Norwegian University of Life Sciences

UArctic

IJRC-PTS

International Symposium on
Persistent Toxic Substances

PTS 2026

Arctic Organic Pollutants in a Changing Environment

Arctic Climate Change as a Driver of Pollutant Mobility



Photo: R. Kallenborn – Longyearbyen, Longyeardalen towards Adventfjorden and Hiorthfjellet (Svalbard)

PROGRAMME & ABSTRACT BOOK

Funken Lodge · Longyearbyen · Svalbard

2 – 4 November 2026

Organised by the Norwegian University of Life Sciences (NMBU)
with the International Joint Research Center for Persistent Toxic Substances (IJRC-PTS)
and the UArctic Regional Centre in China (UArctic–HIT Training Centre)

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Welcome from the Chairs

Dear colleagues and friends,

It is a great pleasure to welcome you to Longyearbyen and to the International Symposium on Persistent Toxic Substances, PTS 2026. For three days, the northernmost town in the world becomes a meeting place for researchers from Asia, Europe and North America who share a common concern: how persistent and emerging organic pollutants travel to, accumulate in and are released again from the Arctic environment.

There could hardly be a more fitting place for this discussion. Svalbard is warming faster than almost any other region on Earth. Glaciers retreat, permafrost thaws, sea ice declines and the archives of contaminants stored in snow, ice and soils are being remobilised. At the same time, local activities, from energy production and traffic to wastewater and tourism, add new sources that complicate the classical picture of the Arctic as a passive sink for long-range transported pollution. Understanding these interacting processes requires exactly the combination of disciplines represented at this meeting: atmospheric and analytical chemistry, ecotoxicology, epidemiology and environmental health.

PTS 2026 is deliberately designed as a compact, discussion-oriented meeting. Each day combines plenary and invited lectures with contributed presentations and interactive workshop sessions. The results of these discussions will feed directly into a joint white paper and a comprehensive review on “Chemicals of emerging Arctic concern in a changing environment – global implications and consequences”. We warmly invite all participants to contribute actively to this shared effort.

The symposium is organised by the Norwegian University of Life Sciences (NMBU) together with the International Joint Research Center for Persistent Toxic Substances (IJRC-PTS) and the University of the Arctic (UArctic) through its Regional Centre in China at the Harbin Institute of Technology. It continues a long tradition of scientific cooperation between Chinese and Nordic partners, and it brings this cooperation to the High Arctic itself.

We thank all speakers and participants, many of whom have travelled very long distances to be here, as well as our partners and the staff at Funken Lodge for their support. The polar night has just begun over Longyearbyen. We hope that the dark season, the snow-covered mountains and, with some luck, the northern lights will make your stay as memorable as the science.

We wish you an inspiring symposium and a pleasant stay on Svalbard.



Prof. Roland Kallenborn
Chair, National Organising Committee
NMBU / Nord University · UArctic Chair



Prof. Yi-Fan Li
Co-Chair, IJRC-PTS
Harbin Institute of Technology, China

Organisation

Symposium Chairs

Prof. Roland Kallenborn — Norwegian University of Life Sciences (NMBU) / Nord University, Norway
Prof. Yi-Fan Li — International Joint Research Center for Persistent Toxic Substances (IJRC-PTS), Harbin Institute of Technology, China

National Organising Committee

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International Joint Research Center for Persistent Toxic Substances (IJRC-PTS), Harbin, China
University of the Arctic (UArctic) — UArctic Regional Centre in China / UArctic–HIT Training Centre

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Air sampling equipment at the Zeppelin Observatory, Ny-Ålesund (Svalbard). Photo: R. Kallenborn

Dressing for the Arctic Winter

Early November on Svalbard means polar night: the sun stays below the horizon from late October until mid-February, and only a faint blue twilight remains around midday. Typical air temperatures in Longyearbyen are between about −5 °C and −15 °C, but wind can make it feel much colder, and weather changes quickly. Roads and footpaths are often covered with snow and ice. With the right clothing, however, the Arctic winter is a wonderful experience.

Dress in layers

- **Base layer:** long-sleeved wool underwear (merino) for top and legs. Avoid cotton, which stays wet and cold.
- **Middle layer:** a wool sweater or fleece jacket; a light down or synthetic insulated jacket for extra warmth.
- **Outer layer:** a windproof and water-repellent jacket with hood, and windproof trousers or insulated ski pants for walks outdoors.

Head, hands and feet

- **Hat and neck gaiter / buff** — most heat is lost from head and neck; a balaclava is useful in strong wind.
- **Mittens** (warmer than gloves), ideally with thin liner gloves so you can use your phone without exposing bare skin.
- **Insulated winter boots** with a good, non-slip sole and warm wool socks. Slip-on ice grips or spikes are strongly recommended on icy roads.

Darkness and safety

- **Headlamp and reflective vest or reflectors** — it is dark around the clock, and roads are shared with cars and snowmobiles.
- **Polar bears:** do not walk outside the settlement area of Longyearbyen. Excursions beyond the town must be made with an authorised guide who carries the required protection.
- **Indoor custom:** in Longyearbyen it is customary to take off your shoes when entering many buildings, including some hotels and public buildings — bring indoor shoes or warm socks.
- **Skin and eyes:** use a fat-based cream on the face in very cold weather, and keep your phone warm in an inner pocket — batteries drain quickly in the cold.

The walk between Funken Lodge and the town centre takes about ten minutes. Local shops in Longyearbyen sell quality outdoor clothing if anything has been forgotten.



Snowmobile tracks on Arctic sea ice in low winter light. Photo: R. Kallenborn

The Venue: Funken Lodge

Funken Lodge stands at Haugen in Longyeardalen, overlooking Adventfjorden and the mountain Hiorthfjellet. The building dates from 1947, when Store Norske Spitsbergen Kulkompani — the mining company that founded and for many decades ran Longyearbyen — built it as accommodation and dining hall for its officials and managers (in Norwegian, funksjonærer). The name "Funken" is a short form of Funktionærmessen, the officials' mess, a name still carried by the hotel restaurant today.

From the start the building served as Store Norske's representative residence. With its architecture and interior it was regarded as the grandest building in Longyearbyen and became the centre of the town's social life in the mining era. Over the years it has received explorers, researchers, royalty and heads of state. The historic wine cellar once housed Svalbard's original wine and spirits shop.

After extensive refurbishment, Funken is today a boutique hotel with 88 rooms and suites, including the historic Store Norske and Bergmester suites. Historic photographs, old maps and newspaper clippings in the corridors and lounges tell the story of the coal-mining community that shaped Longyearbyen. The hotel is operated by Hurtigruten Svalbard.

Practical information

- **Address:** Funken Lodge, Vei 212-4 (formerly Vei 10), 9170 Longyearbyen.
- **Getting there:** about 20 minutes by airport bus from Svalbard Airport, Longyear; about 10 minutes on foot from the town centre.
- **Meeting room, lunches and coffee breaks:** all sessions, lunches and health breaks take place at Funken Lodge.
- **Social events:** informal get-together at Kroa pub in the town centre (Sunday 1 November, 19:00, about 10 minutes' walk from Funken Lodge), welcome reception (Monday 2 November) and conference dinner (Tuesday 3 November) at Funken Lodge; the dinner requires prior registration (NOK 1000).
- **Travel:** we recommend arriving on Sunday 1 November and departing on Thursday 5 November 2026. Svalbard has daily flights to and from Oslo, some via Tromsø.



Winter landscape in Ny-Ålesund, Kongsfjorden (Svalbard). Photo: R. Kallenborn

Programme at a Glance

Day 0 — Sunday, 1 November 2026	
All day	Arrival in Longyearbyen; check-in at Funken Lodge and other hotels
19:00	**Informal get-together / icebreaker reception — Kroa pub, Longyearbyen centre** *About 10 minutes' walk from Funken Lodge. All participants and accompanying persons are welcome.*

Day 1 — Monday, 2 November 2026		
Long-range transport, polar atmospheric processes and local sources		
08:30 – 09:00	Registration and collection of conference material (Funken Lodge)	
09:00 – 09:15	Opening ceremony and welcome	Prof. Roland Kallenborn (NMBU) and Prof. Yi-Fan Li (IJRC-PTS / HIT), Symposium Chairs
09:15 – 09:45	Plenary lecture 1: Global fractionation and polar cold trap POPs (PCT-POPs)	Yi-Fan Li
09:45 – 10:45	Session 1A: Atmospheric processes and long-range transport *Session chairs: Yi-Fan Li and Roland Kallenborn*	Weina Zhang, Taicheng An, Hang Xiao
10:45 – 11:00	Health break — coffee / tea	
11:00 – 12:00	Session 1B: Local sources of pollutants in Arctic settlements *Session chairs: Tomasz M. Ciesielski and Jan Ludvig Lyche*	Tomasz M. Ciesielski, Roland Kallenborn
12:00 – 13:00	Lunch — Funktionærmessen restaurant	
13:00 – 14:30	Session 1C: Legacy and emerging contaminants: monitoring and research platforms *Session chairs: Zhiyong Xie and Zi-Feng Zhang*	Roland Kallenborn, Zi-Feng Zhang, Guiying Li, Yi-Fan Li
14:30 – 15:00	Health break — coffee / tea	
15:00 – 15:30	Session 1D · Invited lecture: The University of the Arctic (UArctic) as a Scientific Node for Coordinating Arctic Research and Academic Education	Gunnar Stefánsson
15:30 – 17:00	Workshop I — Long-range transport versus local sources: priorities for the joint white paper	All participants
19:00	Welcome reception — Funken Lodge (all participants)	

Day 2 — Tuesday, 3 November 2026		
Polar oceans, remobilisation and chemicals of emerging Arctic concern (CEACs)		
09:00 – 09:15	Day 2 introduction and recap	Symposium Chairs
09:15 – 09:45	Invited keynote: Exposure and Health Effects of Emerging Pollutants	Tong Zhu
09:45 – 10:45	Session 2A: Polar oceans, cryosphere and remobilisation *Session chairs: Zi-Feng Zhang and Wan-Li Ma*	Zhiyong Xie, Zhibo Lu
10:45 – 11:00	Health break — coffee / tea	
11:00 – 12:00	Session 2B: CEACs I — Pesticides, antimicrobial resistance and human health *Session chairs: Jing Liu and Muhammad Asaduzzaman*	Jing Liu, Muhammad Asaduzzaman
12:00 – 13:00	Lunch — Funktionærmessen restaurant	
13:00 – 13:30	Invited lecture: Introduction to UArctic Regional Centre for China (UArctic-RCC)	Yi-Fan Li
13:35 – 14:30	Workshop II — White-paper working groups (parallel)	All participants
14:30 – 15:00	Health break — coffee / tea	
15:00 – 16:00	Workshop II (continued) — Reports from the working groups	All participants
16:00 – 17:00	Plenary discussion — Monitoring priorities for remobilisation processes and CEACs	All participants
19:00	Conference dinner — Funken Lodge (separate registration, NOK 1000)	

Day 3 — Wednesday, 4 November 2026		
Exposure, health and sustainable solutions		
09:00 – 09:15	Day 3 introduction and recap	Symposium Chairs
09:15 – 09:45	Plenary lecture 2: Plastics and Plastic Additives: Environmental Exposure, Toxicological Effects and Analytical Challenges	Jan Ludvig Lyche
09:45 – 10:45	Session 3A: Human exposure, health and One Health approaches *Session chairs: Tong Zhu and Jan Ludvig Lyche*	Hailing Li, Roland Kallenborn, Yi-Fan Li
10:45 – 11:00	Health break — coffee / tea	
11:00 – 12:00	Workshop III — Local pollution and sustainable solutions in Arctic settlements	All participants
12:00 – 13:00	Lunch — Funktionærmessen restaurant	
13:00 – 14:30	Workshop III (continued) — White paper and review: outline, writing teams and timeline	All participants
14:30 – 15:00	Health break — coffee / tea	
15:00 – 15:30	Closing session	Summary, acknowledgements and next steps — Symposium Chairs

Colour key: yellow = plenary/keynote lecture, green = workshop session, grey = breaks, lilac = social programme. Contributed talks are 20 minutes including questions.

Detailed Programme

Presenting authors are listed. Codes refer to the abstracts, which are printed in alphabetical order of presenting author. PL = plenary lecture, KN = keynote, IS = invited speaker, O = oral presentation.

Day 0 — Sunday, 1 November 2026	
All day	Arrival in Longyearbyen; check-in at Funken Lodge and other hotels
19:00	**Informal get-together / icebreaker reception — Kroa pub, Longyearbyen centre** *About 10 minutes' walk from Funken Lodge. All participants and accompanying persons are welcome.*



Ny-Ålesund and Kongsfjorden seen from the Zeppelin mountain in late winter (Svalbard). Photo: R. Kallenborn

Day 1 — Monday, 2 November 2026

Long-range transport, polar atmospheric processes and local sources

08:30 – 09:00	**Registration and collection of conference material (Funken Lodge)**	
09:00 – 09:15	**Opening ceremony and welcome** *Prof. Roland Kallenborn (NMBU) and Prof. Yi-Fan Li (IJRC-PTS / HIT), Symposium Chairs*	
09:15 – 09:45	**Plenary lecture 1 (PL-1) — Yi-Fan Li** *Global fractionation and polar cold trap POPs (PCT-POPs)*	
09:45 – 10:45	**Session 1A — Atmospheric processes and long-range transport** Session chairs: Yi-Fan Li and Roland Kallenborn	
09:45	**O-01**	Weina Zhang *Amine-Promoted Chlorine Activation at Polar Air–Ice Interfaces*
10:05	**O-02**	Taicheng An *Chemical Oxidation Mechanisms of Typical Volatile Organic Compounds at Surfaces of Atmospheric Liquid Droplet*
10:25	**O-03**	Hang Xiao *Breaking the Wind Barrier: A High-Precision All-Weather Flow-Through Sampler for Polar Atmospheric POPs Monitoring*
10:45 – 11:00	Health break — coffee / tea	
11:00 – 12:00	**Session 1B — Local sources of pollutants in Arctic settlements** Session chairs: Tomasz M. Ciesielski and Jan Ludvig Lyche	
11:00	**O-04**	Tomasz M. Ciesielski *Beyond long-range transport: local sources of organic pollutants in Svalbard*
11:20	**O-05**	Roland Kallenborn *From coal to diesel: emission profiles of PAHs, oxy-PAHs and nitro-PAHs after the energy transition in Longyearbyen, Svalbard*
11:40	**O-06**	Roland Kallenborn *Tire-wear-derived p-phenylenediamine quinones (6PPD-Q and analogues) in urban Arctic soils, Longyearbyen, Svalbard*
12:00 – 13:00	Lunch — Funktionærmessen restaurant	
13:00 – 14:30	**Session 1C — Legacy and emerging contaminants: monitoring and research platforms** Session chairs: Zhiyong Xie and Zi-Feng Zhang	
13:00	**O-07**	Roland Kallenborn *Legacy and emerging PFAS in snow and water from Svalbard and northern Canada: method validation and indications of local point sources*
13:20	**O-08**	Zi-Feng Zhang *The Arctic research in International Joint Research Center for Arctic Environment and Ecosystem (IJRC-AEE)*
13:40	**O-09**	Guiying Li *Formation Mechanism of Highly Antibiotic-Resistant Dormant Subpopulations in Bioaerosol during Aerosolizing from Aquatic Environments*
14:00	**O-16**	Yi-Fan Li (on behalf of D. Wang, H. Gao and J. Ma) *Kinetic aerosol trapping drives Arctic enrichment of organophosphate flame retardants*
14:20	**—**	*Session discussion (10 min)*
14:30 – 15:00	Health break — coffee / tea	
15:00 – 15:30	**Session 1D · Invited lecture (IS-2) — Gunnar Stefánsson** *The University of the Arctic (UArctic) as a Scientific Node for Coordinating Arctic Research and Academic Education*	
15:30 – 17:00	**Workshop I — Long-range transport versus local sources: priorities for the joint white paper**	
19:00	**Welcome reception — Funken Lodge (all participants)**	

Day 2 — Tuesday, 3 November 2026

Polar oceans, remobilisation and chemicals of emerging Arctic concern (CEACs)

09:00 – 09:15	**Day 2 introduction and recap** *Symposium Chairs*	
09:15 – 09:45	**Invited keynote (KN-1) — Tong Zhu** *Exposure and Health Effects of Emerging Pollutants*	
09:45 – 10:45	**Session 2A — Polar oceans, cryosphere and remobilisation** Session chairs: Zi-Feng Zhang and Wan-Li Ma	
09:45	**IS-1**	Zhiyong Xie (invited, 30 min) *Emerging Organic Contaminants in the Global Ocean and Polar Regions*
10:15	**O-10**	Zhibo Lu *Occurrence and profiles of benzotriazole UV stabilizers in bird feathers from polar regions and China*
10:35	**—**	*Session discussion (10 min)*
10:45 – 11:00	Health break — coffee / tea	
11:00 – 12:00	**Session 2B — CEACs I — Pesticides, antimicrobial resistance and human health** Session chairs: Jing Liu and Muhammad Asaduzzaman	
11:00	**O-11**	Jing Liu *Pesticide Exposure and Female Reproductive Health*
11:20	**O-12**	Muhammad Asaduzzaman *Chronic arsenic exposure and antibiotic-resistant Escherichia coli colonization in mother–child pairs: implications for metal co-selection and AMR monitoring*
11:40	**O-13**	Muhammad Asaduzzaman *Medical device biomaterials and antimicrobial resistance: implications for polar monitoring and a policy pathway for PVC in healthcare*
12:00 – 13:00	Lunch — Funktionærmessen restaurant	
13:00 – 13:30	**Invited lecture (IS-3) — Yi-Fan Li** *Introduction to UArctic Regional Centre for China (UArctic-RCC)*	
13:35 – 14:30	**Workshop II — White-paper working groups (parallel)** *WG 1: Long-range transport and local sources · WG 2: Climate-driven remobilisation from ice, snow and permafrost · WG 3: CEACs — PFAS, plastics additives, pharmaceuticals and AMR*	
14:30 – 15:00	Health break — coffee / tea	
15:00 – 16:00	**Workshop II (continued) — Reports from the working groups**	
16:00 – 17:00	**Plenary discussion — Monitoring priorities for remobilisation processes and CEACs**	
19:00	**Conference dinner — Funken Lodge (separate registration, NOK 1000)**	

Day 3 — Wednesday, 4 November 2026

Exposure, health and sustainable solutions

09:00 – 09:15	**Day 3 introduction and recap** *Symposium Chairs*	
09:15 – 09:45	**Plenary lecture 2 (PL-2) — Jan Ludvig Lyche** *Plastics and Plastic Additives: Environmental Exposure, Toxicological Effects and Analytical Challenges*	
09:45 – 10:45	**Session 3A — Human exposure, health and One Health approaches** Session chairs: Tong Zhu and Jan Ludvig Lyche	
09:45	**O-14**	Hailing Li *Comprehensive Characterization of Occupational Exposure to Coking-Related Pollutants and Their Associations with Liver Function*
10:05	**O-15**	Roland Kallenborn *One Health as a tool for pollutant mitigation in a changing Arctic: Svalbard as an example*
10:25	**O-17**	Yi-Fan Li (incl. session discussion) *Gridded annual emission inventories with high resolution for tire wear particles (TWPs) in China from 2004 to 2024*
10:45 – 11:00	Health break — coffee / tea	
11:00 – 12:00	**Workshop III — Local pollution and sustainable solutions in Arctic settlements**	
12:00 – 13:00	Lunch — Funktionærmessen restaurant	
13:00 – 14:30	**Workshop III (continued) — White paper and review: outline, writing teams and timeline** *"Chemicals of emerging Arctic concern in a changing environment – global implications and consequences"*	
14:30 – 15:00	Health break — coffee / tea	
15:00 – 15:30	**Closing session** *Summary, acknowledgements and next steps — Symposium Chairs*	

Plenary and Invited Speakers



Prof. Yi-Fan Li

Plenary lecture PL-1 · Harbin Institute of Technology (HIT), China

Dr. Yi-Fan Li is a Full Professor at the Harbin Institute of Technology (HIT), China, a member of the Norwegian Scientific Academy for Polar Research (NVP), and one of the world's most experienced researchers on the long-range transport, fate, and modelling of persistent organic pollutants (POPs) in the global and Arctic environment. He holds a Ph.D. in Physics from the University of Waterloo, Canada (1989), and a Master's degree from Harbin Institute of Technology (1980).

Dr. Li built the first two decades of his research career in Canada from 1992 to 2012, as a Senior Research Scientist with Environment and Climate Change Canada. During this period, he became a leading contributor to Canada's national understanding of Arctic contamination, serving as one of the main authors of the Canadian Arctic Contaminant Assessment Report (CACAR) and contributing to Arctic Monitoring and Assessment Programme (AMAP) reporting. His pioneering work on global emission inventories and atmospheric transport modelling, including the Arctic Mass Balance Box Model and global gridded emission inventories for organochlorine pesticides such as hexachlorocyclohexane (HCH), has shaped how the scientific community understands the way pollutants emitted far from the poles accumulate in Arctic ecosystems.

Since returning to China, Dr. Li has held a Full Professorship at HIT (since 2012) and an Adjunct Professorship at Dalian Maritime University (since 2006), where he has supervised 23 Ph.D. students and 21 Master's students to date. He is the founding Director of the UArctic Regional Centre (formerly named the UArctic-HIT Training Centre), the first UArctic Regional Centre established outside the eight Arctic states, and Executive Vice Principal of its International Arctic School, through which he has built a durable bridge between Chinese and international Arctic science communities. He also serves as Chief Scientist of the Polar Academy at HIT and Executive Vice Chair of the Specialized Committee for Arctic Environment and Ecosystem of the Chinese Society for Environmental Sciences.

Dr. Li's current research addresses the sources, gas/particle partitioning, and long-range transport of contaminants including polybrominated diphenyl ethers (PBDEs), phthalate esters, and other persistent and emerging pollutants, combining field monitoring with fugacity- and mass-balance-based modelling. He leads the UArctic Thematic Network on "POPs and Chemicals of Emerging Arctic Concern in the Asian Arctic," connecting Asian and Arctic research communities on pollution pathways under a changing climate.

An internationally recognized voice in chemicals policy, Dr. Li served on the expert group that revised the Stockholm Convention's guidance on climate change and POPs, and has been a member of the AMAP Expert Group on POPs since 2015. He is Series Editor of the Springer book series "From Pole to Pole" and sits on the editorial board of the journal Processes.

Dr. Li has authored nearly 330 peer-reviewed journal articles spanning more than three decades and has been consistently listed among Elsevier’s Most Cited Chinese Researchers since 2014. Dr. Li's work continues to shape how the world tracks and understands the journey of persistent pollutants from distant source regions to the Arctic.



Prof. Tong Zhu

Keynote lecture KN-1: “Exposure and Health Effects of Emerging Pollutants” · Peking University, China

Tong ZHU, a Boya Chair Professor at College of Environmental Sciences and Engineering, the founding Director of the Institute of Tibetan Plateau, Peking University. He is a Member of the Chinese Academy of Sciences, a Fellow of the World Academy of Sciences, and a Fellow of American Geophysical Union (AGU). He is appointed as a Counsellor of the State Council of the People’s Republic of China in 2020.

His research focuses on Atmospheric Chemistry and Environmental Health, and has published more than 500 peer reviewed papers. He has carried out extensive research on the fundamental understanding in atmospheric chemistry, long-range transport of POPs, and health effects of air pollution and climate change. He contributed greatly to science-based air pollution control, his

findings have greatly supported China's Air Pollution Prevention and Control Action Plan, which drastically improved air quality over the past decade in China. His research on the health effects of air pollution and climate change has promoted the interdisciplinary research and education program of environmental health in China.

He was the founding director of the Center for Environment and Health (2007-2022) and the former Dean (2012-2023) of the College of Environmental Sciences and Engineering, Peking University, a Global Scholar of Princeton University (2012-2015). He served as a Co-Chair of the Scientific Steering Committee (SSC) of the International Global Atmospheric Chemistry (IGAC, 2009-2012), vice president of international Committee for Atmospheric Chemistry and Global Pollution (iCACGP, 2018-2022), member of Board of Directors of AGU (2019-2022). Currently he is a vice chair of WMO GAW SSC, chair of the SSC of Future Earth-Monsoon Asia Integrated Research for Sustainable Development (FE-MAIRS).



Prof. Gunnar Stefánsson

Invited lecture IS-2 · Vice-President Research, University of the Arctic (UArctic); University of Iceland

Prof. Gunnar Stefánsson is Professor of Industrial Engineering at the University of Iceland and at Chalmers University of Technology, Sweden, and has served as Vice-President Research of the University of the Arctic (UArctic) since July 2023. At the University of Iceland he is Director of the Engineering Research Institute, overseeing research across the engineering faculty, including master's, doctoral and postdoctoral research and the faculty's national and international project funding, mainly from EU programmes.

He holds a degree in mechanical engineering and computer science from the University of Iceland and received his PhD from Chalmers University of Technology in 2004, after an earlier career in management positions in the business sector. His research addresses transport management across the four major transport modes, with a focus on efficiency, digitalisation and reducing the environmental impacts of transport operations. Arctic transport and logistics have been a recurring theme, including operations in rural areas and the Northwest and Northeast Passages.

Since 1998 he has taken part in numerous Swedish, Icelandic and EU-funded projects, has published in a range of high-impact journals and has served as guest editor for several international journals.



Prof. Jan Ludvig Lyche

Plenary lecture PL-2 · Faculty of Veterinary Medicine, Norwegian University of Life Sciences (NMBU)

Jan Ludvig Lyche is Professor and Laboratory Leader at the Department of Preclinical Sciences, Faculty of Veterinary Medicine, Norwegian University of Life Sciences (NMBU). A veterinarian by training, he received his Cand.med.vet. (1993) and Dr.med.vet. (2004) from the Norwegian School of Veterinary Science. He then worked in veterinary practice and as Head of the Toxicology Unit at the Norwegian Veterinary Institute before joining NMBU as professor in 2014.

His research addresses the occurrence, exposure and toxicological effects of persistent organic pollutants, PFAS and plastic additives in wildlife, fish, food and humans. It ranges from endocrine disruption and reproductive toxicology to human biomonitoring in breast milk and blood, and to contaminants in Arctic, Norwegian and African aquatic environments.

He leads tasks and work packages in national and international projects, including the EU Horizon project ArcSolution, the NFR Centre of Excellence CERAD, the NFR SFI Harvest and several Norad-funded capacity-building programmes in East, Southern and West Africa. He also coordinates the Norwegian monitoring of EU Water Framework Directive priority contaminants in freshwater fish. Since 2014 he has served as an expert on the Norwegian Scientific Committee for Food Safety.

Prof. Lyche has supervised 19 PhD and 18 Master's students. He has authored around 100 original research articles, as well as numerous risk-assessment reports for the Norwegian Food Safety Authority and the Norwegian Environment Agency.



Dr. Zhiyong Xie

Invited lecture IS-1 · Helmholtz-Zentrum Hereon, Germany

Dr. Zhiyong Xie is an environmental analytical scientist at the Institute of Coastal Environmental Chemistry, Helmholtz-Zentrum Hereon, Germany. His research focuses on the transport, and fate of organic contaminants in the global ocean, particularly in the Arctic and Antarctic. Using advanced sampling techniques, targeted and non-targeted chemical analysis, and environmental transport modelling, he investigates contaminant sources, long-range transport, biogeochemical cycling, and bioaccumulation. With 20 years of Arctic research experience, he has conducted extensive fieldwork aboard icebreaker expeditions and at the AWIPEV research station in Ny-Ålesund, Svalbard. He serves as Co-Chair of the ImPACT Expert Group of the Scientific Committee on Antarctic Research (SCAR) and coordinates Theme 5, “Anthropogenic Signatures in Antarctica,” under the international initiative Antarctica InSync.



Prof. Roland Kallenborn

Symposium Chair · UArctic Chair for Arctic Environmental Pollution Research, NMBU / Nord University

Professor Roland Kallenborn is an internationally renowned scientist and university teacher in the fields of organic analytical chemistry, environmental chemistry, and environmental risk assessment, with a particular focus on bioaccumulation and food web responses to environmental contaminants. He holds the University of the Arctic Chair for Arctic Environmental Pollution Research and is affiliated with the Norwegian University of Life Sciences (NMBU), Faculty of Chemistry, Biotechnology and Food Science (KBM), as well as Nord University (NordU), Faculty of Biosciences and Aquaculture (FBA). Across both institutions, he combines an active research programme with teaching and supervision, training the next generation of environmental chemists in analytical method development and risk assessment.

Kallenborn is the coordinator of the EU-funded project "Arctic pollution in a One Health perspective – from complex challenges to sustainable solutions" (ArcSolution). As an environmental chemist, his work centres on the development of methods for the identification, characterisation, and mitigation of organic environmental pollutants, including contaminants of emerging concern and their transformation products. His current research addresses the elucidation of pollutant profiles across urban agriculture, food processing, and Arctic environments, connecting analytical method development to real-world questions of exposure and risk.

Beyond his own research programme, Kallenborn plays a leading role in coordinating academic teaching and research across the University of the Arctic network in his capacity as UArctic Chair in Environmental Pollution Research. He also serves as the current Chair of the Division of Chemistry and the Environment (DCE) of the European Chemical Society (EuChemS). Internationally, he is a titular member of IUPAC Division VI (Chemistry and the Environment), where he co-chairs the sub-committee on Chemical and Biophysical Processes in the Environment (CABPE). Through these roles, he helps set research priorities and shape scientific collaboration in environmental chemistry at both the European and global level.

Kallenborn's scientific output reflects a career built on sustained, wide-ranging contributions to the field: he is author or co-author of some 150 peer-reviewed publications, 12 books and monographs (as author, chapter author, and editor), 20 contract reports, and 10 popular science papers, alongside more than 400 presentations at international conferences and seminars. His citation record includes an ISI H-Index of 46 and a Google Scholar H-Index of 60, reflecting the sustained international impact of his work on environmental pollutants and their behaviour in the environment.

Kallenborn also contributes actively to the scientific publishing community, serving as editor or editorial board member for several impact-factor-registered journals, including Current Chromatography, Fresenius Environmental Bulletin, Environmental Toxicology and Chemistry, Environmental Science and Pollution Research (Springer), and Chemosphere (Elsevier). Through this combination of research leadership, international network coordination, and editorial service, Roland Kallenborn continues to shape how the scientific community understands, monitors, and addresses organic pollution in sensitive environments, from Arctic ecosystems to the food systems that connect them to the rest of the world. His work consistently bridges disciplinary and

institutional boundaries, bringing together analytical chemistry, ecotoxicology, and environmental policy in pursuit of practical, science-based solutions to pollution challenges.

Abstracts

Abstracts are printed as submitted by the authors, in alphabetical order of the presenting author (underlined, or named below the affiliations when presenting on behalf of the authors). Minor typographical corrections only.

O-02 Session 1A, Monday, 2 November 2026, 10:05

Chemical Oxidation Mechanisms of Typical Volatile Organic Compounds at Surfaces of Atmospheric Liquid Droplet

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Volatile organic compounds (VOCs) are critical precursors to ozone and secondary organic aerosol. Their atmospheric transformation largely occurs at droplet interfaces via gas particle partitioning. However, it is unclear how these interfaces initiate chemical oxidation and alter reaction pathways. To address this, we used custom built mist chambers, online mass spectrometry, electron paramagnetic resonance, and molecular dynamics simulations. We systematically investigated the interfacial chemistry of typical VOCs and their derivatives. The results show that the oxidation of typical VOCs at droplet interfaces proceeds spontaneously without light. This oxidation is driven by hydroxyl and iodine radicals. These radicals are generated by the intense interfacial electric field (~10^9 V m^{-1}), and can oxidize gas phase cyclohexane to cyclohexanone and cyclohexanol. This confirms spontaneous interfacial oxidation as an effective atmospheric pathway. The same droplet interface not only supplies radicals but also accelerates amine to amine salt conversion, through the acidic sulfate environment. Critically, amine salts are not terminal products because they are synergistically activated by interfacial •OH and sulfate ions. The activation involves H abstraction, O_2 addition, and hydrolysis. In summary, our findings show that the droplet interface acts as an autonomous microreactor, and then spontaneously generates oxidants. These oxidants drive VOC oxidation, accelerate nitrogen containing VOC conversion, and even reactivate inert salts. These conclusions reshape our understanding of nighttime and haze period atmospheric chemistry.

Keywords: Volatile organic compounds; Droplet interface; Interfacial oxidation; Atmospheric chemistry

Acknowledgments: This work was financially supported by NSFC (42020104001).

O-12 Session 2B, Tuesday, 3 November 2026, 11:20

Chronic arsenic exposure and antibiotic-resistant Escherichia coli colonization in mother–child pairs: implications for metal co-selection and AMR monitoring

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Toxic metals such as arsenic can co-select for antibiotic resistance, and metal resistance genes are reported alongside antibiotic resistance genes even in remote Arctic settings such as Svalbard, where polar sites serve as baselines for tracking antimicrobial resistance (AMR). Whether chronic arsenic exposure through drinking water affects human gut carriage of resistant bacteria is unclear. Though our current study is not in Arctic but its findings can be translated in any settings including arctic. We compared mother–child pairs (children <1 year) from 50 households each in Matlab (water arsenic <10 ppb, low arsenic, LA) and Hajigonj (>100 ppb, high arsenic, HA), Chandpur, Bangladesh. Stool and household drinking water were cultured for fluoroquinolone-resistant and third-generation cephalosporin-resistant (3GCr) E. coli; PCR detected pathogenic, arsenic-resistance and AMR genes.

Resistant E. coli were found in stool of 97% of HA versus 86% of LA pairs (P<0.05). Among children, 3GCr colonisation was 93.3% in HA versus 76.3% in LA; HA mothers carried higher 3GCr counts (log10 6.34 vs 5.88 CFU/g). Resistant E. coli in drinking water were also more frequent in HA. HA isolates were more often multi-class resistant, and arsB, arsC, blaTEM, blaOXA-1 and blaCTX-M-1 were more prevalent in stool and water isolates (P<0.05).

Higher arsenic exposure was associated with greater carriage of resistant E. coli, though this cross-sectional design cannot establish causation. Metal-contaminated water may link toxic exposure, resistant gut bacteria and environmental spread. We suggest polar and other AMR monitoring include metal co-selection markers alongside resistance genes.

O-13 Session 2B, Tuesday, 3 November 2026, 11:40

Medical device biomaterials and antimicrobial resistance: implications for polar monitoring and a policy pathway for PVC in healthcare

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Arctic environments are increasingly used as baselines for tracking the global spread of antimicrobial resistance (AMR): soils in Svalbard already contain 131 resistance genes, including blaNDM-1, linked to human and wildlife inputs. Meanwhile, the direct link of plastics and plasticizers such as polyvinyl chloride (PVC) and Di(2-ethylhexyl) phthalate (DEHP) with AMR is not well explored. PVC is widely used in single-use medical devices, still whether device biomaterials influence infection or AMR outcomes is unknown. We have examined three pathways in this context:

(1) Biofilm: device surfaces support biofilms, which enhance tolerance and persistence (not heritable resistance) and favor horizontal gene transfer; co-selection with metal resistance, seen in environmental plastic biofilms, is untested on device materials. (2) Plasticizer leaching: DEHP migrates from flexible PVC and exposure is documented in ICU patients and neonates; no evidence links it to infection susceptibility, antimicrobial use or AMR. (3) Drug sorption: loss varies by drug and material, mostly for non-antimicrobials; clinically significant antimicrobial underexposure is not demonstrated. Evidence supports the upstream steps but becomes indirect downstream; a causal link between PVC and clinical AMR is not established.

We recommend comparative research on biofilm, sorption and immune effects across PVC and alternatives; mandatory disclosure of device composition; procurement prioritizing NICUs and maternity wards; a formal EU regulation on the registration, evaluation, authorization and restriction of chemicals (REACH) pathway for PVC with a time-bound transition beyond the 2030 DEHP deadline; and polar monitoring that pairs resistance genes, mobile elements and metal markers with plastic and plasticizer measurements within a One Health framework.

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O-04 Session 1B, Monday, 2 November 2026, 11:00

Beyond long-range transport: local sources of organic pollutants in Svalbard

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The Arctic is commonly regarded as a relatively pristine region, where the occurrence of organic pollutants is largely attributed to long-range atmospheric and oceanic transport. However, local anthropogenic activities represent an additional and potentially important source of contamination in Svalbard, particularly in the vicinity of settlements, industrial sites and areas experiencing increasing human activity.

Historical and ongoing activities, including coal mining, energy production, waste disposal, wastewater discharge and maritime traffic, contribute to the release of diverse organic contaminants. Previous studies have documented elevated concentrations of polycyclic aromatic hydrocarbons (PAHs) associated with coal mining and combustion activities, while local sources of per- and polyfluoroalkyl substances (PFAS) have been linked to firefighting activities, waste disposal and wastewater. Municipal wastewater discharges represent an additional potential pathway for contaminants of emerging concern (CECs), including pharmaceuticals, personal care products and other household-derived chemicals, into Arctic coastal waters.

Ongoing climatic changes may further influence the distribution and fate of these contaminants by altering hydrological processes, coastal erosion and the mobilisation of historically deposited pollutants. Simultaneously, increasing tourism, shipping and infrastructure development may introduce new contamination pressures.

Despite growing evidence of local sources of organic pollutants, important knowledge gaps remain concerning their relative contributions, spatial distribution, transport pathways, bioavailability and potential biological effects. Improved understanding of these sources is essential for distinguishing locally derived contamination from long-range inputs and supporting targeted monitoring and mitigation strategies in Svalbard.

O-05 Session 1B, Monday, 2 November 2026, 11:20

From coal to diesel: emission profiles of PAHs, oxy-PAHs and nitro-PAHs after the energy transition in Longyearbyen, Svalbard

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Polycyclic aromatic compounds (PACs), including parent PAHs and their oxygenated (oxy-) and nitrated (nitro-) derivatives, are formed during incomplete combustion. Some derivatives are more toxic than their parent compounds. A 2019 study identified the coal-fired power plant in Longyearbyen as a major local PAC source. In 2023, the plant was decommissioned and replaced by diesel generators. This created a rare opportunity to assess how an Arctic community's energy transition affects local air quality.

In August 2024, we collected gaseous and particulate air samples at five locations in Longyearbyen: at the diesel generator, a gas station, a snowmobile rental site, a pedestrian pathway, and a high-volume background station at UNIS. We analysed 16 PAHs by GC-EI-MS/MS, and 8 oxy-PAHs and 19 nitro-PAHs by GC-NICI-MS, applying strict quality criteria to each analyte.

At the emission source, gaseous PAH concentrations (1,384–60,773 pg/m³) were three to seven times higher than those measured at the coal-fired plant in 2019. Oxy-PAHs (61–954 pg/m³) and nitro-PAHs (51–351 pg/m³) were 2 to 14 times higher. In ambient air, PAHs ranged from 103 to 2,416 pg/m³, oxy-PAHs from 1.5 to 1,418 pg/m³, and nitro-PAHs from 1.4 to 126 pg/m³. Spatial differences were likely driven by meteorology and photolytic degradation. The results suggest that replacing coal with diesel generators has not reduced local PAC emissions and may have increased them. Because this study covers only the summer season, year-round measurements, including the polar night, are needed to fully evaluate the air quality effects of the energy transition.

O-07 Session 1C, Monday, 2 November 2026, 13:00

Legacy and emerging PFAS in snow and water from Svalbard and northern Canada: method validation and indications of local point sources

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Per- and polyfluoroalkyl substances (PFAS) reach remote Arctic regions via long-range atmospheric and oceanic transport. However, data on their occurrence and transport pathways remain scarce, particularly for short-chain and neutral PFAS, which are analytically challenging. We validated an LC-MS/MS method for 28 ionic and neutral PFAS in water and snow. We then applied it to surface snow from 15 sites near Longyearbyen and to water from four sites near Hornsund (Svalbard, spring 2025), as well as to water from four sites in the Yellowknife area (Northwest Territories, Canada, summer 2023). Method LOQs ranged from 0.14 to 10 ng/L. The method showed good linearity and reproducibility for most compounds. However, short-chain PFAS, especially PFBA, were prone to background contamination and elevated recoveries at low concentrations.

PFAS were detected in most samples, with short-chain PFAS dominating the profiles. PFPeA reached 52.8 ng/L in Svalbard snow, and PFBA reached 43.9 ng/L in Hornsund water. These profiles are consistent with long-range atmospheric transport as a major input pathway. Of the neutral PFAS, only FOSA was quantified in most samples. Several sites showed clear signs of local contamination. 6:2 FTS reached 332 ng/L in snow near Longyearbyen, and elevated levels were found near the airport and a former landfill in Adventdalen. The highest overall burden was found at Kam Lake Lagoon (Yellowknife), where eight short- and long-chain PFAS each ranged from 7.6 to 33.4 ng/L. Canadian samples generally contained more long-chain PFAS than those from Svalbard. These results show that Arctic PFAS contamination reflects both diffuse long-range transport and local anthropogenic sources. Analytical methods for short-chain and neutral PFAS need further improvement.

O-15 Session 3A, Wednesday, 4 November 2026, 10:05

One Health as a tool for pollutant mitigation in a changing Arctic: Svalbard as an example

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Arctic pollution is conventionally assessed through separate environmental, veterinary and public health channels, each with its own monitoring programmes, endpoints and regulatory routes. In a region where the same water body may serve simultaneously as drinking water source, harvesting ground and effluent recipient, this separation obscures precisely the couplings that determine exposure. One Health offers an operational alternative: a framework in which human, animal and environmental health are assessed together, and in which mitigation is designed against the exposure pathway rather than against the individual environmental compartment.

Svalbard provides an unusually complete demonstration case. Longyearbyen draws its supply from a single shallow reservoir embedded in degrading permafrost, and recent exceedances of sulfate and nickel have prompted official advice against drinking tap water. Per- and polyfluoroalkyl substances originating from firefighting foam persist around the airport, the coal-mining legacy contributes geogenic and industrial metals, pharmaceuticals have been detected in crustaceans close to the settlement, and minimally treated wastewater is discharged into the same coastal waters that support harvested species. Seasonal tourism multiplies the effective population well beyond the design capacity of the infrastructure.

Because the system is small and its couplings are short, integrated surveillance of source water, drinking water, wastewater, wildlife and human exposure is here a definable and affordable undertaking rather than an institutional aspiration. We argue that Svalbard should be developed deliberately as a One Health demonstration site, and that the monitoring architecture, mitigation priorities and governance arrangements derived from it are transferable to Arctic settlements elsewhere and, in time, to small and remote communities far beyond the polar regions.

O-06 Session 1B, Monday, 2 November 2026, 11:40

Tire-wear-derived p-phenylenediamine quinones (6PPD-Q and analogues) in urban Arctic soils, Longyearbyen, Svalbard

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N,N'-substituted p-phenylenediamines (PPDs) are added to tire rubber as antioxidants and antiozonants. Their ozonation products, PPD-quinones, have attracted global attention since 6PPD-quinone (6PPD-Q) was found to be acutely toxic to salmonids at environmentally relevant concentrations (24-h LC_{50} of 0.095 µg/L for coho salmon). Data from Arctic environments are still lacking.

We developed an HPLC-MS/MS (triple quadrupole) method for eight PPD-quinones: 6PPD-Q, DPPD-Q, PTPD-Q, IPPD-Q, CPPD-Q, SPPD-Q, 66PD-Q and 77PD-Q. Soils were prepared by ultrasonic extraction and SPE, and water by LLE and SPE. LOQs were 1 ng/g dw for 6PPD-Q and 0.6 ng/g dw for the other quinones. In August 2024, we sampled surface soil on three days at 20 traffic-exposed sites and four background sites in Longyearbyen, together with water from a sewage outlet, a river and a river outlet.

6PPD-Q was quantified in 25 of 53 soil samples, with concentrations up to 21.2 ng/g dw. The highest levels were consistently found at the main supermarket parking lot. Levels were also elevated around the gas station and in the industrial area. PTPD-Q was quantified in four samples (maximum 2.3 ng/g dw), also at the parking lot. DPPD-Q was detected in all soil samples, but background contamination prevented quantification. The other five quinones were not detected. Matrix interference prevented reliable determination in the water samples. These first data on PPD-quinones in Svalbard show that tire-wear contaminants accumulate in urban Arctic soils near traffic hotspots. Further method development and seasonal sampling are needed, including winter, when snowmobiles dominate local traffic.

O-09 Session 1C, Monday, 2 November 2026, 13:40

Formation Mechanism of Highly Antibiotic-Resistant Dormant Subpopulations in Bioaerosol during Aerosolizing from Aquatic Environments

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The characteristics and responses of bacteria aerosolized from aquatic to atmospheric environments remains poorly elucidated. This study investigated the aerosolization responses and mechanisms of three antibiotic-resistant Escherichia coli DH5α strains (CTX, MCR, and GEN). Carrying antibiotic resistance genes enhanced bioaerosol survival against aerosolization stress by promoting phenotypic differentiation into wild-type, small colony variant (SCV), and viable but non-culturable (VBNC) subpopulations. Specifically, Cefotaxime (CTX)-resistant E. coli bioaerosols generated the highest percentage of VBNCs (15.1%), whereas gentamycin (GEN)-resistant E. coli bioaerosols predominantly formed SCVs (13.4%). Characterization of GEN-resistant E. coli SCVs revealed suppressed growth and metabolic activity, coupled with elevated adenosine triphosphate, increased intracellular reactive oxygen species, upregulated protein synthesis-related genes, and amplified gentamicin resistance. Oxidative stress responses were activated to defend against stress and promoted the formation of dormant subpopulations. Up-regulation of cell wall synthesis genes promoted VBNC formation, while enhanced protein synthesis gene drove SCV formation. These findings highlight that antibiotic resistance in aquatic bacteria contributes to the formation of different dormant subpopulations in bioaerosols, presenting distinct risks to ecosystems and human health.

Keywords: Aerosolization; Bioaerosol; Dormant subpopulations; Response mechanism; Formation mechanism.

Acknowledgments: This work was supported by the NSFC (U25A20814).

O-14 Session 3A, Wednesday, 4 November 2026, 09:45

Comprehensive Characterization of Occupational Exposure to Coking-Related Pollutants and Their Associations with Liver Function

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Coking-related pollution poses complex environmental challenges and potential risks to human health. This study comprehensively characterized occupational exposure among coking workers using integrated non-targeted and targeted analytical approaches. Non-target screening identified 32 distinct compounds, including several previously unreported substances such as quinolin-2-ol, naphthylmethanols, N-hydroxy-1-aminonaphthalene, hydroxydibenzofuran, hydroxyanthraquinone, and hydroxybiphenyl. Targeted analysis further revealed elevated levels of hydroxy-polycyclic aromatic hydrocarbons and hydroxy-heterocyclic aromatic compounds among workers, particularly those involved in coking, coal preparation, and chemical production, compared with surrounding residents and controls. Co-exposure to aromatic pollutants was associated with biomarkers of DNA damage and oxidative stress, with heterocyclic aromatic compounds showing important contributions. Exploratory analyses further indicated significant associations between aromatic pollutant exposure and liver function, accompanied by alterations in amino acid and energy metabolism. Network toxicology suggested that xenobiotic metabolism, oxidative stress, and hepatic injury-related pathways may contribute to these associations. Overall, these findings provide evidence of complex occupational exposure to previously underrecognized coking-related pollutants and offer insights into their potential implications for liver health.

Keywords: Exposome; Coking-related pollutants; Non-targeted screening; Liver function

Acknowledgments: This work was financially supported by NSFC (42530702, 42577483).

PL-1 Plenary lecture 1, Monday, 2 November 2026, 09:15 – 09:45

Global fractionation and polar cold trap POPs (PCT-POPs)

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The concept of global and latitudinal fractionation of persistent organic pollutants (POPs) was first proposed by Wania and Mackay in 1993[1,2]. This concept posits that highly persistent semi-volatile organic compounds (SVOCs) become enriched along spatial latitudinal temperature gradients. This pioneering work greatly advanced our understanding of long-range POPs transport toward the Arctic. In their original framework, two key components governing global/latitudinal fractionation — the latitudinal transect and atmospheric temperature gradient — were treated as indistinguishable.

Background soil constitutes the largest terrestrial reservoir for legacy POPs and serves as the optimal environmental compartment for observing POPs fractionation phenomena. By integrating model simulations, monitoring datasets of POPs in soils across China and the globe, together with previously published research, we comprehensively investigated the mechanisms and characteristics governing POPs fractionation. This report summarizes the novel key findings from our study:

1. The octanol-air partitioning coefficient (K_{OA}) is a superior parameter compared with molecular weight or volatility for describing the distribution and fractionation of POPs. This advantage is particularly evident for POP isomers sharing identical molecular weights but differing K_{OA} values. For example, α HCH and β HCH (two HCH isomers) exhibit both longitudinal and latitudinal fractionation patterns in Chinese background and rural soils[4].
2. The latitudinal transect and atmospheric temperature gradient represent two distinct mechanisms. The latitudinal transect acts as the primary factor shaping the primary distribution and fractionation patterns of POPs, whereas the atmospheric temperature gradient functions as a secondary factor controlling secondary distribution and fractionation.
3. The latitudinal transect is the dominant driver for POP fractionation toward polar environments and ecosystems. Meanwhile, the poleward decreasing latitudinal temperature trend promotes long-term POP accumulation in cold climates via the polar cold-trapping effect.
4. Although all POPs possess considerable long-range-transport potential and can reach polar environments and ecosystems, only a subset of POPs with low K_{OA} values — such as α-HCH, β-HCH, CB-28, and BDE-28 — produce secondary distribution patterns in surface soils, with higher concentrations in Arctic soils relative to non-Arctic soils. We term this subset polar cold-trapped POPs (PCT-POPs), which exert greater harmful impacts than other POPs. Accordingly, it is necessary to develop screening criteria to identify PCT-POPs among all POP substances and build a dedicated PCT-POPs database. Such work is critically important for protecting the pristine Arctic and Antarctic environments against contamination risks posed by PCT-POPs.

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O-17 Session 3A, Wednesday, 4 November 2026, 10:25

Gridded annual emission inventories with high resolution for tire wear particles (TWPs) in China from 2004 to 2024

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As a key component of non-exhaust particulate matter (NEPM), tire wear particles (TWPs) are experiencing continuous growth in environmental emissions and now exceed conventional tailpipe-derived fine particulate matter. Accurate quantification of TWP emission fluxes is therefore critical for exposure risk assessment and regulatory policymaking. This study develops a comprehensive emission inventory to systematically characterize the large-scale, long-term spatiotemporal dynamics of TWP emissions, along with their interannual and intra-annual variability. National TWP emissions increased almost sixfold, from 3.18×10^5 t in 2004 to 1.87×10^6 t in 2024. A structural transition occurred around 2013, after which consumption-driven mobility — principally small passenger vehicles — superseded production-oriented heavy-duty freight as the dominant growth contributor, with the small passenger vehicle share rising from 24.4% (2005) to 51.3% (2020). Spatially, emissions display a persistent “east-high, west-low” asymmetry bounded by the Hu Line, evolving from discrete hotspots to contiguous regional blankets, and five ultra-dense megaclusters emerged by 2024: Beijing–Tianjin–Hebei and the North China Plain, the Yangtze River Delta, the Pearl River Delta, the Chengdu–Chongqing circle, and the Central Plains–Jianghan Plain corridor. Notably, municipal-scale TWP emissions have transitioned from scattered localized hotspots to extensive national and regional high-emission clusters. This transformation indicates that the environmental hazards of TWPs have evolved from city-limited, localized concerns into large-scale environmental stressors posing concurrent risks to multiple interconnected ecosystems. This work provides a solid database for predictive TWP emission modelling and supports the development of targeted mitigation strategies tailored to the heterogeneous emission features across China.

IS-3 Invited lecture, Tuesday, 3 November 2026, 13:00 – 13:30

Introduction to UArctic Regional Centre for China (UArctic-RCC)

Yi-Fan Li, Liyan Liu, Wanli Ma, Zifeng Zhang, Mingqi Chen, Feiyi Gao

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This talk introduces the UArctic Regional Centre for China (UArctic-RCC) hosted by Harbin Institute of Technology (HIT). Officially launched on 26 February 2019 and formerly named the UArctic-HIT Training Centre, it is the first UArctic Regional Centre outside the eight Arctic nations. The missions of the UArctic-RCC are: to serve as a hub connecting UArctic and its members in China; a platform broadening knowledge of Arctic across China; an education centre delivering Arctic-related programmes for students and faculty at Chinese universities; and a research network to facilitate Arctic research collaboration among the UArctic members in the Arctic and China.

Since its founding, the UArctic-RCC has achieved substantial progress, marked by three historic breakthroughs:

1. Establishment of the first UArctic Regional Centre beyond the eight Arctic nations;
2. Leadership of a UArctic Thematic Network (TN) project (POPs and chemicals of emerging concern in the Asian Arctic), marking the first time a university outside the eight Arctic nations has led such a TN project; and
3. A seat on the UArctic Congress Program Committee — the first time an expert from outside the eight Arctic nations has held this position.

Under its Thematic Network project concerning persistent organic pollutants and chemicals of emerging concern in the Asian Arctic, a cross-latitudinal monitoring network spanning from the Russian Asian Arctic to southern China has been established, yielding high-level research outputs. To expand student mobility, UArctic-RCC developed the China2North Mobility Programme and piloted the Four-University Consortium Mobility initiative to facilitate exchanges between Chinese and Arctic higher-education institutions. Moreover, the Centre founded the International Arctic School at HIT (IAS-HIT). It organizes annual summer schools in the Norwegian Arctic as well as summer and winter schools in Harbin. Since 2019, eleven sessions have been held (online during the COVID-19 period), attracting 859 students from 33 countries. Supported by HIT and UArctic, UArctic-RCC advances educational and research cooperation and helps implement China’s Arctic strategy.

O-16 Session 1C, Monday, 2 November 2026, 14:00

Kinetic aerosol trapping drives Arctic enrichment of organophosphate flame retardants

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Presented on behalf of the authors by **Yi-Fan Li** (IJRC-PTS / Harbin Institute of Technology).

Organophosphate flame retardants (OPFRs) are emerging contaminants posing significant risks to the Arctic environment and human health. Concerns have been raised about the origins of Arctic OPFRs, because atmospheric models have failed to reproduce the high Arctic OPFR levels due to unresolved phase-partitioning dynamics and atmospheric chemistry. Here, we implement a kinetic gas-particle accumulation scheme, in which particle-bound OPFRs do not re-equilibrate to the gas phase, into the atmospheric chemistry model GEOS-Chem GCHP v14.5.0. A 2 × 2 factorial design crossing the partitioning mechanism with OH chemistry isolates the importance of each process. In the Arctic, kinetic accumulation reduces the apparent OH removal efficiency from 79% under equilibrium partitioning to 64%. The corresponding atmospheric lifetime of ΣOPFRs is extended from 1.0 day under gas-phase-only conditions to 9.8 days under the kinetic accumulation framework. Sulfate and hydrophilic organic carbon together carry over 90% of the Arctic particulate OPFR burden. This kinetic scheme increases the simulated Arctic annual mean ΣOPFR concentration from 82 pg m^{-3} under gas-phase-only conditions and 145 pg m^{-3} under instantaneous equilibrium to 353 pg m^{-3}, representing 4.3-fold and 2.4-fold increases, respectively, consistent with field measurements across the Arctic.

O-11 Session 2B, Tuesday, 3 November 2026, 11:00

Pesticide Exposure and Female Reproductive Health

Jing Liu*

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Pesticide exposure has emerged as a significant environmental risk factor for female reproductive health. This study investigates the associations between pesticide exposure and adverse reproductive outcomes, focusing on ovarian dysfunction, gestational diabetes mellitus (GDM), and placental toxicity.

We first optimized the sampling methods for assessing exposure to non-persistent pesticides (e.g., pyrethroids, organophosphates, and neonicotinoids). Single urine measurements inadequately reflect long-term exposure due to low intraclass correlation coefficients (ICC < 0.4). Repeated sampling (3–4 random urine samples over a year) is recommended for accurate exposure assessment.

Epidemiological and toxicological evidence links organochlorine (e.g., DDTs) and pyrethroid pesticides to primary ovarian insufficiency (POI). Metabolites of these pesticides were widely detected in women from Zhejiang, China. Significant positive associations were observed between DDTs, the pyrethroid metabolite 3-PBA, and POI risk, as well as elevated FSH and reduced anti-Müllerian hormone (AMH) levels. Animal studies revealed that pyrethroids upregulate pro-apoptotic protein BMF, disrupt ovarian follicle development, and impair fertility, mirroring clinical features of POI.

We demonstrated that pyrethroid exposure disrupts glucose homeostasis in mice, inducing insulin resistance by impairing hepatic glucose uptake and glycogen synthesis. A nested case-control study further identified a significant association between urinary 3-PBA levels and higher GDM risk in pregnant women, independent of oxidative stress mediators.

Placental toxicity was observed with benzimidazole/triazole fungicides (e.g., benomyl and tebuconazole), which promoted human trophoblast cell apoptosis and inhibited cell migration. In mice, exposure to the herbicide glufosinate impaired placental development and resulted in low birth weight offspring.

These findings underscore the reproductive health risks posed by pesticide exposure, advocating for stricter regulations and targeted interventions for vulnerable populations.

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O-10 Session 2A, Tuesday, 3 November 2026, 10:15

Occurrence and profiles of benzotriazole UV stabilizers in bird feathers from polar regions and China

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Benzotriazole ultraviolet stabilizers (BUVs) are widely used plastic additives and contaminants of emerging concern. However, their occurrence in polar environments, particularly in Antarctic biota, remains insufficiently understood. In this study, BUVs were investigated in bird feathers collected from the Arctic, Antarctic and China to examine their occurrence and profiles across different regions.

BUVs were detected in feathers from all study regions. Differences in BUV profiles were observed among bird groups, as well as among samples from the Arctic, Antarctic and China. Notably, BUVs were identified in Antarctic bird feathers, whereas previous biomonitoring studies using other biological matrices reported non-detectable BUV levels in Antarctic samples. These results extend current knowledge of BUV contamination in remote polar regions and provide initial evidence for their occurrence in Antarctic wildlife.

Bird feathers are a practical and non-destructive matrix for investigating BUV contamination in wildlife. However, the concentrations and profiles measured in feathers may be influenced by species ecology, sampling year, feather growth, preen-oil transfer, metabolism and external deposition. Therefore, differences among regions and species should be interpreted cautiously, as they cannot by themselves identify contamination sources or transport pathways.

Overall, this study demonstrates the occurrence of BUVs in bird feathers from the Arctic, Antarctic and China, and highlights the potential of feathers as a complementary matrix for monitoring emerging plastic additives in wildlife from remote and populated regions.

PL-2 Plenary lecture 2, Wednesday, 4 November 2026, 09:15 – 09:45

Plastics and Plastic Additives: Environmental Exposure, Toxicological Effects and Analytical Challenges

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Widespread plastic use, inadequate waste management and resistance to degradation have resulted in contamination of freshwater, marine and terrestrial ecosystems.

Larger plastic debris can cause physical harm through entanglement, ingestion and gastrointestinal obstruction. Weathering and fragmentation generate microplastics and nanoplastics with variable size, shape, surface properties and chemical composition, influencing their environmental behavior and potential uptake across biological barriers. Particles have been reported in aquatic organisms, birds and food products. Microplastics have also been reported in a range of human tissues including lungs, liver, placenta and blood, as summarized in recent reviews. These reports suggest internal exposure, but differences in analytical methods, contamination control and particle-size detection limits complicate interpretation and comparison. The extent of tissue accumulation, persistence and associated health effects remains uncertain.

In addition to potential particle-mediated effects, chemical hazards may arise from substances incorporated into plastic products to modify their properties and from contaminants adsorbed from the environment. Relevant substances include phthalate plasticizers, bisphenols used in polymer production, flame retardants and UV stabilizers. Potential health concerns include endocrine disruption and reproductive, developmental, metabolic and neurological effects. Human biomonitoring has documented exposure to plastic-associated chemicals in vulnerable populations. Studies of hospitalized very low birth weight infants have detected urinary biomarkers of exposure to phthalates and bisphenol A, highlighting exposure to multiple chemicals during neonatal care. Exposure to phthalates and phenols has also been documented in Norwegian children who had undergone kidney transplantation. These findings demonstrate chemical exposure but do not establish exposure through ingested plastic particles or identify plastics as the sole source.

Contamination also extends to the Arctic. Microplastics have been measured in sea ice, snow and deep-sea sediments. In Svalbard, UV stabilizers have been detected in both ingested plastics and northern fulmar plasma. In the Canadian Arctic, benzotriazole UV stabilizers and diphenylamine antioxidants have been detected in seabirds and ringed seals. These findings demonstrate exposure to plastic-associated chemicals in remote ecosystems, although they do not establish plastics as the sole source or demonstrate transfer from ingested plastics into tissues.

Reliable exposure of micro/nanoplastics remains hampered by analytical limitations. Inconsistent contamination control, variable particle-size detection limits and limited analytical capacity hinder comparisons and risk assessment. Validated methods, rigorous quality assurance and integrated assessment of particles and associated chemicals are therefore essential for linking environmental contamination to biological exposure and effects.

IS-2 Session 1D · Invited lecture, Monday, 2 November 2026, 15:00 – 15:30

The University of the Arctic (UArctic) as a Scientific Node for Coordinating Arctic Research and Academic Education

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The Arctic is warming nearly four times faster than the global average. Its environments and communities face rapid, interconnected change: thawing permafrost, declining sea ice, long-range transported contaminants and shifting socio-economic conditions. Understanding and responding to these changes requires research and education that cross disciplinary, institutional and national boundaries. Since its launch in 2001 as an initiative of the Arctic Council, the University of the Arctic (UArctic) has grown into a unique cooperative network of universities, research institutes and other organisations committed to higher education and research in and about the North. Following a record intake of 28 new members at the 2026 Assembly, UArctic now has 226 members across all eight Arctic states and a growing number of non-Arctic countries.

This plenary presentation examines UArctic as a scientific node connecting knowledge producers, knowledge holders and decision-makers. Its thematic networks and institutes offer flexible, bottom-up platforms for joint research, shared field infrastructure, joint courses and doctoral training. In 2026, eight new networks were added, including networks on Arctic AI, Arctic water, food transitions and natural hydrogen. Mobility and recognition programmes such as north2north, the UArctic Chairs and the biennial UArctic Congress support early-career researchers and strengthen the links between Arctic science and policy, including the assessment work of the Arctic Council working groups.

Drawing on examples from environmental chemistry and contaminant research, such as the long-term monitoring of persistent organic pollutants in Arctic air and biota, the presentation shows how network-based cooperation turns individual expertise into coordinated long-term observation and capacity building. Particular attention is given to the inclusion of Indigenous knowledge and Northern communities, to equitable access for smaller northern institutions, and to sustaining scientific cooperation in a changing geopolitical climate. The presentation concludes with perspectives on how UArctic can further strengthen its role as a trusted, inclusive and resilient platform connecting Arctic research, education and society.

O-03 Session 1A, Monday, 2 November 2026, 10:25

Breaking the Wind Barrier: A High-Precision All-Weather Flow-Through Sampler for Polar Atmospheric POPs Monitoring

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Effective monitoring of atmospheric persistent organic pollutants (POPs) is essential for evaluating the Stockholm Convention, yet polar regions remain exceptionally challenging because of ultra-low concentrations and harsh conditions. Wind-driven flow-through samplers (FTS) can collect large air volumes and are promising for remote Arctic deployment, but accurate quantification of sampled volume under extreme conditions is still difficult.

We had systematically investigated how temperature, sampling rate, and sampling volume affect breakthrough of polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and organochlorine pesticides (OCPs) on polyurethane foam (PUF) cartridges in FTS systems coupled with active pumps. Breakthrough profiles were fitted with nonlinear and alternative sigmoidal models to quantify sampling losses and derive loss-corrected air concentrations. For highly volatile compounds with significant breakthrough, the upstream PUF disk was treated as an equilibrium passive sampler, allowing PUF–air partition coefficients and their temperature dependence to be determined. Using these coefficients, atmospheric concentrations and effective sampling volumes were independently estimated and compared with experimental values. Repeated validation across multiple compounds—including fluorene, phenanthrene, anthracene, etridiazole, simazine, and PCB-3—confirmed that temperature-dependent PUF–air partition coefficients can accurately infer both air concentrations and effective sampling volumes. This provides a robust basis for estimating concentrations of other pollutants with low sampling losses and for calculating FTS effective sampling volumes under harsh polar conditions without precise wind-speed measurements. The approach can be applied to historical FTS observations from the Arctic and Great Lakes to improve atmospheric POP concentration estimates and support climate-related assessments of pollutant mobility.

IS-1 Session 2A, Tuesday, 3 November 2026, 09:45

Emerging Organic Contaminants in the Global Ocean and Polar Regions

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Emerging organic contaminants (EOCs) and the remobilization of legacy persistent organic pollutants (POPs) raise growing concerns for Arctic and Antarctic environments. Drawing on research across the global ocean and polar regions, this study examines the occurrence, long-range transport, and environmental distribution of per- and polyfluoroalkyl substances (PFASs), organophosphate esters (OPEs), and phthalate esters (PAEs), which have been detected in air, water, snow, ice, and biota. The main contribution is to link global atmospheric and oceanic transport pathways with observed contaminant patterns in the Arctic and Antarctic, while assessing how local emissions complicate the interpretation of polar measurements. Comparing findings across regions and environmental compartments reveals key challenges in distinguishing long-range transported contaminants from locally derived pollution, particularly near research stations. These influences can bias estimates of regional background concentrations and complicate assessments of contaminant sources and distribution. The synthesis identifies priorities for improving sampling strategies, establishing reliable background levels, and strengthening long-term monitoring. These insights advance understanding of contaminant transport and fate in remote ocean and polar ecosystems and provide a foundation for assessing how climate change and increasing human activities may alter contaminant dynamics and environmental exposure in polar regions.

O-01 Session 1A, Monday, 2 November 2026, 09:45

Amine-Promoted Chlorine Activation at Polar Air–Ice Interfaces

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Reactive chlorine species drive catalytic ozone destruction in the polar troposphere and stratosphere. However, conventional gas phase mechanisms are too slow. They cannot explain the sudden chlorine bursts observed during spring. We explored two complementary interfacial pathways by using classical and ab initio molecular dynamics. These pathways occur at air ice and air water surfaces which are ubiquitous in polar regions. We first examined $ClNO_2$, a major nocturnal chlorine reservoir. On chloride containing supercooled surfaces, it undergoes a facile heterogeneous bimolecular reaction. This reaction directly releases Cl radicals. It bypasses slow hydrolysis sustaining radical production under polar spring sunlight. We further investigated HOCl conversion to Cl_2O. Cl_2O is a key photolabile precursor. The reaction proceeds via a two step interfacial mechanism. First, HOCl deprotonates to ClO^-. Then ClO^- attacks a second HOCl nucleophilically. The rate limiting step is deprotonation. Basic amines dramatically accelerate this step. These amines include NH_3, methylamine, and dimethylamine. They are naturally emitted from polar seabird colonies, melt ponds, and snowpack photochemistry. With amine catalysis, the Cl_2O formation rate constant reaches 8.97×10^7 $M^{-1}s^{-1}$. This value is over 25 orders of magnitude higher than the gas phase value. Notably, catalytic efficiency follows NH_3 > methylamine > dimethylamine. This order is contrary to gas phase basicity. It underscores the decisive role of interfacial hydrogen bonding and solvation. These factors stabilize transition states. Together, these two routes reveal that polar interfacial environments act as efficient chlorine activators. Trace amines, despite low ambient concentrations, can enormously amplify chlorine release. Our findings bridge polar biogeochemistry with atmospheric oxidation. They provide essential mechanistic constraints for improving ozone depletion models in cold regions.

Keywords: Chlorine activation; Polar air ice interfaces; Amine catalysis; Reactive chlorine species; Interfacial chemistry

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O-08 Session 1C, Monday, 2 November 2026, 13:20

The Arctic research in International Joint Research Center for Arctic Environment and Ecosystem (IJRC-AEE)

Zi-Feng Zhang, Wan-Li Ma, Li-Yan Liu, Nan-Qi Ren, Yi-Fan Li

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The International Joint Research Center for Arctic Environment and Ecosystem (IJRC-AEE), based at Harbin Institute of Technology (HIT) in China, is the country's first university-affiliated research center dedicated to Arctic environmental and ecological studies. Established in January 2018, the center was co-founded by 11 universities and research institutions from China, Russia, Norway, Canada, and other countries, with the aim of fostering international cooperation and building a world-class platform for frontier Arctic research. Operating under the principle of "cooperation, openness, and innovation," IJRC-AEE conducts state-of-the-art research on Arctic environment and ecosystems, with a particular focus on the impact of global climate change on the Arctic, the long-range transport (LRT) of persistent organic pollutants (POPs) through air and ocean currents, the budget and future trends of these pollutants in the Arctic Ocean, and their effects on Arctic biota. The center also works in alignment with the Arctic Monitoring and Assessment Programme (AMAP) framework, contributing to scientific assessments of pollution and climate change impacts in the region. Through its activities and international collaborations, IJRC-AEE seeks to promote joint research, train young scholars and students in Arctic environmental science, and provide scientific support for policy-making on Arctic environmental protection and sustainable development.

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Low winter sun over the Arctic sea ice. Photo: R. Kallenborn

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