AGU Town Hall TH35D

Scientific Drilling in the Polar Regions

AGU Fall Meeting 2025

Scientific Drilling in the Polar Regions

Agenda

IDP – Mary Albert

COLDEX – Ed Brook

ICECReW – Julia Andreason

Hercules Dome – Murat Aydin

Audience Participation

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Audience Participation

Update from the

NSF Ice Drilling Program (IDP)

Mary Albert
IDP Executive Director

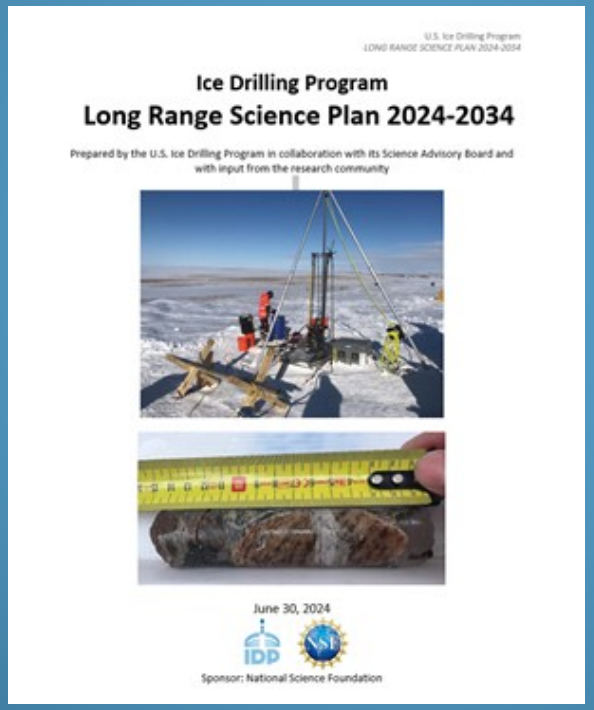
www.Icedrill.org

NSF Ice Drilling Program

Long Range Planning & Drilling For Multiple Fields of Science

IDP Working Groups

- Ice core working group (ICWG)
- Englacial and subglacial science working group (ESAWG)



LRSP Science Topics

- Past Climate Change
- Ice Dynamics & Glacial History
- Subglacial Geology, Sediments & Ecosystems
- Ice as a Scientific Observatory

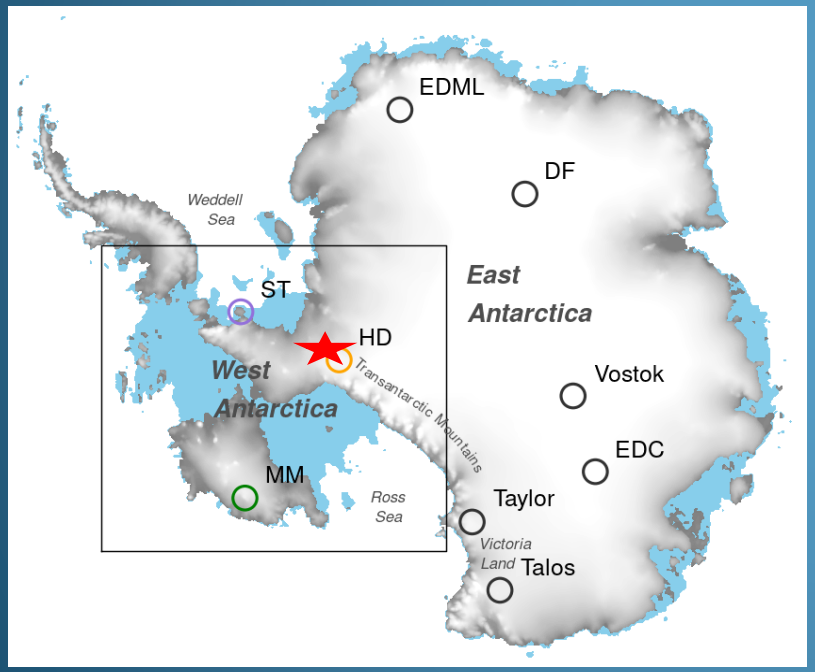
Science planning drives IDP drill development & use

www.Icedrill.org

NSF Ice Drilling Program Working Group Activities

Ice Core Working Group

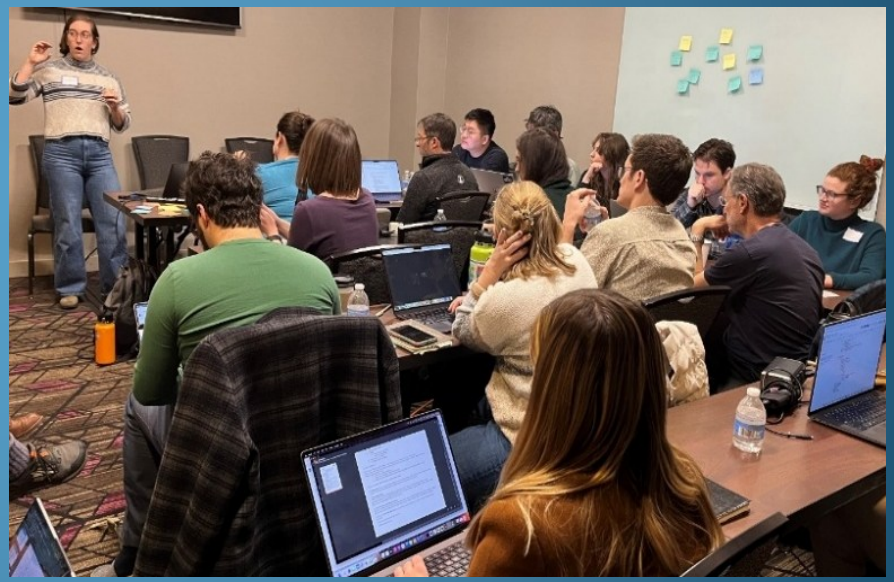
Community priority since 2016: Hercules Dome ice core



*** Murat Aydin's Herc Dome talk coming up**

Englacial & Subglacial Access Working Group

Community priority: grounding zone & bed conditions



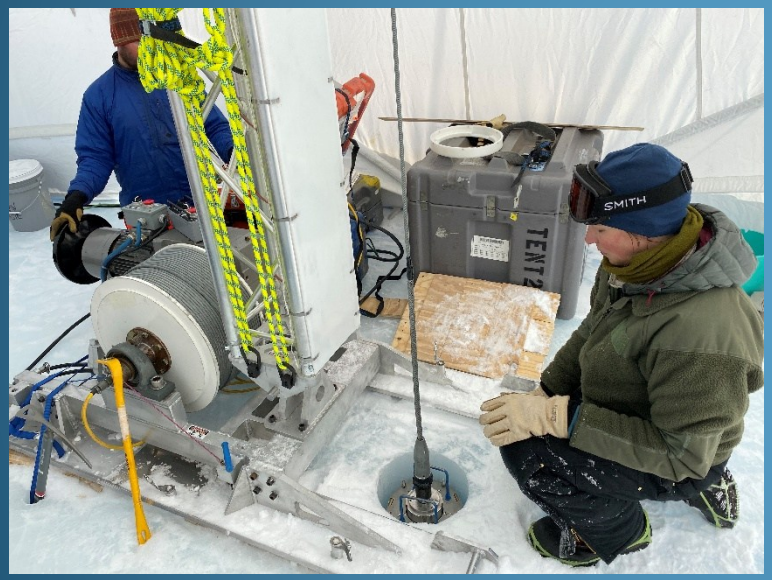
Drilling technology priority need:

- **Deep clean hot water drill**

www.Icedrill.org

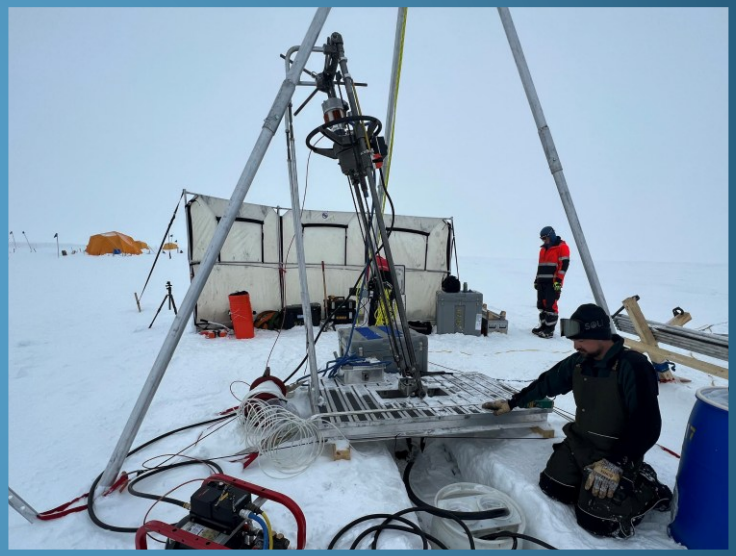
IDP Drilling Highlights

Blue Ice Drill
6 M year old ice < 200 m depth



IDP drilling for COLDEX 2025

Ice-enabled Winkie Drill
5.8 m rock core under 50 m of ice



IDP drilling for Greendrill 2024

www.Icedrill.org

NSF Ice Drilling Program

Education & Outreach featuring *your* science!

- IDP School of Ice for educators
- IDP Virtual Field Labs for educators
- Educational resources online

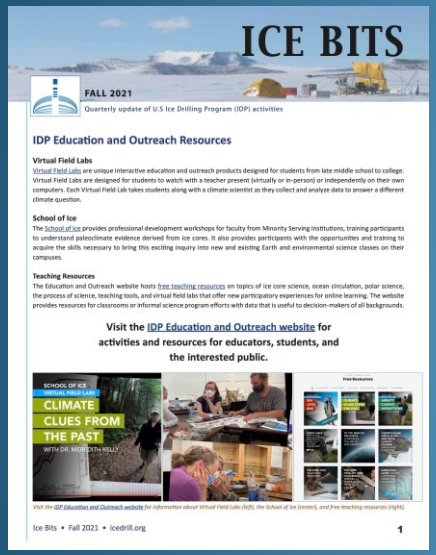
Louise Huffman
IDP Education & Outreach

Contact Louise!!
Louise.T.Huffman@Dartmouth.edu

www.Icedrill.org and http://icedrill-education.org/

NSF Ice Drilling Program

Get involved !


ICE BITS

FALL 2021

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

IDP Education and Outreach Resources

Virtual Field Labs

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.

School of Ice

The School of Ice provides professional development workshops for faculty from Minority Serving Institutions, training participants to understand paleoclimate evidence derived from ice cores. It also provides participants with the opportunities and training to acquire the skills necessary to bring this exciting inquiry into new and existing Earth and environmental science classes on their campuses.

Teaching Resources

The Education and Outreach website hosts free teaching resources on topics of ice core science, ocean circulation, polar science, the process of science, teaching tools, and virtual field labs that offer new participatory experiences for online learning. The website provides resources for classrooms or informal science program efforts with data that is useful to decision-makers of all backgrounds.

Visit the IDP Education and Outreach website for activities and resources for educators, students, and the interested public.

SCHOOL OF ICE

VIRTUAL FIELD LABS

CLIMATE CLUES FROM THE PAST

WITH DR. MEREDITH KELLY

Visit the IDP Education and Outreach website for information about Virtual Field Labs (left), the School of Ice (center), and free teaching resources (right).

Ice Bits • Fall 2021 • icedrill.org 1

- Sign up for our newsletter!
- Participate in IDP Working Group (online) meetings!
- Make sure your science is in the IDP Long Range Science Plan!
- Get help with outreach for your science!
- Request drilling & EO support for your NSF proposal!

www.Icedrill.org

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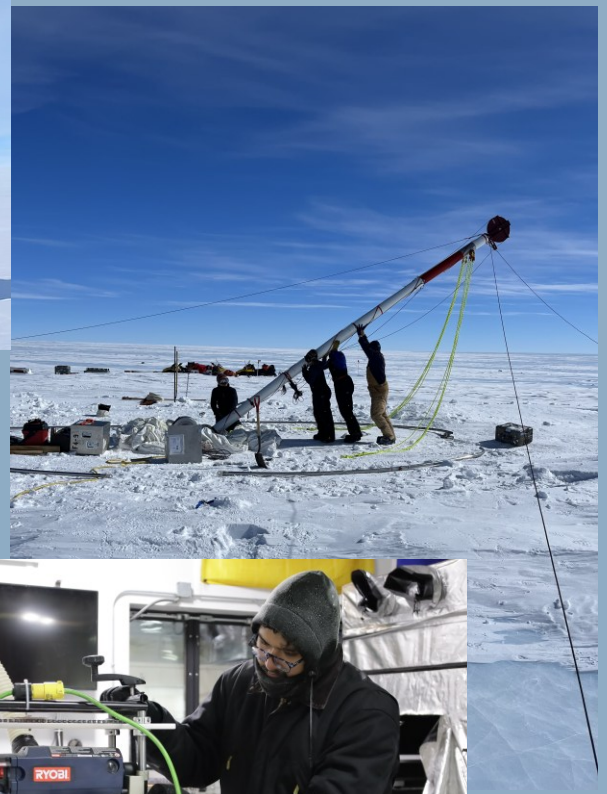
Audience Participation

Center for Oldest Ice Exploration

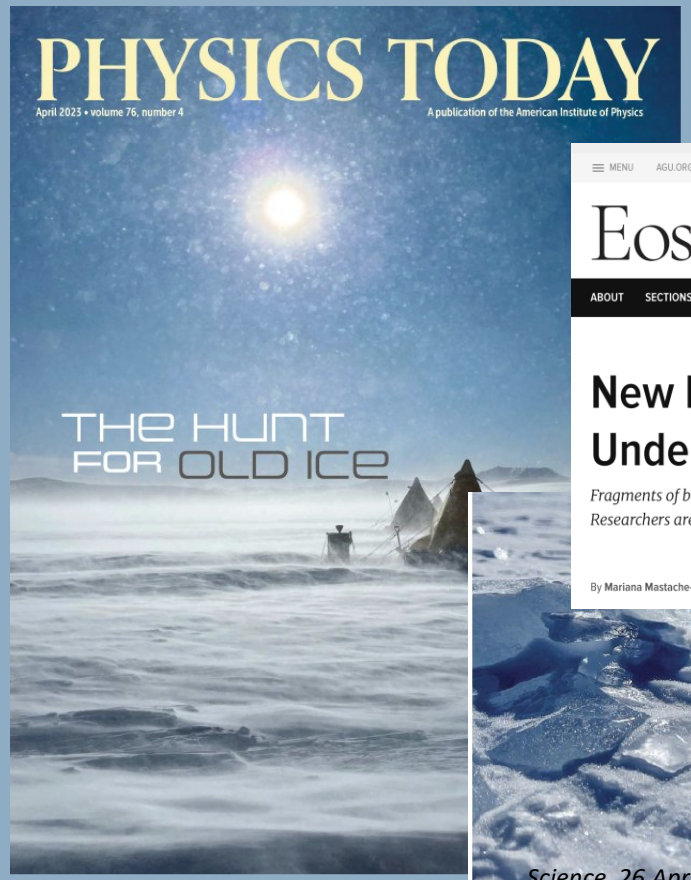
COLDEX
Center for Oldest Ice Exploration

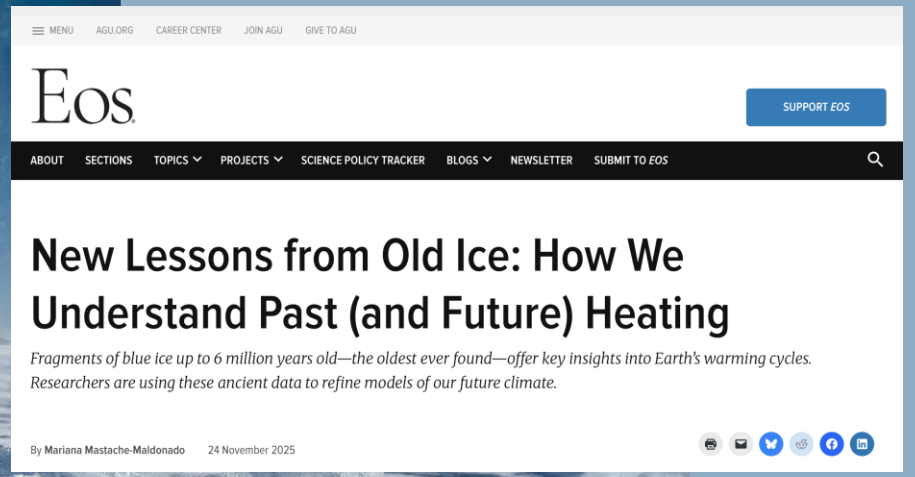
- NSF Science and Technology Center
- Headquartered at Oregon State University
- Funded 2021-2026.
- Phase 2 (2026-2031) proposal in review
- 14-institution collaboration in research, education, technology, broadening participation, knowledge transfer



COLDEX MISSION

- Explain the evolution of Earth's climate over the last 5+ million years.
- To do this we want very old ice from Antarctica.
- The challenge is that the oldest ice is rarely preserved and can be difficult to interpret.

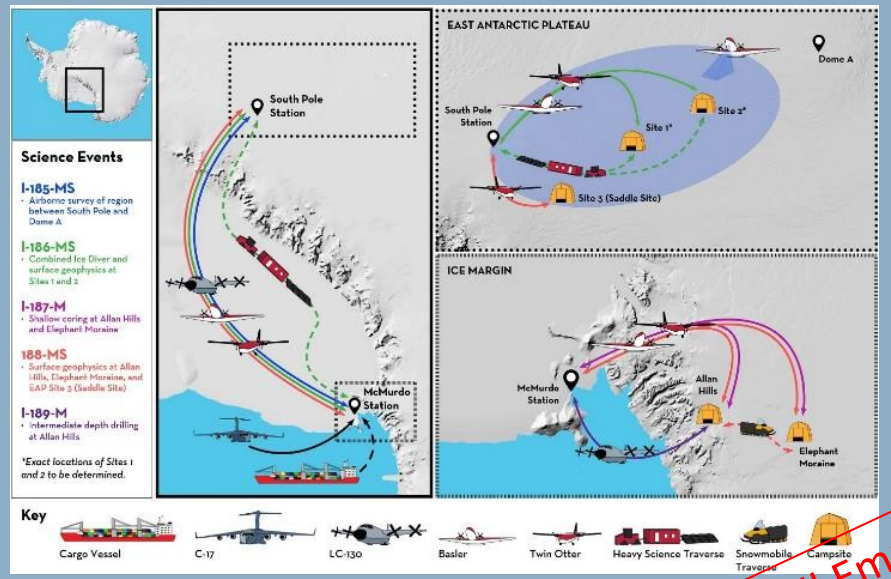




MEETING THE OLD ICE CHALLENGE

COLDEX
Center for Oldest Ice Exploration

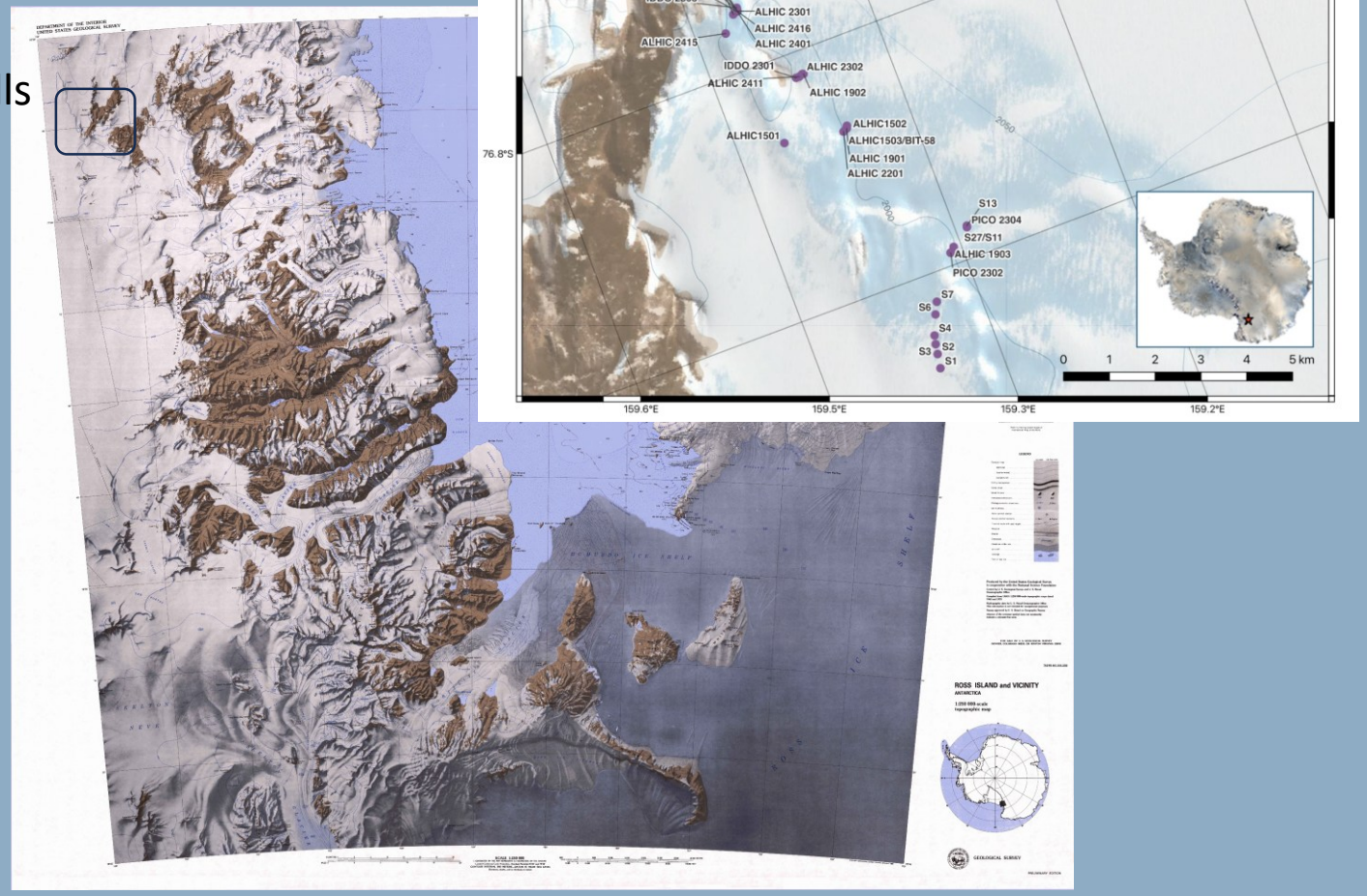
- **Exploration and Ice Sheet Modeling**
  - Find site for 1.5-million-year ice core
    - Airborne and surface radar echo-sounding
    - Novel thermal melt probes
    - Modeling age vs. depth along ice flow lines
- **Ice coring and analysis**
  - Ice coring on ice margin and (eventually) interior
  - Centralized laboratory at OSU
  - Improving age and other analyses
  - Advanced ice imaging



Phase 2 Will Emphasize Oldest Ice on Ice Margin

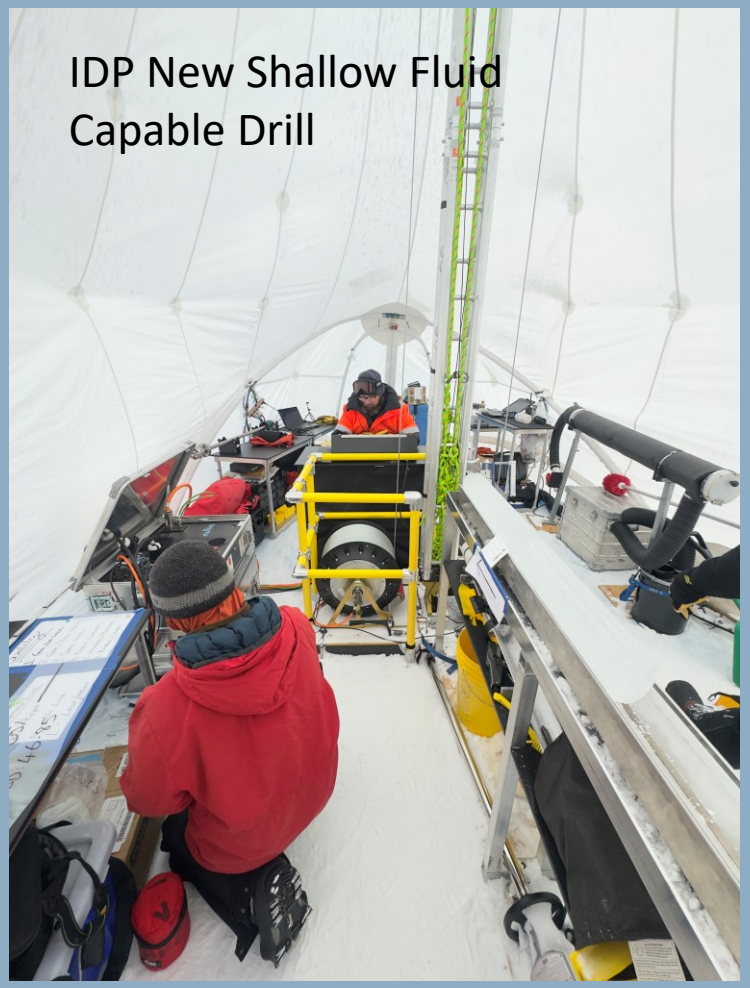
Very Old Ice at Allan Hills

- Shallow (~100-200 m) cores
- 9-inch, 4-inch and 3-inch diameter cores
- Ages based on $^{40}Ar_{atm}$ chronometer
- Multiple cores with ages up to 5-6+ Ma
- Stratigraphy is complex, but over 300 depth intervals have been dated
- Year 5 Drilling happening now

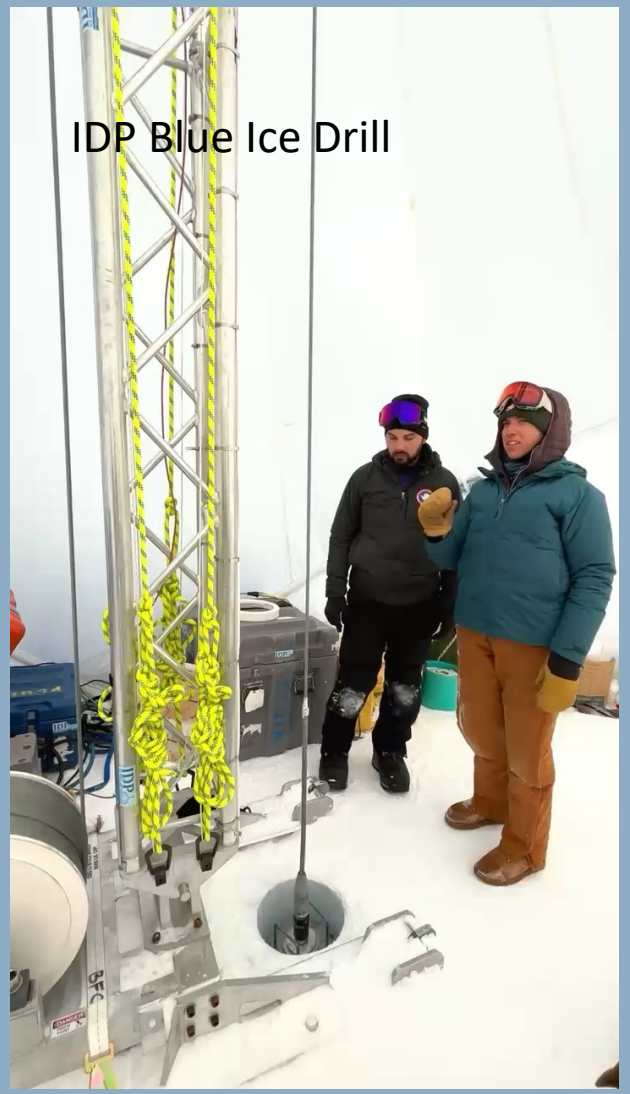


Allan Hills Cores Shallow Drilling

IDDO Hand Auger



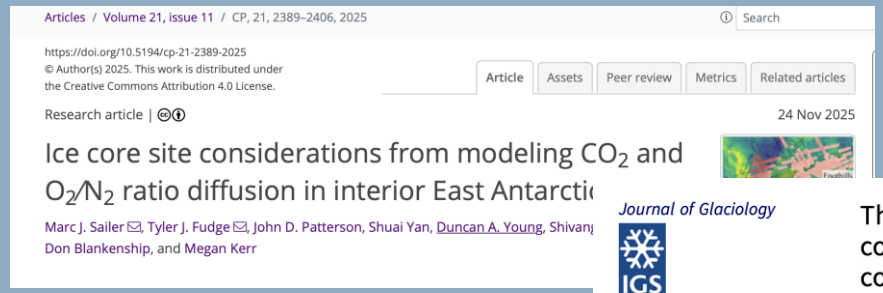
IDP New Shallow Fluid Capable Drill

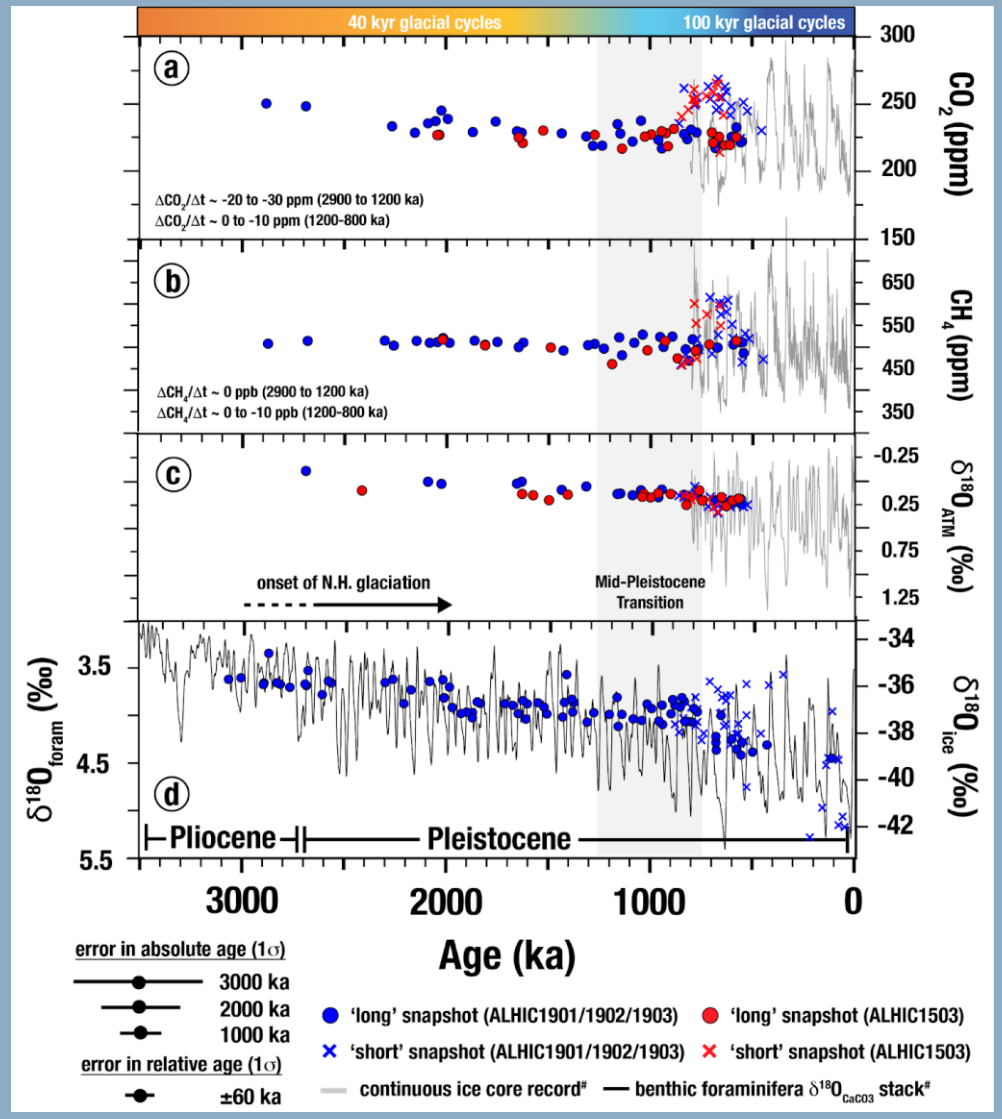


IDP Blue Ice Drill

Extending The Ice Core Record

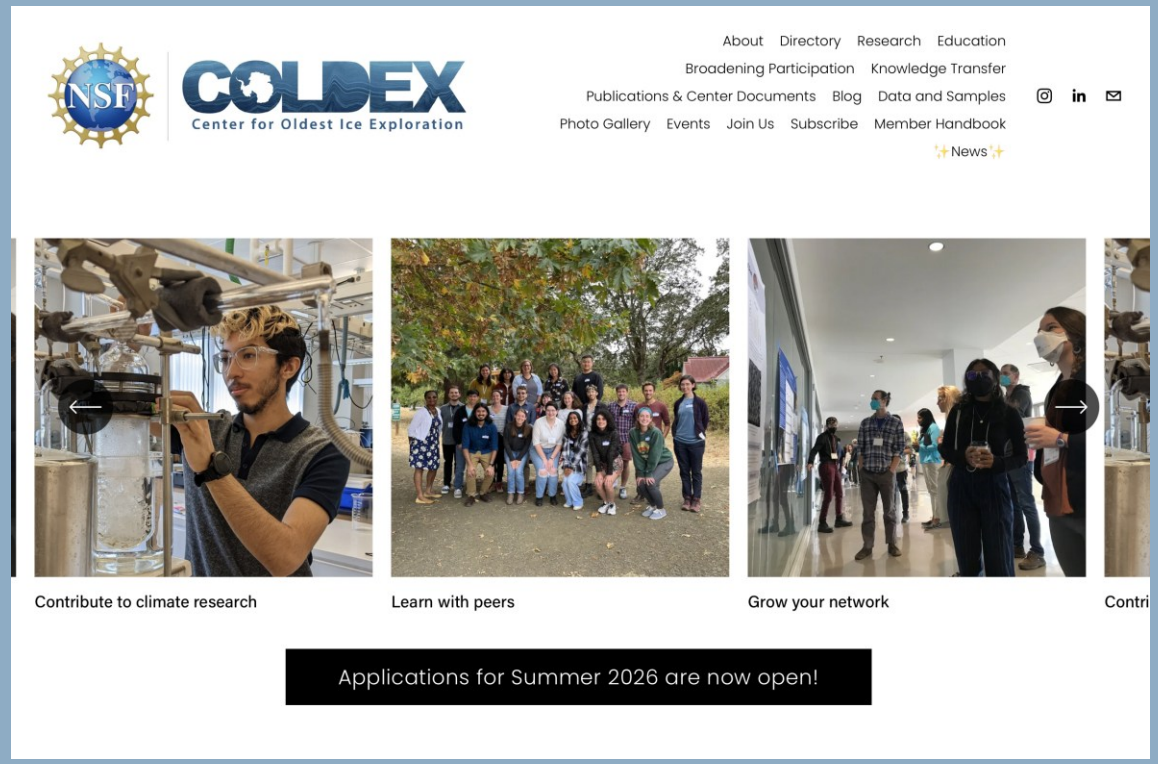
- Antarctic climate back to 6 Ma (Shackleton et al.,2025, *PNAS*).
- Greenhouse gas and mean ocean temperature back to 3 Ma (Marks Peterson et al. and Shackleton et al., forthcoming in *Nature).*
- More papers coming out now
- Numerous (~30) presentations this week
- coldex.org/news

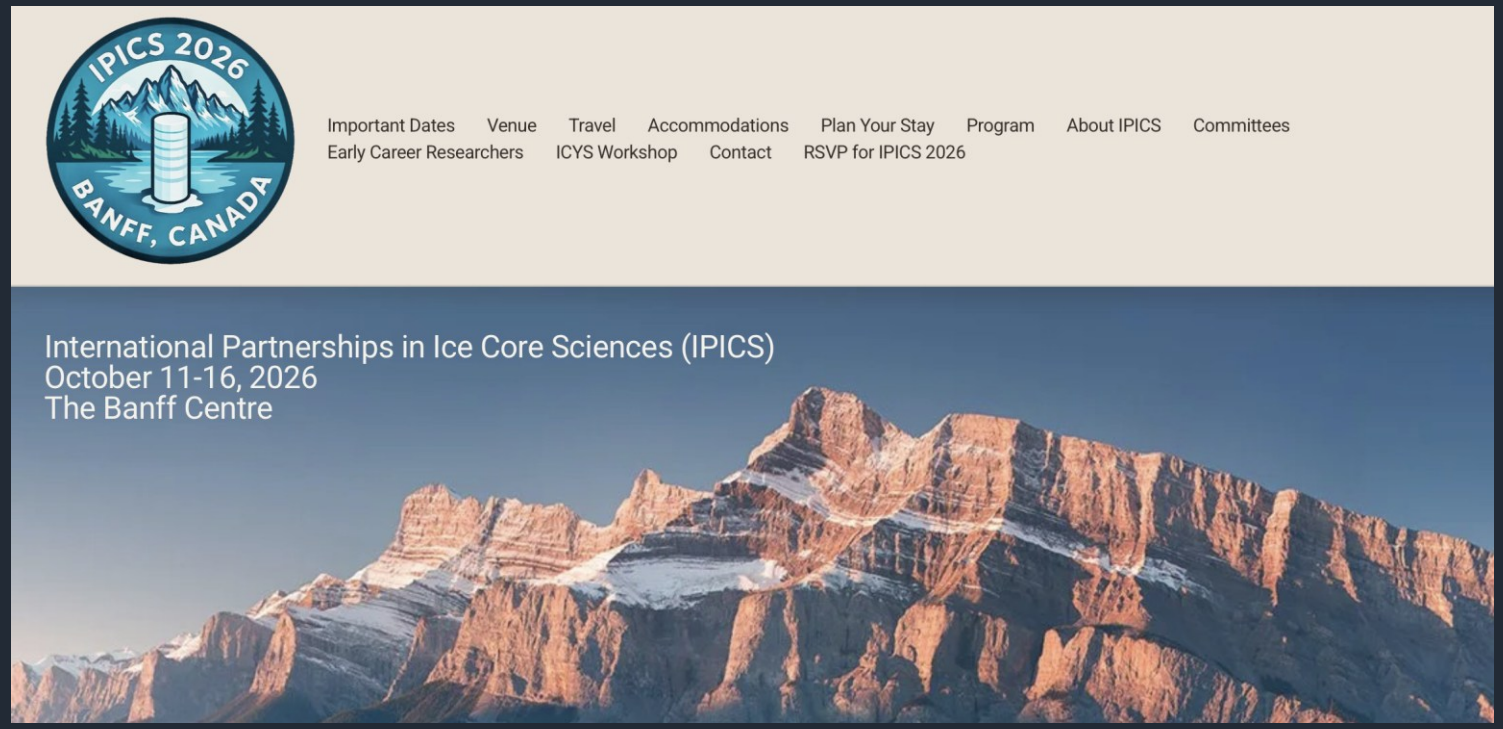




Get Involved!

- Allan Hills ice core samples are available now.
  - Sample information and request form at www.coldex.org
  - For more information contact Ed Brook (brooke@geo.oregonstate.edu) or Jenna Epifanio (jenna.epifanio@gmail.com).
- Annual COLDEX Open Science Meetings
  - Watch web site for 2026 date
- COLDEX REU Program
  - Applications open now
  - https://coldex.org/reu
- Apply for a COLDEX Early Career Researcher Scholarship
- ECR Workshops
- Data at USAP Data Center and Open Polar Server





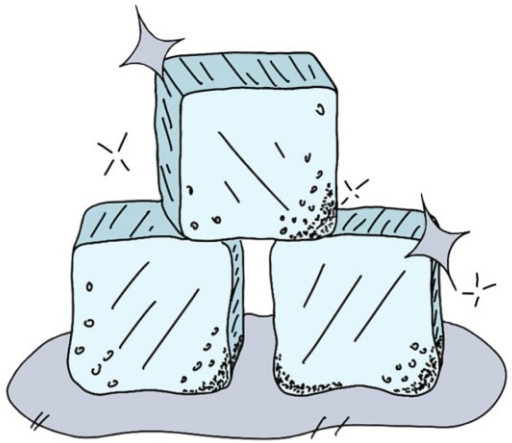
IPICS 2026 in North America: Banff Center for Arts and Creativity, Banff, Canada

October 11-16 2026

RSVP: ipics2026.org

IPICS 2026 Local Organizing Committee

Fowzia Ahmed, University of Manitoba
Ed Brook, Oregon State University
Christo Buizert, Oregon State University
Alison Criscitiello, University of Alberta
Dorthe Dahl-Jensen, University of Manitoba
Rafael dos Reis, Ohio State University
Romilly Harris Stuart, Oregon State University
Karl Kreutz, University of Maine
Rhys-Jasper Leon, University of Colorado Boulder
Bradley Markle, University of Colorado Boulder
Anne Myers, University of Alberta
Anais Orsi, University of British Columbia
Joerg Schaefer, LDEO, Columbia University
Armina Soleymani, University of Manitoba
Danielle Whittaker, Oregon State University



ICECReW
May 7–8th 2023

Ice Core Early Career Researchers Workshop

2025 Organizers: Bess Koffman (Colby), T. J. Fudge (U. Washington), **Julia Andreasen** (U. Alaska Fairbanks), Jacob Chalif (Dartmouth), Laurel Bayless (CU Boulder), Kara Lamantia (U. Bristol), Ursula Jongebloed (MIT)

Supported by NSF

ICECReW's Mission

To provide **early career researchers** (ECRs) who study **ice cores and related topics** with opportunities to meet each other and form **relationships**, learn **skills** relevant to academic work and beyond, and feel **included** in the ice core community.

We strive for:

- Broad participation
- Broad research representation
- ECR leadership
- Tangible takeaways

What does ICECReW look like?

- **~ 1.5 days** before or after the Ice Core Community Meeting (IceCOMM)
- **30 - 40 participants** (+/- 3 years of PhD)
- **4 - 6 panelists** from various career stages and career types
- **Early Career focus;** all scientists welcome

What does ICECReW do?

- **2022: History and future of ice core science**
  - Review major scientific discoveries made possible by ice cores
  - *Takeaway: Write PAGES articles on ice core-related research*
- **2023: Science collaboration and proposal writing**
  - Learn about the process of applying for funding
  - *Takeaway: Write up mock-proposals and discuss with NSF Directors*
- **2024: Career opportunities for ECRs studying ice cores**
  - Discuss opportunities and job-search strategies for careers in academia, industry, and government
  - *Takeaway: Share application materials and receive feedback from mid-late career leaders*
- **2025: Scientific paper writing (with COLDEX!)**
  - Share best practices for communicating scientific research in academic papers
  - *Takeaway: Peer feedback on writing samples and writing check-ins every 2 weeks*

EDITORIAL: EARLY-CAREER PERSPECTIVES ON ICE-CORE SCIENCE 97

Early-career perspectives on ice-core science

Jessica Badgeley[1], T.J. Fudge[1], B. Koffman[2] and S. Rupper[3]

Julia R. Andreasen (she/her)
IARC Postdoctoral Researcher
University of Alaska, Fairbanks, AK 99709
Email: jrandreasen@alaska.edu
Website: juliaandreasen.weebly.com

EDUCATION

Ph.D. in Land and Atmospheric Science, University of Minnesota, Twin Cities — 2025
Advisor: *Dr. Peter D. Neff,* Minor: *Geographic Information Science*

Master of Research in Climate and Atmospheric Science, University of Leeds, UK — 2019
Advisor: *Anna E. Hogg,* Dissertation: *The Analysis of Circum-Antarctic Calving Fronts- How have Antarctica's Major Ice Shelves Changed in the Past 10 Years?*

Bachelor of Science in Atmospheric Sciences, The Ohio State University, Columbus — 2018
Green Engineering Scholar, Minor: *Women's Gender and Sexuality Studies*

RESEARCH APPOINTMENTS

International Arctic Research Center, UAF, Fairbanks, AK — 2025-Present
Postdoctoral Researcher

NASA Earth Science Division, Twin Cities, MN — 2021 - 2025
NASA FINESST Future Investigator and Research Fellow

University of Minnesota SWAC Department, Twin Cities, MN — 2020 - 2021
Graduate Research Assistant

NASA Goddard Space
Experiential Le

University of Leeds Sch
Centre for Pola

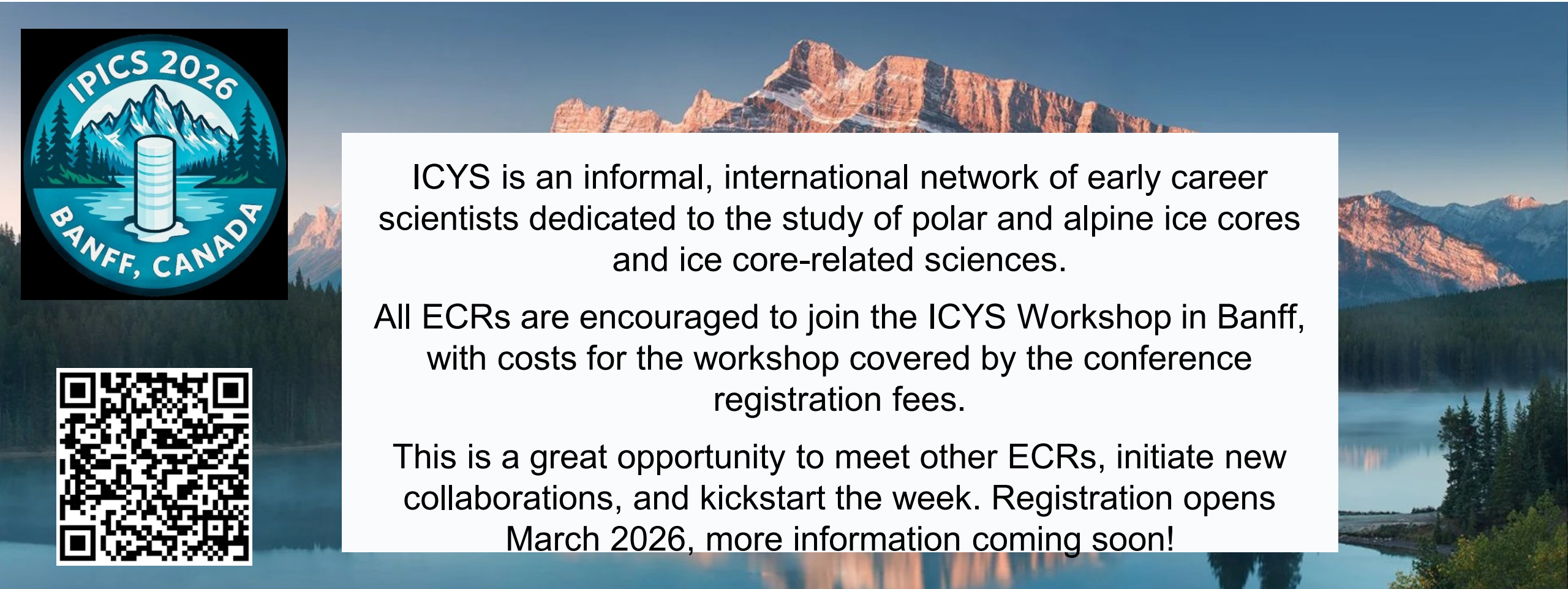
The Ohio State Univers
Climate Analyti
Undergraduate

Instructions:

Milestones	Jacob Chalif	Liam Kirkpatrick	Bridget Hall	Maddy Lewis	Margot Shaya	Austin Weber
Started tracking my writing	6/2/2025	6/2/2025	6/3/2025	6/4/2025	6/4/2025	6/4/2025
Finished manuscript draft					6/16/2025	
Submitted a manuscript!					7/5/2025	
Submitted a proposal						
Got reviews back					8/5/2025	
Got published!					10/7/2025	
Stats						
Total writing time since you joined (hours)	8.1	3	0.5	6.7	52.8	8.8
Longest streak (Consecutive days achieving goal (weekends don't count against you))	2	2	1	5	9	2
Monthly progress!						
Month	Days you met your goal (Total writing hours)	Days you met your goal (Total writing hours)	Days you met your goal (Total writing hours)	Days you met your goal (Total writing hours)	Days you met your goal (Total writing hours)	Days you met your goal (Total writing hours)
June 2025	5 days (8 total hours)	3 days (3 total hours)	1 days (1 total hours)	8 days (7 total hours)	10 days (15 total hours)	6 days (9 total hours)

When is the next ICECReW?

2027! For 2026, we encourage you to attend the Ice Core Young Scientists (ICYS) Workshop on **October 11, 2026** as part of the IPICS Conference in Banff



ICYS is an informal, international network of early career scientists dedicated to the study of polar and alpine ice cores and ice core-related sciences.

All ECRs are encouraged to join the ICYS Workshop in Banff, with costs for the workshop covered by the conference registration fees.

This is a great opportunity to meet other ECRs, initiate new collaborations, and kickstart the week. Registration opens March 2026, more information coming soon!

How do I get involved?

- If you are an ECR, keep an eye out for **ICECReW 2027** applications!
- If you are a researcher (e.g., professor) or late-stage ECR, reach out to be an organizer!
- If you are a researcher in another field and want to bring this to your community, email us!
- **Information from ICECReW 2025 can be found here:**

https://herculesdome.org/icecrew-2025

My email: jrandreasen@alaska.edu

"This was one of the most **well-organized and open/welcoming** workshops I have ever been a part of."

"For the first time since starting my program, **I feel like part of the ice core community.**"

"It provided a great way for me to interact with many people in my field that I haven't met before. I felt **really excited and hopeful about the future of ice core science!** I'm specifically looking forward to contributing to the synthesis publication."

Thank you! Questions?

Get involved: **https://herculesdome.org/icecrew-2025**

Supported by NSF

Hercules Dome Ice Core

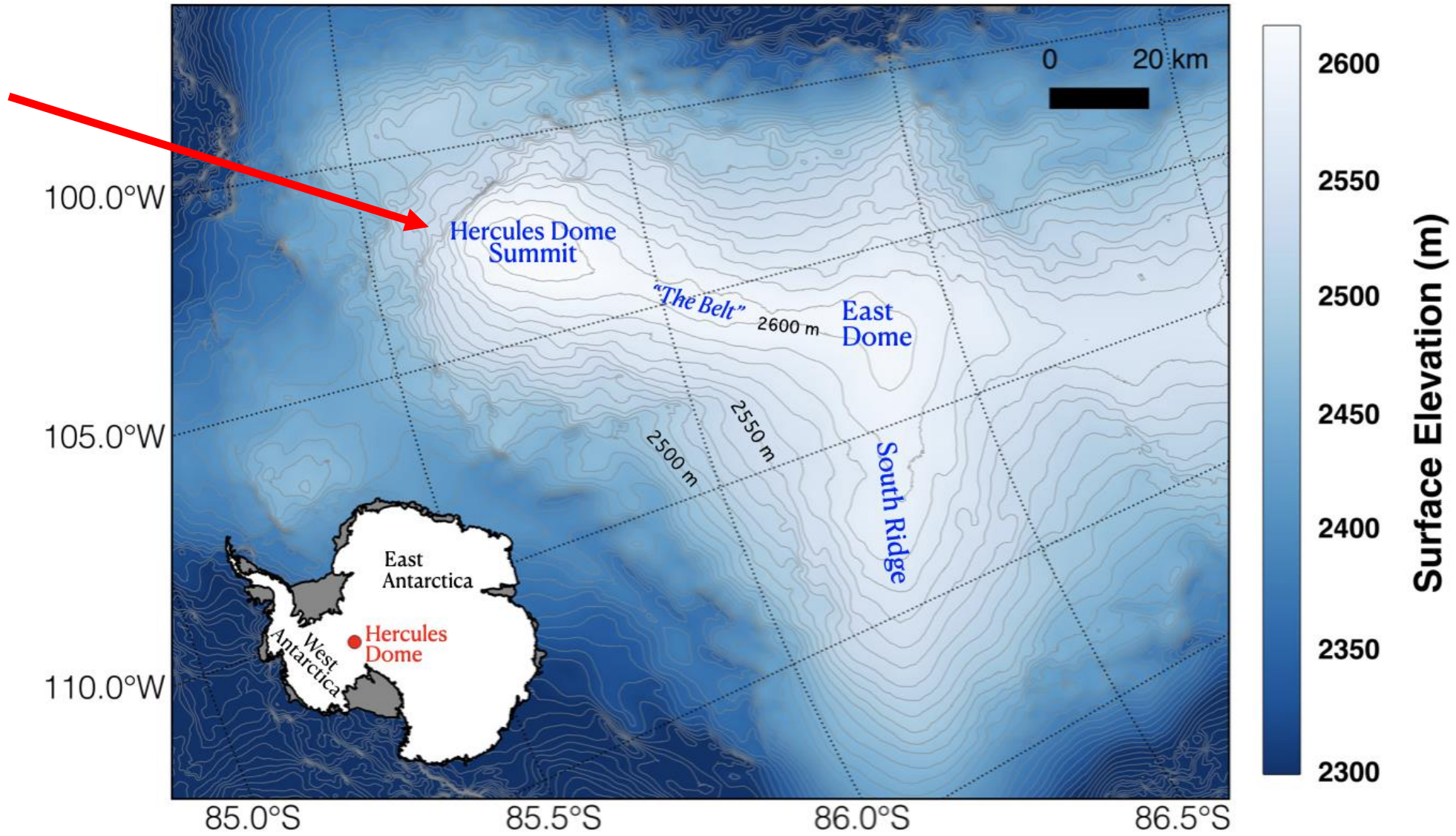
Murat Aydin, Eric Steig, Joe Souney, Mark Twickler, T.J. Fudge

With: Knut Christianson, Ben Hills, Nick Holschuh, Annika Horlings, Andrew Hoffman, Gemma O'Connor, John Christian, Liam Kirkpatrick, Emma Erwin, Heidi Roop

UNIVERSITY of WASHINGTON UCIRVINE UNIVERSITY OF MINNESOTA Amherst College University of New Hampshire

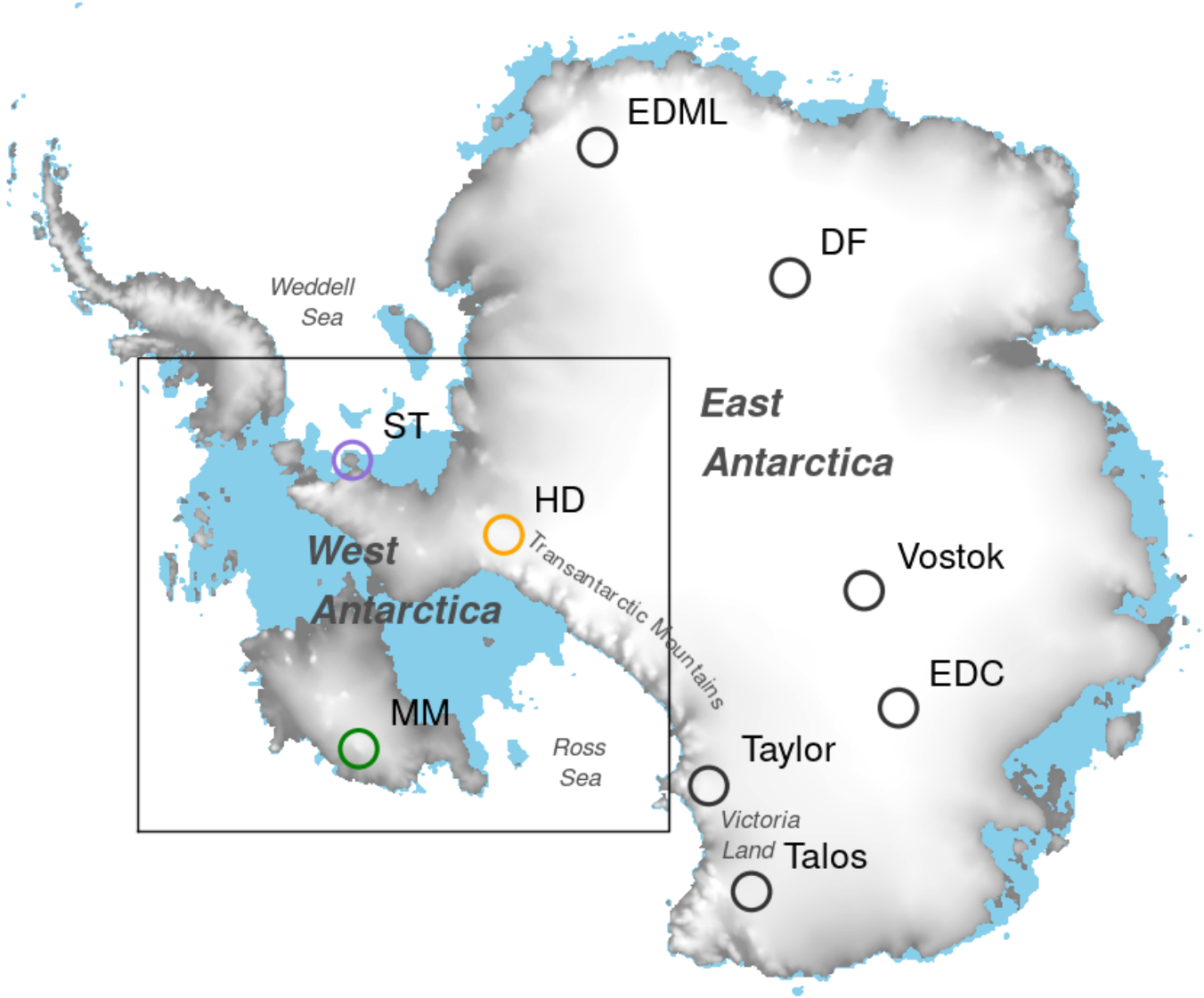
Location map

Core will be drilled at the Summit



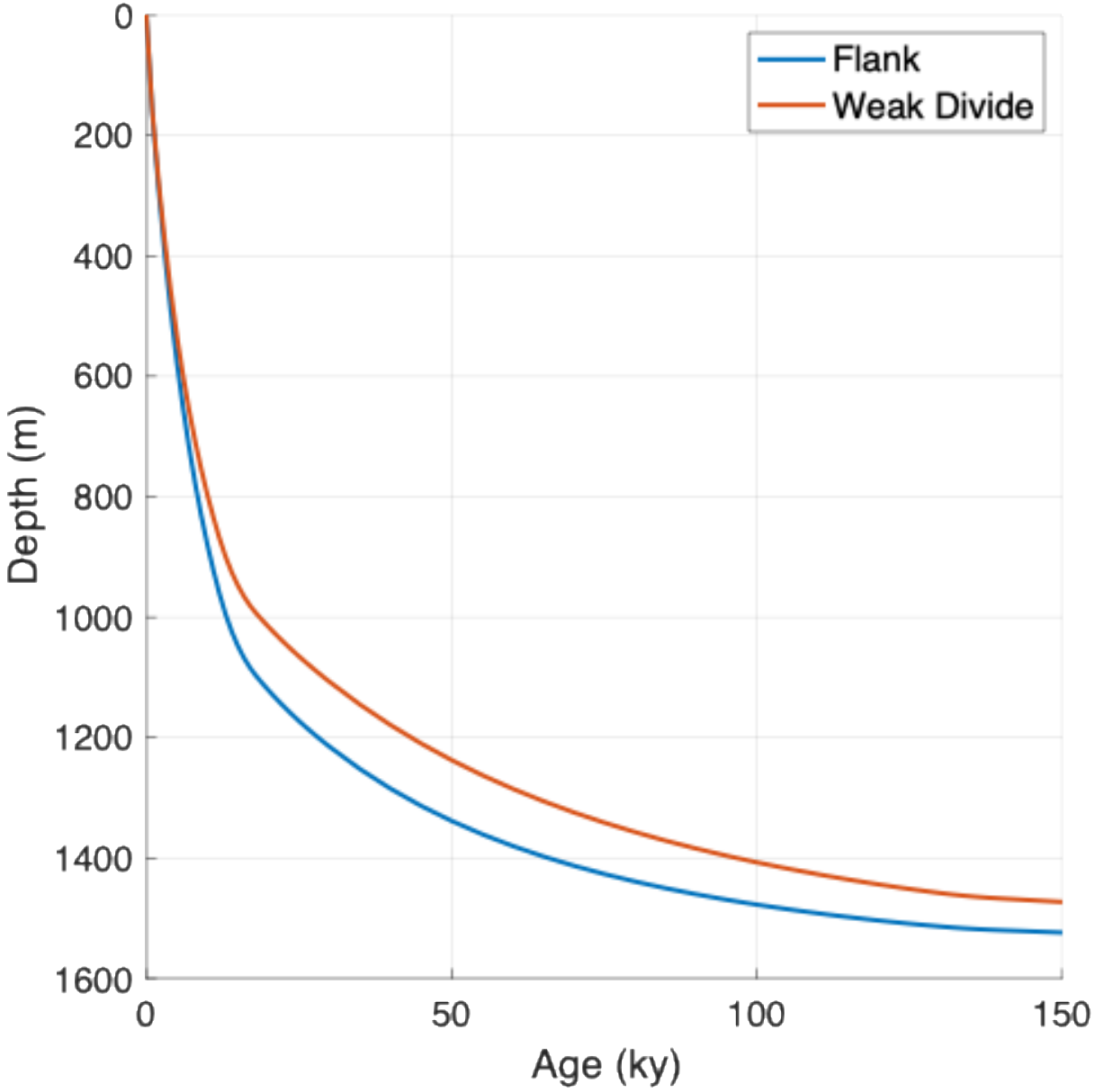
Why Hercules Dome?

- Climate of the West Antarctic region during the LIG is unknown.
- Climate at Hercules Dome is affected by the topography and climate of West Antarctica.



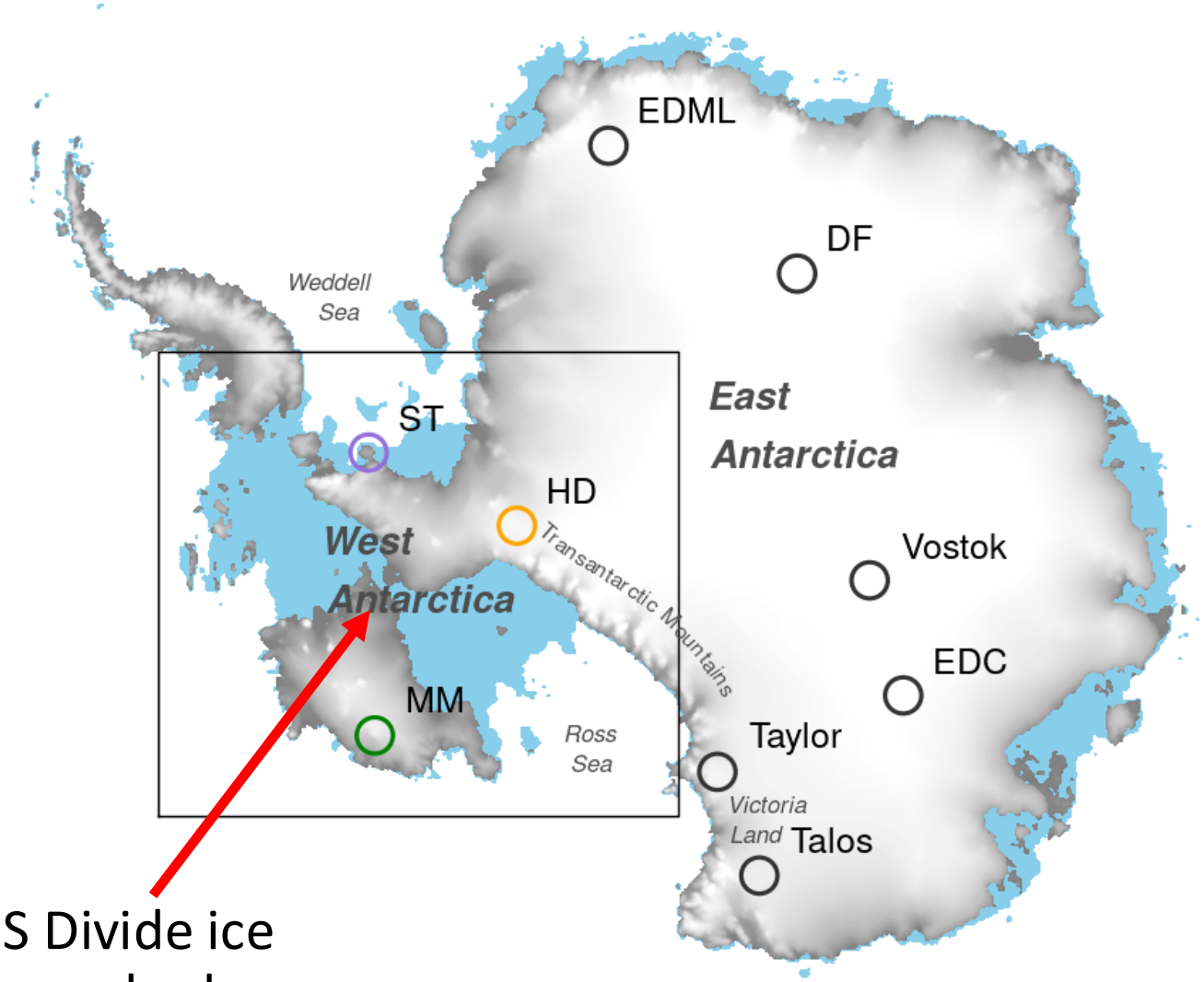
Why Hercules Dome?

- Accumulation rate is in 11 - 14 cm/year: high for East Antarctica.
- Mean annual temperature is about -40°C.
- Bedrock at about 1600 m.
- Expected to reach 130-150 ky.



Why Hercules Dome?

- Will provide ice for numerous other science goals.
- Ice and gas records through MIS 5: Beyond what is available from the WAIS Divide and South Pole ice cores.



Brief history and update

- Herc Dome has been a priority deep ice core site in Antarctica for the U.S. ice core community since 2016.
- Funded in 2019 for drilling intended to start in 2022.
- A Science Logistics Plan (SLP) has been submitted to the NSF.
- Logistical plan includes use of Heavy and Intermediate Science Traverse platforms via the well established South Pole Traverse (SPOT) route (via a deviation on the plateau) to reduce reliance on aircrafts (LC-130s).
- This plan benefits Antarctic logistics for other projects that might need traverse capability.

Timeline

- **24/25:** Intermediate Science Traverse vehicles were tested successfully.
- **25/26 26/27:** Improve traverse capabilities and develop CAMP 20 (on the South Pole Traverse route) as a logistics hub (by NSF/ASC).
- **27/28:** First cargo traverse to Hercules Dome.
- **28/29:** Second traverse, camp and drill set-up, drill and case the firn, possible summer core processing at the NSF ICF
- **29/30:** First main drilling season through the Holocene, followed by summer core processing.
- **30/31:** Second main drilling season to bedrock, followed by summer core processing
- **31/32:** Final drilling season if needed. Perhaps replicate coring (not yet proposed).

Herc Dome is a community project

Get involved:

- Get on the Herc Dome mailing list at herculesdome.org.
- Plan to be at the proposal-planning workshop expected in 2027 or 2028.
- Proposals will require discussion with the lead team, which will consider contribution to overall project and ice allocation needs in collaboration with the NSF.

AGU Town Hall TH35D

Scientific Drilling in the Polar Regions

Thanks for attending!