

# The 36th International Symposium on the Okhotsk Sea & Polar Oceans

English



*Poles in front of Sea Ice Museum.*

*Red poles represent increasing temperature and blue poles represent decreasing sea-ice period, which show the recent global warming. Photo by Shuhei Takahashi*

**21-23 February 2022**

**Mombetsu Citizens' Public Hall  
Okhotsk Sea Ice Museum of Hokkaido  
Mombetsu Municipal Museum  
Arctic Research Center, Hokkaido University**

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## PURPOSE OF SYMPOSIUM

*Sea ice covers 10% of the earth's oceans, which produces dynamic cycles in the atmosphere and in the oceans as a major factor in the global heat balance.*

*The Sea of Okhotsk is the lowest latitude freezing sea in the world, and the coast of Hokkaido is the southern limit of sea ice in the Northern Hemisphere. Every winter, 60-70% of the Sea of Okhotsk is covered with sea ice, which has both merits and demerits in human lives.*

*Furthermore, the sea ice extent in the Arctic Ocean has decreased rapidly due to the recent global warming, which is a serious environmental problem. On the other hand, the opening of the "Arctic Sea Routes" between the Pacific Ocean and Europe has become a new subject.*

*For these reasons, sea ice deeply relates to the global environment and also to human activities such as fisheries, agriculture, and industry. Our Symposium will cover a variety of topics of the latest sea ice researches, global warming, environment change in polar regions, biology and fisheries, Arctic Sea Routes, and many subjects in the Okhotsk region.*

*The International Symposium on Okhotsk Sea & Polar Oceans has been held every year in Mombetsu since 1986, and has counted 35 times in 2020. In 2021, the Symposium was canceled due to the new coronavirus. However, in 2022, we can hold the online academic sessions as the 36th Symposium. We hope that many participants will have fruitful discussions at this Symposium.*

### Organized by

- ◆ City of Mombetsu
- ◆ Symposium Committee

### Organized and Sponsored by

- OSPORA
- Arctic Research Center, Hokkaido University (ARC)
- Japan Arctic Research Network Center (J-ARC Net)
- Institute of Low Temperature Science, Hokkaido University (ILTS)
- Graduate School of Fisheries Sciences, Hokkaido University
- Field Science Center for Northern Biosphere, Hokkaido University
- Kitami Institute of Technology (KIT)
- Tokyo University of Agriculture, Faculty of Bioindustry
- Tokai University, Sapporo Campus
- Atmosphere and Ocean Research Institute, the University of Tokyo (AORI)
- Tokyo University of Marine Science and Technology
- Fisheries Resources Institute, Japan Fisheries Research and Education Agency
- National Institute of Polar Research (NIPR)
- Japan Consortium for Arctic Environmental Research (JCAR)
- City of Mombetsu

### International Advisory Committee

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- Hiroyuki Enomoto, National Institute of Polar Research, Japan
- Katsushi Iwamoto, City of Mombetsu, Japan
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- Shuhei Takahashi, Prof. Emer., Kitami Institute of Technology, Japan
- Masato Tanaka, Hokkaido University, Japan
- Kazutaka Tateyama, Kitami Institute of Technology, Japan
- Hajime Yamaguchi, National Institute of Polar Research, Japan

(Alphabetical order)

## Online Academic Sessions

Japan Arctic Research Network Center, Hokkaido University and Okhotsk Sea Ice Museum

**Monday 21 Feb. 2022**

**Room 1**

**9:00-9:10 Opening Session**

※ simultaneous interpretation

Opening Address Shuhei Takahashi (Chair of the Symposium Committee)  
Manabu Fukui (Institute of Low Temperature Science, Hokkaido University)

**9:10-12:00 KEY NOTE SPEECH K :**

※ simultaneous interpretation

- 9:10- 9:50 **K-1** Okhotsk Sea marine mammals face challenges of the 21st century  
Olga V. Shpak (Severtsov Institute of Ecology and Evolution, RAS, Russia)
- 9:50-10:30 **K-2** SmartICE: A social enterprise partnership with indigenous communities to mitigate ice travel risks  
Trevor Bell (Memorial University of Newfoundland, Canada)
- 10:40-11:20 **K-3** The cutting edge of Arctic international collaborative research -Changes in the northern snow and ice  
Hiroyuki Enomoto (National Institute of Polar Research)
- 11:20-12:00 **K-4** Promotion of polar oceans research to contribute to the UN Decade of Ocean Science (2021-2030)  
Yutaka Michida (The University of Tokyo)

**13:00-17:50 Workshop A : Sea ice, Wave, and Ocean Observation for Safe Navigation in the Arctic Ocean**

**Monday 21 Feb. 2022**

**Room 2**

**15:00-17:10 Scientific Session B : Snow, Ice and Human Life**

**Tuesday 22 Feb. 2022**

**Room 1**

**8:40-12:30 Workshop C : Sustainable Arctic Sea Routes in a Rapidly Changing Environment**

**13:30-18:15 Workshop D : Activities to Promote Collaborative Research for Social Implementation with Industry-Government-Academia Collaboration on the Arctic Region Supported by J-ARC Net**

**Tuesday 22 Feb. 2022**

**Room 2**

**13:30-18:10 Scientific Session E : Marine Biology and Fisheries in the Ice-Covered Waters**

**9:00-10:20 Scientific Session F : Freshwater Discharge**

**10:30-11:50 Scientific Session G : Climate Change**

**13:00-14:00 Scientific Session H : Okhotsk Sea**

**14:10-15:10 Scientific Session I : Remote Sensing**

**15:20-16:40 Scientific Session J : Engineering**

**16:40-17:00 Closing Session**

Closing Address Shuhei Takahashi (Chair of the Symposium Committee)  
Natsuhiko Otsuka (Arctic Research Center, Hokkaido University)

## **Public Program**

**Mombetsu Citizens' Public Hall, Mombetsu Municipal Museum and Okhotsk Sea Ice Museum**

### **Public Program - Poster Session**

Date: Friday 11 Feb. to Monday 28 Feb.

Place: Mombetsu Municipal Museum, Okhotsk Sea Ice Museum of Hokkaido

Exhibition Theme:

- Symposium for Public Education: Presentations by Junior-High School Students
- Okhotsk Marine Environment Conservation Seminar
- Forum of Oil Pollution Measures and Environmental Protection
- Our Home: Okhotsk Sea
- Symposium on the Forest-Ocean Linkage
- How Do We Act at Heavy Snowstorm in Okhotsk Area?
- Marine Information Provision

### **Symposium on Sea Ice for Children**

Lecture on Demand: Sea of Okhotsk and Sea Ice

Shuhei Takahashi (Sea Ice Museum of Hokkaido)

Movie: Our Future -Ministry of the Environment "Save the Earth in Glass!" Project

Date: Tuesday 15 Feb. - Friday 18 Feb.

Places: Elementary Schools of Kamishokotsu, Minamigaoka, Saruru, Shiomi and Mombetsu

### **Okhotsk Terroir Symposium 2022 in Mombetsu -HARU Forum-**

Exploring the origin of sustainability in Okhotsk and the creation of a system

Date: Thursday 24 Feb., 13:00-17:00

Place: Mombetsu Citizens' Public Hall

### **Sponsorship Event : Drift-ice Textile Exhibition**

Date: Friday 11 Feb. - Monday 28 Feb.

Place : Okhotsk Sea Ice Museum of Hokkaido

**Monday 21 Feb. 2022**
**Room 1**

9:00	<b>【Opening Session】</b> Chair, Seiji Katakura (City of Mombetsu) ※ simultaneous interpretation Opening Address Shuhei Takahashi (Chair of the Symposium Committee) Manabu Fukui (Institute of Low Temperature Science, Hokkaido University)
9:10	<b>【K: Key Note Speech】</b> Chair, Shuhei Takahashi (Okhotsk Sea Ice Museum) ※ simultaneous interpretation <b>K-1</b> Okhotsk Sea marine mammals face challenges of the 21st century (simultaneous interpretation) Olga V. Shpak (Severtsov Institute of Ecology and Evolution, RAS, Russia)
9:50	<b>K-2</b> SmartICE: A social enterprise partnership with indigenous communities to mitigate ice travel risks Trevor Bell (Memorial University of Newfoundland, Canada)
10:30	Break
10:40	Chair, Masato Tanaka (Hokkaido Univ.) <b>K-3</b> The cutting edge of Arctic international collaborative research -Changes in the northern snow and ice Hiroyuki Enomoto (National Institute of Polar Research)
11:20	<b>K-4</b> Promotion of polar oceans research to contribute to the UN Decade of Ocean Science (2021-2030) Yutaka Michida (The University of Tokyo)
12:00	Lunch
13:00	<b>【A: Workshop, Sea ice, Wave, and Ocean Observation for Safe Navigation in the Arctic Ocean】</b>

**Monday 21 Feb. 2022**
**Room 2**

15:00	<b>【B : Snow, Ice and Human Life】</b> Chair, Shuhei Takahashi (Okhotsk Sea Ice Museum) <b>B-1</b> Examining the factors influencing air pollution in the extractive and energy industries in the sparsely populated regions of Russian Arctic ○Nadezhda Krasilnikova (Arctic Scientific Res. Centre, Russia), Iolanda Ialongo (Finnish Meteorological Inst., Finland), Daria Gritsenko (Helsinki Univ., Finland), Tuyara Gavriilyeva (Federal Res. Centre, Russia) and Henrik Virta (Finnish Meteorological Inst., Finland)
15:20	<b>B-2</b> Microplastics study in the Sea of Okhotsk and Arctic seas of Russia ○Alexandra Ershova, Tatjana Eremina and Irina Makeeva (Russian State Hydrometeorological Univ., Russia)
15:40	<b>B-3</b> International Students and Cold Regions: One of attraction that connect Japan and the world -Trend of international students when choosing “Cold Region” as destination for studying abroad- ○Kei Horio, Muhammad Haziq Aiman Bin Mohd Hazbauni (Utsunomiya Univ.) and Asyraf Bin Su Azmi
16:00	Break
16:10	<b>B-4</b> Weather around the Sea of Okhotsk analyzed from documents in the mid-19th century and climate change at that time ○Yoshio Tagami, Gaston R. Demarée (Royal Meteorological Inst. Belgium, Belgium), Takehiko Mikami (Tokyo Metropolitan Univ.) and Togo Tsukahara (Kobe Univ.)
16:30	<b>B-5</b> Winter/spring climatic changes in Northern Japan during 1705-1860 reconstructed from snowfall rates and lake-freezing records ○Takehiko Mikami (Tokyo Metropolitan Univ.), Naoko Hasegawa (Ochanomizu Univ.), Junpei Hirano (Teikyo Univ.) and Bruce Batten (Inter-Univ. Center for Japanese Language Studies)
16:50	<b>B-6</b> A meteorological manuscript for Labrador/Nunatsiavut concerning May 1872-June 1873 found in Moravian Missionary Records ○Gaston R. Demarée (Royal Meteorological Inst. Belgium, Belgium), Thea Olsthoorn (Nijmegen, Netherlands), Pascal Mailier (Royal Meteorological Inst. Belgium, Belgium) and Astrid E. J. Ogilvie (Stefansson Arctic Inst., Iceland/Univ. Colorado, USA)

	<b>[A: Workshop, Sea ice, Wave, and Ocean Observation for Safe Navigation in the Arctic Ocean]</b> Chair, Tsubasa Kodaira (Univ. Tokyo)
13:00	<b>A-1</b> Resent change of sea-ice age distribution in the Arctic ○Noriaki Kimura, Hiroyasu Hasumi (Univ. Tokyo), Motomu Oyama and Hajime Yamaguchi (NIPR)
13:20	<b>A-2</b> Radar observation of sea-ice and waves in a controlled laboratory environment ○Takuji Waseda (Univ. Tokyo/JAMSTC), Takatoshi Matsuzawa (Natl. Mar. Res. Inst.), Kazutaka Tateyama (Kitami Inst. Tech.), Tsubasa Kodaira, Yasushi Fujiwara, Tomotaka Katsuno, Takehiko Nose, Keita Nishizawa, Koya Sato and Ryosuke Uchiyama (Univ. Tokyo)
13:40	<b>A-3</b> Analysis on long-term trend of vessel icing predictor in the Arctic Ocean and measurement of sea spray and waves on R/V Mirai ○Ryosuke Uchiyama (Univ. Tokyo), Takuji Waseda (Univ. Tokyo/JAMSTC), Toshihiro Ozeki (Hokkaido Univ. Educ. Sapporo), Tsubasa Kodaira, Yasushi Fujiwara (Univ. Tokyo) and Hajime Yamaguchi (NIPR)
14:00	<b>A-4</b> Lagrangian observation of sea ice drift ○Yasushi Fujiwara, Tsubasa Kodaira (Univ. Tokyo), Takuji Waseda (Univ. Tokyo/JAMSTEC), Takehiko Nose, Keita Nishizawa and Ryosuke Uchiyama (Univ. Tokyo)
14:20	Break
	Chair, Takuji Waseda (Univ. Tokyo)
14:25	<b>A-5</b> Interannual variation of sea ice concentration over the Canada Basin ○Tsubasa Kodaira (Univ. Tokyo), Takuji Waseda (Univ. Tokyo/JAMSTEC), Takehiko Nose and Yasushi Fujiwara (Univ. Tokyo)
14:45	<b>A-6</b> Coupled model for simulating the interaction of wave and ice particles ○Zijing Jin (Univ. Tokyo), Takuji Waseda (Univ. Tokyo/JAMSTEC), Yasushi Fujiwara and Tomotaka Katsuno (Univ. Tokyo)
15:05	<b>A-7</b> Observation and model comparison of surface ocean waves in the Laptev Sea ○Takehiko Nose (Univ. Tokyo), Jean Rabault (Norwegian Meteorological Inst., Norway), Takuji Waseda (Univ. Tokyo/JAMSTEC), Tsubasa Kodaira, Tomotaka Katsuno, Naoya Kanna (Univ. Tokyo), Kazutaka Tateyama (Kitami Inst. Tech.), Joey Voermans (Univ. Melbourne, Australia) and Tatiana Alekseeva (Arctic Antarctic Res. Inst., Russia)
15:25	<b>A-8</b> Sea ice observation using a portable and satelliteborne passive microwave radiometers in 2021 NABOS expedition ○Kazutaka Tateyama (Kitami Inst. Tech.), Anna Timofeeva (Arctic Antarctic Res. Inst., Russia), Naoya Kanna, Takuji Waseda (Univ. Tokyo) and Hiroyuki Enomoto (NIPR)
15:45	<b>A-9</b> Peculiarities of using the data of sea ice concentration derived from satellite microwave radiometry for navigational tasks ○Tatiana Alekseeva, Julia Sokolova, Ekaterina Afanasyeva (Arctic Antarctic Res. Inst., Russia/Space Res. Inst. RAS, Russia), Vasily Tikhonov (Space Res. Inst., RAS, Russia/Inst. Water Environ. Problems, RAS, Russia), Mikhail Raev (Space Res. Inst., RAS, Russia), Takuji Waseda, Takehiko Nose (Univ. Tokyo) and Eugeny Sharkov (Space Res. Inst., RAS, Russia)
16:05	Break
	Chair, Tatiana Alekseeva (Arctic Antarctic Res. Inst./Space Res. Inst., Russia)
16:10	<b>A-10</b> Recent conditions of ice navigation in the Tatar Strait of the Sea of Japan ○Evgeniya Pavlova, Evgeniy Grishin, Tatiana Alekseeva and Evgeniy Mironov (Arctic Antarctic Res. Inst., Russia)
16:30	<b>A-11</b> The results of the specialized ice observations in the Arctic Basin during autumn season in 2021 ○Anna Timofeeva (Arctic Antarctic Res. Inst., Russia), Kazutaka Tateyama (Kitami Inst. Tech.) and Naoya Kanna (Univ. Tokyo)
16:50	<b>A-12</b> Dependence of the parameters of the Ob-Yenisei flaw polynya of the Kara Sea on meteorological conditions ○Evgeniya Pavlova, Alexander Yulin and Valentina Kashkova (Arctic Antarctic Res. Inst., Russia)
17:10	<b>A-13</b> Stochastic simulation of sea ice cover morphometry by the method of discrete elements ○Nina A. Krupina, Polina V. Maksimova and Anna V. Savitskaya (Arctic Antarctic Res. Inst., Russia)
17:30	<b>A-14</b> Analysis of ice conditions along the Northern Sea Route ultra-late transit navigations in winter 2020-2021 ○Alina A. Petrova (Arctic Antarctic Res. Inst. Russia/St. Petersburg State Univ., Russia) Yu. V. Sokolova, T. A. Alekseeva (Arctic Antarctic Res. Inst. Russia/Space Res. Inst., Russia) and Ye. A. Grishin (Arctic Antarctic Res. Inst., Russia)

<b>[ C : Workshop, Sustainable Arctic Sea Routes in a Rapidly Changing Environment ]</b>	
Chair, Akihisa Konno (Kogakuin Univ.)	
8:40	<b>C-1</b> Comparison of sea ice thickness estimated from GCOM-W/AMSR2 and SMOS/MIRAS ○Kazutaka Tateyama, Yurika Watanabe, Naoto Shoji (Kitami Inst. Tech.), Akihisa Konno (Kogakuin Univ.), Genki Sagawa (Weathernews Inc.), Koh Izumiyama (Hokkaido Univ.), Seita Hoshino (JAXA), Soichiro Kubo, Takumi Hashimoto (Kogakuin Univ.) and Kosuke Kawamura (Kitami Inst. Tech.)
9:00	<b>C-2</b> Improvement of estimating sea ice thickness using AMSR2 data for Arctic first-year ice ○Yurika Watanabe, Kazutaka Tateyama, Naoto Shoji (Kitami Inst. Tech.), Akihisa Konno (Kogakuin Univ.), Genki Sagawa (Weathernews Inc.), Koh Izumiyama (Hokkaido Univ.), Seita Hoshino (JAXA), Soichiro Kubo, Takumi Hashimoto (Kogakuin Univ.) and Kosuke Kawamura (Kitami Inst. Tech.)
9:20	<b>C-3</b> Improvement of sea ice thickness measurement method using the shipborne Electro-Magnetic Inductive device ○Kosuke Kawamura and Kazutaka Tateyama (Kitami Inst. Tech.)
9:40	<b>C-4</b> Recent sea ice changes observed from Beaufort Gyre Exploration Project ice draft and drift velocity datasets ○Koh Izumiyama (Hokkaido Univ.)
10:00	<b>C-5</b> Numerical study on the relationship between ship route and ice resistance in ice-covered water ○Junji Sawamura and Ryota Kobayashi (Osaka Univ.)
10:20	Break
Chair, Takatoshi Matsuzawa (Natl. Mar. Res. Inst.)	
10:30	<b>C-6</b> Effect of ship bow shape to brash ice channel resistance: A preliminary study ○Taiki Tokudome and Akihisa Konno (Kogakuin Univ.)
10:50	<b>C-7</b> Laboratory experiment of spray icing using urea-doped water -Shape and amount of icing on cylindrical specimen with different diameters- ○Toshihiro Ozeki (Hokkaido Univ. Educ. Sapporo), Takatoshi Matsuzawa (Natl. Mar. Res. Inst.), Satoru Adachi (Snow Ice Res. Ctr.), Taiki Tokudome (Kogakuin Univ.), Taiki Nunokawa (Hokkaido Univ. Educ. Sapporo/Yukiken Snow Eaters Co. Ltd.), Yuta Matsuda (Hokkaido Univ. Educ. Sapporo) and Akihisa Konno (Kogakuin Univ.)
11:10	<b>C-8</b> A preliminary assessment of oil-spill response methods in the Arctic coastal area ○Takatoshi Matsuzawa (Natl. Mar. Res. Inst.), Akihisa Konno, Takumi Sugaya (Kogakuin Univ.) and Motomu Oyama (Kogakuin Univ./NIPR)
11:30	<b>C-9</b> Toward the application of particle advection diffusion analysis method for simulating oil spill in the ice-infested water ○Akihisa Konno, Takumi Sugaya (Kogakuin Univ.), Motomu Oyama (Kogakuin Univ./NIPR) and Takatoshi Matsuzawa (Natl. Mar. Res. Inst.)
11:50	<b>C-10</b> Medium-term Arctic sea ice forecast conducted by the Arctic Sea Ice Information Center in 2021 ○Motomu Oyama, Hajime Yamaguchi (NIPR) and Noriaki Kimura (Univ. Tokyo)
12:10	<b>C-11</b> Feasibility of Northern Sea Route by using a global maritime container shipping simulation model ○Ryuichi Shibasaki, Sota Aoyagi, Naoki Kosuge, Keigo Shibuya, Kosuke Shiga and Chathumi Ayanthi Kavirathna (Univ. Tokyo)
12:30	Lunch
13:30	<b>[ D : Workshop, Activities to Promote Collaborative Research for Social Implementation with Industry-Government-Academia Collaboration on the Arctic Region Supported by J-ARC Net ]</b>

	<p><b>[D : Workshop, Activities to Promote Collaborative Research for Social Implementation with Industry-Government-Academia Collaboration on the Arctic Region Supported by J-ARC Net]</b> Chair, Shotaro Uto (Hokkaido Univ.)</p>
13:30	<p><b>D-1</b> Activities to promote industry-government-academia collaborative research on the Arctic region supported by Japan Arctic Research Network Center (J-ARC Net) ○Masato Tanaka, Natsuhiko Otsuka and Yasushi Fukamachi (Hokkaido Univ.)</p>
	<p><b>「PART-1 Observation」</b></p>
13:55	<p><b>D-2</b> Toward sustainable meteorological profiling using an inexpensive Unmanned Aircraft Systems in polar regions ○Kazutoshi Sato (Kitami Inst. Tech.) and Jun Inoue (NIPR/SOKENDAI)</p>
14:15	<p><b>D-3</b> Pack ice observations by UAV and Sentinel-2 Satellite ○Kanichiro Matsumura (Tokyo Univ. Agriculture), Stanley Anak Suab and Ram Avtar (Hokkaido Univ.)</p>
14:35	<p><b>D-4</b> Study on characteristics of zooplankton community in coastal water around Mombetsu during sea ice season ○Hiromi Kasai (Japan Fish. Res. Educ. Agcy.), Seiji Katakura (City of Mombetsu), Tomoyasu Yamazaki (Shellfish Museum Rankoshi), Katsunori Kimoto (JAMSTEC), Junya Hirai (Univ. Tokyo), Kohei Matsuno and Atsushi Yamaguchi (Hokkaido Univ.)</p>
14:55	<p>Break</p>
15:05	<p><b>D-5</b> Consequences of wildfires in boreal forests underlain by ice-rich permafrost near Batagay, NE Siberia ○Go Iwahana (Hokkaido Univ./Univ. Alaska, USA), Kazuki Yanagiya, Masato Furuya (Hokkaido Univ.), Petr Danilov (Nort-Eastern Federal Univ., Russia), Nikolai Fedorov (Yakutsk Permafrost Inst, Russia), Takahiro Abe (Mie Univ.), Takumi Kawamura (Iwata Chizaki Inc.), Syunji Kanie (Hokkaido Univ.), Yoshihiro Iijima (Mie Univ.), Takeo Tadono (JAXA), Alexey Desyatkin (Yakutsk Permafrost Inst., Russia/Inst. Biological Problems Cryolithozone, Russia) and Alexander Fedorov (Yakutsk Permafrost Inst., Russia)</p>
15:25	<p><b>D-6</b> Arctic Marine Plastic Pollution -Lectures and discussion meetings on the marine plastic- ○Naoki Nakazawa (Syst. Eng. Assoc., Inc.), Satoshi Akagawa (Cryosphere Eng. Lab.), Shinsuke Iwasaki (Civil Eng. Res. Inst. Cold Region), Atsumi Kataishi (Chuo Univ.), Shunji Kanie (Hokkaido Univ.), Shinji Kioka (Civil Eng. Res. Inst. Cold Region), Yuji Kodama (Hokkaido Univ.), Tomoe Komoriya (Nihon Univ.), Takahiro Takeuchi (Hachinohe Inst. Tech.), Masato Tanaka (Hokkaido Univ.), Shinya Nishio (Nihon Univ.), Hotaek Park (JAMSTEC), Hironori Yabuki (NIPR) and Kenji Yamasaki (US Army Corps of Engineers, USA)</p>
	<p><b>「PART-2 Engineering」</b> Chair, Masato Tanaka (Hokkaido Univ.)</p>
15:45	<p><b>D-7</b> Needs for technical research on the Arctic region/Seeds analysis and matching study meeting report ○Akira Kurokawa (Eng. Adv. Assoc. Japan), Hajime Yamaguchi (NIPR), Kazuma Nakamizo (Mitsubishi Shipbldg. Co., Ltd.), Satoru Fukuba (Japan Mar. United Corp.), Toshihide Kuwagaki (INPEX Corp.), Takao Kashiwagi (Mitsui O.S.K. Lines Ltd.), Hajime Yoshida (Zeni Lite Buoy Ltd.), Eisuke Akane (JAMSTEC), Yuji Kodama (Hokkaido Univ), Hironori Yabuki (NIPR), Masato Tanaka, Yasushi Fukamachi (Hokkaido Univ), Takashi Kikuchi (JAMSTEC), Tetsuya Nakamura (NiGK Corp.), Masahiro Mikami (Fieldpro, Inc.), Koichi Goto (KANSO Technos Co., Ltd.), Genki Sagawa (Weathernews Inc.), Hidefumi Yatomi (Cubic-i Ltd.) and Yu Houraku (PASCO Corp.)</p>
16:05	<p><b>D-8</b> Evaluation of ship resistance in ice regime using ice chart ○Shotaro Uto and Takenobu Toyota (Hokkaido Univ.)</p>
16:25	<p>Break</p>
	<p><b>「PART-3 Utilization」</b></p>
16:35	<p><b>D-9</b> Trans-Arctic submarine fiber-optic cables: Recent developments and future prospects ○Juha Saunavaara (Hokkaido Univ.)</p>
16:55	<p><b>D-10</b> Research exchange between Japan and Finland on data centers in the cold climate region ○Taro Mori and Juha Saunavaara (Hokkaido Univ.)</p>
17:15	<p><b>D-11</b> Prospects for sustainable development of the cruise industry in the Pacific Arctic: Outcomes of the Japan-Russia online workshop held on 8-9 December 2021 ○Marina Lomaeva, Juha Saunavaara and Masato Tanaka (Hokkaido Univ.)</p>
17:35	<p><b>D-12</b> Breaking the ice as a tourist experience: Local initiatives facing global challenges ○Juha Saunavaara (Hokkaido Univ.), Mari Partanen (JAMK Univ. Applied Sci., Finland /Univ. Oulu, Finland), Takafumi Fukuyama and Masato Tanaka (Hokkaido Univ.)</p>
17:55	<p><b>D-13</b> Extracting issues for appropriate Arctic tourism development concerning community resilience ○Takafumi Fukuyama, Hirofumi Ueda, Noriaki Nishiyama, Hidetoshi Kobayashi, Mayumi Okada, Masato Tanaka, Fujio Ohnishi, Juha Saunavaara, Taro Mori, Tomoe Kato (Hokkaido Univ.), Shuhei Takahashi (Okhotsk Sea Ice Museum) and Shunwa Honda (Open Univ. Japan)</p>



[ E : Marine Biology and Fisheries in the Ice-Covered Waters ]	
13:30	<p><b>E-1</b> Temporal variation of oceanographic environment in coastal region around Mombetsu, southwestern Okhotsk Sea, in winter -Results from the surveys during sea-ice season by the Garinko-II                      ○Hiromi Kasai (Japan Fish. Res. Educ. Agcy.), Katsushi Iwamoto, Seiji Katakura (City of Mombetsu), Katsushi Murai, Ryuichi Nagata (Okhotsk Garinko Tower Co., Ltd.) and Soushi Hamaoka (City of Mombetsu)</p> <p style="text-align: right;">Chair, Satoru Taguchi (NIPR)</p>
13:50	<p><b>E-2</b> Responses of phytoplankton assemblages to nutrient availability during summer bloom in Akkeshi Bay                      ○Uki Kawata, Tomonori Isada (Hokkaido Univ.), Yukiko Taniuchi (Japan Fish. Res. Educ. Agcy.), Takeshi Yoshimura, Koji Suzuki (Hokkaido Univ.) and Hiromi Kasai (Japan Fish. Res. Educ. Agcy.)</p>
14:10	<p><b>E-3</b> Time-series monitoring by metabarcoding revealed clear seasonal changes in eukaryote biodiversity based on the transition of current systems in Mombetsu, Hokkaido, Japan                      ○Satoshi Nagai (Natl. Res. Inst. Fish. Sci.), Sirje Sildever (Tallinn Univ. Techn., Estonia), Noriko Nishi, Satoshi Tazawa (AXIOHELIX Co. Ltd.), Hiromi Kasai (Natl. Res. Inst. Fish. Sci.), Akihiro Shiimoto (Tokyo Univ. Agriculture) Taisei Kikuchi (Univ. Miyazaki) and Seiji Katakura (City of Mombetsu)</p>
14:30	<p><b>E-4</b> Plankton communities of inshore area of southeastern Sakhalin (Sea of Okhotsk)                      -Plankton of southeastern Sakhalin-                      ○Olga Mukhametova, Inga Atamanova, Irina Motylkova and Natalia Konovalova (SakhNIRO, Russia)</p>
14:50	<p>Break</p>
15:00	<p style="text-align: right;">Chair, Satoshi Nagai (Natl. Res. Inst. Fish. Sci.)</p> <p><b>E-5</b> Vertical distribution, standing stocks, and taxonomic accounts of the entire plankton community, and the estimation of vertical material flux via faecal pellets in the southern Okhotsk Sea                      Daiki Kojima, Yusuke Hamao, Kohei Matsuno and ○Atsushi Yamaguchi (Hokkaido Univ.)</p>
15:20	<p><b>E-6</b> Ecological dynamics of marine copepods and viruses in the Okhotsk Sea                      ○Junya Hirai (Univ Tokyo), Seiji Katakura (City of Mombetsu) and Satoshi Nagai (Japan Fish. Res. Educ. Agcy.)</p>
15:40	<p><b>E-7</b> Euthecosomatous pteropod (Sea butterfly) <i>Limacina helicina</i> in the southern Okhotsk Sea: Morphological variability and plasticity to ocean environmental changes                      ○Katsunori Kimoto (JAMSTEC), Keisuke Shimizu (Univ. Tokyo), Masahide Wakita (JAMSTEC), Kiminori Shitashima (Tokyo Univ. Mar. Sci. Tech.), Atsushi Yamaguchi, Kohei Matsuno (Hokkaido Univ.), Hiromi Kasai (Japan Fish. Res. Educ. Agcy.), Hitomi Yoshida (Okhotsk Garinkotower Co., Ltd.) and Seiji Katakura (City of Mombetsu)</p>
16:00	<p><b>E-8</b> Quantification of species-specific biogenic silica flux of radiolarians (Rhizaria) in the western Arctic Ocean using microfocuss X-ray computed tomography                      ○Takahito Ikenoue, Katsunori Kimoto, Yuriko Nakamura (JAMSTEC), Kjell R. Bjørklund (Univ. Oslo, Norway), Naoki Kuramoto, Masaaki Ueki, Yuichi Ota (Natl. Inst. Adv. Ind. Sci. Tech.), Jonaotaro Onodera, Naomi Harada, Makio C. Honda, Miyako Sato, Eiji Watanabe, Motoyo Itoh, Shigeto Nishino and Takashi Kikuchi (JAMSTEC)</p>
16:20	<p>Break</p>
16:30	<p style="text-align: right;">Chair, Yoshitaka Sasaki (Salmon Freshwater Fish. Res. Inst.)</p> <p><b>E-9</b> Detection of fish environmental DNA from under-ice water and sea ice in Saroma-ko Lagoon, Hokkaido, Japan                      ○Tatsuya Kawakami, Makoto Ozaki (Hokkaido Univ.), Aya Yamazaki (Kyoto Univ.), Daiki Nomura and Akihide Kasai (Hokkaido Univ.)</p>
16:50	<p><b>E-10</b> Distribution of Russian catches of walleye pollock in the Sea of Okhotsk in connection with Lagrangian water properties -Catches and Lagrangian water properties-                      ○Vladimir Kulik (TINRO-Center, Russia), Maxim Budyansky (V.I.II'ichev Pacific Oceanological Inst., Russia), Kirill Kivva (Russian Federal Res. Inst. Fish. Oceanography, Russia), Michael Uleysky and Sergey Prants (V.I.II'ichev Pacific Oceanological Inst., Russia)</p>
17:10	<p><b>E-11</b> Global seafood marketing amid the coronavirus pandemic by FAO GLOBEFISH market reports in 2020 and 2021                      ○Ikutaro Shimizu (Hokkaido Salmon Distribution Econ. Inst.)</p>
17:30	<p><b>E-12</b> Distribution of black-eared kites in relation to river scale                      ○Kei Matsumoto (Kitami Inst. Tech.)</p>
17:50	<p><b>E-13</b> Khairusova-Belogolovaya estuary (Kamchatka, Russia) -one of the main stopovers of EAAF for the long-distance wader migrants on the southward migration                      ○Dmitry Dorofeev and A. Ivanov (All-Russian Res. Inst. Environmental Protection, Russia)</p>

9:00	<b>【F : Freshwater Discharge】</b> <b>F-1</b> Estimation of freshwater discharge from the Gulf of Alaska drainage basins ○Peng Xin, Humio Mitsudera, Muqing Shi and Takayuki Shiraiwa (Hokkaido Univ.)	Chair, Yutaka Michida (Univ. Tokyo)
9:20	<b>F-2</b> Hydrological zoning of rivers in the Kamchatka Peninsula based on discharge and meteorological features ○Muqing Shi and Takayuki Shiraiwa (Hokkaido Univ.)	
9:40	<b>F-3</b> Estimation of freshwater discharge by using Acoustic Doppler Current Profilers in a tidal zone, Bekanbeushi River, Hokkaido ○Manhui Ding and Takayuki Shiraiwa (Hokkaido Univ.)	
10:00	<b>F-4</b> Changes of Geo-Runoff Components in Russian Arctic Rivers ○A. Georgiadi, E. Kashutina and I. Milyukova (Inst. Geography, RAS, Russia)	
10:20	Break	
10:30	<b>【G : Climate Change】</b> <b>G-1</b> Mechanism of warming of the ocean -“ENSO in Pacific Ocean”- ○Takao Nakajin (Tokai Univ.)	Chair, Takahiro Toyoda (Meteorological Res. Inst.)
10:50	<b>G-2</b> Atmospheric warming over the Barents Sea during moisture intrusion events in January 2006 ○Atsuyoshi Manda (Mie Univ.)	
11:10	<b>G-3</b> Impact of climate change on snow and lifestyle in winter Hokkaido, Japan ○Hiroaki Suzuki, Izumi Noguchi, Kazuhiro Hamahara and Takashi Yamaguchi (Res. Ins. Energy, Environment Geology)	
11:30	<b>G-4</b> Evaluation of the factors contributing to the mid-20th century Arctic cooling ○Takuro Aizawa (Meteorological Res. Inst./NIPR), Naga Oshima and Seiji Yukimoto (Meteorological Res. Inst.)	
12:00	Lunch	
13:00	<b>【H : Okhotsk Sea】</b> <b>H-1</b> Sea fog characteristics of the Okhotsk Sea ○Yuta Okochi, Chisato Mori and Ayato Yasukawa (Wakkanai Local Meteorological Office)	Chair, Kazutoshi Sato (Kitami Inst. Tech.)
13:20	<b>H-2</b> Shiretoko marine project on prediction of sea ice variations due to climate change, and its impacts on biogeochemical processes and marine ecosystems ○Humio Mitsudera (Hokkaido Univ.), Hiroaki Ueda (Tsukuba Univ.), Tomohiro Nakamura, Jun Nishioka, Orio Yamamura, Ritsu Saiki, Tomoki Usui (Hokkaido Univ.) and Takuya Nakanowatari (Japan Fish. Res. Educ. Agcy.)	
13:40	<b>H-3</b> Sea ice variability along the Okhotsk coast of Hokkaido based on long-term JMA meteorological observatory data ○Takahiro Toyoda, Yoshiteru Kitamura (Meteorological Res. Inst.), Ryohei Okada (Atmosphere Ocean Dept., JMA), Kanichiro Matsumura (Tokyo Univ. Agriculture), Kensuke K. Komatsu, Kei Sakamoto, L. Shogo Urakawa and Hideyuki Nakano (Meteorological Res. Inst.)	
14:00	Break	
14:10	<b>【I : Remote Sensing】</b> <b>I-1</b> Observations of ice cakes with a drone in the southern Sea of Okhotsk ○Takenobu Toyota, Yuriko Arihara (Hokkaido Univ.), Takuji Waseda (Univ. Tokyo), Masato Ito (NIPR) and Jun Nishioka (Hokkaido Univ.)	Chair, Kazutaka Tateyama (Kitami Inst. Tech.)
14:30	<b>I-2</b> Snowfall detection by a newly deployed X-band Doppler radar at Syowa Station, Antarctica ○Naohiko Hirasawa (NIPR/SOKENDAI), Hiroyuki Konishi (Osaka-Kyoiku Univ.), Yasushi Fujiyoshi (Prof. Emer. Hokkaido Univ.), Kazuhiro Shibata (NIPR) and Katsushi Iwamoto (City of Mombetsu)	
14:50	<b>I-3</b> Spatial heterogeneity of post-fire abrupt permafrost thaw detected by L-band InSAR and on-site observations at Batagay, Northeastern Siberia ○Kazuki Yanagiya, Masato Furuya (Hokkaido Univ.), Go Iwahana (Hokkaido Univ./Univ. Alaska, USA) and Petr Danilov (North-Eastern Federal Univ, Russia)	
15:10	Break	
15:20	<b>【J : Engineering】</b> <b>J-1</b> A case study: Development of water wave measurement systems under the self-made principle ○Vitaly Kuzin and Andrey Kurkin (Nizhny Novgorod State Tech. Univ. n.a. R.E. Alekseev, Russia)	Chair, Koh Izumiyama (Hokkaido Univ.)
15:40	<b>J-2</b> Use of GIMS -technology for diagnostics of the state of the Arctic aquasystem ○Ferdinand Mkrtychyan (Kotelnikov Inst. Radioengin. Electronics, Russia)	
16:00	<b>J-3</b> Main features of wind wave climate of the Japan, Okhotsk and Bering Seas ○Stanislav Myslenkov (Lomonosov Moscow State Univ., Russia)	
16:20	<b>J-4</b> Field observation and image analysis of the effects of river ice on concrete structures ○Takaaki Abe, Hiroshi Yokoyama and Hiroya Ogushi (Civil Engin. Res. Inst. Cold Region)	
16:40	<b>【Closing Session】</b> Closing Address Shuhei Takahashi (Chair of the Symposium Committee) Natsuhiko Otsuka (Arctic Res. Center, Hokkaido University)	Chair, Seiji Katakura (City of Mombetsu)



*Sea ice at Omusaro in Mombetsu (Feb. 25, 2003)  
Photo by Shuhei Takahashi*



*Crab Claw Monument*

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