Highlight of 2014 field results & preliminary plan for 2015

Japan

Takashi Kikuchi (JAMSTEC)
with inputs from other Japanese scientists

Japanese Arctic Ocean observation in 2014

1) Japanese research vessel cruise

- **R/V Mirai Arctic cruise in September-October 2014**
- **R/V Hakuho-maru cruise in July-August 2014**

2) Participations in ice-breaker cruises

- CCGS S. W. Laurier July cruse; *Mooring recoveries and deployments*
- CCGS Louis S. St.- Laurant cruises;

  Sea ice observation, hydrography & water sampling, and mooring recoveries & deployments
- IBRV Araon Arctic cruise;

  Hydrography and mooring recoveries & deployments
- CCGS Amundsen cruise;

  Sea ice observation, hydrography & water sampling, mooring recoveries & deployments, and buoy deployments

3) Others

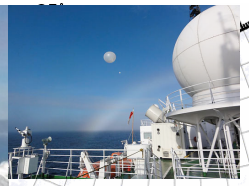
- Ice thickness monitoring off Barrow, Alaska
- XCTD observation in the Arctic Ocean and so on. . .

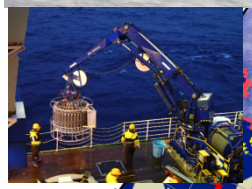
Japanese research vessel cruise in 2014

R/V Mirai Arctic cruise in September-October 2014

Leading to a better understanding of the uncertainty of the Arctic atmospheric circulation

→ **Fixed point observation (FPO) for ~ 3 weeks**





August 31: Dutch Harbor

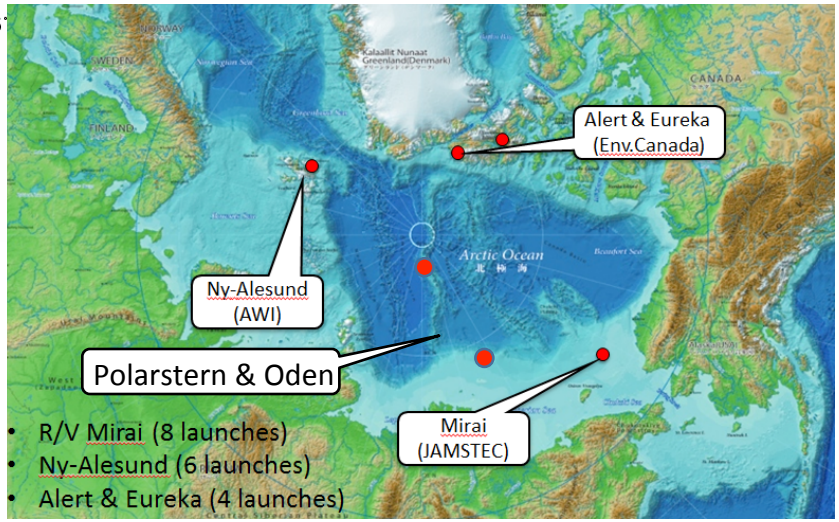
↓ * September 6 ~ 25

Fixed point observation@ 74 45N, 162 00W

October 10: Yokohama

(P.I. Dr. J. Inoue (NIPR/JAMSTEC))

Arctic **R**esearch **C**ollaboration for **R**adiosonde **O**bserving **S**ystem **E**xperiment (ARCROSE)



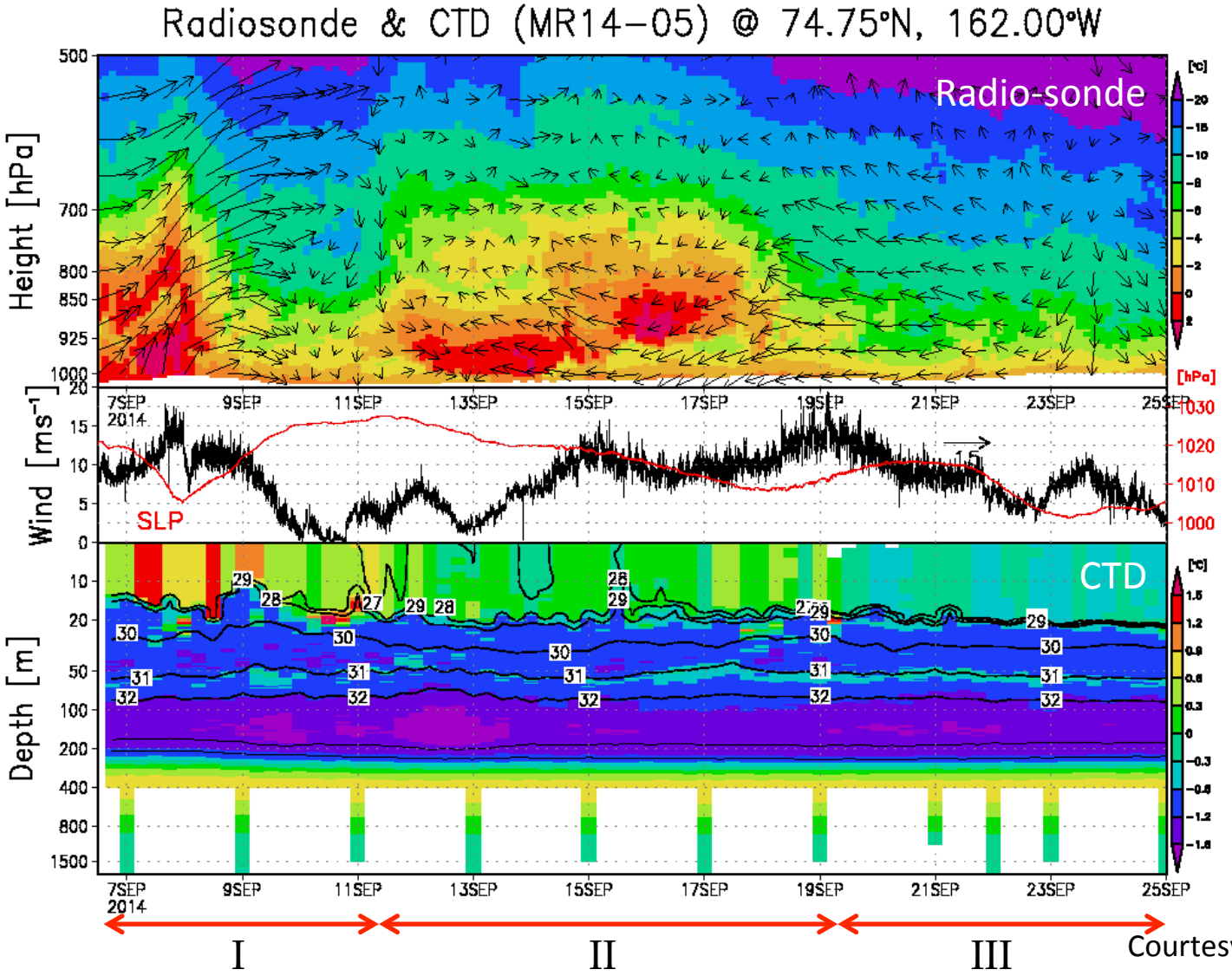
Radio-sonde : every 3 hours
Ozon-sonde: every 2nd day
CTD (400m): every 6 hours
Water sampling: every half day
CTD (1800m): every 2nd day
Turbulent measurement: every 6 hours

Courtesy from Dr. Inoue (NIPR/JAMSTEC)

Japanese research vessel cruise in 2014

R/V Mirai Arctic cruise in September-October 2014

Leading to a better understanding of the uncertainty of the Arctic atmospheric circulation



I: (Sept 7-11)
Frontal passage
Warm strong wind
Warm ocean surface mixed layer

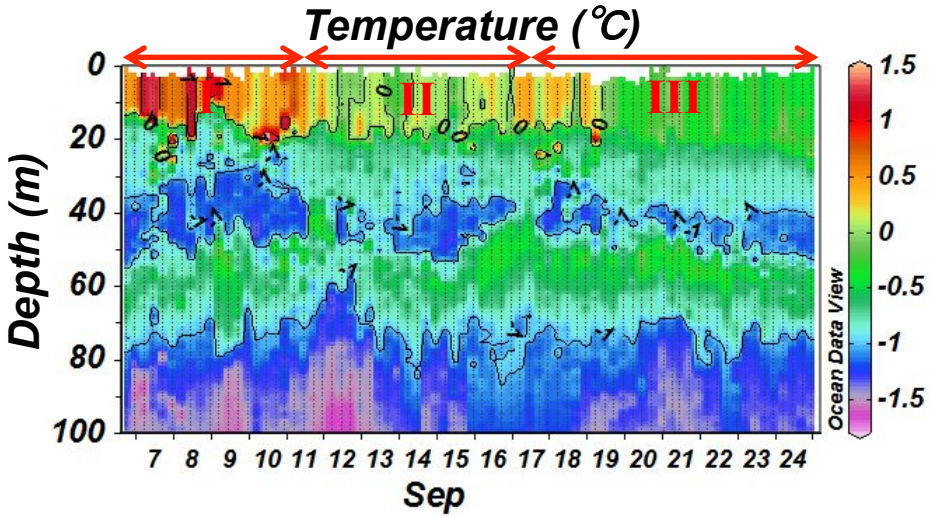
II: (Sept 11-19)
Strong easterly wind along the edge of High pressure system

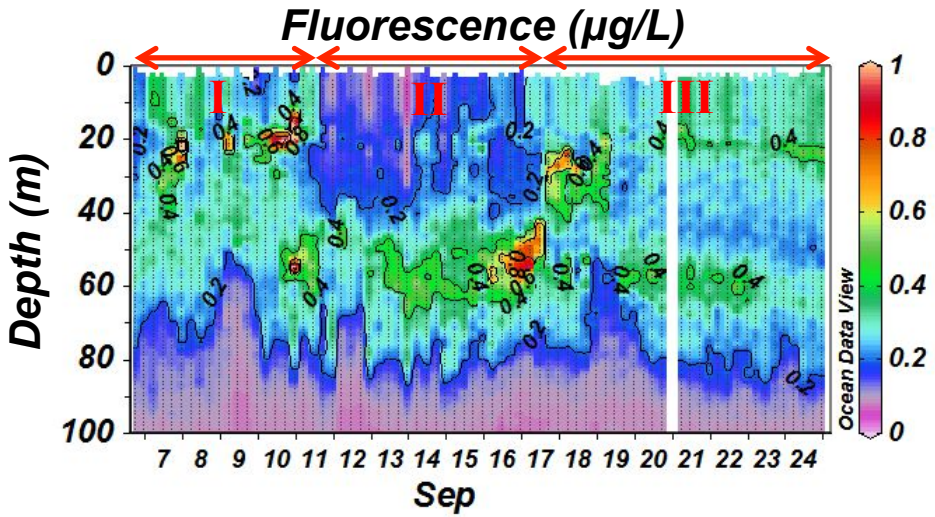
III: (Sept.19-25)
Cold air outbreak & Cooling of ocean mixed layer

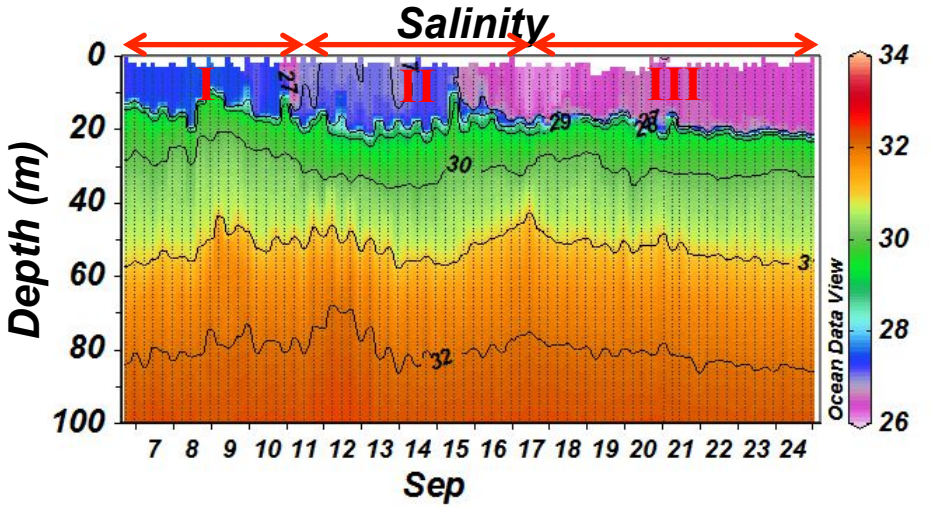
Courtesy from Dr. Inoue (NIPR/JAMSTEC)

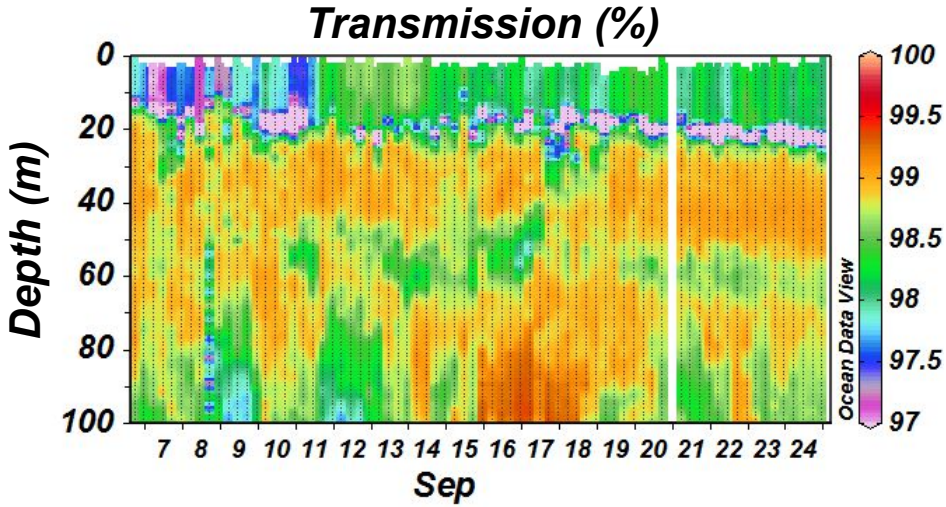
Japanese research vessel cruise in 2014

R/V Mirai Arctic cruise in September-October 2014









Courtesy from Dr. Nishino (JAMSTEC)

Japanese research vessel cruise in 2014

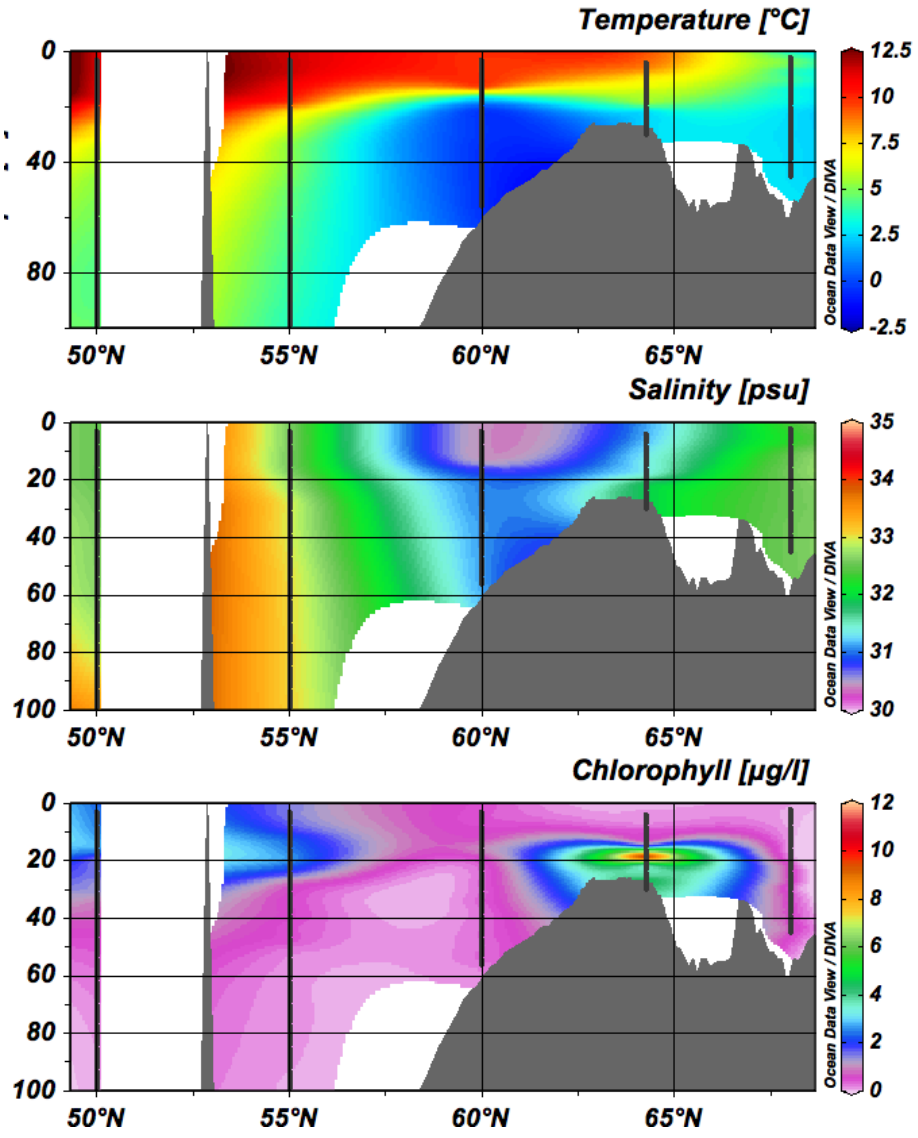
R/V Hakuho-maru cruise in July-August 2014

June 23: Tokyo

July 15: Honolulu

July 25 ~ 31: Bering and Chukchi Sea observation (CTD/water sampling, bio-geochemical analysis)

August 11: Tokyo



Courtesy from Dr. Kondo (NIPR/U. Tokyo)

Japanese Arctic Ocean observation in 2014

1) Japanese Research vessel cruise
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JAMSTEC moorings in the Chukchi Sea and Canada Basin

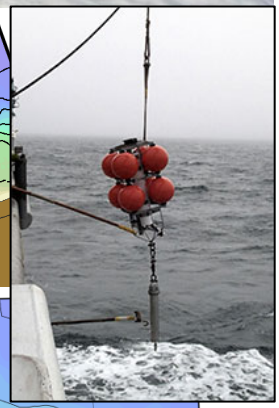
Sediment trap in the Canada Basin
CAP-12t; 75d 12.371m N, 172d 32.919m W, 447m dep
NAP-12t; 75d 00.171m N, 162d 00.182m W, 1971m dep
NAP-13t; 74d 31.361m N, 161d 55.592m W, 1681m dep
→ Recovered

At the mouth of Barrow Canyon
BCW-14; 71d 47.742m N, 155d 20.750m W, 170m dep.
BCC-14; 71d 43,585m N, 155d 11.108m W, 283m dep.
BCE-14; 71d 40.353m N, 154d 59.742m W, 106m dep.
→ Recovered and Re-deployed

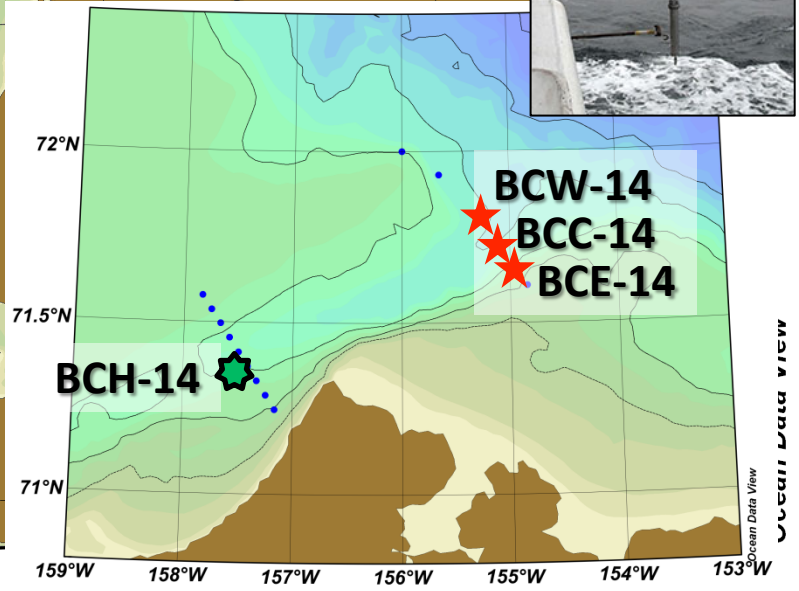
Barrow Canyon close to DBO-5 line
BCH-14; 71d 18.920m N, 157d 08.802m W, 62m dep
→ Recovered and Re-deployed

Hope Valley in the southern Chukchi Sea (DBO-3)
SCH-14; 68d 02.002m N, 168d 50.028m W, 60m dep
SCH-14w; 68d 03.006m N, 168d 50.003m W, 60m dep
→ Recovered and Re-deployed

CAP-12t (Sed.Trap)
NAP-12t (Sed.Trap)
NAP-13t (Sed.Trap)



SCH-14
SCH-14w

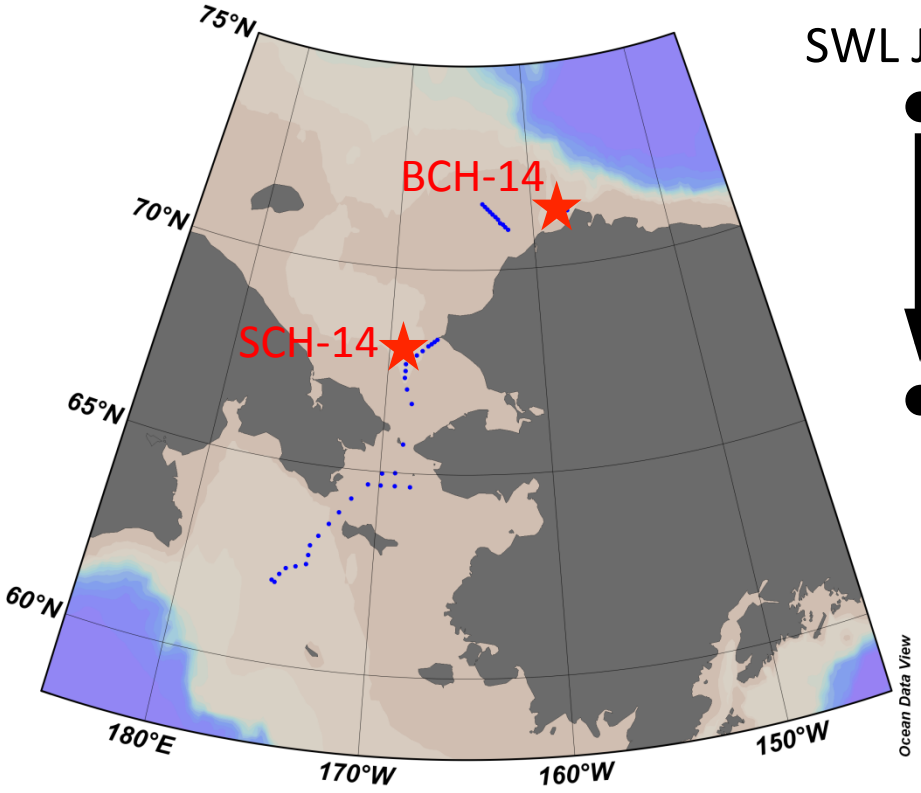


CCGS S. W. Laurier

170°W

Participation in ice breaker cruise in 2014

CCGS S. W. Laurier July cruise

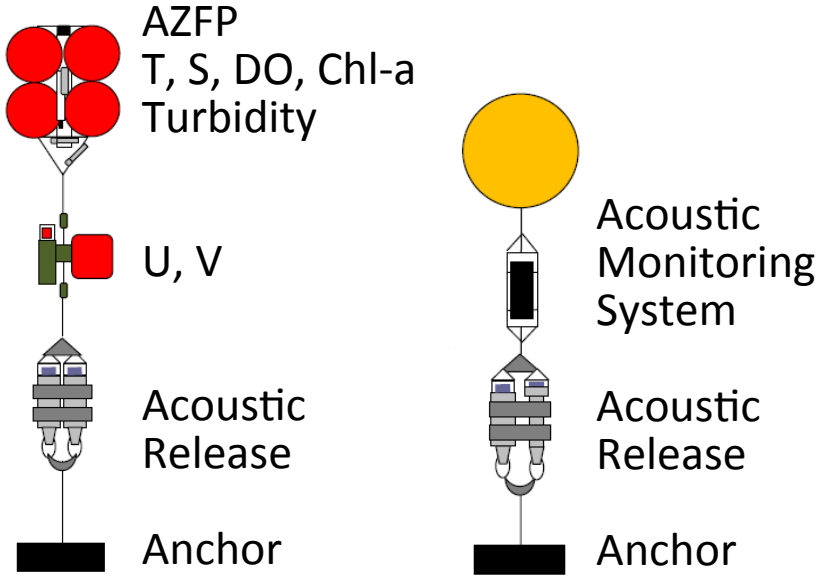


CTD stations during SWL July cruise in 2014

SWL July cruise in 2014

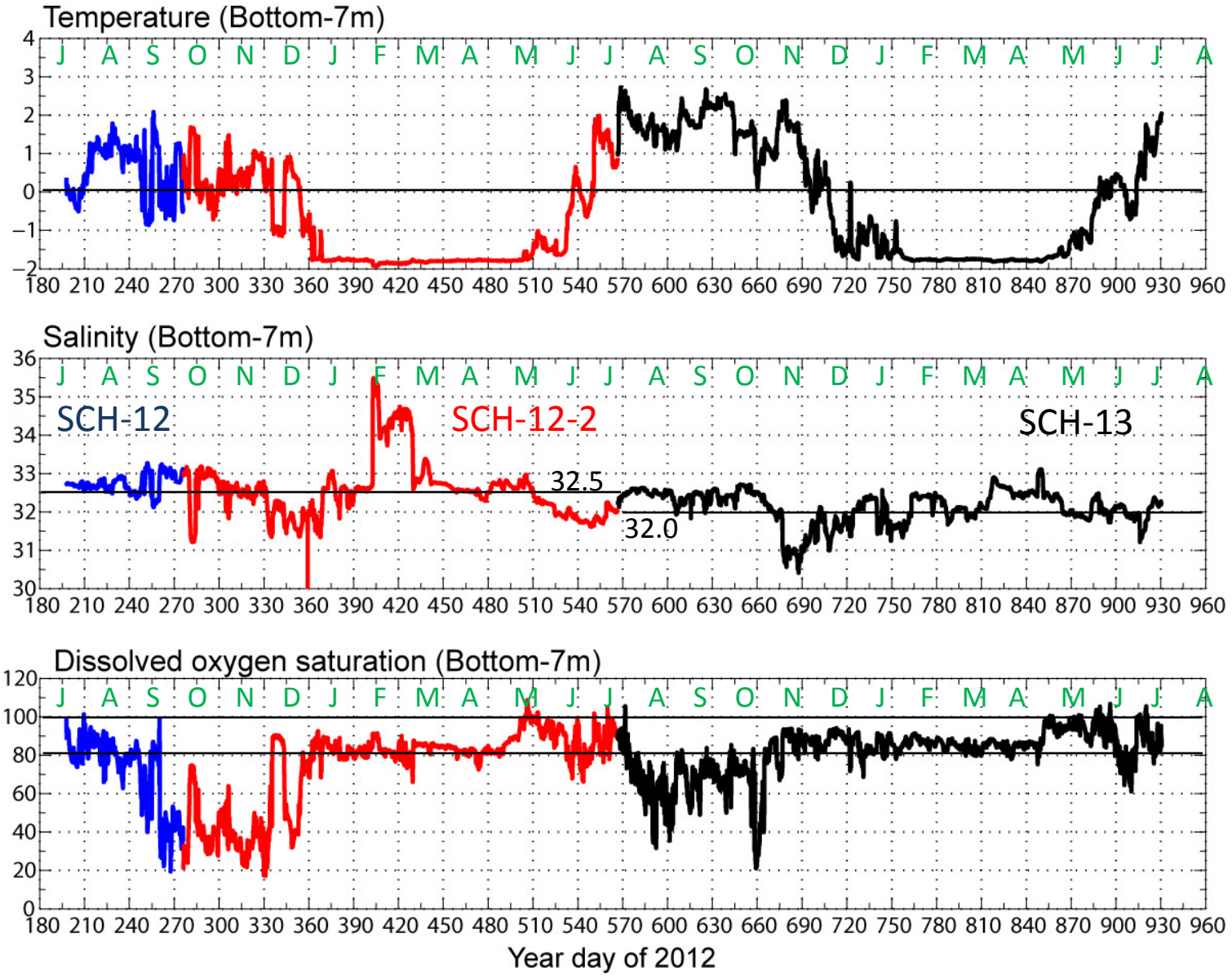
- July 11 Dutch Harbor
  - ✓ DBO-1,2,3
  - ✓ SCH-13 recovery & SCH-14 deployment
  - ✓ DBO-4, 5
  - ✓ BCH-13 recovery & BCH-14 deployment
- July 23 Barrow

[Mooring diagram of SCH-14 & SCH-14w]



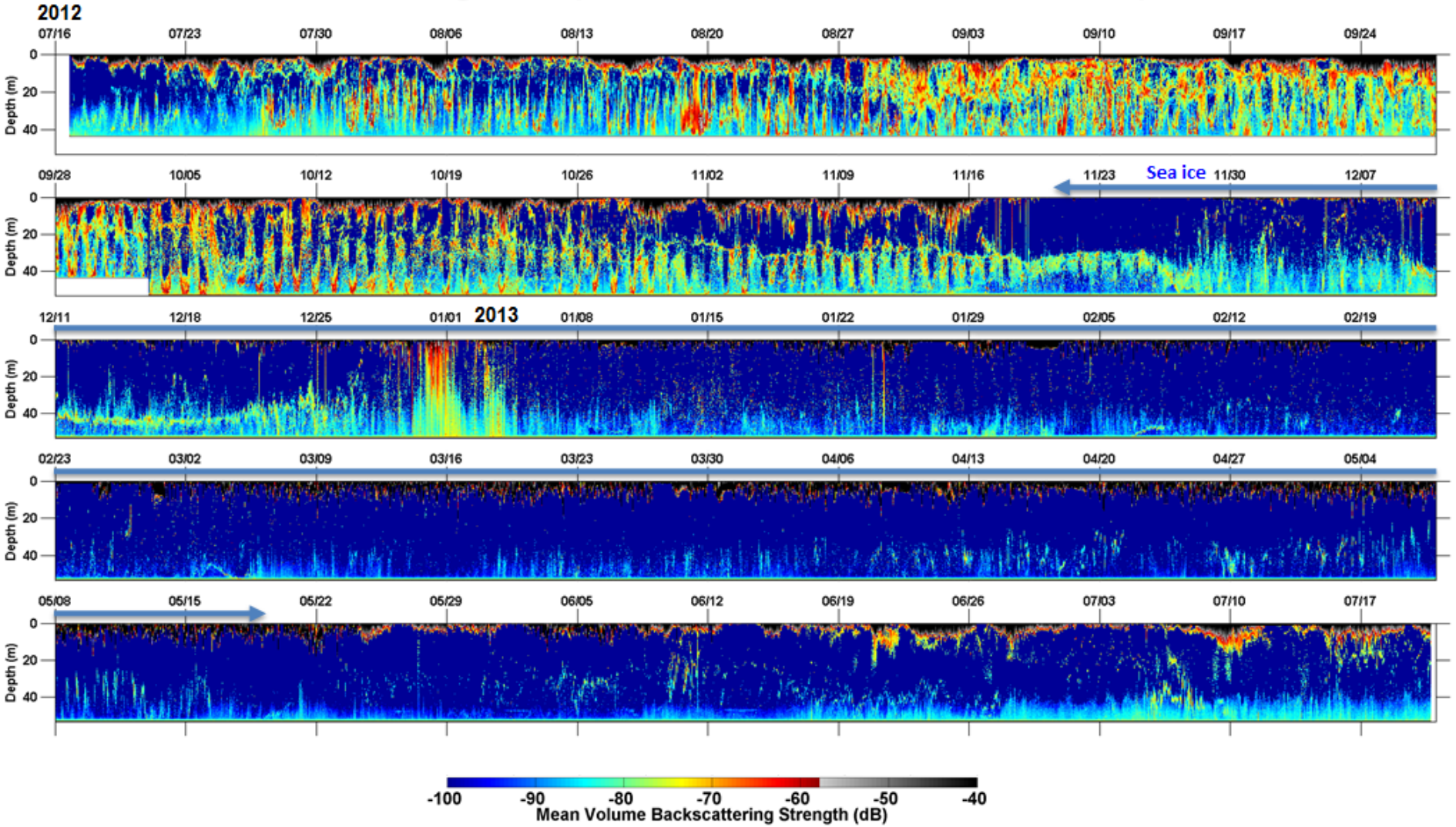
Participation in ice breaker cruise in 2014

SCH (DBO-3) mooring: T, S, DO



Participation in ice breaker cruise in 2014

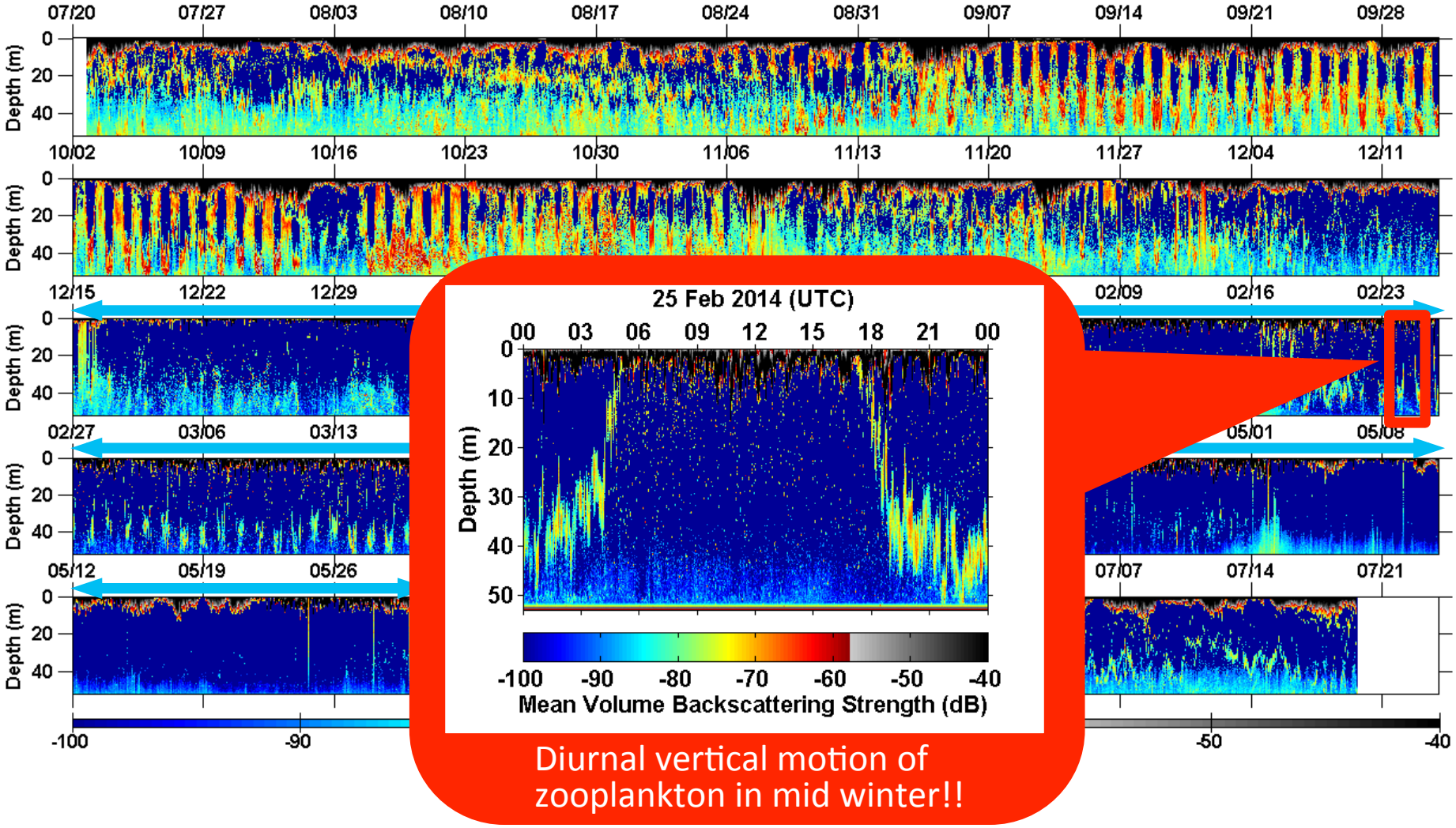
SCH (DBO-3) mooring:
AZFP 125 kHz Echogram (Oct. 2, 2012 to Jul.20, 2013)



Courtesy from Dr. Amakasu (Tokyo University of Marine Science and Technology) and Dr. Kitamura (JAMSTEC)

Participation in ice breaker cruise in 2014

SCH (DBO-3) mooring:
AZFP 125 kHz Echogram (Jul. 20, 2013 to Jul.20, 2014)



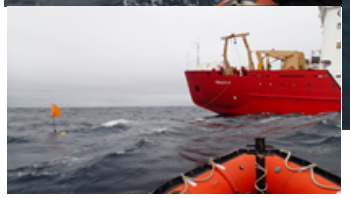
Diurnal vertical motion of zooplankton in mid winter!!

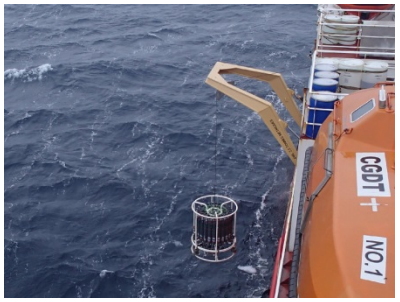
Courtesy from Dr. Amakasu (Tokyo University of Marine Science and Technology) and Dr. Kitamura (JAMSTEC)

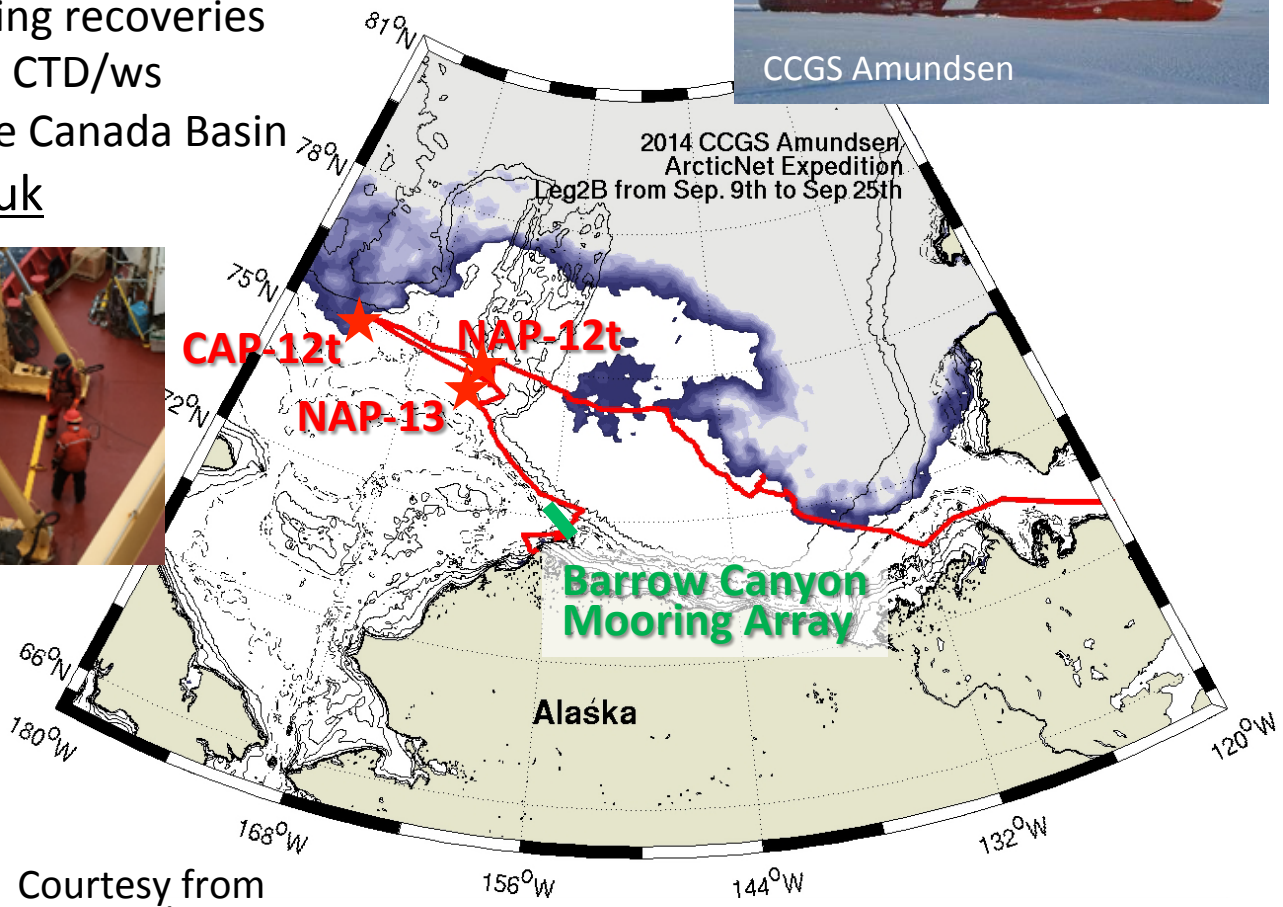
Participation in ice breaker cruise in 2014

CCGS Amundsen cruise (in collaboration with ArcticNet)

- September 9 Barrow
  - ✓ DBO-5 CTD/water sampling
  - ✓ BC mooring recoveries & deployments
  - ✓ Sediment trap mooring recoveries
  - ✓ Across-Canada basin CTD/ws
  - ✓ Sea ice mission in the Canada Basin
- September 25 Kugluktuk



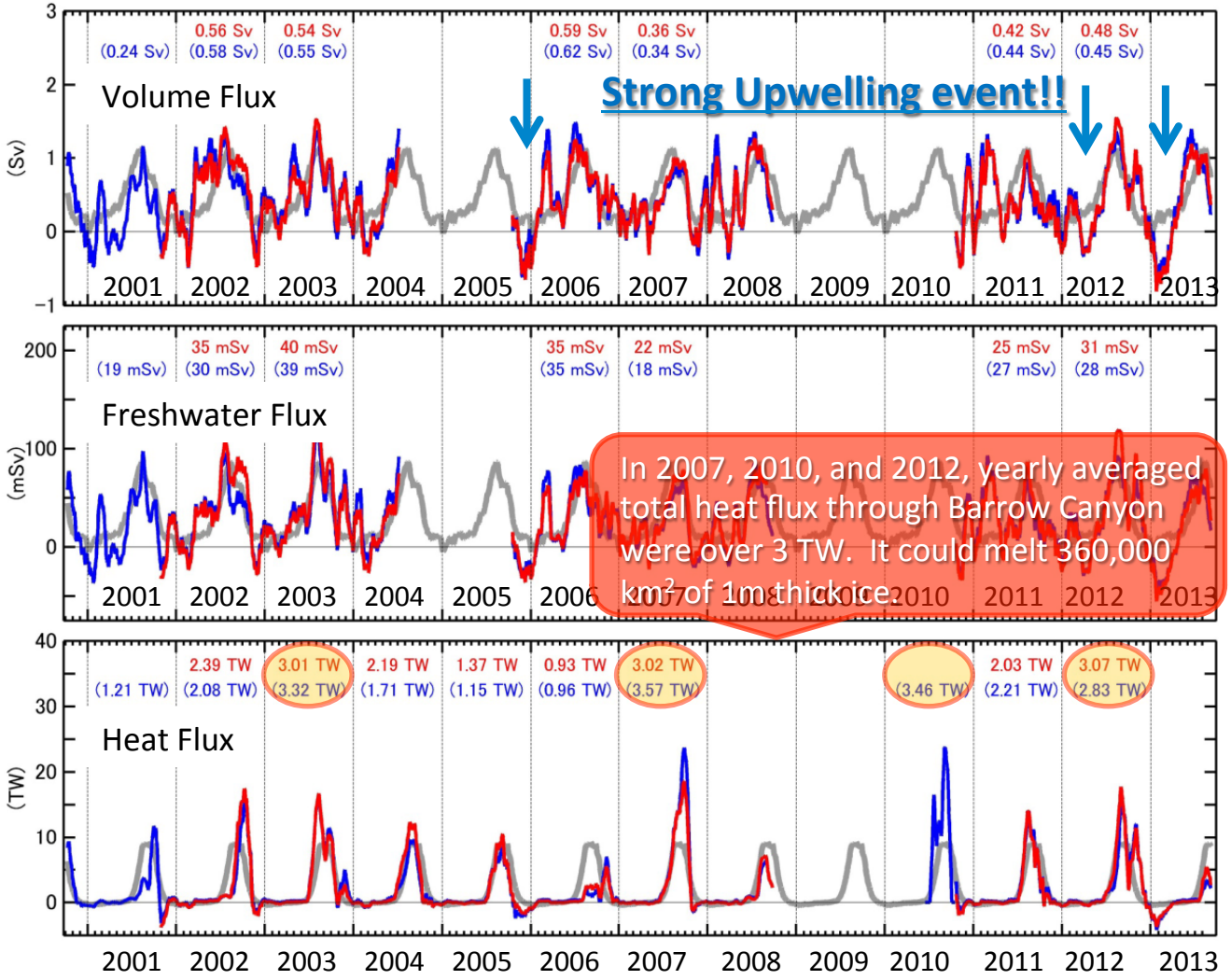




Courtesy from
Dr. Mizobata
(Tokyo University of Marine Science and Technology)

Participation in ice breaker cruise in 2014

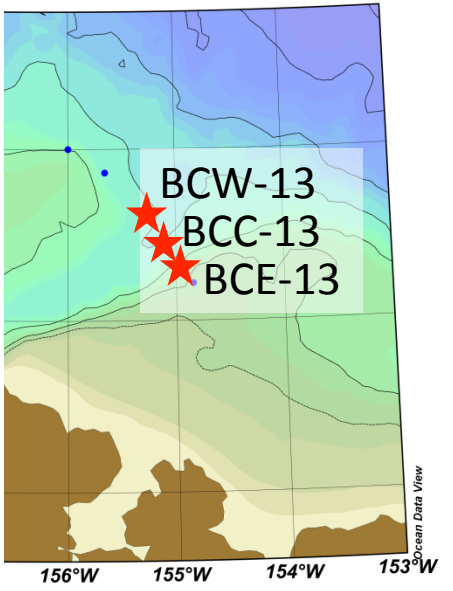
Monitoring of volume, heat and freshwater fluxes through Barrow Canyon by long-term moorings (2000 to present)



Update from Itoh et al. (2013, *J. Geophys. Res.*)

Yearly averaged fluxes through Barrow Canyon between 2001 and 2012

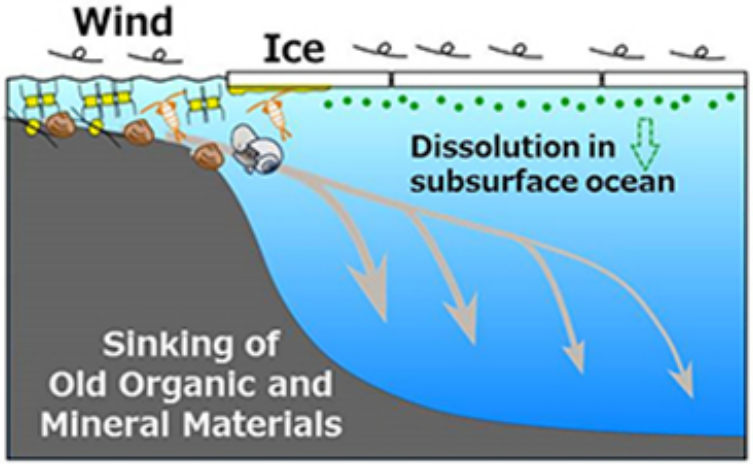
Volume: 0.48 Sv
Freshwater: 31 mSv
Heat: 2.25 TW
(Updated from Itoh et al., 2013)

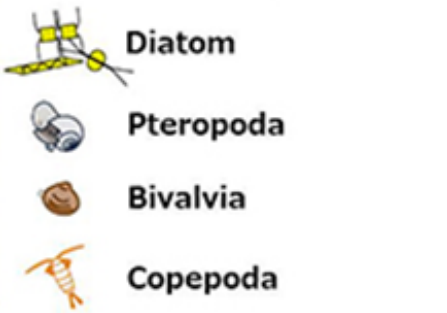


Pacific Arctic Group Spring Meeting
April 6-7, 2014 during ASSW 2014
In Helsinki, Finland

Participation in ice breaker cruise in 2014

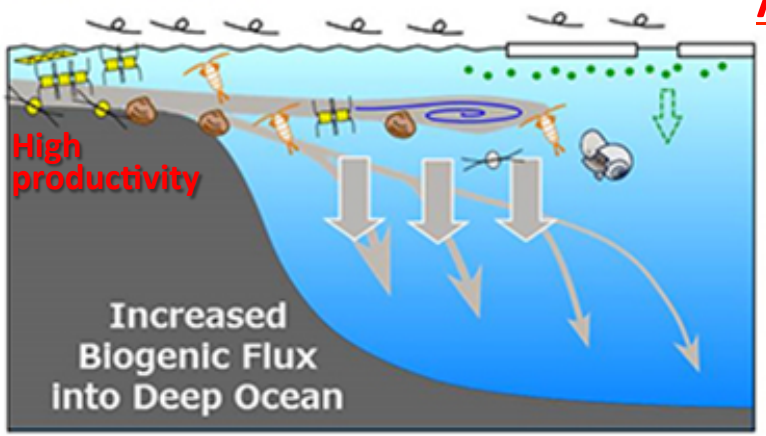
Enhanced Role of Eddies in Arctic Marine Ecosystems
~ Sea Ice Reduction Creates Better Plankton Habitat ~



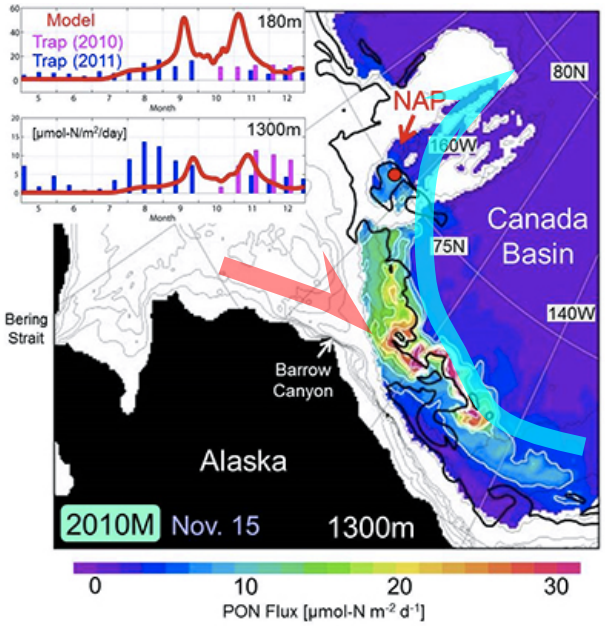


After sea ice retreat

High Eddy Activity
Strong Ocean Current



Plankton Habitat is expanding along Eddy Pathway



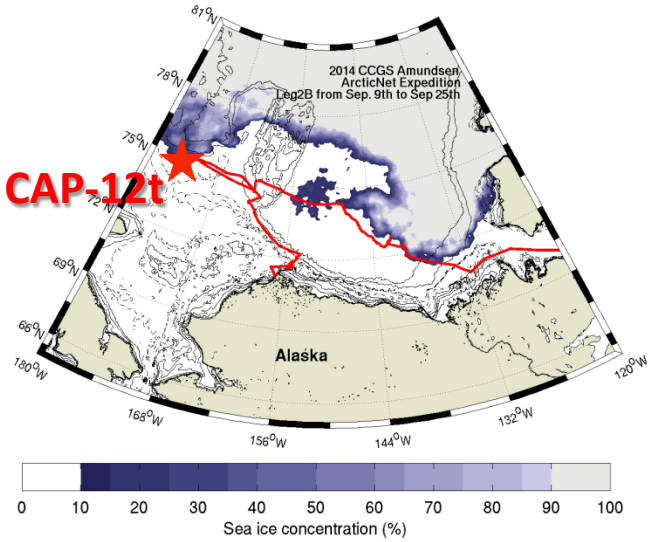
Sea ice retreat causes high biological productivities on the (nutrient-rich) shelves and enhances eddy activity and ocean current in the deep basin area. As a result, plankton habitat is expanding along eddy pathway.

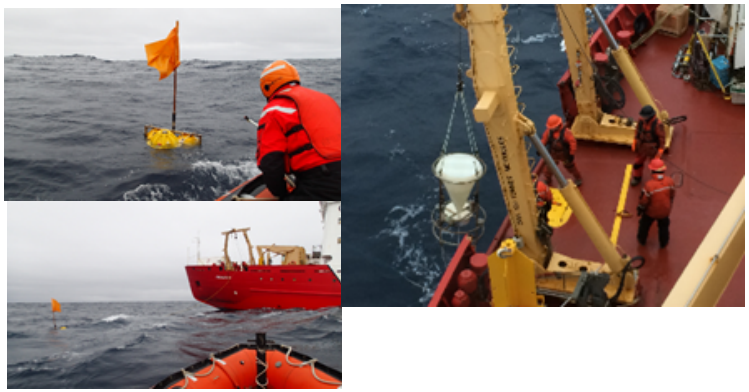
After Watanabe, Onodera, et al. (2014, Nature Comm.)

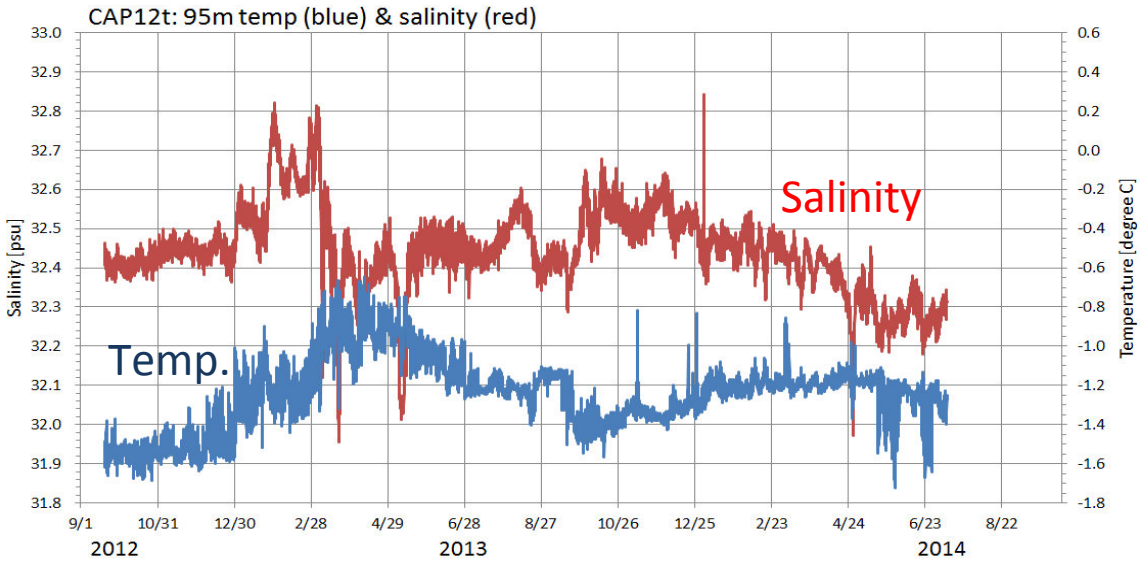
Participation in ice breaker cruise in 2014

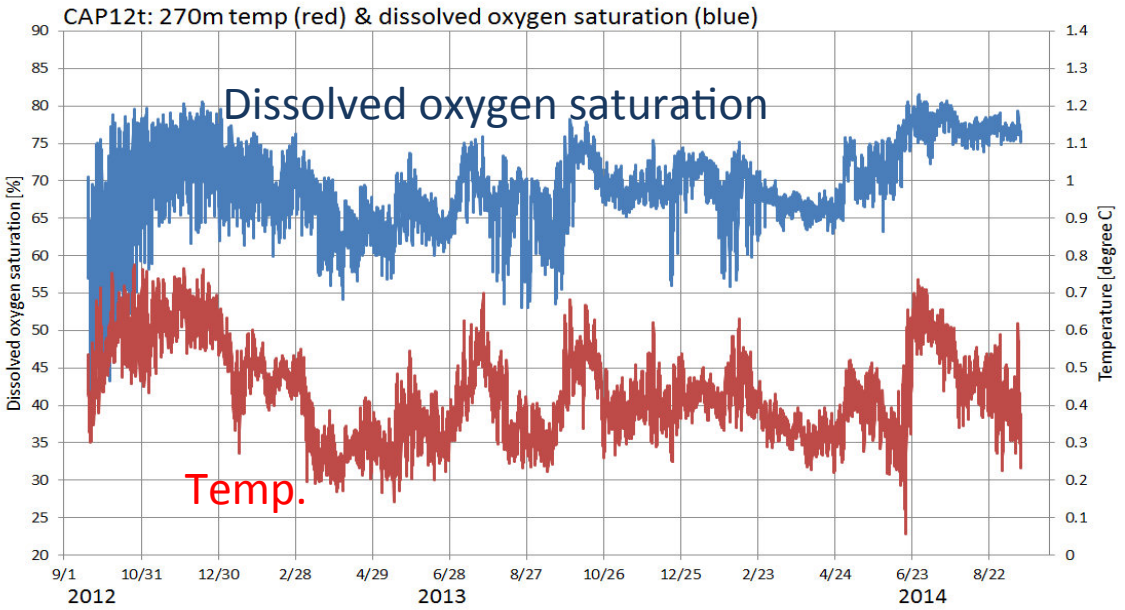
CCGS Amundsen cruise (in collaboration with ArcticNet)

Preliminary result from CAP-12t
(Temperature, salinity, and DO)





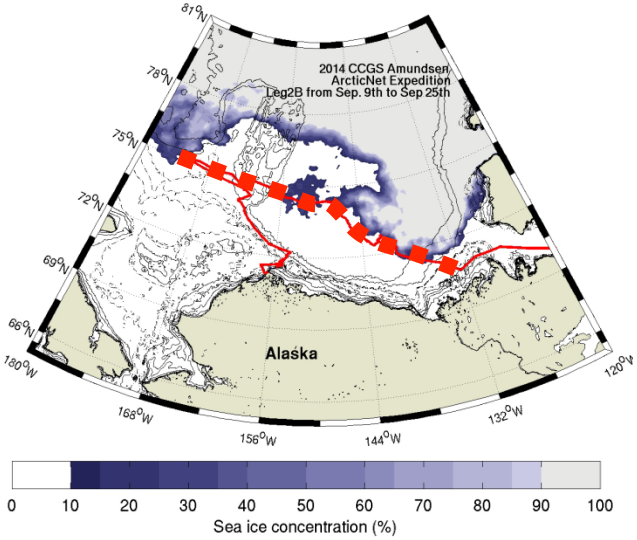


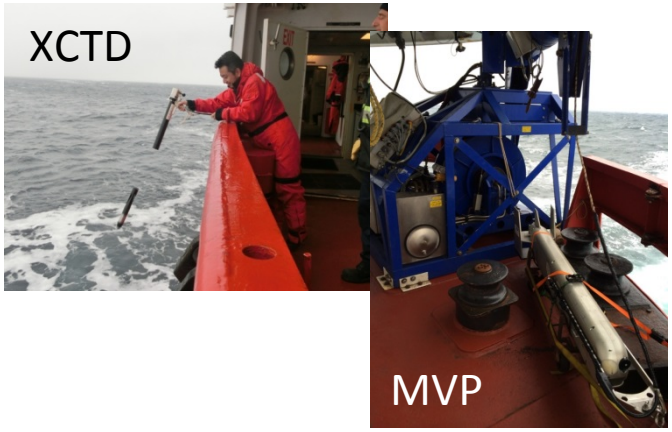


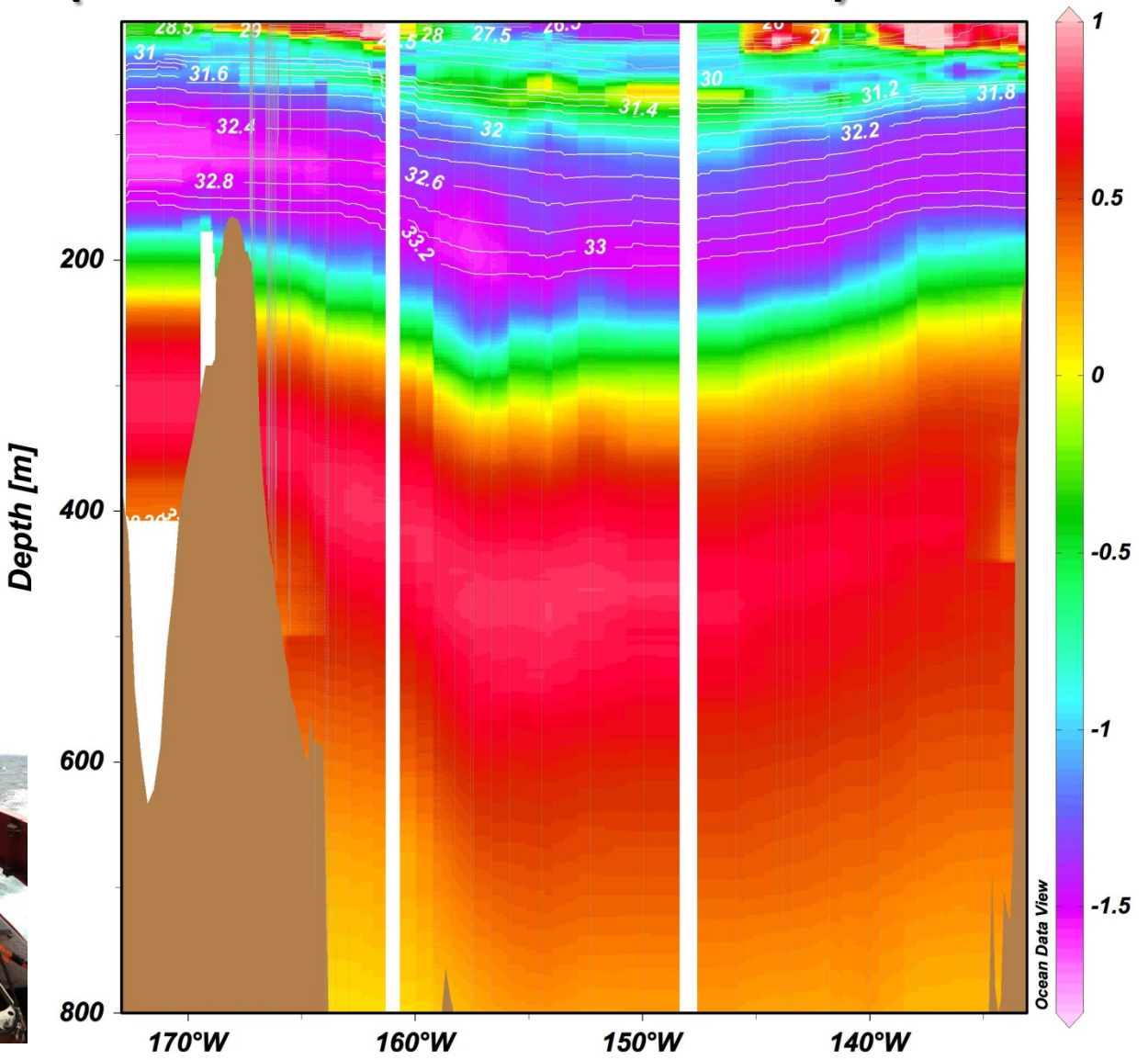
Participation in ice breaker cruise in 2014

CCGS Amundsen cruise (in collaboration with ArcticNet)

XCTD/MVP observation across the Canada Basin







Courtesy from Dr. Mizobata (Tokyo University of Marine Science and Technology)

Participation in ice breaker cruise in 2014

CCGS Louis S. St.- Laurant cruises (Sept.22~ Oct. 17???);

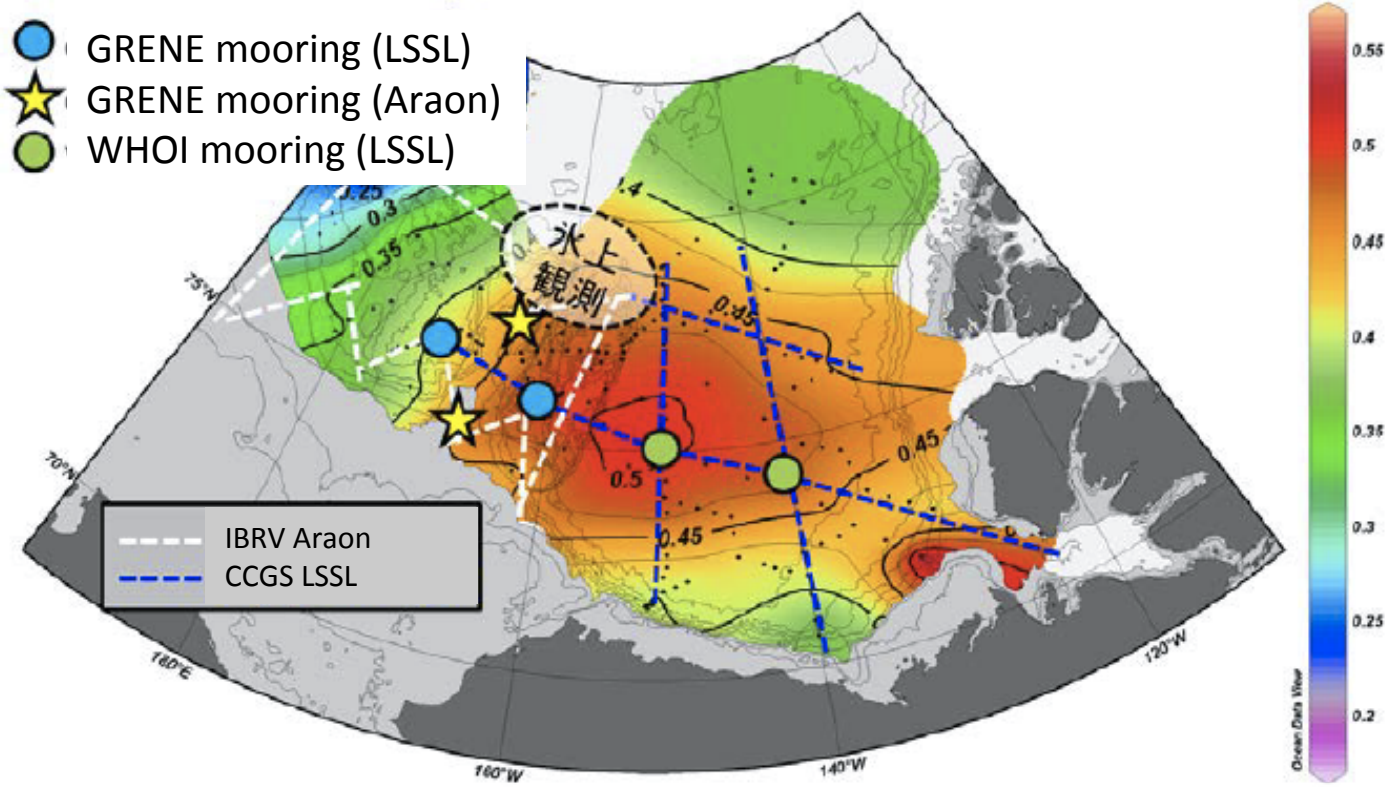
Sea ice observation, hydrography & water sampling, and mooring deployments

IBRV Araon Arctic cruise (July ~ Sept.);

Hydrography and mooring recoveries & deployments


CCGS Louis St. S-Laurant
(From CCG web site)


RV ARAON
(From KOPRI web site)



After "FY2014 plan of GRENE Arctic Climate Change Research Project" by Dr. Shimada

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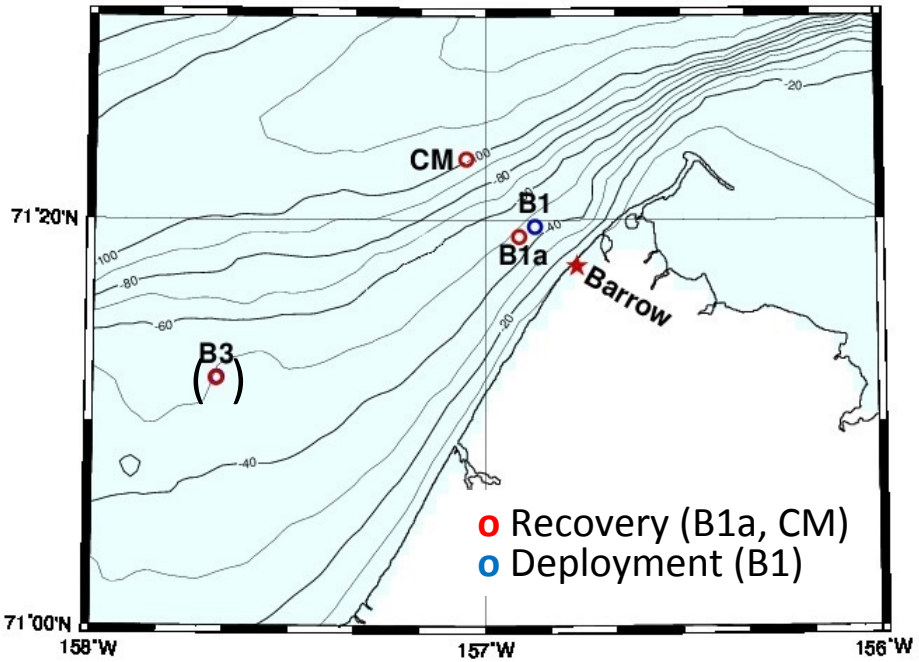
   - XCTD observation in the Arctic Ocean and so on. . .

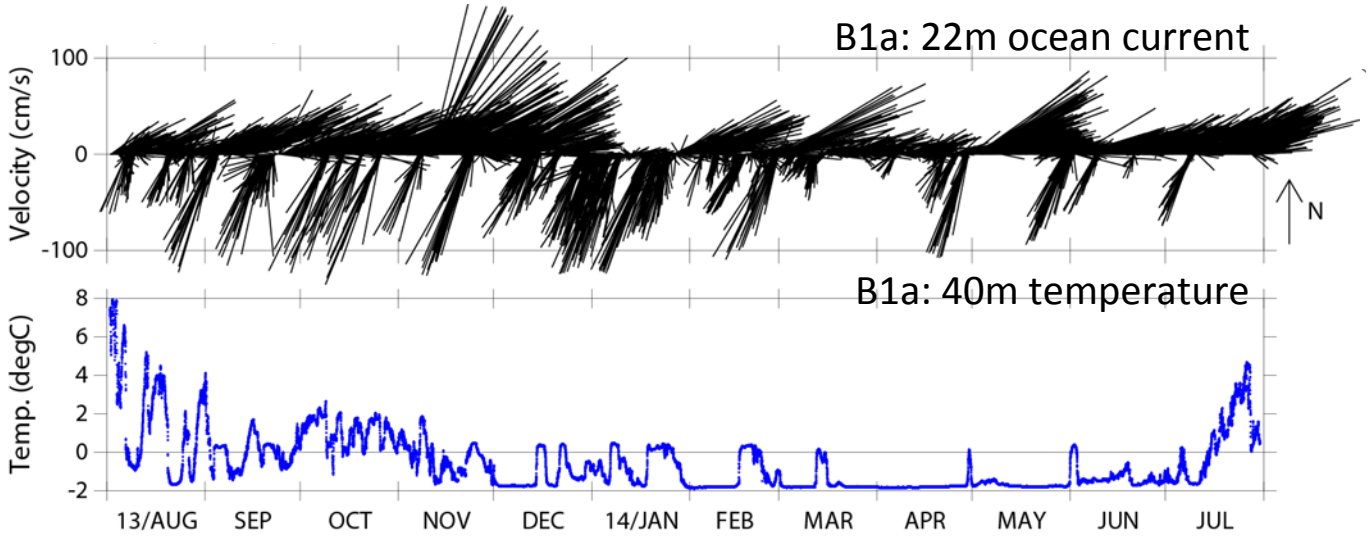
Ice thickness monitoring off Barrow

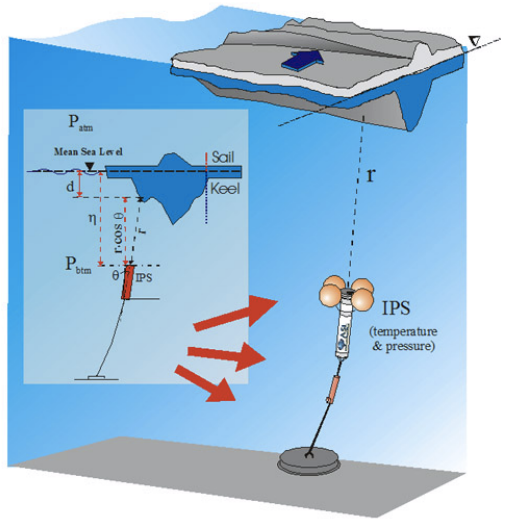


Mapping of sea ice production by SSMI
& Ice thickness monitoring by IPS

IPS mooring recovery
on Jul.30

Tamura &Ohshima, 2011, JGR





Courtesy from Dr. Fukamachi (Ints.Low Tem. Sci., Hokkaido University)

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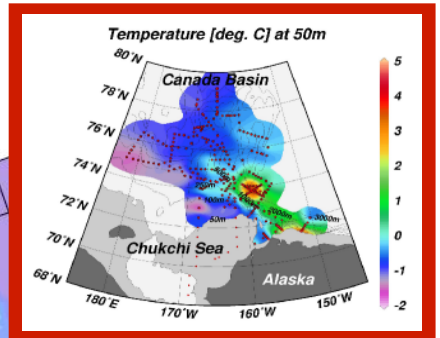
Japanese research vessel cruise in 2015

R/V Mirai Arctic cruise in September-October 2015

"Observational Studies on the Arctic Ocean Climate and Ecosystem Variability"

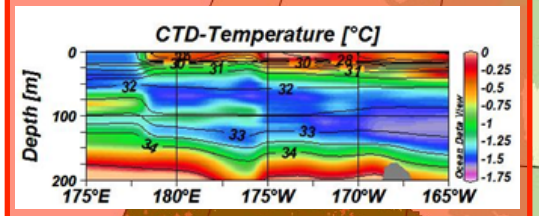
PI: Dr. S. Nishino (JAMSTEC)



Large warm-core eddy & its impact to marine ecosystem
Kawaguchi *et al.* [2012]
Nishino *et al.* [2011b]

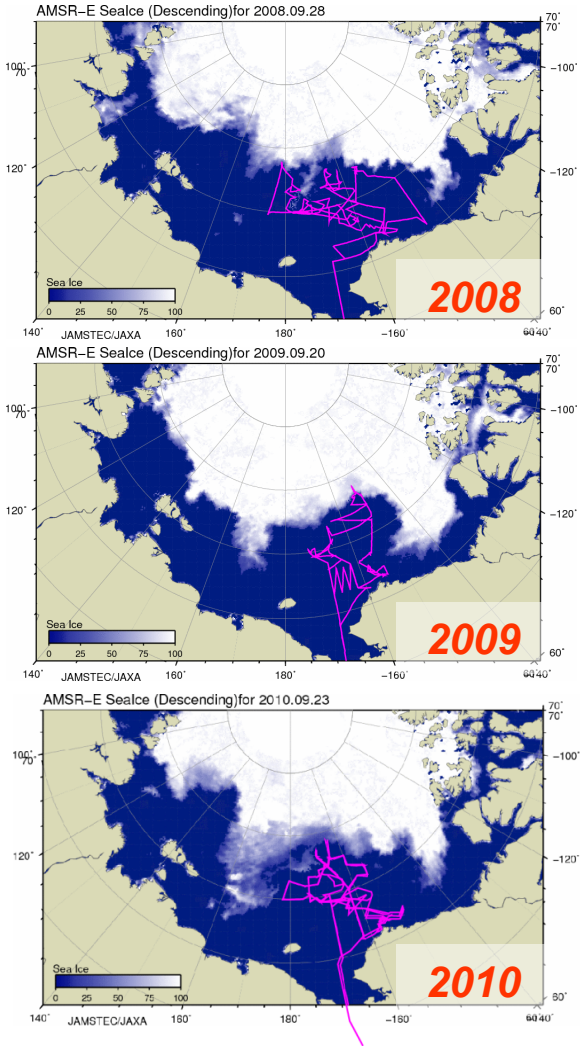
Revisit obs.

Siberian shelf-basin interaction



Impact from Siberian shelf water & the inter-annual variability
Nishino *et al.* [2008, 2013]

Intensive obs. of eddy & shelf-break jet by CTD/LADCP/ water sampling and TurboMAP



Courtesy from Dr. Nishino (JAMSTEC)

Schematics of 2015 R/V Mirai observational studies

Sea ice reduction
Changes in ocean circulation
Impact on ecosystem
Oasis or Desert ?

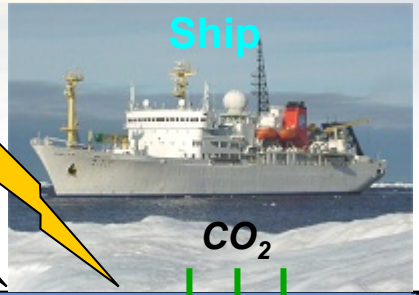
Numerical model

Satellite

Light
+
Nuts

Ocean circulation

Ship



CO_2

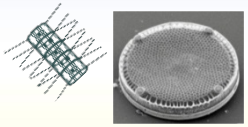
Siberian side:
Collaborative observations

Increase or decrease in primary production?

Changes in phytoplankton species and distributions?

Sea ice reduction

Ocean acidification and freshening



Impact on ecosystem?

Alaskan side:
Intensive observations of eddy & shelf-break jet

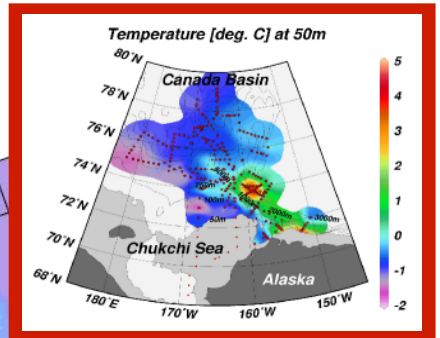
Enhancement or reduction of biological pump?

Japanese research vessel cruise in 2015

R/V Mirai Arctic cruise in September-October 2015

"Observational Studies on the Arctic Ocean Climate and Ecosystem Variability"

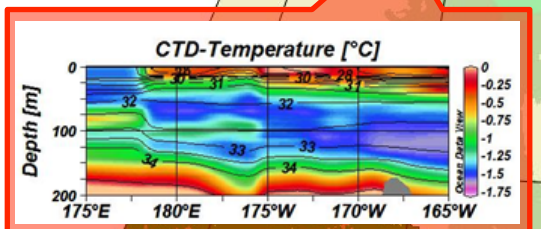
PI: Dr. S. Nishino (JAMSTEC)



Large warm-core eddy & its impact to marine ecosystem
Kawaguchi *et al.* [2012]
Nishino *et al.* [2011b]

Revisit obs.

Siberian shelf-basin interaction



Impact from Siberian shelf water & the inter-annual variability
Nishino *et al.* [2008, 2013]

Intensive obs. of eddy & shelf-break jet by CTD/LADCP/ water sampling and TurboMAP

75°N
65°N
170°E
180°E
170°W
160°W
150°W

[Tentative cruise plan]

August 25: Hachinohe (JAPAN)

September 4: Bering Str.

Observations in the Arctic Ocean

October 3: Bering Str.

October 6: Dutch Harbor (in)

October 9: Dutch Harbor (out)

October 21: Hachinohe (JAPAN)

Courtesy from Dr. Nishino (JAMSTEC)