

NATIONAL
ACADEMIES

Sciences
Engineering
Medicine

Exploring Key Research Topics for the Fifth International Polar Year

Workshop Proceedings Public Release Webinar

March 10, 2026

SUPPORTED BY NASA, NSF, AND THE NATIONAL
ACADEMIES



Workshop Proceedings



<https://www.nationalacademies.org/publications/29327>

Read the proceedings online or download as PDF
at no cost.



Exploring Key Research and Monitoring Topics for U.S. Engagement in the Fifth International Polar Year

Convened May 20–21, 2025

Workshop Proceedings

- Provide a factual accounting of the event; they do not provide any consensus analysis, findings, conclusions, or recommendations.
- Statements, opinions, and ideas expressed in the proceedings have been attributed to individual participants or groups of participants in the workshop, and do not necessarily reflect the views of, consensus of, or endorsement by the National Academies, sponsors, or the planning committee.
- **This webinar provides a general summary and highlights of the contents of the proceedings; it is not meant to prioritize any presentations or concepts over others.**

Why this workshop?

Provide a forum for the research community, knowledge holders, and others to discuss the pressing research and monitoring questions that could be investigated by the U.S. and international partners during the Fifth International Polar Year (IPY5), in 2032-2033

Today's Discussion

- **Background Context for IPY5**
- Workshop Overview
- Proceedings Takeaways
- Participant Reflections
- Q&A

Webinar Speakers

Workshop Planning Committee Presenters

Craig Lee, University of Washington (*Chair*)

Andrew Lloyd, Columbia University

Participant Reflections

Jackie Grebmeier, UMD Center for Environmental Science

Madeleine Youngs, UMD College Park



**Exploring Key Research
and Monitoring Topics for
U.S. Engagement in the Fifth
International Polar Year**

Convened May 20–21, 2025

Value of International Polar Years

- Galvanize research community & foster large-scale international coordination and national investments in polar observations, research, and applications
- Accelerate polar research, discovery and innovation
- Demonstrate the importance of polar regions in the Earth system
- Expand polar research capabilities
- Translation of science for policy- and decision- making
- Broaden public engagement in research

The Fifth International Polar Year (IPY5)

- Build on prior IPY efforts to expand observations and long-term monitoring
- Assess ecosystems and their global connections, and applications to inform local and global adaptation
- Build on advances from IPY4 in methods, technologies, and knowledge system integration
- Achieve a step-change in transdisciplinary polar research

PROGRESS UPDATE REPORT
OCTOBER 2025



International Polar Year 2032–33 (IPY-5)

IPY-5: Cooperation for a Changing World

The 5th International Polar Year (2032–33), or IPY-5 for short, is being organised with unprecedented urgency due to rapid environmental and social changes in the polar regions. There is widespread concern about crossing thresholds that may irreversibly alter life in the Arctic, Antarctic, and around the world. IPY-5 will build on four groundbreaking IPYs since 1881 and millennia of Indigenous Peoples' knowledge production, that together form a long chain of coordinated polar research and credible scientific evidence and knowledge on socio-ecological changes in the polar regions. Most recently, the fourth IPY (2007–2008) drew together evidence from thousands of participants emphasizing that polar changes have global consequences. IPY-5 will encourage and enable vital cooperation across countries, disciplines, and knowledge systems to coordinate research, observations and monitoring, as well as innovative expeditions in the polar regions to produce urgently needed and actionable knowledge to more deeply understand global processes, support informed decisions and offer effective and implementable solutions.

IPY-5 will:

- Extend observations of accelerating changes, and establish new baselines to guide actions
- Harness new tools and methods developed since IPY-4, across disciplines and knowledge systems
- Advance transdisciplinary research by integrating diverse knowledge systems including from natural sciences, social sciences, humanities research, and Indigenous knowledge;
- and much more

This momentum aligns with international developments such as the 2023 Helsinki Declaration and the 4th International Conference on Arctic Research Planning Process (ICARP IV), and the UN Decades of Ocean Sciences, Cryospheric Sciences, Ecosystem Restoration, and Indigenous Languages. IPY-5 will work with and alongside these and other initiatives, which together highlight the need for greater international coordination to provide evidence for effective decision-making on urgent global issues.

Organisations involved in the IPY-5 Planning Group



The Fifth International Polar Year (IPY5)

Recent updates

- Call for bids to host International Coordination Office
- Call for national committees
- Call for IPY5 Projects



Call for Bids to host the
International Coordination Office for the
5th International Polar Year 2032–33 (IPY-5)



Call for National Committees:
International Polar Year 2032–2033



Call for IPY-5 Projects from 2026!

Today's Discussion

- Background Context for IPY5
- **Workshop Overview**
- Proceedings Takeaways
- Participant Reflections
- Q&A

This Workshop: May 20-21, 2025

- Convened U.S. and international researchers to identify **pressing polar research questions and operational needs** potentially suitable for IPY5.
- Framed IPY5 as “**big science built for use**”—projects that benefit from multinational collaboration and pooled resources.
- Emphasized **societal outcomes** (decision support, services) alongside scientific advances.

* The workshop was viewed as a starting point for discussion of topics; it did not result in an exhaustive list

Workshop Planning Committee

Craig Lee (Chair)

University of Washington

Lilian Alessa

University of Idaho

Jenny Baeseman

Polar Consultant

Scott Goetz

Northern Arizona University

Jamin Greenbaum

Scripps Institution of Oceanography

Michael Hartinger

Space Science Institute

Cana Uluak Itchuaqiyaaq

Virginia Polytechnic Institute and State
University

Andrew Lloyd

Lamont-Doherty Earth Observatory, Columbia
University

Britney Schmidt

Cornell University

Workshop Design

May 20 – 21, 2025

Hybrid; In-person component
in Washington, D.C.



- Interdisciplinary speakers and participants spanning expertise in both Arctic and Antarctic
- Thematic panels with speaker presentations, followed by Q&A and discussion
- Interactive group activities with plenary report outs

* Agenda is included as an appendix in the proceedings

2030 in the Polar Regions: Setting the Stage for IPY5

Pre-recorded presentations that complement workshop discussions – are available at the QR code below and the event webpage: <https://www.nationalacademies.org/projects/DELS-BASCPR-24-02/event/44787>

IPYs: What has been achieved

Julie Brigham-Grette, University of Massachusetts, Amherst

Sea Ice Projections and impacts

Alexandra Jahn, University of Colorado Boulder

Shifting Ecosystems and Ripple Effects

Michelle Mack, Northern Arizona University

Large Scale Antarctic Atmospheric Patterns

Ryan Fogt, Ohio University

Safeguarding Against Space Weather Hazards

Hyomin Kim, New Jersey Institute of Technology

Value of Co-Production for IPY

Margaret Rudolf, University of Alaska Fairbanks

Overview of Key Themes from March 2025 Polar Early Career World Summit

Mariama Dryák-Vallies, Polar Science Early Career Community Office

Large Scale Arctic Atmospheric Patterns

Jennifer Francis, Woodwell Climate Research Center



Scan here for pre-recorded presentations

Today's Discussion

- Background Context for IPY5
- Workshop Overview
- **Proceedings Takeaways**
- Participant Reflections
- Q&A

The Workshop Proceedings

Chapter 1. Framing the 5th International Polar Year

Chapter 2. Keynote Address: Overview of the Polar Regions

Chapter 3. Polar Science for Society

Chapter 4. Key Scientific Questions & Multidomain Operations

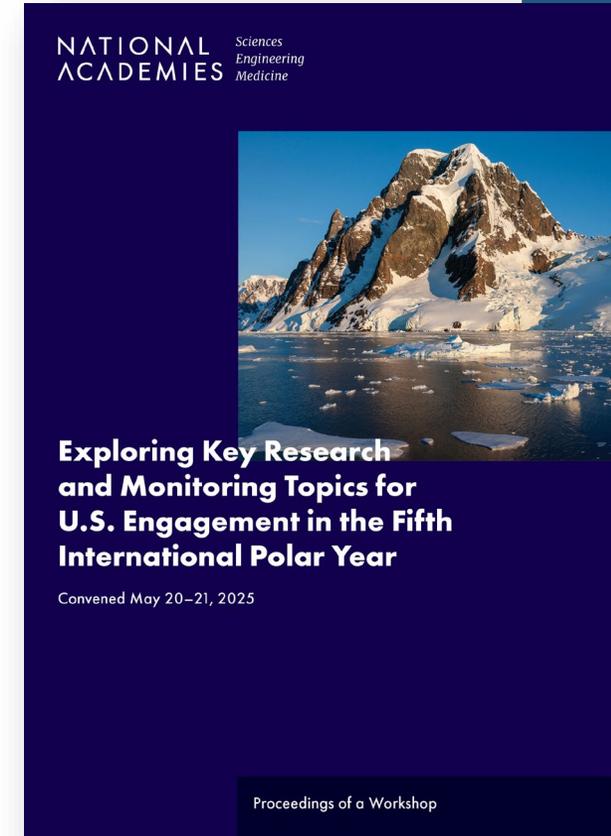
Chapter 5. Approaches & Capabilities to Support IPY5

Chapter 6. Recap of Day One

Chapter 7. Human Capacity & Collaboration

Chapter 8. Moving the Science Forward for IPY5

Chapter 9. Forming the Vision for the Future



Proceedings Takeaways

Overview of Key Takeaways

- **Sea level & ice sheets:** Ice-sheet change is a central driver of uncertainty; integrated observing + modeling across ice, ocean, and solid Earth can improve projections.
 - Coastal investments hinge on credible projections; current models diverge, esp. at grounding zones. IPY-scale observing + data-assimilative modeling can narrow key uncertainties relevant to costly coastal protection (Keynote, Richard Alley).
- **Ice–ocean coupling:** Evolving freshwater and heat exchanges were described as capable of reshaping circulation and ice-shelf melt; broad-scale, year-round Southern Ocean observations paired with coupled models can sharpen forecasts.
- **Permafrost, fire, carbon:** Speakers emphasized linked risks for infrastructure, ecosystems, air quality, and global feedbacks; combining ground flux sites with remote sensing and atmospheric inversions can narrow carbon-budget uncertainty.

Proceedings Takeaways

Overview of Key Takeaways

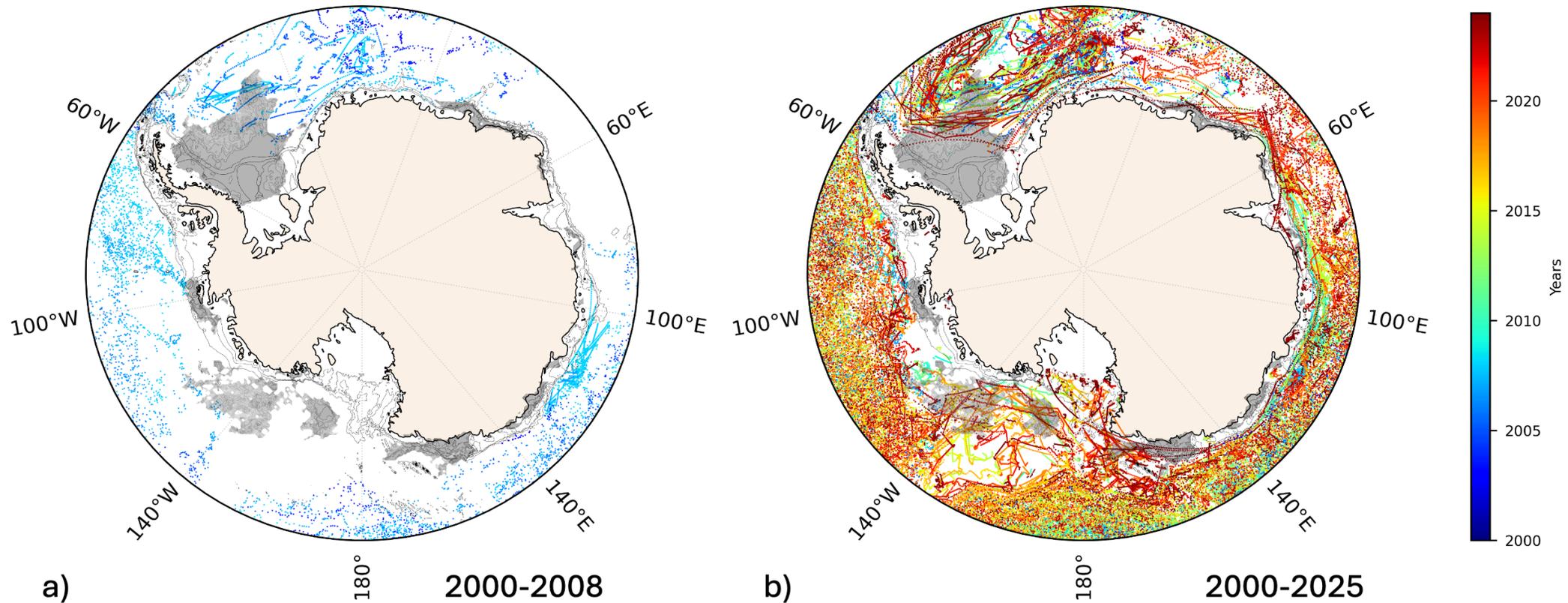
- **Geospace / space weather:** Polar regions were described as key entry points for solar-driven disturbances that disrupt navigation, communications, and power; shared observing/logistics can strengthen services.
- **One Health & communities:** A One Health lens connected human, animal, and environmental health, pointing to value from community-based monitoring and local & tribal health systems in polar research.
- **Capabilities & data practices:** Winter-hardy autonomy, improved power, AI-enabled mapping, and early & open sharing with science-ready metadata can advance capabilities and increase understanding through expanded data use.
- **Human capacity & coordination:** Discussion emphasized early-career leadership pathways, equitable Indigenous partnership and data sovereignty, and international coordination mechanisms.

Research & Monitoring Areas

What IPY-scale innovations in monitoring & modeling are needed to keep pace with accelerated change in the polar regions?

- Example: Broadscale observations of the Southern Ocean
 - Update ocean/ice models using the expanded Argo footprint since IPY4 to better constrain Southern Ocean circulation, heat transport, and carbon uptake.
 - Scale up toward an integrated, international observing backbone that feeds directly into model testing and improvement.

Increase in broadscale observations of the Southern Ocean compared between 2008 and 2025



SOURCE: Presentation by Esmee van Wijk on May 21, 2025; figure prepared by N. Kolodziejczyk

Research & Monitoring Areas

What IPY-scale innovations in monitoring/modeling are needed to keep pace with accelerated change in the polar regions?

- Example: Bring missing Arctic feedbacks into earth system models
 - Models still omit or simplify key Arctic processes, especially permafrost carbon, interactions with fire, vegetation dynamics, and the nitrogen cycle.
 - IPY5 could support systematic benchmarking that uses scorecards comparing models to observations across a wide array of variables, such as biomass, permafrost area, ocean fluxes.

Enabling the Research & Monitoring

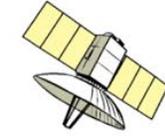
How can international coordination make IPY5 investments more successful and longer-lived?

- Example: Use Concrete Precedents
 - **IPY4's POLENET:** POLENET expanded polar monitoring to a wide network of GPS and seismic stations across Greenland and Antarctica. The network prioritized durable field systems and open data access; its measurements continue to support new science and reuse by multiple communities.
 - **Korea's LIONESS model:** Land-Ice/Ocean Network Exploration Using Semiautonomous Systems: a collaborative model designed to link land, ice, and ocean observations to better constrain the Antarctic Ice Sheet's contribution to future sea-level rise.

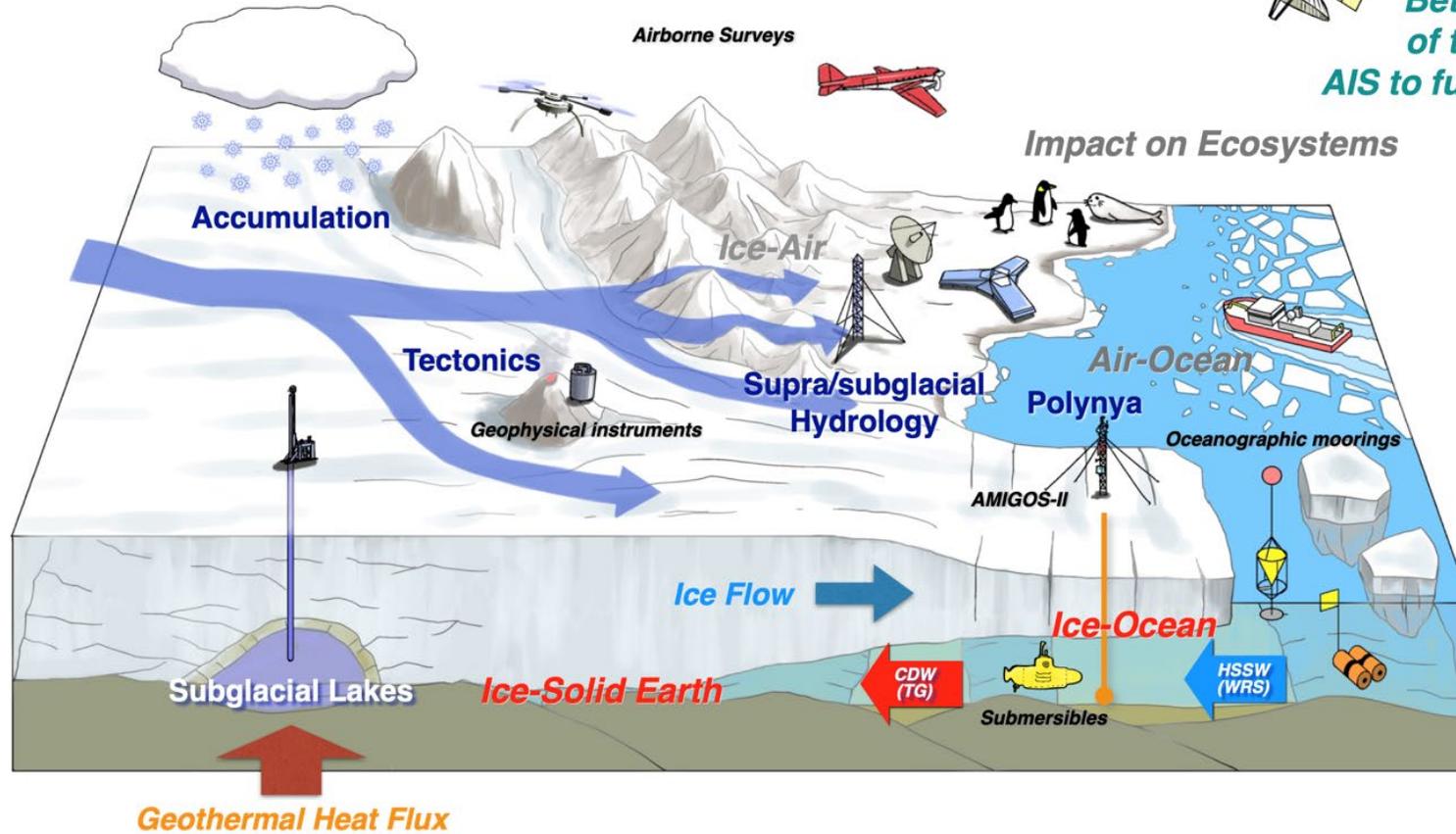
LIONESS Model



Satellite Remote Sensing



Better understanding of the contribution of AIS to future sea level rise



Land-Ice/Ocean Network Exploration using Semiautonomous Systems



SOURCE: Presentation by Won Sang Lee on May 22, 2025; design by Won Sang Lee.



해양수산부



극지연구소

Enabling the Research & Monitoring

How can international coordination make IPY5 investments more successful and longer-lived?

- Additional Strategies
 - Build “**plug-and-play**” infrastructure so instruments from different nations can share platforms (power, comms, and standards), reducing duplication.
 - National engagement through the International Arctic Science Committee (IASC) and Scientific Committee on Antarctic Research (SCAR)

Proceedings Takeaways From Research to Use

How can IPY5 make polar research more usable for communities and decision-makers? Approaches discussed:

One Health: Connect environmental change to human and animal health (e.g., contaminants, zoonotic pathways, food systems, and wildfire smoke).

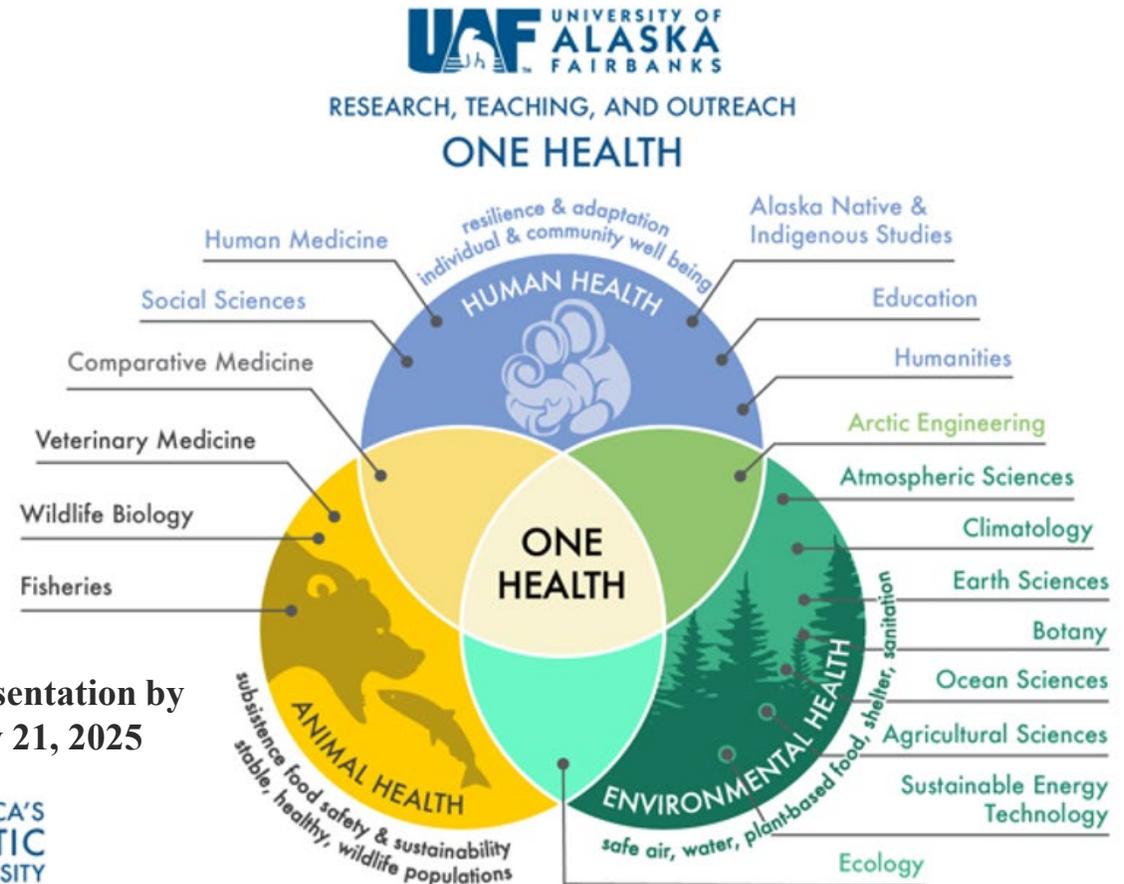


IMAGE SOURCE: Presentation by Alisa Alexander on May 21, 2025

Proceedings Takeaways

From Research to Use

How can IPY5 make polar research more usable for communities and decision-makers? Approaches discussed:

- **Community-embedded observing + respectful data governance:** Support Indigenous and local monitoring, return results in usable formats, and respect Indigenous priorities and data sovereignty.
- **Service-ready products (beyond papers):** Translate observations and models into practical tools (e.g., forecasts, dashboards, risk maps) that can be sustained beyond IPY.

Some Suggested Next Steps

- **Consolidate “umbrella” priorities** (e.g., grounding zones, freshwater fluxes, permafrost carbon, geo-space hazards) and map core observations/models needed for each.
- **Drive inclusive participation:** Involve early-career scientists, Indigenous partners, and communicators from the outset; track participation to reveal whose perspectives inform planning.
- **Provide guidance:** Develop and publish guidance on metadata, common vocabulary, importance of early-release of data from major campaigns, and harmonized codes of conduct and reporting for international fieldwork.
- **Engage SCAR/IASC/ICARP** to ensure alignment with international priority-setting and to keep U.S. teams connected.

Today's Discussion

- **Workshop Overview**
- **Proceedings Takeaways**
- **Participant Reflections**
- **Q&A**

Participant Reflections

These are personal reflections: they do not represent the position of the full planning committee and may not have been discussed at the workshop

NATIONAL
ACADEMIES

Sciences
Engineering
Medicine



Exploring Key Research and Monitoring Topics for U.S. Engagement in the Fifth International Polar Year

Convened May 20–21, 2025

Proceedings of a Workshop

Today's Discussion

- **Workshop Overview**
- **Proceedings Highlights**
- **Committee Members' Reflections**
- **Q&A**

Thanks for joining!

For further questions or information about this project, contact John Ben Soileau (JSoileau@nas.edu) and April Melvin (AMelvin@nas.edu).



View proceedings at:

<https://www.nationalacademies.org/publications/29327>



Exploring Key Research and Monitoring Topics for U.S. Engagement in the Fifth International Polar Year

Convened May 20–21, 2025