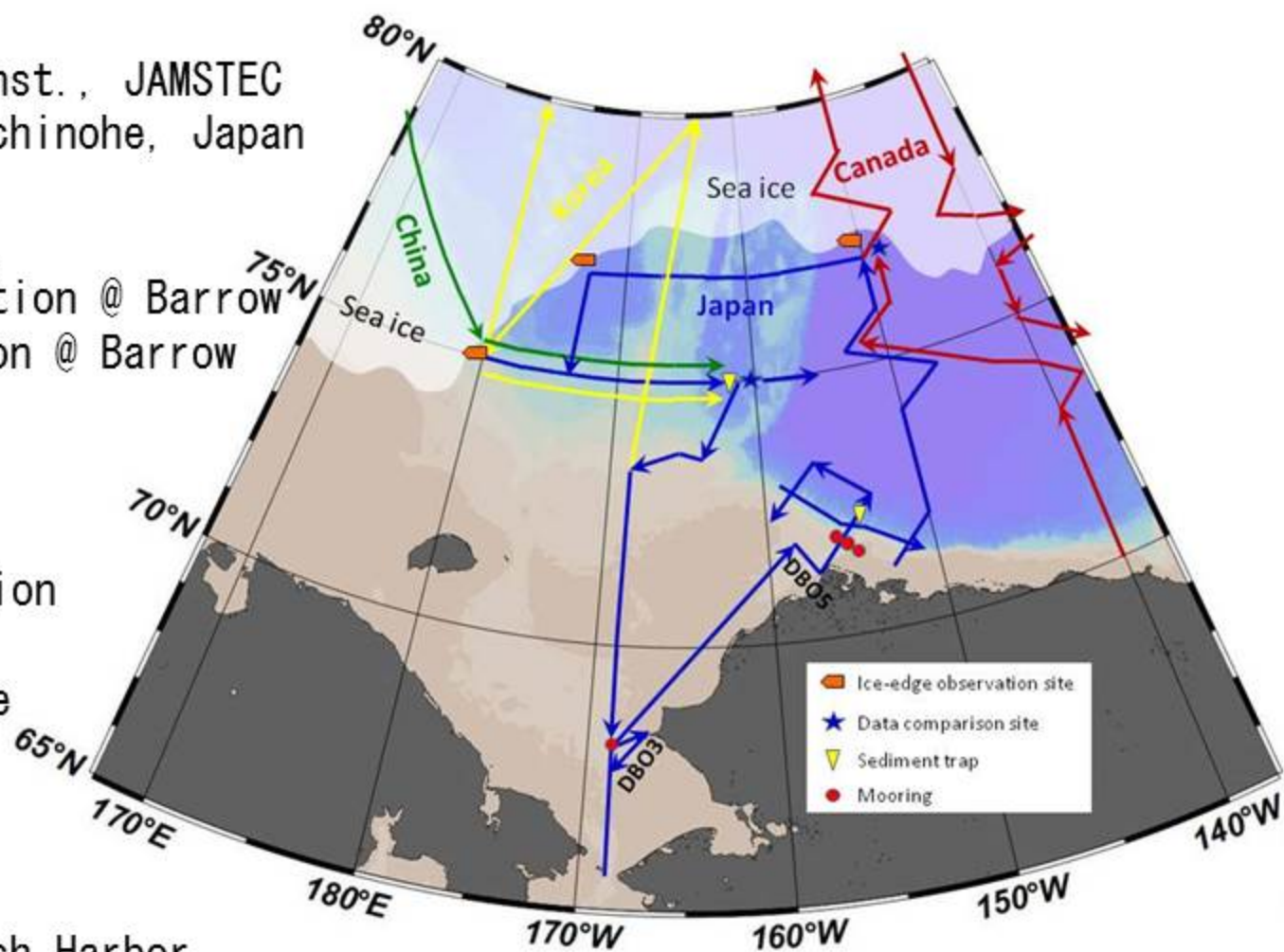
Cruise Plan: R/V Mirai Arctic cruise in 2020

Schedule (Tentative)

- 28 Aug: Leave Mutsu Inst., JAMSTEC
- 29 Aug: In and out Hachinohe, Japan
- 7 Sep: Off Nome
- 8 Sep: via Bering St.
- 11 Sep: Start observation @ Barrow
- 15 Sep: End observation @ Barrow

- Canada Basin
 - 150W Line
 - Joint with LSSL
 - Ice edge observation
- Chukchi Borderland
 - Ice edge, 75N Line
- Makarov Basin?
- Chukchi Sea
 - 168W Line, DB03

- 12 Oct: Arrive in Dutch Harbor
- 14 Oct: Leave Dutch Harbor
- 27 Oct: In and out Hachinohe, Japan
- 28 Oct: Arrive in Mutsu Inst., JAMSTEC



R/V Mirai cruise plan in 2020

Research themes of the *SAS-Mirai* Arctic cruise in 2020

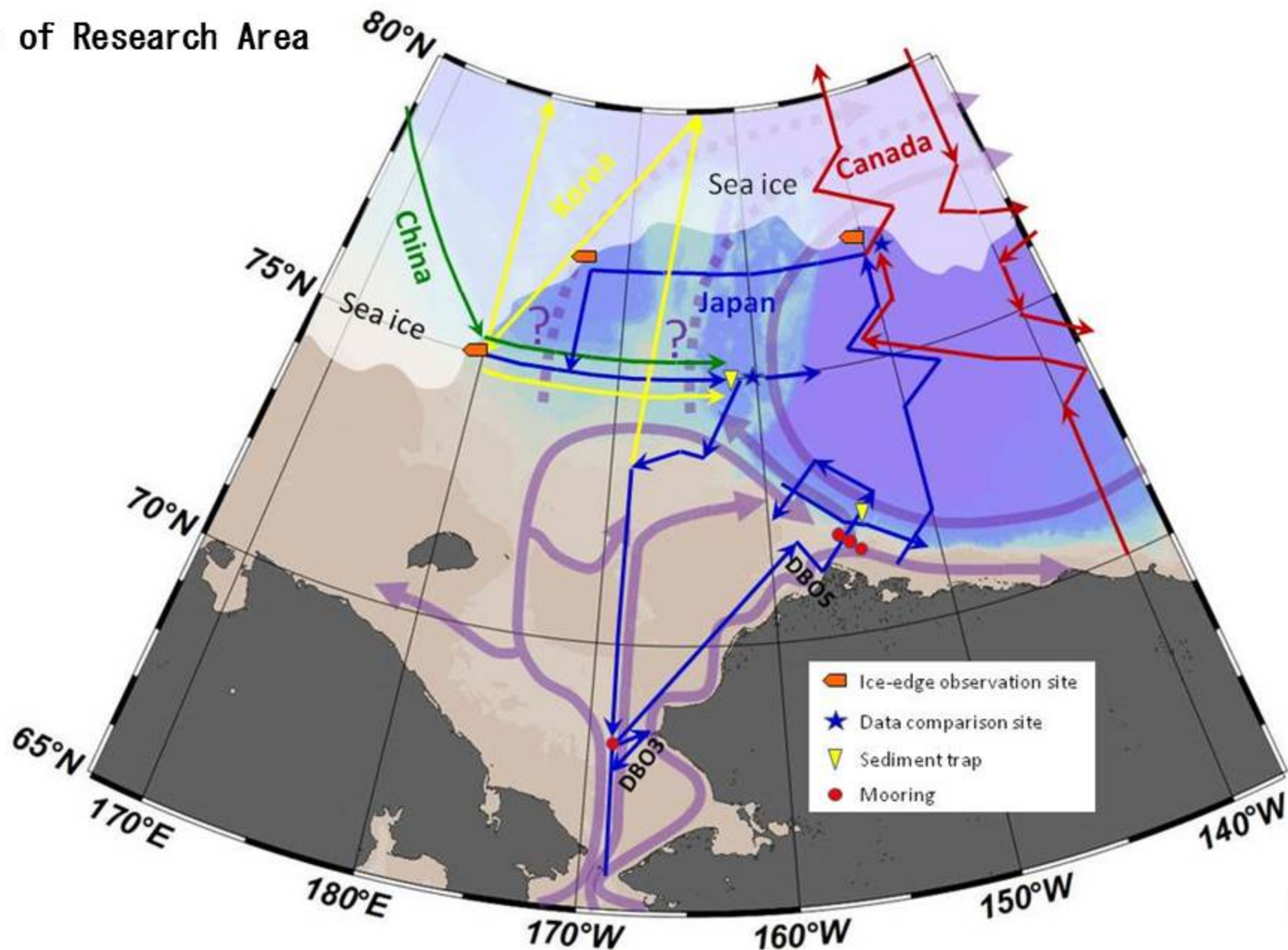
- 1) Synoptic Arctic Survey (SAS): A coordinated multi-ship, multi-nation pan-Arctic ship-based sampling campaign
(PI: Dr. Shigeto Nishino, JAMSTEC)
- 2) Sea trials in the Arctic Ocean for an Underwater Smart Drone (USDA)
(PI: Dr. Shojiro Ishibashi, JAMSTEC)
- 3) Observation of air-sea-wave-ice interaction in the Marginal Ice Zone
(PI: Dr. Takuji Waseda, The Univ. of Tokyo)
- 4) Ocean and sea ice dynamics along the Alaska coast
(PI: Dr. Daisuke Hirano, Hokkaido Univ.)
- 5) Researches of physical oceanographic changes in the Arctic Ocean
(PI: Dr. Yusuke Kawaguchi, AORI)
- 6) Horizontal distribution of plankton community associated with sea-ice reduction in the Pacific sector of the Arctic Ocean
(PI: Dr. Kohei Matsuno, Hokkaido Univ.)

Research themes of the *SAS-Mirai* Arctic cruise in 2020

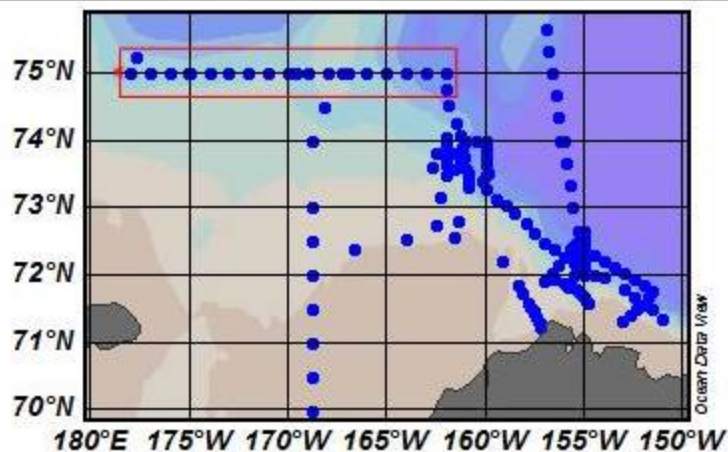
- 7) Ship-borne observations of trace gases/aerosols over the Arctic
(PI: Dr. Fumikazu Taketani, JAMSTEC)
- 8) Ship-board observations of atmospheric greenhouse gases and related species in the Arctic ocean and the western North Pacific
(PI: Dr. Yasunori Tohjima, NIES)
- 9) Observation of isotope ratio in atmospheric water vapor
(PI: Dr. Hotaek Park, JAMSTEC)

Cruise Plan: R/V Mirai Arctic cruise in 2020

Map of Research Area

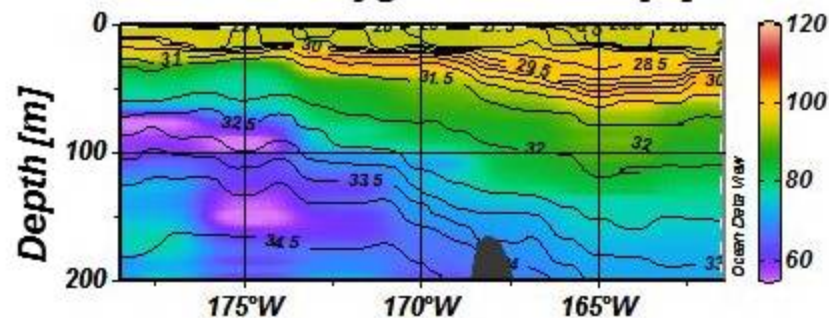


Results from the R/V Mirai Arctic Ocean cruise in 2017

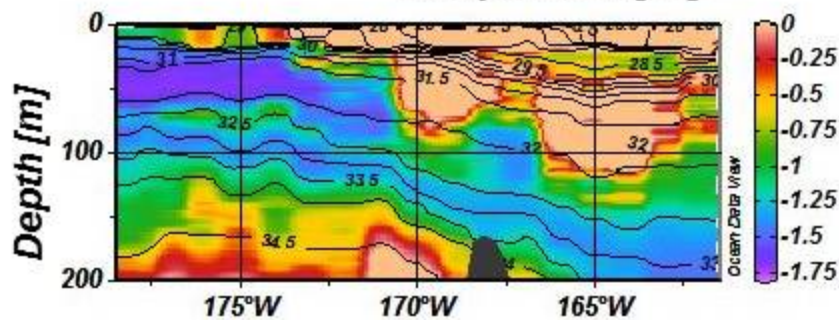


Along 75°N line

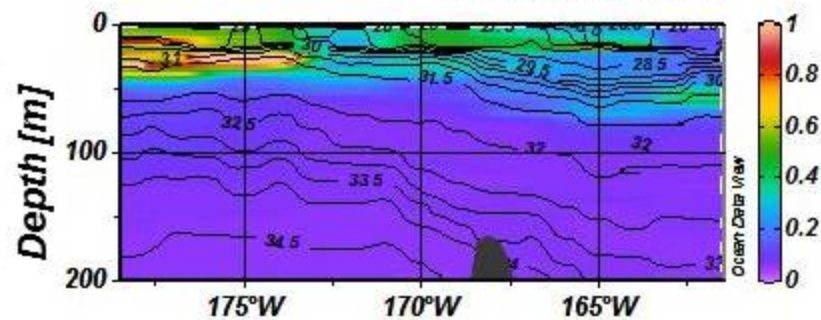
Oxygen saturation [%]



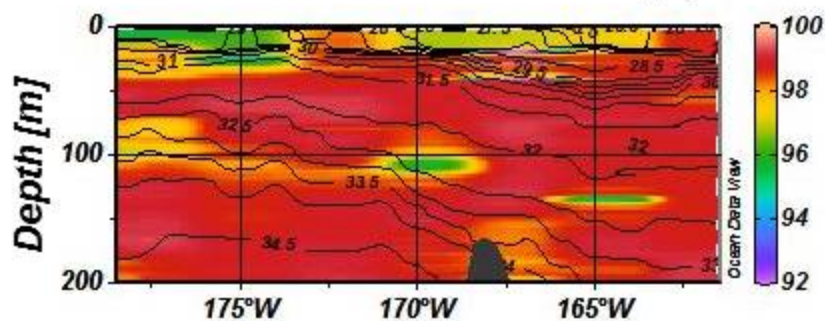
Temperature [°C]



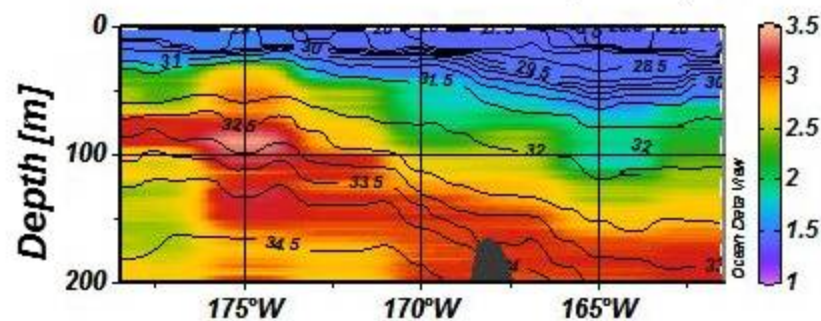
Fluorescence



Beam Transmission [%]

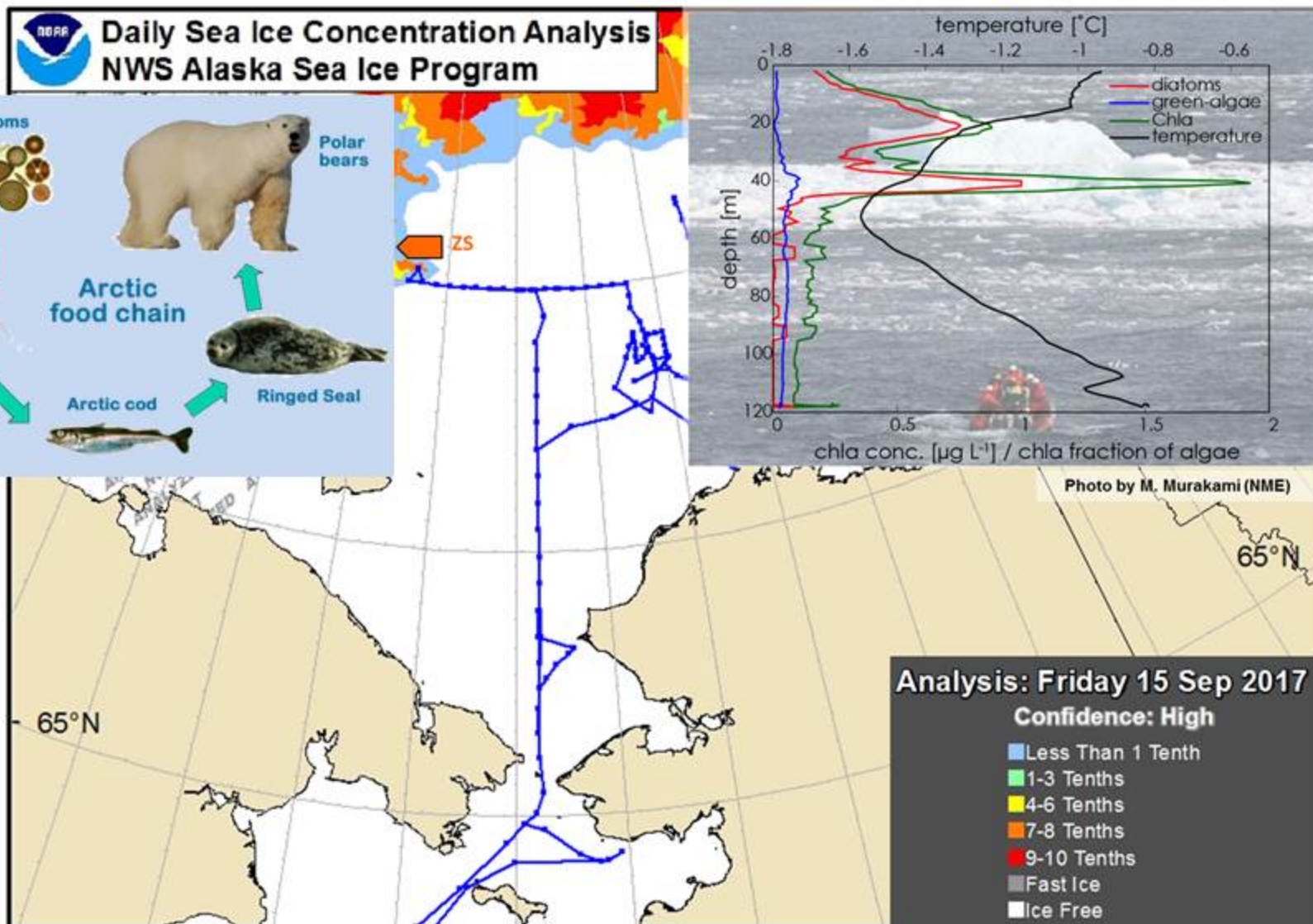


Nitrate (SUNA)

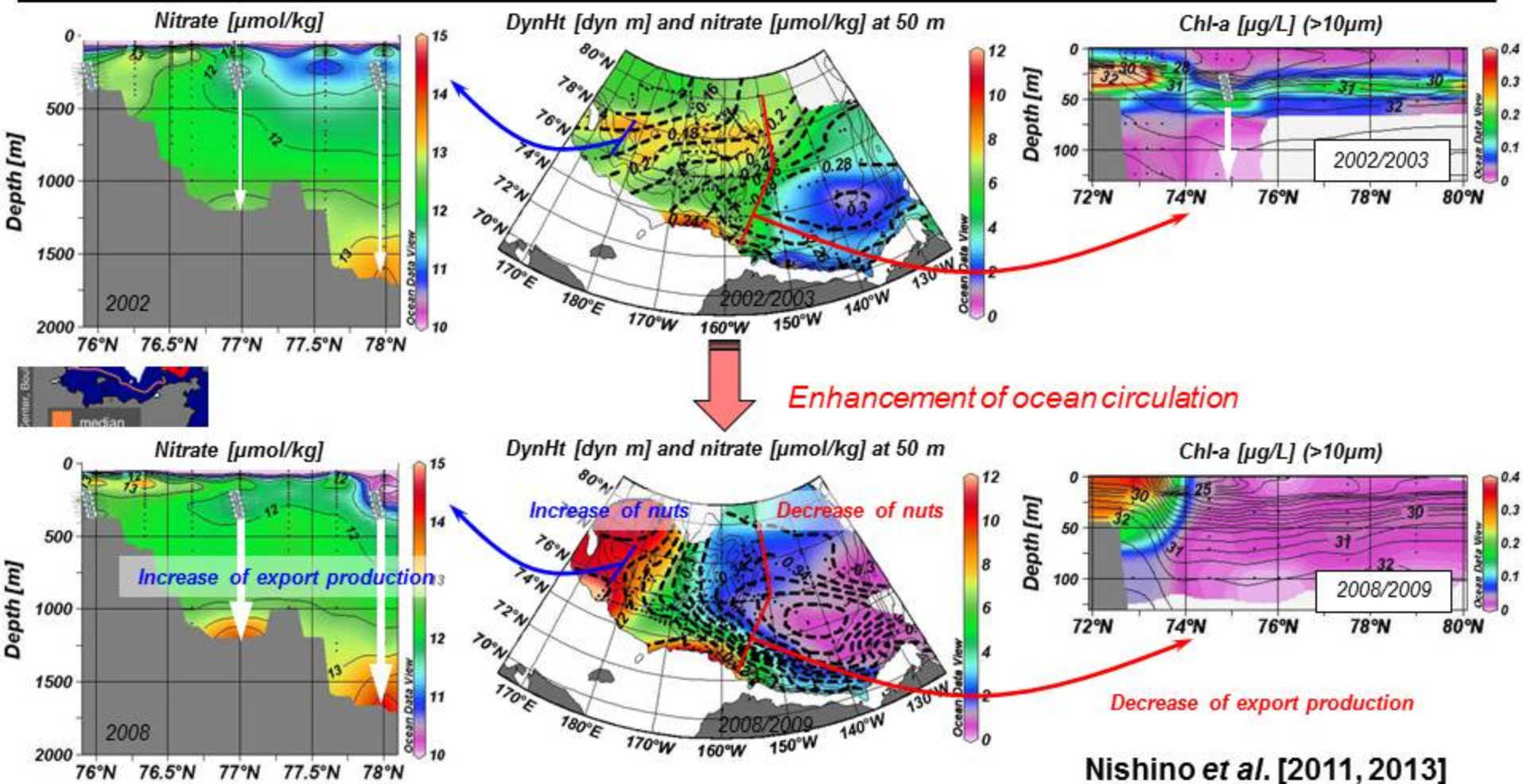


Results from the R/V Mirai Arctic Ocean cruise in 2017

Zodiac boat survey in an ice-edge area



Changes in biological production caused by the enhancement of ocean circulation

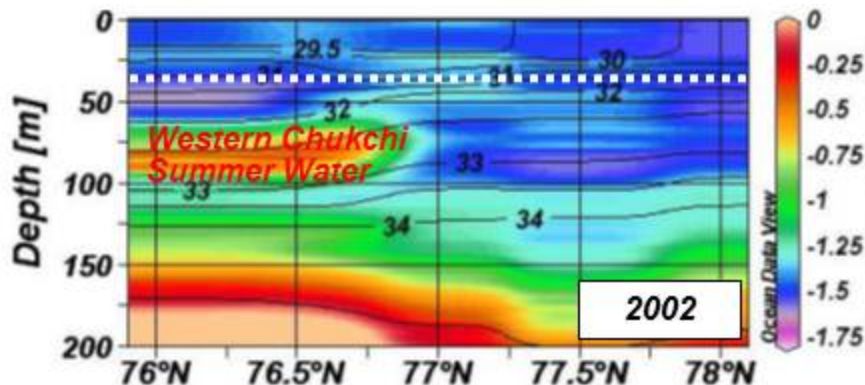


- In the Canada Basin (within the Beaufort Gyre), deepening of nutricline may result in the decrease of export production.
- In the Makarov Basin (outside of the Beaufort Gyre), shoaling of nutricline may result in the increase of export production.

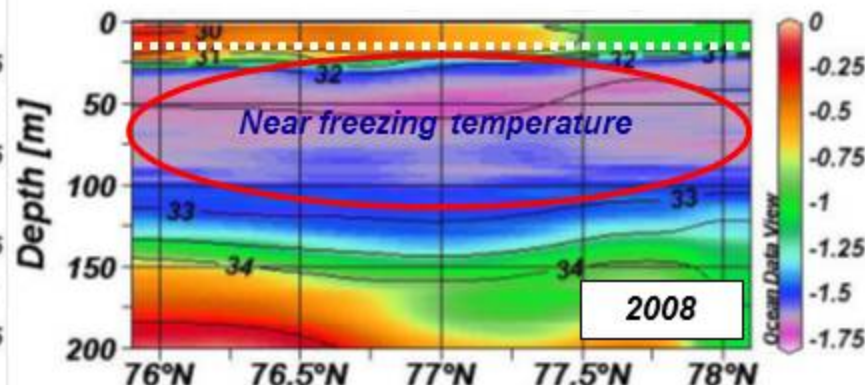
Changes in water masses due to the sea ice reduction

Arctic Ocean warming (Alaskan side) vs. cooling (Siberian side)
Nutricline deepening (Alaskan side) vs. shoaling (Siberian side)

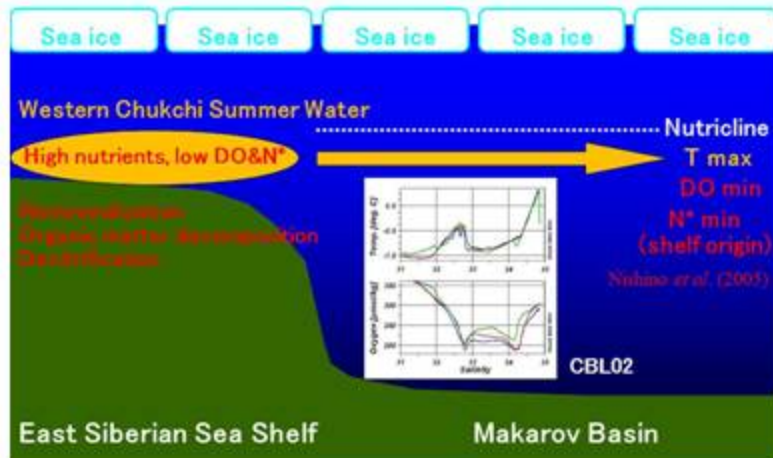
Temperature [°C] and salinity in 2002



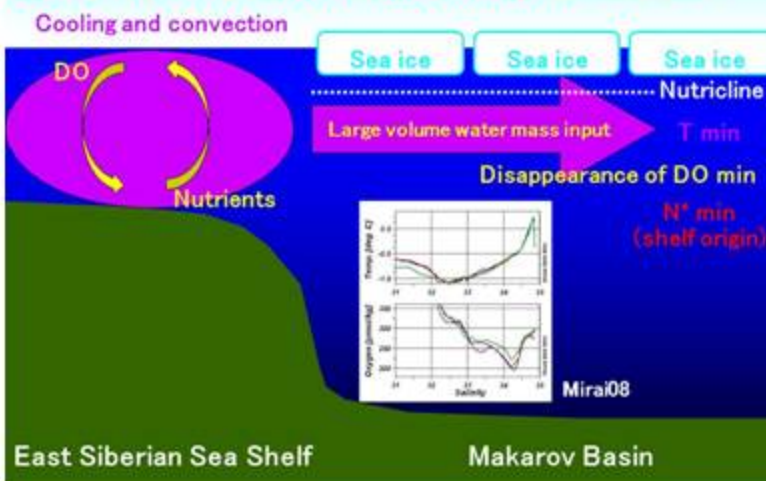
Temperature [°C] and salinity in 2008



Spreading of warm water from the East Siberian Sea into the Makarov Basins



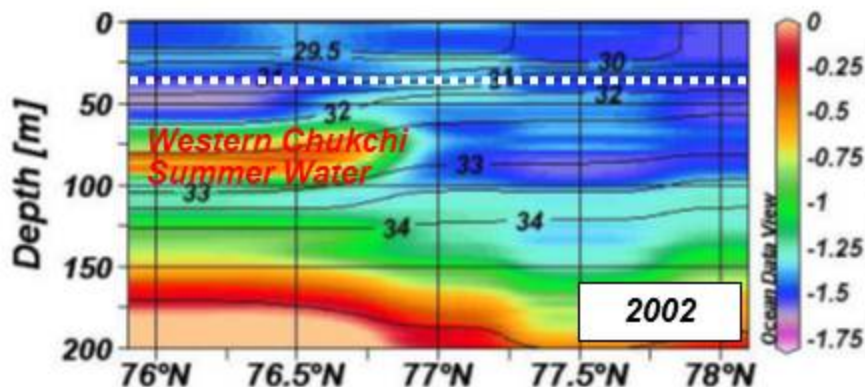
Formation of large volume water mass due to the delay in autumn freeze-up



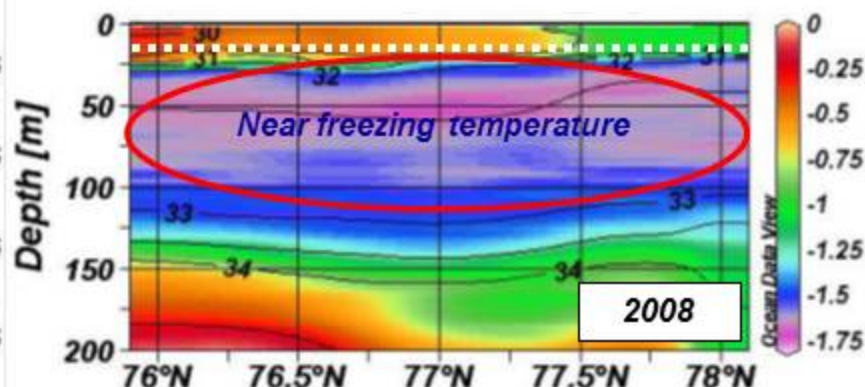
Recent changes in the Makarov Basin

Arctic Ocean warming (Alaskan side) vs. cooling (Siberian side)
Nutricline deepening (Alaskan side) vs. shoaling (Siberian side)

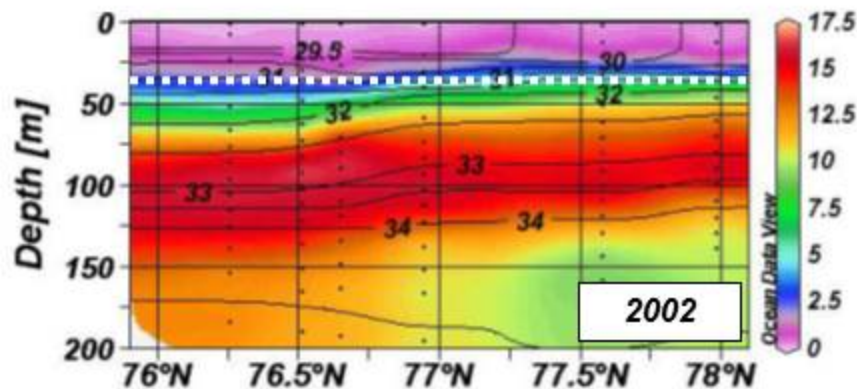
Temperature [$^{\circ}\text{C}$] and salinity in 2002



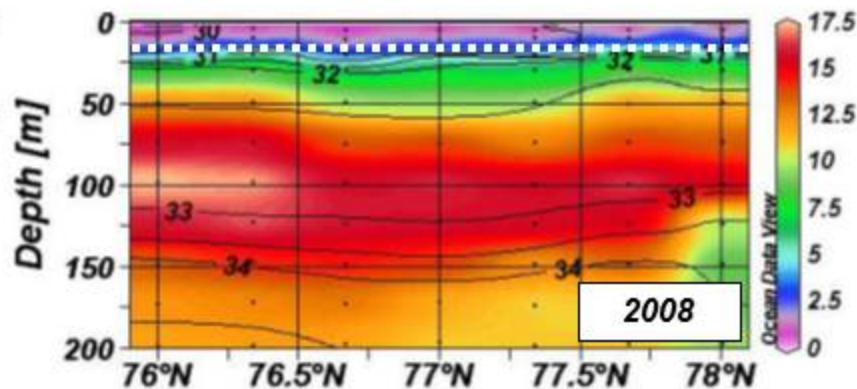
Temperature [$^{\circ}\text{C}$] and salinity in 2008



Nitrate [$\mu\text{mol/kg}$] and salinity in 2002



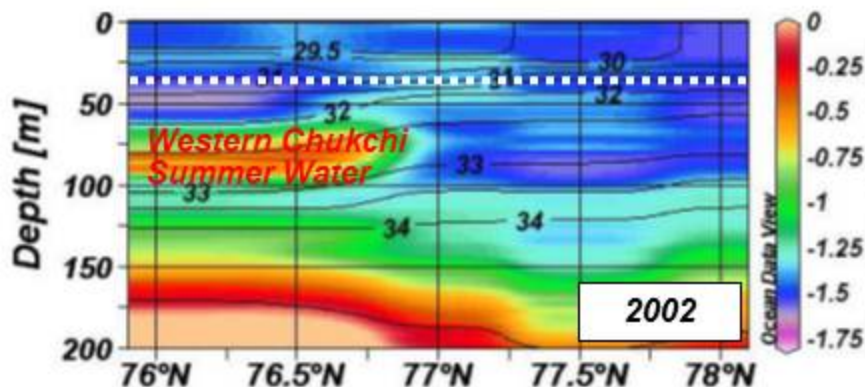
Nitrate [$\mu\text{mol/kg}$] and salinity in 2008



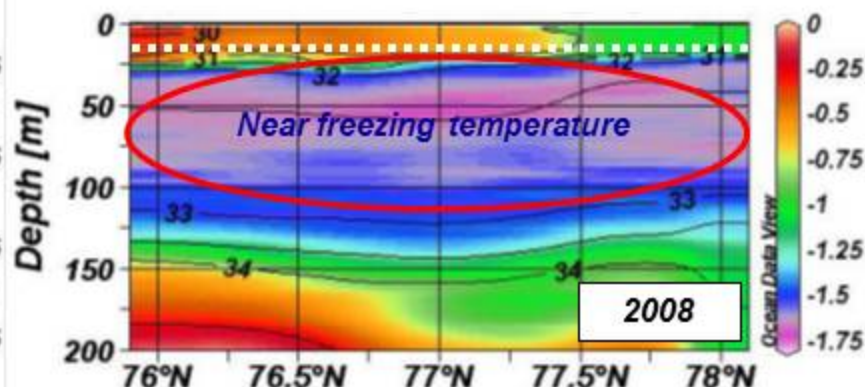
Recent changes in the Makarov Basin

Arctic Ocean warming (Alaskan side) vs. cooling (Siberian side)
Nutricline deepening (Alaskan side) vs. shoaling (Siberian side)

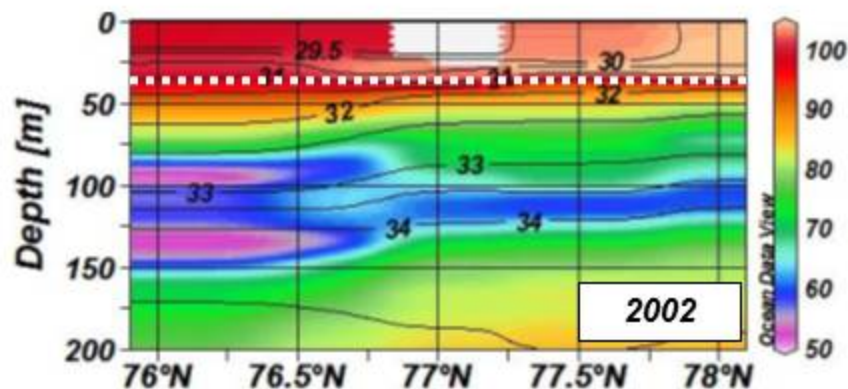
Temperature [$^{\circ}\text{C}$] and salinity in 2002



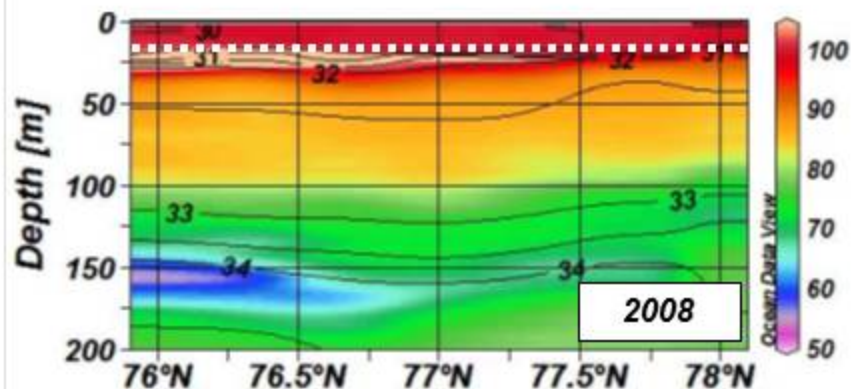
Temperature [$^{\circ}\text{C}$] and salinity in 2008



Oxygen saturation [%] and salinity in 2002



Oxygen saturation [%] and salinity in 2008



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., CO₂ 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)?

No interaction

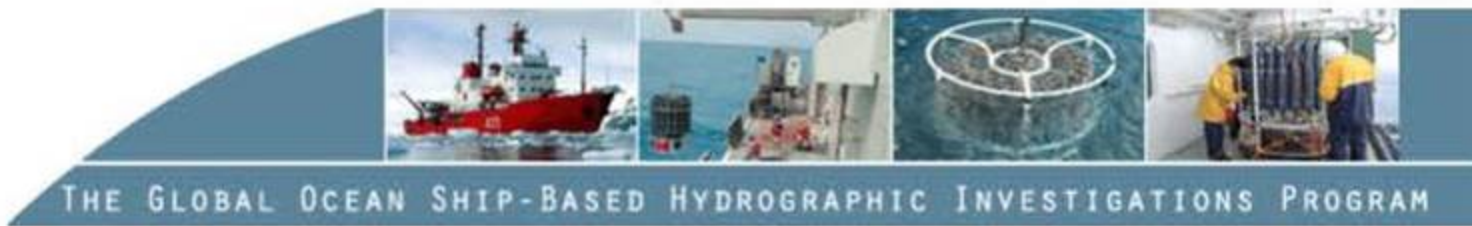
Limited ice-pelagic coupling

Strong ice-pelagic-benthic coupling



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

WWW.GO-SHIP.ORG



THE GLOBAL OCEAN SHIP-BASED HYDROGRAPHIC INVESTIGATIONS PROGRAM



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

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CRUISE PLANS

DATA DIRECTORY

HYDRO MANUAL

DOCUMENTS

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United Nations Educational,
Scientific and Cultural Organization



Intergovernmental
Oceanographic
Commission



Standards for Sal, Nuts, CO₂



IAPSO Standard Seawater



SCOR-JAMSTEC CRM

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

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 these 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.)

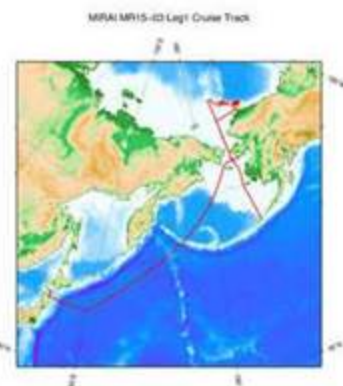
<http://www.godac.jamstec.go.jp/darwin/e>

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 Research]
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



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

[Enlarge Image](#)

Data List

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

Cruise Plan: R/V Mirai Arctic cruise in 2020

Map of Research Area

