

第36回北方圏国際シンポジウム オホーツク海と流氷

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



*Sea Ice Observation in the Sea of Okhotsk. Patrol Vessel Ice Breaker "Soya"
Photography Cooperation: Japan Coast Guard
Photo by Takenobu Toyota*

と き 2022年2月21日（月）～23日（水）
ところ 紋別市民会館 道立オホーツク流氷科学センター
紋別市立博物館 北海道大学北極域研究センター

21-23 February 2022

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

北方圏国際シンポジウム概略

開催趣旨

世界の海の10%を覆う流氷は、地球の熱的バランスの大きな要素として大気・海洋大循環の駆動力を生み出しています。オホーツク海は、世界で最も低緯度の凍る海で、流氷の南限です。毎冬、オホーツク海の60～70%は流氷野となり、私たちの生活にも功罪両面の働きをしています。さらに最近の地球温暖化の影響により北極海の水氷面積は急激に減少し、環境問題としては由々しき事態ですが、一方で太平洋と欧州を結ぶ「北極海航路」の開通が注目を集めています。

このように流氷は地球環境のみならず、水産業、農業、工業などの生産活動にも深く関わっています。シンポジウムでは、最新の海水研究から地球温暖化、環境問題、海洋生物、北極海航路、極地、オホーツク地域の諸問題まで様々な話題が取り上げられます。

北方圏国際シンポジウム「オホーツク海と流氷」は、1986年に第1回が開催されて以来、毎年紋別市で開かれ、2020年で35回を数えました。2021年は新型コロナウイルスのために学術分科会は中止になりましたが、2022年は第36回北方圏国際シンポジウムとしてオンライン学術分科会が開かれます。是非、多くの皆様がシンポジウムに参加して、実り多い討論と交流を深める機会になることを期待します。また「子ども流氷シンポジウム」や「市民公開講座」など市民向け行事は、出前授業、ポスター展示という形で開催します。

- 主 催 紋別市
- 共 催 北海道大学北極域研究センター 北極域研究共同推進拠点 (J-ARC Net)
- 主 管 北方圏国際シンポジウム実行委員会
- 後 援 国立極地研究所, 北見工業大学, 東海大学札幌キャンパス
東京農業大学オホーツクキャンパス, 東京海洋大学, 北海道大学低温科学研究所
北海道大学大学院水産科学研究院, 北海道大学北方生物圏フィールド科学センター
東京大学大気海洋研究所, (国研)水産研究・教育機構水産資源研究所
(国研)宇宙航空研究開発機構, (国研)海洋研究開発機構, 北極環境研究コンソーシアム
(一財)リモート・センシング技術センター, (公社)日本雪氷学会, 日本海洋学会
(公社)日本気象学会, (公社)日本水産学会北海道支部, 国土交通省, 文部科学省, 水産庁
北海道, 北見市, 網走市, オホーツク町村会, (公社)北海道国際交流・協力総合センター
(公財)北海道環境財団, (独法)国際交流基金, (公財)オホーツク生活文化振興財団
(公財)札幌国際プラザ, NHK 北見放送局, 北海道新聞社, (株)北海民友新聞社

氷海研究グループ (International Advisory Committee)

- ◆ Hajo Eicken, University of Alaska, Fairbanks, USA
- ◆ 榎本 浩之 国立極地研究所
- ◆ 岩本 勉之 紋別市
- ◆ 泉山 耕 北海道大学
- ◆ 片倉 靖次 紋別市
- ◆ 北川 弘光 海洋政策研究所
- ◆ 松村 寛一郎 東京農業大学
- ◆ 道田 豊 東京大学
- ◆ 三寺 史夫 北海道大学
- ◆ Ferdenant Mkrtchyan, Institute of Radioengineering & Electronics, Russia
- ◆ 西山 恒夫 東海大学 名誉教授
- ◆ 大塚 夏彦 北海道大学
- ◆ 尾関 俊浩 北海道教育大学札幌校
- ◆ 塩元 明弘 東京農業大学
- ◆ 田口 哲 国立極地研究所
- ◆ 高橋 修平 北見工業大学 名誉教授
- ◆ 田中 雅人 北海道大学
- ◆ 舘山 一孝 北見工業大学
- ◆ 山口 一 国立極地研究所 (アルファベット順)

オンライン学術分科会

北海道大学北極域研究センター・北海道立オホーツク流水科学センター

2月21日(月)

第1会場

9:00～9:10 学術分科会開会式 開会のことば: 高橋 修平 (北方圏国際シンポジウム実行委員会)
※ 同時通訳 あいさつ: 福井 学 (北海道大学低温科学研究所)

9:10～12:00 基調講演 K ※ 同時通訳

9:10- 9:50 **K-1** 21世紀のオホーツク海の海洋哺乳類が直面する課題
Olga V. Shpak (ロシア科学アカデミー生態進化研究所, ロシア)

9:50-10:30 **K-2** SmartICE の活動: アイストラベルのリスク軽減に向けた先住民コミュニティとの社会的企業のパートナーシップ
Trevor Bell (ニューファンドランドメモリアル大学, カナダ)

10:40-11:20 **K-3** 北極域国際連携研究の最先端～気候変動と北方圏雪氷・海洋環境の変化と影響
榎本 浩之 (国立極地研究所, 国際北極環境研究センター)

11:20-12:00 **K-4** 極域海洋研究の推進による国連海洋科学の10年 (2021-2030) への貢献
道田 豊 (東京大学大気海洋研究所)

13:00～17:50 ワークショップ A: 北極海における安全航行のための海氷、波浪、海洋観測

第2会場

15:00～17:10 学術分科会 B: 雪氷と暮らし

2月22日(火)

第1会場

8:40～12:30 ワークショップ C: 北極海の環境変動を考慮した持続可能な航路利用の探究

13:30～18:15 ワークショップ D: 北極域をめぐる産学官連携共同研究活動
～北極域研究共同推進拠点産学官連携事業～

第2会場

13:30～18:10 学術分科会 E: 氷海の生物と水産

2月23日(水)

第1会場

9:00～10:20 学術分科会 F: 淡水供給

10:30～11:50 学術分科会 G: 気候変化

13:00～14:00 学術分科会 H: オホーツク海

14:10～15:10 学術分科会 I: リモートセンシング

15:20～16:40 学術分科会 J: 工学

16:40～17:00 学術分科会閉会式 閉会のことば: 高橋 修平 (北方圏国際シンポジウム実行委員会)
あいさつ: 大塚 夏彦 (北海道大学北極域研究センター)

市民公開講座 ポスター展 子ども流水シンポジウム 協賛行事

紋別市民会館・紋別市立博物館・北海道立オホーツク流水科学センター 他

■ポスター展

日程:2月11日(金)~2月28日(月)

会場:紋別市立博物館 北海道立オホーツク流水科学センター

『参加団体』

教育シンポジウム中学生の部, 海洋環境保全セミナー, 油汚染対策と環境保護フォーラム
オホーツクふるさとの海, 森から海の連環を考える, オホーツク地域の暴風雪を考える
海洋情報提供

■子ども流水シンポジウム

出前授業-オホーツク海と流水

講師:北海道立オホーツク流水科学センター所長 高橋修平

映画上映「私たちの未来」(環境省『ガラスの地球を救え!』プロジェクト)

日程:2月15日(火)~2月18日(金)

会場:上渚滑小学校, 南丘小学校, 沙留小学校, 潮見小学校, 紋別小学校

■オホーツクテロワールシンポジウム 2022 in 紋別

=HARU (ハル) フォーラム=

「未来につなぐオホーツク・ビジョンを語ろう」-オホーツクの持続可能性の原点と仕組みづくりを探る-

日時:2022年2月24日(木) 13:00~17:00

会場:紋別市市民会館 3階小ホール

13:30~ 主催者挨拶 大黒宏 (オホーツク・テロワール代表理事)

13:35~「第1部 報告」

・HARU(ハル)を巡る旅(遠軽・滝上編モニターツアー)について 長南進一 (オホーツク・テロワール理事)

13:45~「第2部 話題提供」

・酪農から見えるテロワール 三谷朋弘 (北海道大学大学院農学研究院)

・オホーツクの持続可能性と地域連携に向けた仕組みづくりの課題 大黒宏 (オホーツク・テロワール)

14:15~「第3部 パネル・フォーラム」 未来につなぐオホーツク・ビジョンを語ろう -オホーツクの持続可能性と新たな地域連携の仕組みづくりにむけて-

16:30~ 閉会行事

■協賛行事 流水織物展 流水をテーマにした織物を展示

日程:2月11日(金)~2月28日(月)

会場:北海道立オホーツク流水科学センター

9:00	【学術分科会開会式】 開会のことば: 高橋修平 (北方圏国際シンポジウム実行委員会) あいさつ: 福井学 (北海道大学低温科学研究所)	司会: 片倉靖次 (紋別市) ※ 同時通訳
9:10	【K: 基調講演】 K-1 21世紀のオホーツク海の海洋哺乳類が直面する課題. Olga V. Shpak (ロシア科学アカデミー生態進化研究所, ロシア)	座長: 高橋修平 (流水科学センター) ※ 同時通訳
9:50	K-2 SmartICE の活動: アイストラベルのリスク軽減に向けた先住民コミュニティとの社会的企業のパートナーシップ Trevor Bell (ニューファンドランドメモリアル大学, カナダ)	
10:30	休憩	
10:40	K-3 北極域国際連携研究の最先端～気候変動と北方圏雪氷・海洋環境の変化と影響 榎本浩之 (国立極地研究)	座長: 田中雅人 (北大北極セ)
11:20	K-4 極域海洋研究の推進による国連海洋科学の10年 (2021-2030) への貢献 道田豊 (東京大学大気海洋研究所)	
12:00	昼食	
13:00	【A: ワークショップ、北極海における安全航行のための海水、波浪、海洋観測】	

15:00	【B: 雪氷と暮らし】 B-1 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 Gavrilieva (Federal Res. Centre, Russia) and Henrik Virta (Finnish Meteorological Inst., Finland)	座長: 高橋修平 (流水科学センター)
15:20	B-2 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-3 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- ○堀尾佳以, Muhammad Haziq Aiman Bin Mohd Hazbauni (宇都宮大), Asyraf Bin Su Azmi	
16:00	休憩	
16:10	B-4 Weather around the Sea of Okhotsk analyzed from documents in the mid-19th century and climate change at that time ○田上善夫, Gaston R. Demarée (Royal Meteorological Inst. Belgium, Belgium), 三上岳彦 (東京都立大), 塚原東吾 (神戸大)	
16:30	B-5 Winter/spring climatic changes in Northern Japan during 1705-1860 reconstructed from snowfall rates and lake-freezing records ○三上岳彦 (東京都立大), 長谷川直子 (お茶の水女子大), 平野淳平 (帝京大), Bruce Batten (アメリカ・カナダ大学連合日本研究センター)	
16:50	B-6 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)	

	【A:ワークショップ、北極海における安全航行のための海氷、波浪、海洋観測】 座長:小平翼 (東大院新領域)
13:00	A-1 Resent change of sea-ice age distribution in the Arctic ○木村詞明 (東大大気海洋研), 羽角博康, 大山元夢, 山口一 (極地研)
13:20	A-2 Radar observation of sea-ice and waves in a controlled laboratory environment ○早稲田卓爾 (東大院新領域/JAMSTEC), 松沢孝俊 (海技研), 館山一孝 (北見工大), 小平翼, 藤原泰, 勝野智嵩, 野瀬毅彦, 西澤啓太, 佐藤公哉, 内山亮介 (東大院新領域)
13:40	A-3 Analysis on long-term trend of vessel icing predictor in the Arctic Ocean and measurement of sea spray and waves on R/V Mirai ○内山亮介 (東大院新領域), 早稲田卓爾 (東大院新領域/JAMSTC), 尾関俊浩 (札教大), 小平翼, 藤原泰 (東大院新領域), 山口一 (極地研)
14:00	A-4 Lagrangian observation of sea ice drift ○藤原泰, 小平翼 (東大院新領域), 早稲田卓爾 (東大院新領域/JAMSTEC), 野瀬毅彦, 西澤啓太, 内山亮介 (東大院新領域)
14:20	休憩
	座長:早稲田卓爾 (東大院新領域/JAMSTEC)
14:25	A-5 Interannual variation of sea ice concentration over the Canada Basin ○小平翼 (東大院新領域), 早稲田卓爾 (東大院新領域/JAMSTEC), 野瀬毅彦, 藤原泰 (東大院新領域)
14:45	A-6 Coupled model for simulating the interaction of wave and ice particles ○Zijing Jin(東大院新領域), 早稲田卓爾 (東大院新領域/JAMSTEC), 藤原泰, 勝野智嵩 (東大院新領域)
15:05	A-7 Observation and model comparison of surface ocean waves in the Laptev Sea ○野瀬毅彦 (東大院新領域), Jean Rabault (Norwegian Meteorological Inst., Norway), 早稲田卓爾, 小平翼, 勝野智嵩 (東大院新領域), 漢那直也 (東大大気海洋研), 館山一孝 (北見工大), Joey Voermans (Univ. Melbourne, Australia), Tatiana Alekseeva (Arctic Antarctic Res. Inst., Russia)
15:25	A-8 Sea ice observation using a portable and satelliteborne passive microwave radiometers in 2021 NABOS expedition ○館山一孝 (北見工大), Anna Timofeeva (Arctic Antarctic Res. Inst., Russia), 漢那直也 (東大大気海洋研), 早稲田卓爾 (東大院新領域), 榎本浩之 (極地研)
15:45	A-9 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), Vasiliy Tikhonov (Space Res. Inst., RAS, Russia/Inst. Water Environ. Problems, RAS, Russia), Mikhail Raev (Space Res. Inst., RAS, Russia), 早稲田卓爾, 野瀬毅彦 (東大院新領域), Eugeny Sharkov (Space Res. Inst., RAS, Russia)
16:05	休憩
	座長: Tatiana Alekseeva (Arctic Antarctic Res. Inst./Space Res. Inst., Russia)
16:10	A-10 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	A-11 The results of the specialized ice observations in the Arctic Basin during autumn season in 2021 ○Anna Timofeeva (Arctic Antarctic Res. Inst., Russia), 館山一孝 (北見工大), 漢那直也 (東大大気海洋研)
16:50	A-12 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	A-13 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	A-14 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)

【C：ワークショップ、北極海の環境変動を考慮した持続可能な航路利用の探究】

座長：金野祥久（工学院大学）

- 8:40 **C-1** Comparison of sea ice thickness estimated from GCOM-W/AMSR2 and SMOS/MIRAS
○館山一孝（北見工大）、渡辺由梨加（北見工大院）、東海林尚登（北見工大）、
金野祥久（工学院大学）、佐川玄輝（ウェザーニューズ）、泉山耕（北大北極域セ）、
星野聖太（JAXA）、久保聡一郎、橋本拓海（工学院大学）、川村康輔（北見工大院）
- 9:00 **C-2** Improvement of estimating sea ice thickness using AMSR2 data for Arctic first-year ice
○渡辺由梨加（北見工大院）、館山一孝、東海林尚登（北見工大）、金野祥久（工学院大）、
佐川玄輝（ウェザーニューズ）、泉山耕（北大北極域セ）、星野聖太（JAXA）、久保聡一郎、
橋本拓海（工学院大）、川村康介（北見工大院）
- 9:20 **C-3** Improvement of sea ice thickness measurement method using the shipborne Electro-Magnetic Inductive device
○川村康輔（北見工大院）、館山一孝（北見工大）
- 9:40 **C-4** Recent sea ice changes observed from Beaufort Gyre Exploration Project ice draft and drift velocity datasets
○泉山耕（北大北極域セ）
- 10:00 **C-5** Numerical study on the relationship between ship route and ice resistance in ice-covered water
○澤村淳司、小林亮太（阪大院工）

10:20 休憩

座長：松沢孝俊（海技研）

- 10:30 **C-6** Effect of ship bow shape to brash ice channel resistance: A preliminary study
○徳留大樹、金野祥久（工学院大）
- 10:50 **C-7** Laboratory experiment of spray icing using urea-doped water
-Shape and amount of icing on cylindrical specimen with different diameters-
○尾関俊浩（札教大）、松沢孝俊（海技研）、安達聖（防災科研）、徳留大樹（工学院大）、
布川大暉（札教大/雪研スノーイーターズ）、松田裕太（札教大）、金野祥久（工学院大）
- 11:10 **C-8** A preliminary assessment of oil-spill response methods in the Arctic coastal area
○松沢孝俊（海技研）、金野祥久、菅谷拓未（工学院大）、大山元夢（工学院大/極地研）
- 11:30 **C-9** Toward the application of particle advection diffusion analysis method for simulating oil spill in the ice-infested water
○金野祥久、菅谷拓未（工学院大）、大山元夢（工学院大/極地研）、松沢孝俊（海技研）
- 11:50 **C-10** Medium-term Arctic sea ice forecast conducted by the Arctic Sea Ice Information Center in 2021
○大山元夢、山口一（極地研）、木村詞明（東大大気海洋研）
- 12:10 **C-11** Feasibility of Northern Sea Route by using a global maritime container shipping simulation model
○柴崎隆一、青柳颯太、小菅直樹、渋谷圭吾（東大院工）、志賀航介（東大工）、
Chathumi Ayanthi Kavirathna（東大院工）

12:30 昼食

13:30 【D：ワークショップ、北極域をめぐる産学官連携共同研究活動～北極域研究共同推進拠点産学官連携事業～】

【D：ワークショップ、北極域をめぐる産学官連携共同研究活動～北極域研究共同推進拠点産学官連携事業～】	
	座長：宇都正太郎（北大北極セ）
13:30	D-1 Activities to promote industry-government-academia collaborative research on the Arctic region supported by Japan Arctic Research Network Center (J-ARC Net) ○田中雅人、大塚夏彦、深町康（北大北極セ）
	「PART-1 Observation」
13:55	D-2 Toward sustainable meteorological profiling using an inexpensive Unmanned Aircraft Systems in polar regions ○佐藤和敏（北見工大）、猪上淳（極地研/総研大）
14:15	D-3 Pack ice observations by UAV and Sentinel-2 Satellite ○松村寛一郎（東農大生物産業）、Stanley Anak Suab、Ram Avtar（北大院地球環境）
14:35	D-4 Study on characteristics of zooplankton community in coastal water around Mombetsu during sea ice season ○葛西広海（水産機構資源研）、片倉靖次（紋別市）、山崎友資（蘭越町）、木元克典（JAMSTEC）、平井博也（東大大海研）、松野孝平、山口篤（北大院水産）
14:55	休憩
15:05	D-5 Consequences of wildfires in boreal forests underlain by ice-rich permafrost near Batagay, NE Siberia ○岩花剛（北大/アラスカ大）、柳谷一輝、古屋正人（北大院理）、Petr Danilov（Nort-Eastern Federal Univ., Russia）、Nikolai Fedorov（Yakutsk Permafrost Inst, Russia）、阿部隆博（三重大）、河村巧（岩田地崎）、蟹江俊仁（北大工院）、飯島慈裕（三重大）、田殿武雄（JAXA）、Alexey Desyatkin（Yakutsk Permafrost Inst., Russia/Inst. Biological Problems Cryolithozone, Russia）and Alexander Fedorov（Yakutsk Permafrost Inst., Russia）
15:25	D-6 Arctic Marine Plastic Pollution -Lectures and discussion meetings on the marine plastic- ○中澤直樹（システム工学研究所）、赤川敏（低温圏工学研究所）、岩崎慎介（寒地土木研）、片石温美（中央大）、蟹江俊仁（北大）、木岡信治（寒地土木研）、兒玉祐二（北大北極セ）、小森谷友絵（日大生産工）、竹内貴弘（八戸工業大）、田中雅人（北大北極セ）、西尾伸也（日大生産工）、朴昊澤（JAMSTEC）、矢吹裕伯（極地研）、山崎健二（米陸軍工兵隊）
	「PART-2 Engineering」 座長：田中雅人（北大北極セ）
15:45	D-7 Needs for technical research on the Arctic region/Seeds analysis and matching study meeting report ○黒川明（エンジニアリング協会）、山ロー（極地研）、中溝和馬（三菱造船）、福場寛（ジャパンマリ ンユナイテッド）、桑垣俊秀（INPEX）、柏木孝夫（商船三井）、吉田基（ゼニライトブイ）、赤根英介（JAMSTEC）、兒玉裕二（北大北極セ）、矢吹裕伯（極地研）、田中雅人、深町康（北大北極域セ）、菊地隆（JAMSTEC）、中村哲也（日油技研工業）、三上正洋（フィールドプロ）、後藤浩一（KANSO テクノス）、佐川玄輝（ウェザーニューズ）、弥富秀文（キュービック・アイ）、寶楽裕（パスコ）
16:05	D-8 Evaluation of ship resistance in ice regime using ice chart ○宇都正太郎（北大北極セ）、豊田威信（北大低温研）
16:25	休憩
	「PART-3 Utilization」
16:35	D-9 Trans-Arctic submarine fiber-optic cables: Recent developments and future prospects ○Juha Saunavaara（北大北極セ）
16:55	D-10 Research exchange between Japan and Finland on data centers in the cold climate region ○森太郎（北大院工）、Juha Saunavaara（北大北極セ）
17:15	D-11 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、田中雅人（北大北極セ）
17:35	D-12 Breaking the ice as a tourist experience: Local initiatives facing global challenges ○Juha Saunavaara（北大北極セ）、Mari Partanen（JAMK Univ. Applied Sci., Finland /Univ. Oulu, Finland）、福山貴史（北大観光学高等研セ）、田中雅人（北大北極セ）
17:55	D-13 Extracting issues for appropriate Arctic tourism development concerning community resilience ○福山貴史、上田裕文、西山徳明、小林英俊、岡田真弓（北大観光学高等研セ）、田中雅人、大西富士夫、Juha Saunavaara（北大北極域セ）、森太郎（北大院工）、加藤知愛（北大公共政策大学院）、高橋修平（流氷科学センター）、本多俊和（放送大学）

	【E：氷海の生物と水産】 座長：田口 哲 (極地研)
13:30	E-1 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 ○葛西広海 (水研機構資源研), 岩本勉之, 片倉靖次 (紋別市), 村井克詞, 永田隆一 (オホーツクガリンコタワー), 濱岡荘司 (元紋別市)
13:50	E-2 Responses of phytoplankton assemblages to nutrient availability during summer bloom in Akkeshi Bay ○川田有季 (北大院環境), 伊佐田智規 (北大フィールド科セ), 谷内由貴子 (水研機構資源研), 芳村毅 (北大院水産), 鈴木光次 (北大院地球環境), 葛西広海 (水研機構資源研)
14:10	E-3 Time-series monitoring by metabarcoding revealed clear seasonal changes in eukaryote biodiversity based on the transition of current systems in Mombetsu, Hokkaido, Japan ○長井敏 (水産機構資源研), Sirje Sildever (Tallinn Univ. Tech., Estonia), 西典子, 田澤賢 (アクシオヘリックス), 葛西広海 (水産機構資源研), 塩本明弘 (東京農業大学), 菊地泰生 (宮崎大学), 片倉靖次 (紋別市)
14:30	E-4 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)
14:50	休憩
	座長：長井敏 (水産機構資源研)
15:00	E-5 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 小嶋大己, 濱尾優介, 松野孝平, ○山口篤 (北大院水産)
15:20	E-6 Ecological dynamics of marine copepods and viruses in the Okhotsk Sea ○平井惇也 (東大大気海洋研), 片倉靖次 (紋別市), 長井敏 (水産機構資源研)
15:40	E-7 Euthecosomatous pteropod (Sea butterfly) <i>Limacina helicina</i> in the southern Okhotsk Sea: Morphological variability and plasticity to ocean environmental changes ○木元克典 (JAMSTEC), 清水啓介 (東大院農), 脇田昌英 (JAMSTEC), 下島公紀 (東京海洋大海洋資源), 山口篤, 松野孝平 (北大院水産), 葛西広海 (水産機構資源研), 吉田瞳 (オホーツクガリンコタワー), 片倉靖次 (紋別市)
16:00	E-8 Quantification of species-specific biogenic silica flux of radiolarians (Rhizaria) in the western Arctic Ocean using microfocal X-ray computed tomography ○池上隆仁, 木元克典, 中村由里子 (JAMSTEC), Kjell R. Bjørklund (Univ. Oslo, Norway), 倉本直樹, 植木正明, 大田由一 (産総研), 小野寺丈尚因郎, 原田尚美, 本多牧生, 佐藤都, 渡邊英嗣, 伊東素代, 西野茂人, 菊地隆 (JAMSTEC)
16:20	休憩
	座長：佐々木義隆 (道総研さけます内水試)
16:30	E-9 Detection of fish environmental DNA from under-ice water and sea ice in Saroma-ko Lagoon, Hokkaido, Japan ○川上達也, 尾崎誠 (北大院水産), 山崎彩 (京大学際セ), 野村大樹 (北大北方セ), 笠井亮秀 (北大院水産)
16:50	E-10 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.Il'ichev Pacific Oceanological Inst., Russia), Kirill Kivva (Russian Federal Res. Inst. Fish. Oceanography, Russia), Michael Uleysky and Sergey Prants (V.I.Il'ichev Pacific Oceanological Inst., Russia)
17:10	E-11 Global seafood marketing amid the coronavirus pandemic by FAO GLOBEFISH market reports in 2020 and 2021 ○清水幾太郎 (北海道鮭鱒流通経済研究所)
17:30	E-12 Distribution of black-eared kites in relation to river scale ○松本経 (北見工大)
17:50	E-13 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)

【F：淡水供給】		座長：道田豊 (東大大気海洋研)
9:00	F-1 Estimation of freshwater discharge from the Gulf of Alaska drainage basins ○Peng Xin (北大院環境), 三寺史夫 (北大低温研), Muqing Shi (北大院環境), 白岩孝行 (北大低温研)	
9:20	F-2 Hydrological zoning of rivers in the Kamchatka Peninsula based on discharge and meteorological features ○Muqing Shi (北大院環境), 白岩孝行 (北大低温研)	
9:40	F-3 Estimation of freshwater discharge by using Acoustic Doppler Current Profilers in a tidal zone, Bekanbeushi River, Hokkaido ○Manhui Ding (北大院環境), 白岩孝行 (北大低温研)	
10:00	F-4 Changes of Geo-Runoff Components in Russian Arctic Rivers ○A. Georgiadi, E. Kashutina and I. Milyukova (Inst. Geography, RAS, Russia)	
10:20	休憩	
【G：気候変化】		座長：豊田隆寛 (気象研)
10:30	G-1 Mechanism of warming of the ocean -“ENSO in Pacific Ocean”- ○中陣隆夫 (東海大学)	
10:50	G-2 Atmospheric warming over the Barents Sea during moisture intrusion events in January 2006 ○万田敦昌 (三重大)	
11:10	G-3 Impact of climate change on snow and lifestyle in winter Hokkaido, Japan ○鈴木啓明 野口泉、濱原和広, 山口高志 (道総研エネルギー・環境・地質研究所)	
11:30	G-4 Evaluation of the factors contributing to the mid-20th century Arctic cooling ○相澤拓郎 (極地研/気象研), 大島長, 行本誠史 (気象研)	
12:00	昼食	
【H：オホーツク海】		座長：佐藤和敏 (北見工大)
13:00	H-1 Sea fog characteristics of the Okhotsk Sea ○大河内雄太, 森智聡, 安川礼人 (稚内地方気象台)	
13:20	H-2 Shiretoko marine project on prediction of sea ice variations due to climate change, and its impacts on biogeochemical processes and marine ecosystems ○三寺史夫 (北大低温研), 植田宏昭 (筑波大), 中村知裕, 西岡純 (北大低温研), 山村織生 (北大院水産), 佐伯立 (北大低温研), 臼井知輝 (北大院環境), 中野渡拓也 (水研機構資源研)	
13:40	H-3 Sea ice variability along the Okhotsk coast of Hokkaido based on long-term JMA meteorological observatory data ○豊田隆寛, 北村佳照 (気象研), 岡田良平 (気象庁大気海洋部), 松村寛一郎 (東農大生物産業), 小松謙介, 坂本圭, 浦川昇吾, 中野英之 (気象研)	
14:00	休憩	
【I：リモートセンシング】		座長：舘山一孝 (北見工大)
14:10	I-1 Observations of ice cakes with a drone in the southern Sea of Okhotsk ○豊田威信, 在原百合子 (北大低温研), 早稻田卓爾 (東大院新領域), 伊藤優人 (極地研), 西岡純 (北大低温研)	
14:30	I-2 Snowfall detection by a newly deployed X-band Doppler radar at Syowa Station, Antarctica ○平沢尚彦 (極地研/総研大), 小西啓之 (大阪教育大), 藤吉康志 (北大名誉教授), 柴田和宏 (極地研), 岩本勉之 (紋別市)	
14:50	I-3 Spatial heterogeneity of post-fire abrupt permafrost thaw detected by L-band InSAR and on-site observations at Batagay, Northeastern Siberia ○柳谷一輝, 古屋正人 (北大院理), 岩花剛 (北大北極セ/アラスカ大学), Petr Danilov (North-Eastern Federal Univ, Russia)	
15:10	休憩	
【J：工学】		座長：泉山耕 (北大北極域セ)
15:20	J-1 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)	
15:40	J-2 Use of GIMS -technology for diagnostics of the state of the Arctic aquasystem ○Ferdinand Mkrtychyan (Kotelnikov Inst. Radioengin. Electronics, Russia)	
16:00	J-3 Main features of wind wave climate of the Japan, Okhotsk and Bering Seas ○Stanislav Myslenkov (Lomonosov Moscow State Univ., Russia)	
16:20	J-4 Field observation and image analysis of the effects of river ice on concrete structures ○阿部孝章, 横山洋, 大串弘哉 (寒地土研)	
16:40	【学術分科会閉会式】 閉会のことば: 高橋修平 (北方圏国際シンポジウム実行委員会) あいさつ: 大塚夏彦 (北海道大学北極域研究センター)	
		司会: 片倉靖次 (紋別市)

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**

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

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- 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

Wednesday 23 Feb. 2022

Room 1

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	【Opening Session】 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	【K:Key Note Speech】 Chair, Shuhei Takahashi (Okhotsk Sea Ice Museum) ※ simultaneous interpretation K-1 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	K-2 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.) 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	K-4 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	【A:Workshop, Sea ice, Wave, and Ocean Observation for Safe Navigation in the Arctic Ocean】

Monday 21 Feb. 2022
Room 2

15:00	【B : Snow, Ice and Human Life】 Chair, Shuhei Takahashi (Okhotsk Sea Ice Museum) B-1 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 Gavril'yeva (Federal Res. Centre, Russia) and Henrik Virta (Finnish Meteorological Inst., Finland)
15:20	B-2 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-3 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-4 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-5 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-6 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)

	[A: Workshop, Sea ice, Wave, and Ocean Observation for Safe Navigation in the Arctic Ocean] Chair, Tsubasa Kodaira (Univ. Tokyo)
13:00	A-1 Recent change of sea-ice age distribution in the Arctic ○Noriaki Kimura, Hiroyasu Hasumi (Univ. Tokyo), Motomu Oyama and Hajime Yamaguchi (NIPR)
13:20	A-2 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	A-3 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	A-4 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	A-5 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	A-6 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	A-7 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	A-8 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	A-9 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	A-10 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	A-11 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	A-12 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	A-13 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	A-14 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)

	【C : Workshop, Sustainable Arctic Sea Routes in a Rapidly Changing Environment】 Chair, Akihisa Konno (Kogakuin Univ.)
8:40	C-1 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	C-2 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	C-3 Improvement of sea ice thickness measurement method using the shipborne Electro-Magnetic Inductive device ○Kosuke Kawamura and Kazutaka Tateyama (Kitami Inst. Tech.)
9:40	C-4 Recent sea ice changes observed from Beaufort Gyre Exploration Project ice draft and drift velocity datasets ○Koh Izumiyama (Hokkaido Univ.)
10:00	C-5 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	C-6 Effect of ship bow shape to brash ice channel resistance: A preliminary study ○Taiki Tokudome and Akihisa Konno (Kogakuin Univ.)
10:50	C-7 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	C-8 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	C-9 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	C-10 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	C-11 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	【D : Workshop, Activities to Promote Collaborative Research for Social Implementation with Industry-Government-Academia Collaboration on the Arctic Region Supported by J-ARC Net】

	[D : Workshop, Activities to Promote Collaborative Research for Social Implementation with Industry-Government-Academia Collaboration on the Arctic Region Supported by J-ARC Net] Chair, Shotaro Uto (Hokkaido Univ.)
13:30	D-1 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.)
	「PART-1 Observation」
13:55	D-2 Toward sustainable meteorological profiling using an inexpensive Unmanned Aircraft Systems in polar regions ○Kazutoshi Sato (Kitami Inst. Tech.) and Jun Inoue (NIPR/SOKENDAI)
14:15	D-3 Pack ice observations by UAV and Sentinel-2 Satellite ○Kanichiro Matsumura (Tokyo Univ. Agriculture), Stanley Anak Suab and Ram Avtar (Hokkaido Univ.)
14:35	D-4 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.)
14:55	Break
15:05	D-5 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)
15:25	D-6 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)
	「PART-2 Engineering」 Chair, Masato Tanaka (Hokkaido Univ.)
15:45	D-7 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.)
16:05	D-8 Evaluation of ship resistance in ice regime using ice chart ○Shotaro Uto and Takenobu Toyota (Hokkaido Univ.)
16:25	Break
	「PART-3 Utilization」
16:35	D-9 Trans-Arctic submarine fiber-optic cables: Recent developments and future prospects ○Juha Saunavaara (Hokkaido Univ.)
16:55	D-10 Research exchange between Japan and Finland on data centers in the cold climate region ○Taro Mori and Juha Saunavaara (Hokkaido Univ.)
17:15	D-11 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.)
17:35	D-12 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.)
17:55	D-13 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)

[E : Marine Biology and Fisheries in the Ice-Covered Waters]	
	Chair, Satoru Taguchi (NIPR)
13:30	E-1 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)
13:50	E-2 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.)
14:10	E-3 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)
14:30	E-4 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)
14:50	Break
	Chair, Satoshi Nagai (Natl. Res. Inst. Fish. Sci.)
15:00	E-5 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.)
15:20	E-6 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.)
15:40	E-7 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)
16:00	E-8 Quantification of species-specific biogenic silica flux of radiolarians (Rhizaria) in the western Arctic Ocean using microfocal X-ray computed tomography ○Takahito Ikenoue, Katsunori Kimoto, Yuri 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)
16:20	Break
	Chair, Yoshitaka Sasaki (Salmon Freshwater Fish. Res. Inst.)
16:30	E-9 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 Akihito Kasai (Hokkaido Univ.)
16:50	E-10 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)
17:10	E-11 Global seafood marketing amid the coronavirus pandemic by FAO GLOBEFISH market reports in 2020 and 2021 ○Ikutaro Shimizu (Hokkaido Salmon Distribution Econ. Inst.)
17:30	E-12 Distribution of black-eared kites in relation to river scale ○Kei Matsumoto (Kitami Inst. Tech.)
17:50	E-13 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)

	【F : Freshwater Discharge】	Chair, Yutaka Michida (Univ. Tokyo)
9:00	F-1 Estimation of freshwater discharge from the Gulf of Alaska drainage basins ○Peng Xin, Humio Mitsudera, Muqing Shi and Takayuki Shiraiwa (Hokkaido Univ.)	
9:20	F-2 Hydrological zoning of rivers in the Kamchatka Peninsula based on discharge and meteorological features ○Muqing Shi and Takayuki Shiraiwa (Hokkaido Univ.)	
9:40	F-3 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	F-4 Changes of Geo-Runoff Components in Russian Arctic Rivers ○A. Georgiadi, E. Kashutina and I. Milyukova (Inst. Geography, RAS, Russia)	
10:20	Break	
	【G : Climate Change】	Chair, Takahiro Toyoda (Meteorological Res. Inst.)
10:30	G-1 Mechanism of warming of the ocean -“ENSO in Pacific Ocean”- ○Takao Nakajin (Tokai Univ.)	
10:50	G-2 Atmospheric warming over the Barents Sea during moisture intrusion events in January 2006 ○Atsuyoshi Manda (Mie Univ.)	
11:10	G-3 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	G-4 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	
	【H : Okhotsk Sea】	Chair, Kazutoshi Sato (Kitami Inst. Tech.)
13:00	H-1 Sea fog characteristics of the Okhotsk Sea ○Yuta Okochi, Chisato Mori and Ayato Yasukawa (Wakkanai Local Meteorological Office)	
13:20	H-2 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	H-3 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	
	【I : Remote Sensing】	Chair, Kazutaka Tateyama (Kitami Inst. Tech.)
14:10	I-1 Observations of ice cakes with a drone in the southern Sea of Okhotsk ○Takenobu Toyota, Yuri Akihara (Hokkaido Univ.), Takuji Waseda (Univ. Tokyo), Masato Ito (NIPR) and Jun Nishioka (Hokkaido Univ.)	
14:30	I-2 Snowfall detection by a newly deployed X-band Doppler radar at Syowa Station, Antarctica ○Naohiko Hirasawa (NIPR/SOKENDAI), Hiroyuki Konishi (Osaka-Kyoku Univ.), Yasushi Fujiyoshi (Prof. Emer. Hokkaido Univ.), Kazuhiro Shibata (NIPR) and Katsushi Iwamoto (City of Mombetsu)	
14:50	I-3 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	
	【J : Engineering】	Chair, Koh Izumiyama (Hokkaido Univ.)
15:20	J-1 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)	
15:40	J-2 Use of GIMS -technology for diagnostics of the state of the Arctic aquasystem ○Ferdinand Mkrtchyan (Kotelnikov Inst. Radioengin. Electronics, Russia)	
16:00	J-3 Main features of wind wave climate of the Japan, Okhotsk and Bering Seas ○Stanislav Myslenkov (Lomonosov Moscow State Univ., Russia)	
16:20	J-4 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	【Closing Session】	Chair, Seiji Katakura (City of Mombetsu)
	Closing Address Shuhei Takahashi (Chair of the Symposium Committee) Natsuhiko Otsuka (Arctic Res. Center, Hokkaido University)	



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



Crab Claw Monument

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Japan Consortium for Arctic Environmental Research (JCAR)

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