



# The 26th International Symposium on Polar Sciences

## Responding to Climate Crisis: Contributions of Polar Science and Technology

September 27-29, 2021 | Online

### THIRD CIRCULAR

The Korea Polar Research Institute is pleased to invite you to the 26th International Symposium on Polar Sciences (ISPS2021), which will take place virtually from September 27 to 29, 2021. The symposium aims to bring together polar scientists and engineers with diverse backgrounds to share their research findings and explore further research opportunities at the international level.

With “**Responding to Climate Crisis: Contributions of Polar Science and Technology**” as its overarching theme, ISPS2021 invites researchers to discuss how polar science and technology can contribute to our understanding of climate change. A detailed program and other practical information are attached. We look forward to meeting you online.

### Theme

Climate change is the greatest crisis of our times, as it brings devastating consequences to our planet. We have witnessed many communities suffering from heatwave, drought and wildfire, while others suffered heavy rainfall, typhoon and flood. We are facing extreme events at an unprecedented rate, and they require our immediate and collective attention.

It is the mission of science to continue the observation, and provide scientific understanding and prediction upon which we can implement mitigation efforts. Polar sciences are crucial in the sense that these regions are especially sensitive to climate change, which adds to the instability of the earth system. Warming and cooling patterns are amplified, and the melting of ice sheets causes catastrophic sea level rises.

During this symposium, we will discuss the findings in polar sciences that are closely linked to climate change, and the cutting-edge technologies that enable more efficient and sustainable monitoring under harsh environments, while shedding new light on the unseen.

## Main Programs

### Science Session

The theme of this year's symposium, "Responding to Climate Crisis: Contributions of Polar Science and Technology" will be approached through the following six sessions.

**Session 1.** Polar climate science in the context of global climate crisis

**Session 2.** Cryosphere evolution and sea-level change

**Session 3.** Sea ice and polar oceans in rapid transition

**Session 4.** Technological advances enabling new polar science

**Session 5.** Integrated study of subglacial Antarctic lake ecosystems

**Session 6.** A paleoclimate perspective on climatic and environmental extremes :  
Korea-Italy Jointed Workshop on STREAM (Final year)

### Public Lecture

**Seong-Joong Kim** | Korea Polar Research Institute

**"Responding to Climate Crisis: Contributions of Polar Science and Technology"**

### Plenary Lectures

**Thomas Jung** | Alfred Wegener Institute

**"Polar Prediction: Recent progress and future prospects"**

**Ted Scambos** | University of Colorado Boulder

**"The Thwaites-Amundsen ice-ocean system: current results from the International Thwaites Glacier Collaboration"**

**Michael Karcher** | Alfred Wegener Institute

**"Arctic PASSION - a new 4-year program to advance a pan Arctic Observing Systems in support of societal needs"**

**Rosa T. Affleck** | Cold Regions Research and Engineering Laboratory

**"Engineering and Science Support for U.S. Antarctic Program"**

**Drew Taylor** | The University of Alabama

**"A new airborne ultra-wideband radar system for polar surveys"**

**Dr. John Priscu** | Montana State University

**"Antarctic Subglacial Lakes: Oases for Life in a Polar Desert"**

### Exhibition

**VR Tour** : Virtual Tour of Antarctica and the Korean Research Facilities

**Photo Exhibition** : Winners of the 2020 and 2021 Polar Photo Competition

## Program at a Glance

### Day 1 September 27 (Monday)

Time	Program	Place
15:00-16:00	Public Lecture   <b>Seong-Joong Kim</b> (Korea Polar Research Institute)	Online

### Day 2 September 28 (Tuesday)

Time	Program	Place
09:00-09:30	Opening and Welcoming Remarks	Online
09:30-10:00	Plenary Lecture 1   <b>Thomas Jung</b> (Alfred Wegener Institute, Germany)	Online
10:00-11:40	Session 1. Polar climate science in the context of global climate crisis	Online
11:40-13:00	BREAK	-
13:00-13:30	Plenary Lecture 2   <b>Ted Scambos</b> (University of Colorado Boulder)	Online
13:30-15:00	Session 2. Cryosphere evolution and sea-level change	Online
15:00-15:30	BREAK	-
15:30-16:00	Plenary Lecture 3   <b>Michael Karcher</b> (Alfred Wegener Institute)	Online
16:00-17:30	Session 3. Sea ice and polar oceans in rapid transition	Online

### Day 3 September 29 (Wednesday)

Time	Program	Place
09:30-09:55	Plenary Lecture 4   <b>Rosa T. Affleck</b> (Cold Regions Research and Engineering Laboratory)	Online
09:55-10:20	Plenary Lecture 5   <b>Drew Taylor</b> (Remote Sensing Center, The University of Alabama)	Online
10:20-11:20	Session 4. Technological advances enabling new polar science	Online
11:20-13:00	BREAK	-
13:00-13:30	Plenary Lecture 6   <b>John Prisco</b> (Montana State University)	Online
13:30-15:10	Session 5. Integrated study of subglacial Antarctic lake ecosystem	Online
15:10-15:30	BREAK	-
15:30-18:00	Session 6. A paleoclimate perspective on climatic and environmental extremes : Korea-Italy Jointed Workshop on STREAM (Final year)	Online
18:00-18:30	Announcement of Early Career Poster Award winners and Closing Remarks	Online

Detailed Program and Poster Session is available at [isps2021.or.kr](https://isps2021.or.kr)

## Guidelines for Participants

### Participants

The virtual Symposium will feature public lecture, keynote lectures, and oral and poster presentations. Participants will be able to experience live moderated Q&A sessions after oral presentations, as well as an interactive poster session using comment function within the webpage.

Symposium registration is free of charge, and it will give you an access to the online platform which will enable you to attend most of the sessions and enjoy all the materials posted online. Access to the symposium webpage and registration is available at <https://isps2021.or.kr/> from September 2021.

For more information, please consult the Q&A section attached to the circular below.

### Oral Presenters

Each presenters will be given a guideline on how to participate online. Oral presenters can participate in the symposium real-time via conference platform (ZOOM), or choose to pre-record their presentation. Each presenters may choose the medium according to their needs. More information will be shared with each presenters in due course.

### Poster Presenters

Poster presenters will be given the option to upload their materials as image, or in a video format. The comment function will allow participants to connect with the presenters. Poster guidelines for submission and technical information will be provided to each presenters in due course.

## Virtual Symposium Q&A

### Q How do I register?

A You will be able to register at the symposium website, <https://isps2021.or.kr/> from early September.

**\* All presenters must be registered at the symposium website in advance.**

### Q When will the symposium website be available?

A The symposium website will be available early September.

### Q Will the sessions be available for viewing after the symposium?

A The sessions will remain online for 3 weeks after the symposium, and registrants will be able to access the materials during that time.

### Q What time zone will the symposium be in?

A The symposium is hosted at the Korea Polar Research Institute, located in Incheon, Republic of Korea.

**\* The time zone for the symposium will be in Korea Standard Time (UTC+9).**

### Q Will sessions be pre-recorded or live?

A Plenary lectures and oral presentations will be a mix of pre-recorded and live.

### Q Will attendees be able to ask questions and participate in sessions?

A Oral presentation sessions will have a Q&A function for you to ask questions to the presenters. Questions to be asked will be chosen by the chair. Poster presentation will have comment function for interactive experience.

If you have any other questions, please contact us at [isps2021secretariat@gmail.com](mailto:isps2021secretariat@gmail.com).

We look forward to your participation.

**Secretariat of the 26th International Symposium on Polar Sciences (ISPS2021)**

# Attachment 1. Detailed Program

## Day 1 September 27 (Monday)

### Public Lecture

Online

15:00-16:00 **Responding to Climate Crisis: Contributions of Polar Science and Technology**  
Seong-Joong Kim (Korea Polar Research Institute)

## Day 2 September 28 (Tuesday)

### Opening & Welcoming Remarks

Online

09:00-09:30 **Welcoming remarks**  
Sung-Ho Kang (President of Korea Polar Research Institute)

### Plenary Lecture 1

Online

09:30-10:00 **Polar Prediction: Recent progress and future prospects**  
Thomas Jung (Alfred Wegener Institute)

### Session 1 \_ Polar climate science in the context of global climate crisis

Online

10:00-10:20 **Atmospheric circulation response to the recent winter Arctic sea ice decline: A weather-scale model experiment**  
Heeje Cho (Korea Polar Research Institute)

10:20-10:40 **Recent weakening of the southern stratospheric polar vortex and its impact on the surface climate over Antarctica**  
Hataek Kwon et al. (Seoul National University)

10:40-11:00 **Lightning occurrence observation using electromagnetic field measurement surrounding Antarctica Peninsula**  
Sulaiman Ali Mohammad (National University of Malaysia)

11:00-11:20 **Formation of marine secondary aerosols in the Southern Ocean, Antarctica**  
Shanshan Wang (Third Institute of Oceanography)

11:20-11:40 **Spatio-temporal variations of Black Carbon over Arctic in a regional climate model**  
Rohit Srivastava (National Centre for Polar and Ocean Research)

### Plenary Lecture 2

Online

13:00-13:30 **The Thwaites-Amundsen ice-ocean system: current results from the International Thwaites Glacier Collaboration**  
Ted Scambos (University of Colorado Boulder)

## Session 2 \_ Cryosphere evolution and sea-level change

Online

- 13:30-13:45 **Investigating the role of Marine Ice Cliff Instability in the Amundsen Sea Sector over the next century**  
Mathieu Morlighem (Dartmouth College)
- 13:45-14:00 **Repeat radar survey and basal evolution of Thwaites Glacier, West Antarctica.**  
Lucas Beem (Montana State University)
- 14:00-14:15 **Pathways and heat transports of Circumpolar Deep Water into the Thwaites and Pine Island Glaciers, West Antarctica**  
HyungBo Kim (Seoul National University)
- 14:15-14:30 **Holocene relative changes in the White Sea level according to paleolimnological data**  
Dmitriy Subetto (Herzen State Pedagogical University of Russia)
- 14:30-14:45 **Polynya Preconditioning: Ocean Processes South of the Drygalski Ice Tongue, Western Ross Sea**  
Craig Stevens (National Institute of Water and Atmospheric Research, University of Auckland)
- 14:45-15:00 **Antarctic ice mass change (2003-2016) jointly estimated by satellite gravimetry and altimetry**  
Byeong-Hoon Kim (Korea Polar Research Institute)

## Plenary Lecture 3

Online

- 15:30-16:00 **Arctic PASSION - a new 4-year program to advance a pan Arctic Observing System of Systems in support of societal needs**  
Michael Karcher (Alfred Wegener Institute)

## Session 3 \_ Sea ice and polar oceans in rapid transition

Online

- 16:00-16:15 **Intensified Arctic Cyclone Activities and Observed Driving Mechanisms for Accelerating Summer Sea Ice Decrease**  
Xiangdong Zhang (University of Alaska Fairbanks)
- 16:15-16:30 **Ikaagvik Sikukun: Bridging the Scientific and Indigenous Communities to Study Sea Ice Change in Arctic Alaska**  
Christopher J. Zappa (Columbia University)
- 16:30-16:45 **Large scale sea-ice ecosystem response to changes in under-ice light field**  
Giulia Castellani (Alfred Wegener Institute)
- 16:45-17:00 **Development of KOPRI's operational high-resolution sea ice drift product**  
Jeong-Won Park (Korea Polar Research Institute)
- 17:00-17:15 **Intensive oceanographic and geophysical observation campaign off Sabrina Coast, East Antarctica, in 2019/2020**  
Shigeru Aoki (Hokkaido University)
- 17:15-17:30 **Opposing decadal trend of wintertime mixed layer depth in the Pacific and Indian sectors of the Southern Ocean from 2005 to 2019**  
Hajoon Song (Yonsei University)

**Day 3** September 29 (Wednesday)

**Plenary Lecture 4**

Online

09:30-09:55 **Engineering and Science Support for U.S. Antarctic Program**

Rosa T. Affleck (Cold Regions Research and Engineering Laboratory)

**Plenary Lecture 5**

Online

09:55-10:20 **A new airborne ultra-wideband radar system for polar surveys**

Drew Taylor (Remote Sensing Center, The University of Alabama)

**Session 4 \_ Technological advances enabling new polar science**

Online

10:20-10:35 **Aero-Structural Design and Analysis of Pylons for a 16-Element Airborne Radar Antenna Array**

Mishal Thapa (Remote Sensing Center, The University of Alabama)

10:35-10:50 **The Architecture of Fault-Tolerant Networks for Remote Data Acquisition in Polar Regions**

Jinyoung Lee (Kookmin University)

10:50-11:05 **Estimation of high-resolution sea ice motion in the Arctic Ocean using Sentinel-1 image**

Gwang Seob Park (Korea Institute of Ocean Science & Technology)

11:05-11:20 **Passive microwave satellite L-band sensor-based polar sea ice surface roughness retrieval and its variation analysis**

Suna Jo (Department of Environment, Energy, and Geoinformatics, Sejong University)

**Plenary Lecture 6**

Online

13:00-13:30 **Antarctic Subglacial Lakes: Oases for Life in a Polar Desert**

John Prisco (Montana State University)

**Session 5 \_ Integrated study of subglacial Antarctic lake ecosystems**

Online

13:30-13:50 **Solute sources and weathering processes in subglacial lake systems beneath the West Antarctic Ice Sheet**

Mark Skidmore (Montana State University)

13:50-14:10 **Holocene marine incursion supports a subglacial microbial community in the active hydrologic system beneath the West Antarctic Ice Sheet**

Brad Rosenheim (Florida University)

14:10-14:30 **Metabolic potential in Subglacial Lake Mercer inferred from single-cell genomic data**

Kyungmo Kim (Korea Polar Research Institute)

14:30-14:50 **What can we learn from clay mineralogy of SLM sediment?**

Jinwook Kim (Yeonsei University)

14:50-15:10 **Subglacial lake floods correlated with the ice tongue disintegration in the Thwaites Glacier, Antarctica**

Choon-Ki Lee (Korea Polar Research Institute)

**Session 6 \_ A paleoclimate perspective on climatic and environmental extremes :  
Korea-Italy Jointed Workshop on STREAM (Final year)**

Online

15:30-15:45 **Microstructure of lamination in core RS15-LC42 in the Central Basin of the northwestern Ross Sea: preliminary results**

Boo-Keun Khim (Pusan National University)

15:45-16:00 **Reconstruction of cryospheric and paleoceanographic changes of the past 1 Myrs from the record at the continental margin, NW Ross Sea**

Min Kyung Lee (Korea Polar Research Institute)

16:00-16:15 **Pre-LGM sedimentological feature and paleo oceanographic changes in the Central Basin (Western Ross Sea)**

Fiorenza Torricella (Università di Pisa)

16:15-16:30 **Past and recent sedimentary dynamics recorded in sedimentary cores collected east of the Iselin Bank (Ross Sea, Antarctica)**

Ester Colizza (University of Trieste)

16:30-16:45 **Multidisciplinary analysis of three box cores collected east to the Hillary Canyon (Eastern Ross Sea, Antarctica)**

Andrea Geniram (University of Trieste)

16:45-17:00 **Depositional processes in the Drygalski Basin of the Ross Sea since the Last Glacial Maximum**

Sangbeom, Ha (Pusan National University)

17:00-17:15 **Late Pleistocene glacial-interglacial paleoceanographic changes in the Ross Sea**

Sunghan Kim (Korea Polar Research Institute)

17:15-17:30 **Bottom-current-controlled sedimentary and geomorphic processes in the northwestern Ross Sea margin, Antarctica**

Sookwan Kim (Korea Polar Research Institute)

17:30-17:45 **Tephrochronology in the Western Ross Sea and its role in paleoenvironmental analyses**

Paola Del Carlo (Istituto Nazionale di Geofisica e Vulcanologia)

17:45-18:00 **Changes in the minero-petrographic composition of late Quaternary sediments in the slope-basin area of Western Ross Sea (Antarctica)**

Luca Zurli (University of Siena)

**Announcement of Early Career Poster Award winners and Closing Remarks**

Online

18:00-18:30 **Closing remarks**

Sung-Ho Kang (President of Korea Polar Research Institute)



## Attachment 2. Poster Session

### Session 1 \_ Polar climate science in the context of global climate crisis

Online

- P1 01**    **Ocean acidification impacts on the pteropod shell density in the Arctic and Subarctic oceans**  
Ahra Mo (Korea University)
- P1 02**    **The Issue of climate change evolution within the Antarctic Treaty System**  
Andryi Fedchuk (National Antarctic Scientific Center of Ukraine)
- P1 03**    **Temperature waves: temporal variability of threshold temperatures in the Arctic**  
Elena Grigorieva (Institute for Complex Analysis of Regional Problems, Far Eastern Branch of the Russian Academy of Sciences)
- P1 04**    **First-year sea ice leads to increase in dimethyl sulfide-derived particle formation in the Antarctic Peninsula**  
Eunho Jang (University of Science and Technology)
- P1 05**    **Assessment of Tethered Balloon-Borne Observations of Arctic Low Cloud Properties**  
Gunho Oh (Korea Polar Research Institute)
- P1 06**    **Chemical compositions of carbonaceous aerosol and their impact on optical properties in the marine and Antarctic aerosols**  
Ha Young Yoo (Ewha Womans University)
- P1 07**    **Possible Link Between Barents-Kara Sea Ice and PM10 concentration in South Korea during January**  
Jeong-Hun Kim (Kongju National University, Korea Polar Research Institute)
- P1 08**    **Enhanced carbon emission at moist tundra due to increased respiration under warming environment**  
Ji Yeon Lee (Korea Polar Research Institute)
- P1 09**    **Variability of sea surface salinity in the Nordic Sea**  
Ji-Eun Park (Korea Polar Research Institute)
- P1 10**    **Impact of Antarctic meltwater forcing on East Asian climate under greenhouse warming**  
Ji-Hoon Oh (Pohang University of Science and Technology)
- P1 11**    **Long-term change and impact analysis of net radiation over Arctic**  
Minji Seo (Korea Polar Research Institute)
- P1 12**    **Biological carbon pump processes in the sea ice-affected region of Antarctica**  
Minkyoung Kim (Korea Institute of Ocean Science & Technology)
- P1 13**    **Carbon dioxide and methane fluxes measurement near tundra ponds ecosystems in Cambridge Bay, Canada**  
Namyi Chae (Korea University)
- P1 14**    **Assessment of radiative forcing with sea ice changes over arctic using radiative kernels**  
Nohhun Seong (Pukyong National University)
- P1 15**    **Phenological characteristics in year-round stem respiration of boreal black spruce (Picea mariana) stand, interior Alaska**  
Yongwon Kim (International Arctic Research Center, University of Alaska Fairbanks)

## Session 2 \_ Cryosphere evolution and sea-level change

Online

- P2 01**     **Basal reflectivity and scattering of Thwaites Glacier, West Antarctica**  
Chris Pierce (Montana State University)
- P2 02**     **Autonomous Underwater Glider Observations of Eddy-Driven Transport at the Edge of the Nansen Ice Shelf**  
Drew Friedrichs (University of California, Davis)
- P2 03**     **Changes of Campbell Glacier Tongue in East Antarctica observed with satellite SAR**  
Hyangsun Han (Kangwon National University)
- P2 04**     **Changes in the relative sea-level (RSL) of the Gulf of Dvina (White Sea, north-western Russia)**  
Iurii Kublitskii (Herzen State Pedagogical University of Russia)
- P2 05**     **Multi-layer structures of meltwater plume near grounding line, Antarctica**  
Jisung Na (Korea Polar Research Institute)
- P2 06**     **Oceanographic Conditions in the Grounding Zone Region of Thwaites Glacier**  
Peter E. D. Davis (British Antarctic Survey)
- P2 07**     **Subglacial morphology and hydrology in the 60E – 100E coastal sector of East Antarctica**  
Sergey Popov (Polar Marine Geosurvey Expedition)
- P2 08**     **A high-resolution process study of High Salinity Shelf Water formation in the Terra Nova Bay Polynya, Ross Sea, Antarctica**  
Una Miller (Columbia University)
- P2 09**     **An east-west contrasting salinity change of Antarctic Bottom Water in the Indian sector of Southern Ocean over recent decades**  
Yeon Choi (Seoul National University)

## Session 3 \_ Sea ice and polar oceans in rapid transition

Online

- P3 01**     **Ice algal biomass estimates from under-ice irradiance in the Central Arctic Ocean**  
Gaëlle Veyssiere (British Antarctic Survey)
- P3 02**     **Autonomous zooplankton profiler reveals the changing dynamics of zooplankton during a summer-winter-summer transition in the very high-Arctic**  
Jeremy Wilkinson (British Antarctic Survey)
- P3 03**     **Is the Primary Production in the Antarctic polynya system declining?**  
Jinku Park (Korea Polar Research Institute)
- P3 04**     **Estimation of Arctic basin-scale total freeboard from passive microwave satellite**  
Jong-Min Kim (Korea Polar Research Institute)
- P3 05**     **Future pan-Arctic under-ice light conditions from CMIP6 simulations**  
Julienne Stroeve (University College London)
- P3 06**     **Flexural Strength of the Arctic Sea Ice: A Case Study in the Barents Sea**  
Seung Hee Kim (Korea Polar Research Institute)
- P3 07**     **Spatial distribution of krill(*Euphausia superba* and *E.crystallorophias*) in the Terra Nova Bay polaynya and Ross Sea polynya during summer 2020**  
Wuju Son (Korea Polar Research Institute)

**P3 08**      **Seasonal Variability of Minimum Brightness Temperature at the 6.925 GHz Band of AMSR2 for the polar Oceans**

Young-Joo Kwon (Korea Polar Research Institute)

**P3 09**      **The Response of the Nordic Seas to Wintertime Sea-ice Retreat**

Yue Wu (University of East Anglia)

**Session 4 \_ Technological advances enabling new polar science**

Online

**P4 01**      **Challenging Dynamical Forecast Systems with Spatial Damped Anomaly Persistence for the Sea-Ice Edge**

Bimochan Niraula (Alfred Wegener Institute)

**P4 02**      **Development of an Unmanned Ground Vehicle for Detecting Hidden Crevasses**

Changhyun Chung (Korea Polar Research Institute)

**P4 03**      **Spatial and Regional Intercomparison of the Total Ozone Column in Antarctica Continent based on Ground and Satellite-based Observations**

Songkang Kim (Yonsei University)

**P4 04**      **Enhanced reduction of chromate in the presence of tea wastes and spent coffee ground in frozen aqueous solution**

Tae Uk Han (Korea Polar Research Institute)

**P4 05**      **Remotely sensing natural disaster-induced damage in Svalbard: transfer learning via a Markov logic network framework**

Thomas Y. Chen (Academy for Mathematics, Science, and Engineering)

**P4 06**      **Decomposition of water dissolved organic pollutants using freezing activated HCO<sub>3</sub><sup>-</sup>/PMS system**

Yong-Yoon Ahn (Korea Polar Research Institute)

**Session 5 \_ Integrated study of subglacial Antarctic lake ecosystems**

Online

**P5 01**      **Bacterial Community Structure of Surface Snow in Antarctica**

Ahnna Cho (Korea Polar Research Institute)

**P5 02**      **Mathematical modelling of the rapid draining of lakes and the formation of an ice depression on Dalk Glacier (Larsemann Hills, East Antarctica)**

Alina Boronina (State Hydrological Institute, Saint Petersburg State University)

**P5 03**      **Effect of Antifreeze Proteins from the Arctic Yeast *Leucosporidium* sp.AY30 on Freezing-enhanced Oxidation of Iodide by Hydrogen Peroxide**

Bomi Kim (Korea Polar Research Institute)

**P5 04**      **Rigidity condition for the hyper-activity of ice binding protein and implication for polar microbial survival**

Hackwon Do (Korea Polar Research Institute)

**P5 05**      **Study on the impact of climate change on Antarctic plant-pathogen interactions**

Hongshi Jin (Korea Polar Research Institute)

**P5 06**      **Classification of behaviors of South polar skua (*Stercorarius maccormicki*) breeders using acceleration and video data**

Hyunjae Chung (Korea Polar Research Institute)

- P5 07**     **Soil microbiome in permafrost soils of Eastern Antarctica: functional and structural diversity, environmental factors**  
Ivan Alekseev (Arctic and Antarctic Research Institute, Saint Petersburg State University)
- P5 08**     **Characterization of novel polyethylene terephthalate-degrading enzyme (PETase) from the polar bacterium**  
Jihyeon Yu (Korea Polar Research Institute)
- P5 09**     **Understanding of genomic properties and development of useful genomic resources from polar organisms**  
Jin-Hyoung Kim (Korea Polar Research Institute)
- P5 10**     **Structural and sequence comparisons of bacterial enoyl-CoA isomerase and enoyl-CoA hydratase**  
Jisub Hwang (Korea Polar Research Institute)
- P5 11**     **Gut microbiota and diet composition of Muskox (*Ovibos moschatus*) by age using fecal and stable isotope analysis**  
Ji-Yeon Cheon (Korea Polar Research Institute)
- P5 12**     **Ship noise effects on an Antarctic seal**  
Jongchan Lee (Korea Polar Research Institute)
- P5 13**     **Recolonization of Adélie penguins (*Pygoscelis adeliae*) at Cape Hallett on Ross Sea, Antarctica**  
Jong-U Kim (Korea Polar Research Institute)
- P5 14**     **Soil microbial co-occurrence network became less connected with the soil development along the glacier foreland of Midtre Lovénbreen, Svalbard**  
Ke Dong (Kyonggi University)
- P5 15**     **Changes in Meso-and Macro-zooplankton communities along the Northern Antarctic Peninsula (Summer 2019-2020)**  
Maria Isabel Criales-Hernandez (Universidad Industrial de Santander)
- P5 16**     **Prospect of HSP70 in *Glaciozyma antarctica* as biomarkers under climate change scenario**  
Nur Athirah Yusof (Biotechnology Research Institute, Universiti Malaysia Sabah)
- P5 17**     **Polar Microalgae Project: understanding of species-specific ecophysiological responses to recent climate changes at the phenotypic and genetic levels**  
Sung Mi Cho (Korea Polar Research Institute)
- P5 18**     **Mare incognita: Adélie penguins foraging in newly exposed habitat after calving of the Nansen Ice Shelf**  
Won Young Lee (Korea Polar Research Institute)
- P5 19**     **Microbial community structure across the environmental gradients and physiological characteristics of culturable bacteria in the East Siberian Sea**  
Yerin Park (Korea Polar Research Institute)
- P5 20**     **Dietary niche partitioning in Brown skuas (*Stercorarius lonnbergi*) during the chick-rearing period at Narębski Point on King George Island, Antarctica**  
Youmin Kim (Korea Polar Research Institute)
- P5 21**     **Investigation of intertidal macroalgal distribution and biomass using UAV in Barton Peninsula, King George Island, Antarctica**  
Young Wook Ko (Korea Polar Research Institute)