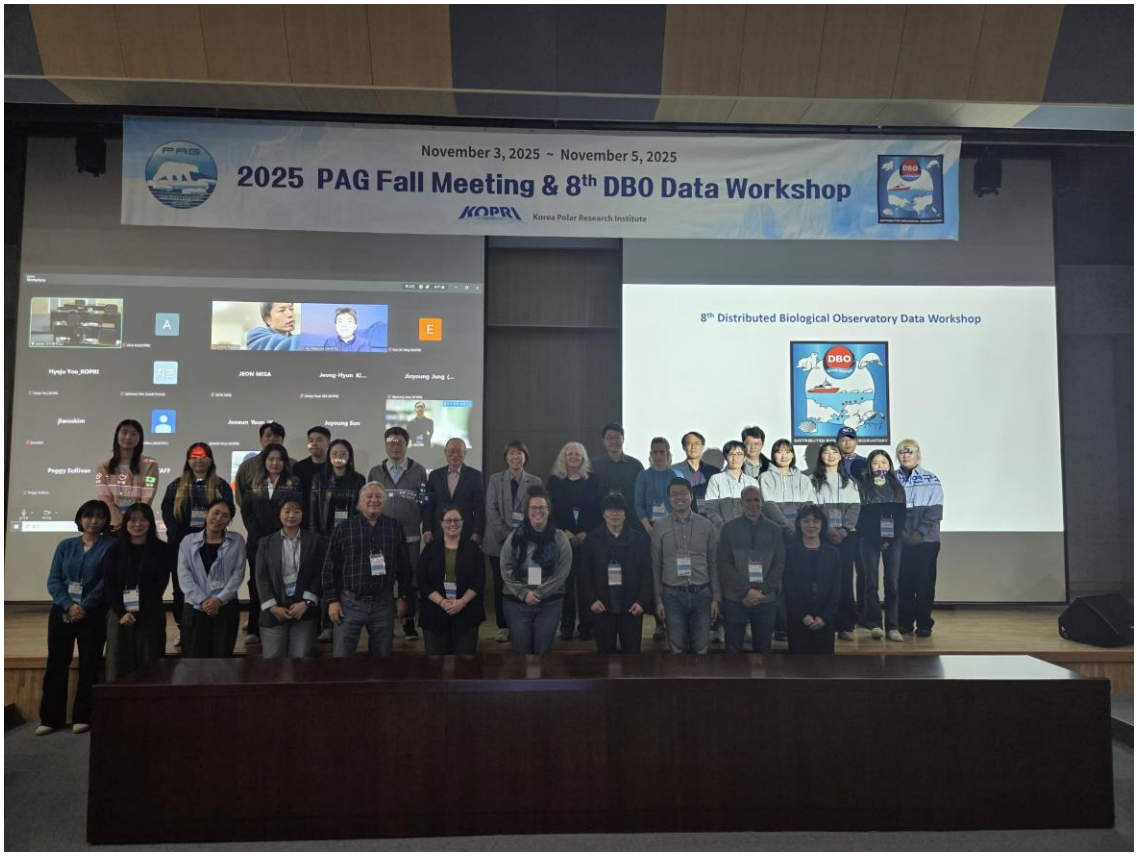
The Distributed Biological Observatory (DBO) 8th Data Workshop Final Report

November 4-5, 2025
Korea Polar Research Institute
26 Songdomirae-ro, Yeonsu-gu, Incheon, 21990
Sejong Seminar Room, 2nd floor, Cafeteria building



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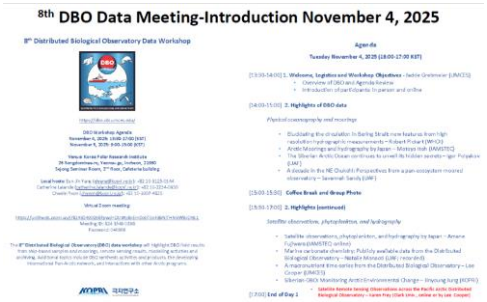
Citation Workshop Report: Grebmeier J.M and A. Bayard. 2026. 8th DBO Data Workshop Report, UMCES CBL, 11 pp.

Day 1 – Tuesday, November 4th, 2025

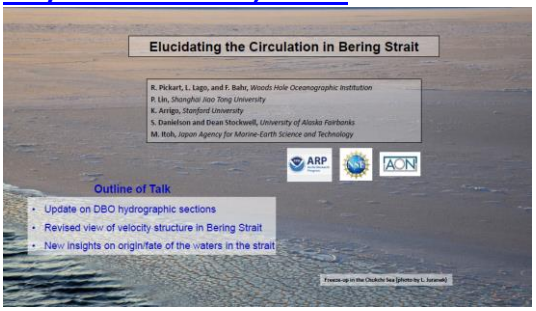
1) 8th DBO Data Meeting - Introduction



Jackie welcomed the group and provided logistic information as well as the meeting agenda.

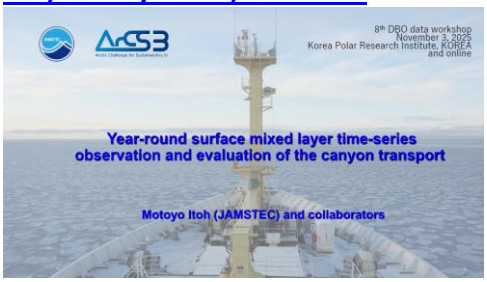
2) Highlights of DBO data

2-1) Robert Pickart, WHOI



Bob provided results elucidating the circulation in Bering Strait, including DBO hydrographic sections, a revised view of velocity structure, and new insights on origin/fate of the waters in the strait. He showed corresponding nitrate sections to the hydrographic results that indicate a distinct flow branch occurs on the western side of the US portion of Bering Strait that supplies a third of the volume transport that is comprised of mainly Bering Summer Water in the warm months of the year. This flow branch accounts for most of the nitrate flux through the US side of the strait in summer, and emanates from the Gulf of Anadyr. By comparison, the Russian side of the strait to the west experiences flow reversals that bring extremely fresh Siberian Coastal Water into the northern Bering Sea before recirculating back to the north.

2-2) Motoyo Itoh, JAMSTEC



Motoyo provided observations and evaluation of a year-round surface mixed layer time-series of the current transport in Barrow Canyon. The focus of the study was to evaluate interannual variabilities of Barrow Canyon transport, especially to focus on the heat transport. She found that: there is no trend in volume transport, but there is an increasing trend in heat transport and heat content. Heat transport in Barrow Canyon has increased 1.5 times in the last 20 years, and it is enough to explain the recent increase in Pacific Summer Water heat content in the Canada Basin. Also, after 2020, the Barrow Canyon heat transport is not as large as the late 2010s.

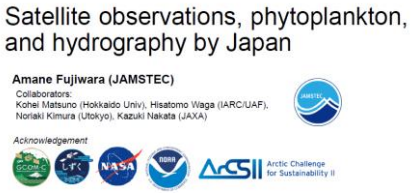
2-3) Igor Polyakov, NABOS

Igor provided updates on the Siberian Arctic Ocean. After 20+ years of mooring observations, it was found that heat from the ocean interior has moved upwards closer to the sea ice. A new Arctic Ocean is developing with sea ice loss being due to stronger oceanic heat flux caused by weaker stratification and deep ocean winter ventilation, and there has been autumnal delay of sea ice formation in recent years. He concluded that observations show deep propagation of atlantification into the Amerasian Basin with unclear, but potentially dramatic, consequences for the biological system.

2-4) Savannah Sandy, University of Alaska Fairbanks

Savannah provided perspectives from a pan-ecosystem moored observatory after a decade in the northeast Chukchi Sea. The Chukchi Ecosystem Observatory has worked to develop a better mechanistic understanding of the Arctic marine ecosystem, fostered coordination and cooperation among research programs, and enhanced information availability with scientific data, analyses, and products tailored to public stakeholders.

2-5) Amane Fujiwara, JAMSTEC



Amane provided a summary of satellite observations, phytoplankton, and hydrography for the Pacific Arctic Region. He found that satellite remote sensing is advantageous for monitoring biogeochemically and biologically active DBO sections. In addition, optically complex water sometimes causes large uncertainties in satellite products. The DBO historical dataset is valuable for evaluation, improvement and development of satellite products. Optimization of the workflow is needed to promote active collaborative studies in the field of marine biology and biogeochemistry.

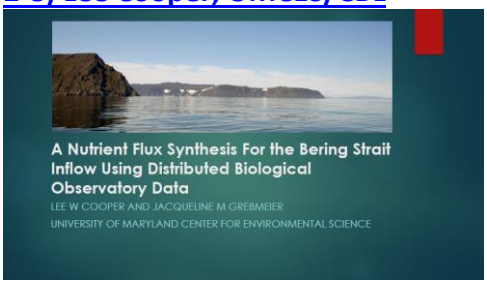
2-6) Karen Frey, Clark University

Karen provided results of satellite remote sensing and optical observations across the Pacific Arctic DBO regions. Updated monthly sea ice concentration graphs from 2018-2025 were presented for all 8 DBO regions. She noted that only DBO1, DBO5, DBO6, and DBO7 showed significant warming during August (the key indicator month for warming). Karen also discussed DBO-related outreach efforts with elementary and middle school students as well as with undergraduate students at Clark University.

2-7) Natalie Monacci, University of Alaska Fairbanks

Natalie presented on the publicly available data from the DBO related to observing the marine carbonate system to detect ocean acidification with the focus on using bottom water aragonite saturation. Through the analysis of data ranging from 2017-2025 and including the months from August to November, carbonate parameters were found to be unfavorable to sensitive species in all years and at all depths. Other research findings indicated that the Bering Sea is acidifying less quickly than the southern and northern Pacific Arctic regions and an analysis of the full water column, including 1970-2022, indicated that the Bering Sea shelf bottom waters are acidifying at nearly 3 times that rate as surface waters. Natalie also provided a demonstration of how to search for publicly available data from the NOAA NCEI OCADS (Ocean Carbon and Acidification Data System).

2-8) Lee Cooper, UMCES/CBL



Lee provided a synthesis of nutrient flux for the Bering Strait inflow using DBO data. He found no clear trends identified yet for nitrate + nitrite. Interannual variation and geographical variation are large across the full region, yet there is good coherence within DBO regions. The lack of sea ice in 2018-2019 may have prevented drawdown in nutrients across the Pacific Arctic region, leaving unutilized nutrients ~1-2 months later in the season. The less critical nutrients, such as silica, may be more sensitive indicators as the silica data show increasing trends in Barrow Canyon and Chirikov Basin over the past 15 years.

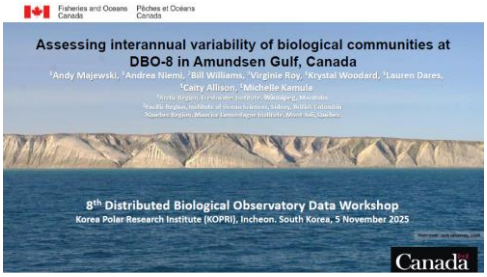
2-9) Jinyoung Jung, KOPRI

Jinyoung provided updates regarding monitoring Arctic environmental change in the Siberian DBO by addressing several research questions. He found an anomalously high surface phytoplankton bloom in 2017 as well as anomalous hydrographic features, including dissolved organic carbon, chlorophyll-a, bacterial abundance, nitrite-nitrate, and phosphorous in 2018 and 2019. Evidence was provided indicating advanced atlantification in the Eastern Eurasian Basin, Marakov Basin, and the East Siberian Sea.

Day 2 – Wednesday, November 5th, 2025

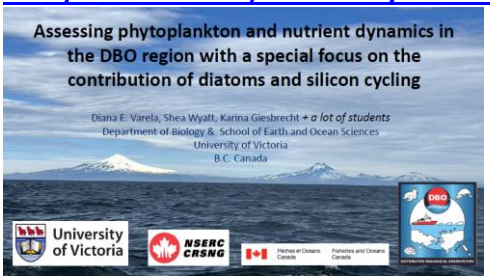
2) Highlights of DBO data, continued

2-10) Michelle Kamula, KOPRI



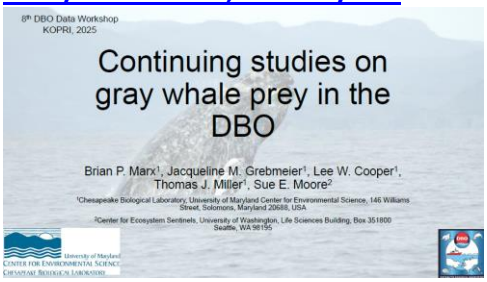
Michelle presented data assessing interannual variability of biological communities at DBO8 in the Amundsen Gulf, Canada. The designated DBO8 stations have been sampled for 7 years during the Canadian Beaufort Sea Marine Ecosystem Assessment (CBS-MEA: 2012-2025). Key conclusions indicate interannual variability at DBO8 generally reflects regional variability, especially at offshore (i.e.>100 m) stations. Ocean observing at DBO8 is providing critical information for interpreting coastal and offshore drivers as well as interannual variability in forage species, and DBO-8 continues to be an active benthic area of interest.

2-11) Diana Varela, University of Victoria



Diana discussed assessing phytoplankton and nutrient dynamics in the DBO region with a special focus on the contribution of diatoms and silicon cycling. She found evidence of decreasing trends in measures of diatom biomass and productivity from 2006 to 2022. An investigation of ocean acidification (OA) impacts on a natural assemblage in Pacific Arctic Region suggested enhancement of large-celled biomass under modest OA (pH 7.90) and a decline in diatom proxies at a lowest pH (7.70).

2-12) Brian Marx, UMCES/CBL



Brian presented on his continued studies on the gray whale prey in the DBO regions. As gray whales bypass the Chirikov Basin in greater numbers to forage further north, they rely less on benthic amphipods and most like on krill and other nesr-bottom crustacean prey. There have been elevated gray whale mortalities and strandings, including in two recent decade Unusual Mortality Events (UME's) in 1999-2000 and 2019-2023, with a continued population decline osbserved currently in low calf recruitment. Brian has focused on a time series analysis of benthic amphipod energy density and finding a 91% decline in mean energy density over 26 years.

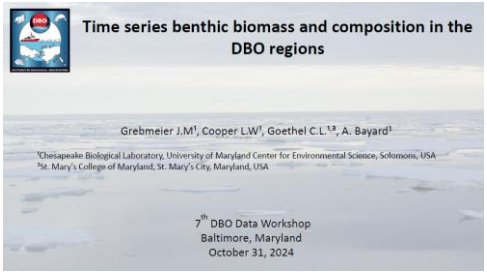
2-13) Sue Moore, University of Washington

Sue provided updates on the marine mammal watches observed at sea via cruises in the Pacific DBO regions. Summary highlights includes that more gray whales are now seen feeding in the southern Chukchi Sea than in the northern Bering Sea. Coincidently, humpbacks are now routinely feeding from the southern Chukchi to the western Beaufort Sea. In addition, walruses and polar bears are spending more time on land and target small sea ice refugia at sea. Walruses are commonly seen swimming and sometimes resting in open water in recent years.

2-14) Catherine Lalande, KOPRI

Catherine provided updates on monitoring export fluxes to detect seasonal and interannual changes in the pelagic ecosystem of the northern Bering Sea. Moored sediment traps at some of the DBO sites offer year-round monitoring to understand the phenology of marine processes and the impact of environmental changes on Arctic marine ecosystems. Summary results were presented for DBO1=NOAA M8 (2020-2022) indicated export production with an early sea ice breakup was followed by a few weeks of sea ice drifting in 2022. Results included observations of higher chl-a, diatoms, biomarkers, and POC fluxes during this period. A majority of diatoms were exported without chloroplasts, possibly due to rapid nitrate depletion. Large fluxes of sea ice-associated diatoms and larger fluxes of pelagic diatoms occurred. Coincidently, there were low numbers of zooplankton and meroplankton, possibly reflecting reduced food supply associated with the dominance of diatoms without chloroplasts. Further monitoring is necessary to determine if the apparent collapse of the zooplankton population is a recurrent event and to confirm if rapid nitrate depletion indirectly led to this significant decline.

2-15) Jackie Grebmeier, UMCES/CBL



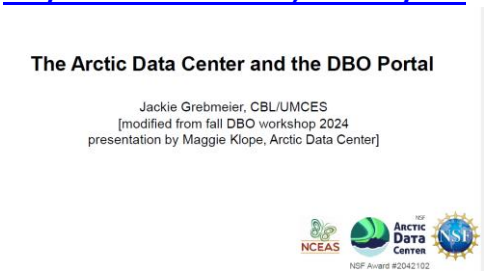
Jackie provided updates on the time series benthic macrofaunal and environmental drivers within the Pacific DBO. These results included comparisons of water column and sediment chl-a, nutrients, temperature, and surface sediment variables. Time series trends in macrofaunal biomass and dominant taxa type were presented, along with biomass/abundance ratio patterns for crustaceans and bivalves. Summary highlights include that sediment chlorophyll a is a seasonal, short-term signature of carbon export to the benthos. High nutrient and chlorophyll in offshore waters were observed in the northern Bering and Chukchi Seas that influence carbon export to benthos. DBO1/Northern Bering Sea benthic data indicated biomass decline at all time-series sites south of SLI in northern Bering Sea. By comparison, DBO3/SE Chukchi Sea had benthic biomass increase with the dominance of large *Macoma calcarea* clams in SE Chukchi DBO3 hotspot. However, there was a noticeable lack of younger clams, suggesting stress on recruitment of population, with variable trend in abundance and biomass in other areas indicative of size class changes in key prey.

2-16) Christina Goethel, UMCES/CBL

Christina provided an analysis of size class distributions of the bivalves *Macoma calcarea* and *Serripes spp*. in the northern Bering Sea and the southeastern Chukchi Sea from 2015-2019. These species are important prey items to birds and walrus, but there has been a decrease in the average size class of bivalves preferred by spectacled eiders, for example, since the mid-1980s.

3) Data access and management

3-1) Jackie Grebmeier, UMCES/CBL



Jackie showed slides related to the NSF funded Arctic Data Center and the DBO Portal, originally presented by Maggie Klope in fall, 2024. Those interested can access the DBO-specific project information at this link: https://arcticdata.io/catalog/portals/DBO . Slides include examples of the custom data search webpage, and a reminder to include DBO-relevant keywords in your metadata (such as "DBO" and "Distributed Biological Observatory"), as well as a summary of ADC's future directions.

Appendix 1 – Meeting Agenda

8th Distributed Biological Observatory Data Workshop

https://dbo.cbl.umces.edu/

DBO Workshop Agenda
November 4, 2025: 13:30-17:00 (KST)
November 5, 2025: 9:00-15:00 (KST)

Venue: Korea Polar Research Institute
26 Songdomirae-ro, Yeonsu-gu, Incheon, 21990
Sejong Seminar Room, 2nd floor, Cafeteria building

Local hosts: Eun-Jin Yang (eiyang@kopri.re.kr); +82 10-3125-0144
Catherine Lalande (catherine.lalande@kopri.re.kr); +82 10-2254-0930
Chaelin Yeon (chyeon@kopri.re.kr); +82 10-3007-4825

Virtual Zoom meeting:

https://us06web.zoom.us/j/82435490298?pwd=CKrWpBrEmDobTbs43BNjTHNGW8cC49.1
Meeting ID: 824 3549 0298
Password: 046969

The **8th Distributed Biological Observatory (DBO) data workshop** will highlight DBO field results from ship-based samples and moorings, remote sensing results, modelling activities and archiving. Additional topics include DBO synthesis activities and products, the developing international Pan-Arctic network, and interactions with other Arctic programs.

KOPRI 극지연구소

Agenda

Tuesday November 4, 2025 (13:00-17:00 KST)

[13:30-14:00] **1. Welcome, Logistics and Workshop Objectives** - Jackie Grebmeier (UMCES)
- Overview of DBO and Agenda Review
- Introduction of participants: in person and online

[14:00-15:00] **2. Highlights of DBO data**

Physical oceanography and moorings

- Elucidating the circulation in Bering Strait: new features from high resolution hydrographic measurements – Robert Pickart (WHOI)
- Arctic Moorings and hydrography by Japan – Motoyo Itoh (JAMSTEC)
- The Siberian Arctic Ocean continues to unveil its hidden secrets – Igor Polyakov (UAF)
- A decade in the NE Chukchi: Perspectives from a pan-ecosystem moored observatory – Savannah Sandy (UAF)

[15:00-15:30] **Coffee Break and Group Photo**

[15:30-17:00] **2. Highlights (continued)**

Satellite observations, phytoplankton, and hydrography

- Satellite observations, phytoplankton, and hydrography by Japan – Amane Fujiwara (JAMSTEC; online)
- Marine carbonate chemistry: Publicly available data from the Distributed Biological Observatory – Natalie Monacci (UAF; recorded)
- A macronutrient time-series from the Distributed Biological Observatory – Lee Cooper (UMCES)
- Siberian-DBO: Monitoring Arctic Environmental Change – Jinyoung Jung (KOPRI)

[17:00] **End of Day 1**

Wednesday November 5, 2025 (9:00-15:00 KST)

[9:00-10:30] **2. Highlights (continued)**

Biological oceanography

- Assessing interannual variability of biological communities at DBO-8 in Amundsen Gulf, Canada – Michelle Kamula (DFO-MPO; online)
- Continuing studies on benthic prey for gray whales in the Pacific Arctic – Brian Marx (UMCES; online)
- Monitoring export fluxes to detect seasonal and interannual changes in the pelagic ecosystem of the northern Bering Sea (DBO1) – Catherine Lalande (KOPRI)
- Time series of benthic macrofaunal and environmental drivers within the Pacific DBO – Jackie Grebmeier (UMCES)

[10:30-11:00] **Coffee break**

[11:00-12:00] **2. Highlights (continued)**

- Size class distributions of the bivalves *Macoma calcarea* and *Serripes* spp. in the northern Bering Sea and the southeastern Chukchi Sea from 2015-2019 – Christina Goethel (UMCES)

3. Modeling efforts within the DBO

- A forecast system using FVCOM-CICE-SWAN model in the Arctic - Jia Wang (NOAA)
- DARWIN and ADS - Motoyo Itoh/Amane Fujiwara (JAMSTEC)

4. Data access and management

- US Arctic Data Center – Jackie Grebmeier (UMCES)
- Open plenary discussion on data access, protocols and data exchange
- Others?

[12:00-13:30] **Lunch (hosted by KOPRI)**

[13:30-14:45] **5. Open discussion period for DBO future direction, field sampling and modeling**

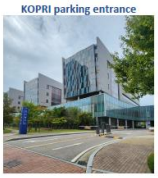
[14:45-15:00] **6. Upcoming relevant DBO meetings**
- ASLO Ocean Sciences Meeting, Glasgow, Scotland, February 2026
- ASSW26 Aarhus, Denmark: PAG 2026 Spring meeting + Pan-Arctic DBO community workshop, March 2026

[15:00] **End of DBO workshop**

Meeting venue map

The cafeteria building is accessible from outside (shuttle drop-off near parking entrance)

KOPRI parking entrance



Cafeteria building

Sejong seminar room – 2nd floor

Appendix 2 – Meeting Participants

Participant Name	Affiliation
Ahra Mo	KOPRI (Korea Polar Research Institute)
Amane Fujiwara	JAMSTEC (Japan Agency for Marine-Earth Science and Technology)
Bill Williams	Fisheries and Oceans Canada (DFO-MPO)
Bob Pickart	WHOI (Woods Hole Oceanographic Institution)
Brian Marx	UMCES/CBL (University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory)
Catherine Lalande	KOPRI
Christina Goethel	UMCES/CBL
Diana Varela	University of Victoria
Dongseon Kim	KIOST (Korea Institute of Ocean Science and Technology)
Eiji Watanabe	JAMSTEC
Eun Jin Yang	KOPRI
Hajo Eicken	UAF (University of Alaska Fairbanks)
Hejun Kong	KOPRI
Hojung Kim	Kyungpook National University
Hyeju Yoo	KOPRI
Jackie Grebmeier	UMCES
Jaeho Choi	KOPRI
Jaeil Yoo	KOPRI
Jaesoon Kim	PKNU (Pukyong National University)
JeeHoon Kim	KOPRI
Jeong Hyun Kim	KOPRI
Jihoon Jeong	KOPRI
Jinsoo Son	Hanyang University
Jinyoung Jung	KOPRI
Jisoo Park	KOPRI
Jiu Kim	PKNU
Jongkuk Moon	KOPRI

Participant Name	Affiliation
Joo Eun Yoon	KOPRI
Jørgen Berge	UiT (The Arctic University of Norway)
Juyoung Kim	KOPRI
Keyhoung Park	KOPRI
Kyeong-Ho Cho	KOPRI
Kyung-Hoon Shin	Hanyang University
Lee Cooper	UMCES
Michelle Kamula	DFO-MPO
Mihae Jeon	KOPRI
Minkyoung Kim	Kyungpook National University
Monika Kędra	IOPAN (Institute of Oceanology Polish Academy of Sciences)
Motoyo Itoh	JAMSTEC
Natalie Monacci	UAF
Peigen Lin	Shanghai Jiao Tong University
Sang Heon Lee	Pusan National University
Savannah Sandy	UAF
Seong-Ho Kang	KOPRI
Shigeto Nishino	JAMSTEC
Sue Moore	University of Washington
Taejin Kim	PKNU
Taewook Park	KOPRI
Takashi Kikuchi	JAMSTEC
Xi Zhao	Sun Yat-sen University
Youngju Lee	KOPRI
Yuri Fukai	JAMSTEC
Zhixuan Feng	East China Normal University