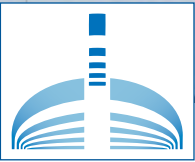


# ICE BITS



**FALL 2023**

Quarterly update of U.S Ice Drilling Program (IDP) activities

## Field Support to Antarctic 2023-2024 Projects

IDP is providing support to the following projects during the 2023-2024 Antarctic field season:

(1) The *STC Integrative Partnership: The Center For Oldest Ice Exploration (COLDEX): Shallow Ice Coring* project (PI Ed Brook; NSF award 2019719; Field lead Sarah Shackleton (I-187-M)) will use the [Blue Ice Drill](#) and the [Badger-Eclipse Drill](#) to drill several cores between 80 and 160 meters deep from the Allan Hills Blue Ice Area. Cores drilled through the Antarctic ice sheet provide a remarkable window into the evolution of Earth's climate and unique samples of the ancient atmosphere. The clear link between greenhouse gases and climate revealed by ice cores underpins much of the scientific understanding of climate change. Unfortunately, the existing data do not extend far enough back in time to reveal key features of climates warmer than today. The cores collected at Allan Hills will contribute to our understanding of how Earth's climate system operated during warmer periods and why the periodicity of glacial cycles lengthened from 40,000 to 100,000 years approximately 1 million years ago.

(2) The *NSF-NERC: Ground Geophysics Survey of Thwaites Glacier* project (PI Sridhar Anandakrishnan; NSF award 1738934; C-442-M) will conduct its final field season in the [Thwaites Glacier](#) region of West Antarctica. The project will conduct seismic and radar surveys along transect lines parallel and perpendicular to the flow of Thwaites Glacier. Based at WAIS Divide, they will separate into teams collecting different measurements. The Vibroseis and Active traverse team will move along transect lines while acquiring radar data and conducting active source seismic surveys. The Passive seismic team will recover Earthscope SAGE-provided nodes at GHOST Subglacial Ridge. The ApRES and Delores teams will collect radar measurements along the parallel Thwaites Glacier transect line, conduct Magnetotelluric measurements, and retrieve radar/GPS stations deployed in the area during the previous season. The Vibroseis and Active traverse team will use the [Rapid Air Movement \(RAM\) Drill](#) to create the shot holes required for the seismic measurements.



*Map of Antarctica showing 2023-2024 Antarctic field season locations. The numbers shown on the maps correspond to the project numbers in the text.*

(3) The *RAPID: US-Korean Collaboration to Build a Ross-Amundsen Ice Core Array (RAICA) Along the West Antarctic Coastline* project (PI Peter Neff; NSF award 2304836; I-345-M) aims to recover a ~100 meter long ice core from an ice rise in the Amundsen Sea region of coastal West Antarctica. The ice core will be used to reconstruct annual climate and environmental variability over the past 200-400 years, constrain surface mass balance variability and trends over the (pre)instrumental period, and contribute greater temporal perspective to ongoing investigations of Thwaites Glacier – an extensive system

that will contribute significantly to global sea level rise for centuries to come. This project collaborates with Korean Polar Research Institute (KOPRI) scientists and is supported via the KOPRI icebreaker RV ARAON. Martin Peninsula, between the Getz Ice Shelf and the Dotson Ice Shelf, has been chosen as the primary site based on existing airborne snow radar data and the high snow accumulation rate, which preserves high-resolution paleoclimate information. The specific drill site will be chosen based on scientific value and logistical constraints associated with the RV ARAON cruise.

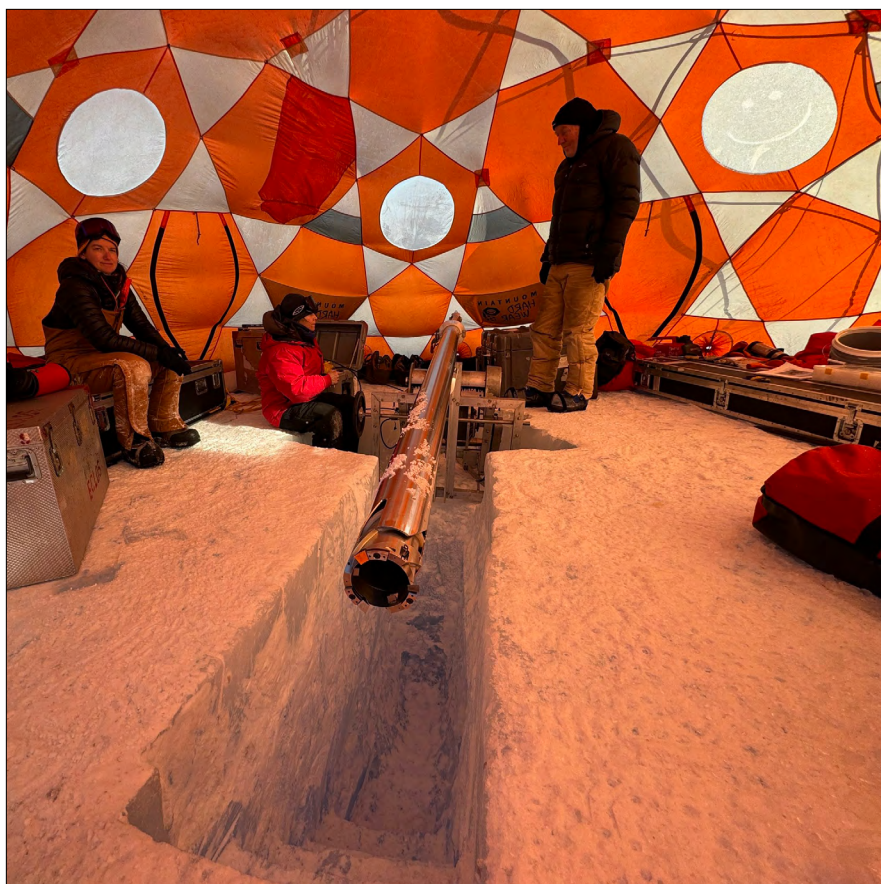
(4) The *Sea-Ice Snow Microbial Communities' Impact on Antarctic Bromocarbon Budgets and Processes* project (PI Karen Junge; NSF award 2031121; B-321-M) will test if bromocarbons in sea ice are produced and degraded by microalgae and bacteria found in sea ice, snow, and the interface between the two. The researchers will use a [Kovacs Hand Auger](#) to drill several cores (up to 24) through ~2.5 meters of sea ice twice per week for six weeks. The cores will be used to collect chemical and biological measurements of sea

ice and snow to determine bromocarbon concentrations, microbial activity associated with them, and intra-cellular genes and proteins involved in bromocarbon metabolism. Bromocarbons are known to contribute to stratospheric ozone depletion over Antarctica. This project will test if they are produced and degraded by algae and bacteria found in sea ice, snow, and the interface between the two.

(5) The *CRREL Support to the Leverett Glacier* project (PI Renee Melendy; T-941-M) involves a ground campaign utilizing ground penetrating radar (GPR) surveys to validate remote sensing imagery to find a less crevassed route to Leverett Glacier. As part of the fieldwork, the team will collect snow property data (snow density and hardness) to determine best-practice snow bridge crossing criteria for the area and ice velocity movement data using GPS station installations. The team will have an [IDDO Hand Auger](#) with them.

(6) The *Cold Regions Research and Engineering Laboratory (CRREL) Activities: McMurdo Shear Zone* project (PI Renee Melendy; T-940-M) will provide annual shear zone crevasse detection and mitigation for the South Pole Traverse (SPoT). The team will have an [IDDO Hand Auger](#) with them.

(7) The *Collaborative Research: Site Survey for Subglacial Bedrock Exposure Dating at the Margin of the Wilkes Basin in Northern Victoria Land* project (PI Greg Balco; NSF award 1744844; I-158-M) aims to establish, through direct geological evidence, whether complete deglaciation of East Antarctic marine basins took place during past warm-climate periods. The researchers will assess the feasibility of achieving this goal using cosmogenic-nuclide measurements on bedrock buried under the ice sheet. During the single field season (2023-24) reconnaissance and site survey, the researchers will conduct snowmobile-towed radar surveys, geologic mapping, and rock/sediment sampling at several sites in the western Outback Nunatacks region of northern Victoria Land. The researchers will also have a [Kovacs Hand Auger](#) with them.



*Dr. Sarah Shackleton, Elizabeth Morton, and Mike Jayred inside the drill tent for the Badger-Eclipse Drill. Credit: Peter Neff, COLDEX.*



## Drill Development and Maintenance/Upgrade News

Assembly of the new [700 Drill](#) is in full swing at IDP in Madison, WI. Mechanical assembly of the sonde is nearly complete, from the anti-torque section down to the cutter head. The control box and console are currently being wired, and electronics testing is underway. Shipping cases were ordered and received, and designs for the core handling and fluid/chips processing systems are now complete.

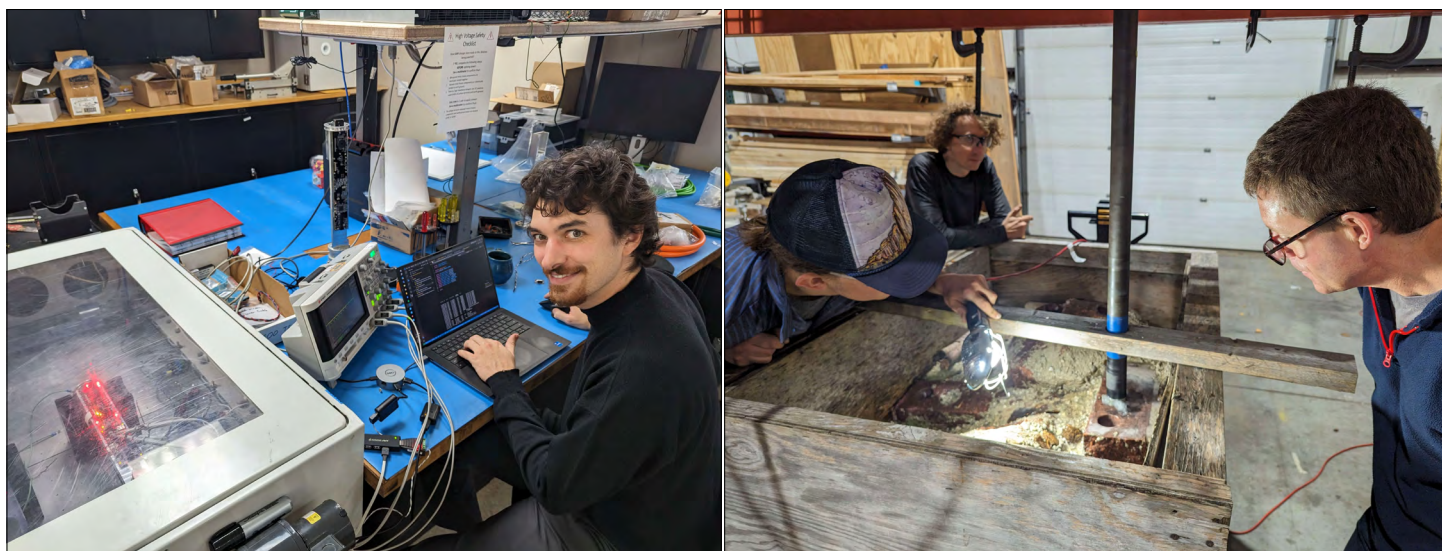
IDP Engineers revisited the [Deep Logging Winch](#) to mitigate electromagnetic interference (EMI) issues previously witnessed in the field with several logging tools provided by community scientists. Through careful investigation and comparison with a winch at the UW Physical Sciences Lab, noise and communication lapses have been successfully mitigated by installing two filters and cleaning of slip ring contacts. The winch is now ready for issue.

Good progress is being made in preparing the [Winkie](#) and [ASIG](#) drills for the second season of the GreenDrill project in northeast Greenland in spring 2024. Maintenance was completed on the Winkie Drill packer and drive head and air compressors for the Winkie and ASIG drills. New core barrel components were ordered, received, and tested for the Winkie Drill to improve clearances when drilling in clay and mixed media, and a new slip foot clamp was implemented and tested.



(Left) Elliot Moravec installs flights on the 700 Drill core barrels. Assembly of the sonde is nearly complete, from the anti-torque section down to the cutter head. Credit: Jess Ackerman. (Right) Winkie Drill test setup at the IDP facility in Madison, WI. Credit: Elliot Moravec.





*(Left) Umberto Stefanini tests the 700 Drill electronics. Credit: Jess Ackerman. (Right) IDP Engineers test the new downhole components of the Winkie Drill. New core barrel components were ordered, received, and tested to improve clearances when drilling in clay and mixed media. Credit: Jess Ackerman.*

## AGU Town Hall: Scientific Drilling in the Polar Regions

The U.S. Ice Drilling Program (IDP) will hold the **AGU Town Hall on Scientific Drilling in the Polar Regions** on **Thursday, 14 December 2023**, from **13:00-14:00 Pacific Standard Time (PST)** in room 2004 – West (Level 2, West, MC) of the Moscone Center, San Francisco, CA. We hope to see you there!

**Abstract:** Ice sheets, glaciers, and the underlying bedrock, sediment and permafrost hold crucial evidence of past climate, ice sheet dynamics, and cratonic geology. National and international collaboration for drilling in the remote Polar Regions requires strategic coordination between science, technology, and logistics. This meeting will provide the scientific research community with brief updates from IDP, Ice Core Young Scientists (ICYS), International Partnerships in Ice Core Sciences (IPICS), GreenDrill, Hercules Dome, and Rapid Access Ice Drill (RAID). Opportunities for community involvement will be showcased, and input from the audience will be solicited.

**Date:** Thursday, 14 December 2023

**Time:** 13:00 - 14:00 PST

**Location:** 2004 - West (Level 2, West, MC), Moscone Center, San Francisco, CA

**Moderator:** Mary R Albert, Dartmouth College

**AGU Link:** <https://agu.confex.com/agu/fm23/meetingapp.cgi/Session/189573>

## Englacial and Subglacial Access Working Group (ESAWG)

With access to the polar ice sheets beginning to open following the pandemic years, the [Science Advisory Board](#) of the U.S. Ice Drilling Program (IDP) has recommended that the Subglacial Access Working Group (SAWG) and Borehole Logging Working Group (BLWG) cease as separate groups. Instead, a single new working group, the IDP [Englacial and Subglacial Access Working Group \(ESAWG\)](#), is being formed. The ESAWG will provide an opportunity to develop and articulate new visions for U.S.-led englacial and subglacial science for the coming decade in the IDP [Long Range Science Plan](#).

## IDP at the 2023 AGU Fall Meeting

The following 2023 AGU Fall Meeting presentations have IDP leadership, engineers, or drillers as authors or co-authors.

Poster	<p><b>C11D-1073 Unique IDP Sub-Ice Drilling Yields Success for Science in Greenland</b>  Mary R Albert, <b>Elliot Moravec</b>, Tanner Kuhl, Richard V Erickson, Forest Harmon, Kristina Slawny, Jay Johnson, Joerg Schaefer, Jessica Ackerman, Allie Balter-Kennedy, Jason P Briner, Caleb Walcott and Nicolas E. Young  <b>Monday, 11 December 2023, 08:30 - 12:50</b>, Poster Hall A-C - South (Exhibition Level, South, MC)  <a href="https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1418963">https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1418963</a></p>
Poster	<p><b>C11D-1072 Holocene ice-sheet history at the Prudhoe Dome margin, NW Greenland: Samples for exposure dating (CRN and OSL) beneath and beyond the ice margin</b>  <b>Jason P Briner</b>, Caleb Walcott, Elliot Moravec, Alexandra Balter-Kennedy, Nathan Brown, Nicolas E. Young, Tanner Kuhl and Joerg Schaefer  <b>Monday, 11 December 2023, 08:30 - 12:50</b>, Poster Hall A-C - South (Exhibition Level, South, MC)  <a href="https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1284195">https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1284195</a></p>
Talk	<p><b>PP13B-08 The basal zone beneath the Greenland Ice Sheet as new paleo-archive to constrain ice sheet vulnerability in space and time— early lessons from the GreenDrill project</b>  <b>Joerg M Schaefer</b>, Jason P Briner, Allie Balter-Kennedy, Caleb Walcott, Nicolas E. Young, Benjamin Andrew Keisling, Sridhar Anandakrishnan, Nathan Stevens, Tanner Kuhl, Elliot Moravec and Kristina Slawny  <b>Monday, 11 December 2023, 15:22 - 15:32</b>, 3024 - West (Level 3, West, MC)  <a href="https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1360466">https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1360466</a></p>
Talk	<p><b>C14A-07 First Results from GreenDrill: Exposure dating in sub-ice material from Prudhoe Dome, northwestern Greenland</b>  <b>Allie Balter-Kennedy</b>, Joerg M Schaefer, Jason P Briner, Nicolas E. Young, Caleb Walcott, Tanner Kuhl, Elliot Moravec, Benjamin Andrew Keisling, Sridhar Anandakrishnan, Nathan Stevens and Nathan Brown  <b>Monday, 11 December 2023, 17:00 - 17:10</b>, 2005 - West (Level 2, West, MC)  <a href="https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1314764">https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1314764</a></p>
Talk	<p><b>ED23A-07 Virtual Field Labs: Facilitated Investigations for Middle School to College Students Led by Climate Scientists</b>  <b>Marc Vankeuren</b>, Louise T Huffman, Bill Grosser, Kristen E Rahilly, and <b>Susan Rubert</b>  <b>Tuesday, 12 December 2023, 15:20 - 15:30</b>, 203 - South (Level 2, South, MC)  <a href="https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1325529">https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1325529</a></p>
Town Hall	<p><b>TH43E Town Hall - Scientific Drilling in the Polar Regions</b>  <b>Mary R Albert</b>, Tas D van Ommen, Jennifer Campos Ayala, Joerg Schaefer, Heidi A Roop, and John W Goodge  <b>Thursday, 14 December 2023, 13:00 - 14:00</b>, 2004 - West (Level 2, West, MC)  <a href="https://agu.confex.com/agu/fm23/meetingapp.cgi/Session/189573">https://agu.confex.com/agu/fm23/meetingapp.cgi/Session/189573</a></p>
Poster	<p><b>ED53C-0571 Analysis of the 2023 COLDEX Research Experience for Undergraduates Applicant Pool</b>  <b>Melyssa Fenton</b>, Kristen E Rahilly, Louise T Huffman, and Stephanie K Jarvis  <b>Friday, 15 December 2023, 14:10 - 18:30</b>, Poster Hall A-C - South (Exhibition Level, South, MC)  <a href="https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1369736">https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1369736</a></p>





## New IDP Virtual Field Lab at AGU 2023 Fall Meeting

Two of IDP's 2023 Train the Trainers workshop participants, Susan Rubert and Marc VanKeuren, are presenting IDP's newest Virtual Field Lab featuring Drs. Karen and Richard Alley at the Fall 2023 AGU Meeting on Tuesday, 12 December 2023. [Virtual Field Labs](#) are unique interactive education and outreach products designed for students from late middle school to college. Virtual Field Labs are designed for students to watch with a teacher present (virtually or in-person) or independently on their own computers. Each Virtual Field Lab takes students along with a climate scientist as they collect and analyze data to answer a different climate question.

**Title:** ED23A-07. Virtual Field Labs: Facilitated Investigations for Middle School to College Students Led by Climate Scientists

**Date:** Tuesday, 12 December 2023

**Time:** 15:20 – 15:30 PST

**Location:** MC, 203 - South

**AGU Link:** <https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1325529>

## Registration Now Open for Climate of HOPE Conference

Registrations are now open for middle school and high school teachers in DuPage County, IL, to join us for the IDP, in partnership with Downers Grove North High School and the Regional Office of Ed, Climate of HOPE (How Our Planet is Evolving) conference. The conference will be held on March 1, 2024, at Downers North High School as part of the countywide professional development day. For additional information, visit <https://sites.google.com/view/2024scienceinstitute/home>.





Sheets





Earth, Ocean & Atmospheric

IDP's education and outreach program is leading a professional development climate change science day in partnership with the DuPage County Regional Office of Education (Wheaton, Illinois), the National Center for Science Education, Downers Grove North High School, and the Fermi National Accelerator Laboratory (Fermilab) on March 1, 2024, in DuPage County, Illinois. The Climate of HOPE Conference will bring a combination of cutting-edge climate research and engaging classroom-ready activities to Illinois science teachers.

## School of Ice Applications for COLDEX Workshop

School of Ice applications for the [COLDEX](https://icedrill-education.org/coldex) workshop, July 21-25, 2024, are now available at <https://icedrill-education.org/school-of-ice/>. School of Ice is open to faculty at US Minority Serving Institutions and Community Colleges. Please pass this on to eligible colleagues. Questions: [louise.t.huffman@dartmouth.edu](mailto:louise.t.huffman@dartmouth.edu).



Group photo of participants from the 2022 School of Ice. For more information about the program, visit <https://icedrill-education.org/school-of-ice/>.

## Collaboration Between Women Helps Close the Gender Gap in Ice Core Science

A [Perspective article](#) published in *Nature Geoscience* tackles the longstanding issue of gender representation in science, focusing on the field of ice core science. Prior work has shown that despite progress toward gender parity over the past fifty years, women continue to be significantly underrepresented within the discipline of Earth sciences and receive disproportionately fewer opportunities for recognition, such as invited talks, awards, and nominations. This lack of opportunity can have long-term negative impacts on women's careers. To help address these persistent gender gaps, the study evaluates patterns related to women's publication in ice core science over the past fifty years. The study was co-led by Bess Koffman of Colby College, USA, and Matthew Osman of Cambridge University, UK, and coauthored by Alison Criscitiello and Sofia Guest, both of the University of Alberta, Canada.

To assess relationships among gender, publication rate, and impact of coauthor networks, the study evaluates a comprehensive, global dataset of abstracts representing published work in ice core science spanning 1969 to 2021 in this historically male-dominated discipline. The Perspective article shows that the inferred gender gap in ice core science has declined from roughly 10:90% women:men in the 1970's to ~30:70% in the past decade. Contrasting with prior work across the sciences, the authors find that women's and men's coauthor networks have remained similarly sized and been similarly cited through time. This finding may reflect the high degree of international cooperation and the large collaborative teams that are typical of the field of ice core science.



Importantly, the gender makeup of coauthors differs substantially for man vs. woman-led studies. Strikingly, within the past decade, woman-led studies have contained on average 20% more women coauthors than man-led studies, a difference found to be even greater in earlier decades. Moreover, since the early 2000s, the analysis shows that women have out-performed by about 8% their estimated proportion within the ice core community in terms of publishing first-authored papers. The new analysis by Koffman, Osman, and colleagues suggests that senior women in particular catalyze women's participation in publishing, and that collaboration between women can help close gender gaps in science.

This collaborative effort by the authors emerged from the first Ice Core Early Career Researchers Workshop (ICECReW).

## Announcing 3<sup>rd</sup> US Ice Core Open Science Meeting

The [third annual US Ice Core Open Science Meeting](#) will be held **May 15-17, 2024**, at the Portland Public Library in beautiful **Portland, Maine**. The NSF-funded Hercules Dome Ice Core Project is convening the meeting.

This meeting is intended for anyone interested in ice core science or related fields, including ice-core analysis, ice or subglacial drilling, glacier geophysics that supports or depends on ice core records, paleoclimate, and contemporary climate and ice sheet change.

The goals of the meeting include:

1. Sharing the latest science.
2. Discussing future ice core and related science projects in both polar regions and alpine environments.
3. Providing career development opportunities.
4. Improving communication about ice-core and related science within and beyond the scientific community.

We hope to attract a diverse group of participants, including those who may not have extensive experience working with ice cores.

While this meeting is primarily oriented toward researchers in the US, international colleagues are welcome to attend.

The meeting will begin midday on Wednesday, May 15, and end in the late afternoon on Friday, May 17. The meeting will be preceded by an [Ice Core Early Career Researchers Workshop \(ICECReW\)](#) for early career researchers focused on applying for academic and alt/ac jobs.

Details on hotel rooms, travel support, and other aspects of the meeting will be publicized in February.

Please join the [Hercules Dome mailing list](#) to ensure you receive all the meeting announcements.

**Dates:** May 15-17, 2024

**Location:** Portland Public Library, Portland, Maine

**Convener:** NSF Hercules Dome Ice Core Project

**Organizing Committee:** Seth Campbell, T.J. Fudge, Kaitlin Keegan, Bess Koffman, Peter Neff

**Meeting website:** <https://herculesdome.org/us-ice-core-open-science-meeting-2024>

## ICECReW 1.5-day workshop before US Ice Core Open Science Meeting

The [third Ice Core Early-Career Researchers Workshop \(ICECReW\)](#) will be held on **May 14 and 15, 2024**, at the Gulf of Maine Research Institute in **Portland, Maine**, ahead of the US Ice Core Open Science Meeting (May 15-17). ICECReW is



an opportunity for early-career researchers to meet and discuss ice-related science. The theme of this year's workshop is exploring career opportunities within and outside of academia. The workshop will focus on developing and receiving feedback on application materials such as CVs, research statements, teaching statements, and cover letters.

ICECReW is intended for early-career researchers whose work contributes to polar sciences or paleoclimatology. We broadly define "early career" as someone within three years of PhD (before or after completion), although exceptions are certainly possible.

Please join the [Hercules Dome mailing list](#) to ensure you receive all the meeting announcements.

More details for the workshop will be announced in early 2024. We anticipate supporting the cost of an additional two nights' lodging for US participants. Travel to/from the US Ice Core Science Meeting may be partially supported depending on need.

The **deadline** for submitting the [ICECReW application](#) is **February 9, 2024**.

**Dates:** May 14-15, 2024

**Location:** Gulf of Maine Research Institute, Portland, Maine

**Application** (deadline February 9, 2024): <https://forms.gle/5KzkvKkXy8AYfG3v8>

**Convener:** NSF Hercules Dome Ice Core Project

**Organizing Committee:** Ursula Jongebloed, Julia Andreasen, Drake McCrimmon, Jacob Chalif, T.J. Fudge, and Bess Koffman

**ICECReW website:** <https://herculesdome.org/icecrew-2024>

## Stay Connected with IDP

[Join our mailing list!](#) We use our mailing list to communicate important IDP news and announcements to members of the ice drilling and ice coring science and technology communities. You can also follow us on [Twitter](#), [Instagram](#), [Facebook](#), and [YouTube](#). And you can find us on the web at <https://icedrill.org> and <http://icedrill-education.org>.

## Ice Drilling Support for NSF Polar Proposals

If you are preparing a National Science Foundation (NSF) proposal that includes any kind of support from IDP, you must include a Letter of Support from IDP in the proposal. If your fieldwork requires support from the U.S. Antarctic Program (USAP), you should include a Letter of Support from IDP in the pre-proposal Concept Outline (see [NSF 23-509](#) for more details).

Researchers are asked to provide IDP with a detailed support request three weeks prior to the date the Letter of Support is required. **Early submissions are strongly encouraged.**

Scientists who seek to include IDP education and outreach activities associated with U.S. ice coring or drilling science projects should contact Louise Huffman at [Louise.T.Huffman@Dartmouth.edu](mailto:Louise.T.Huffman@Dartmouth.edu) during their proposal preparation stage.

For additional information on requesting IDP support, visit our website at <https://icedrill.org/requesting-field-support> or contact us at [IceDrill@Dartmouth.edu](mailto:IceDrill@Dartmouth.edu).