

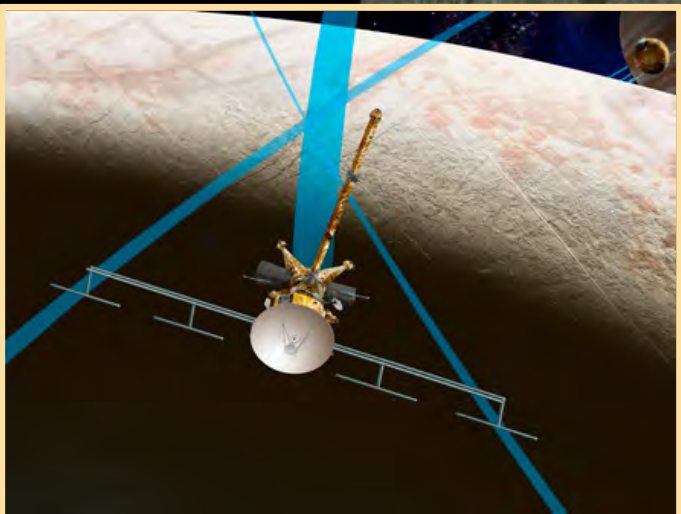
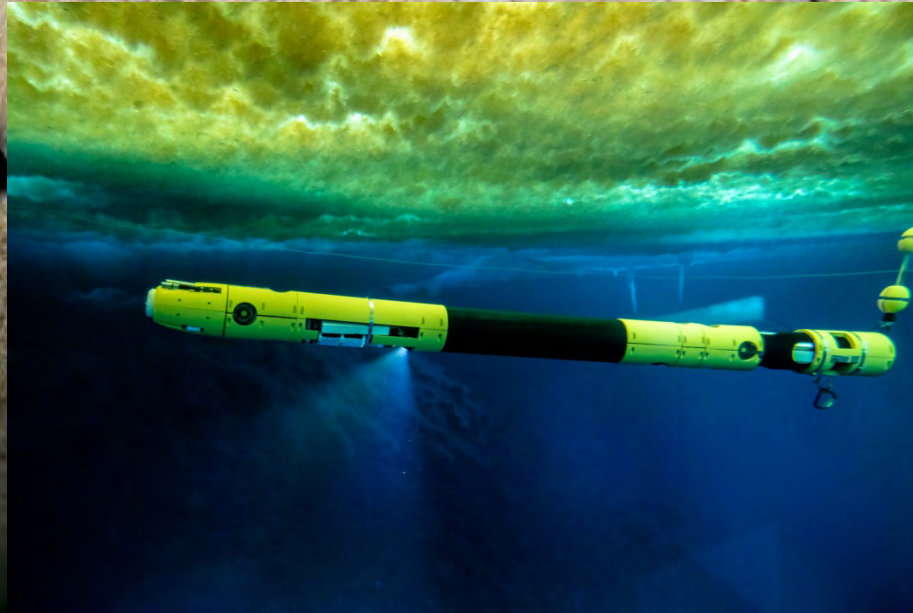
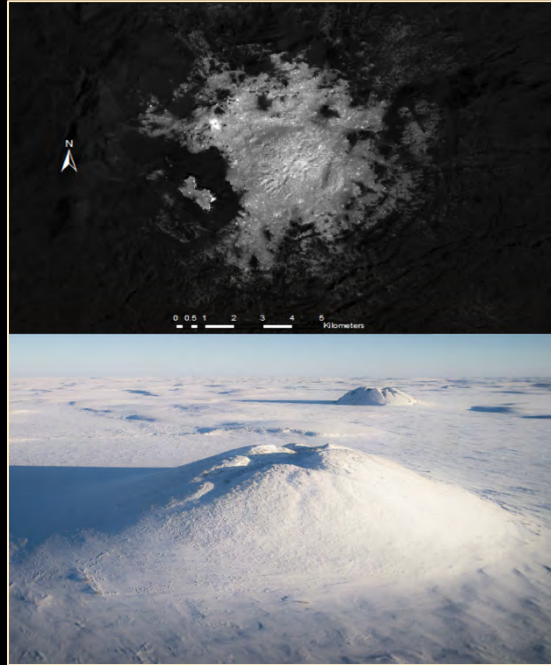
Ocean Worlds Field Work: Highlighting Antarctica

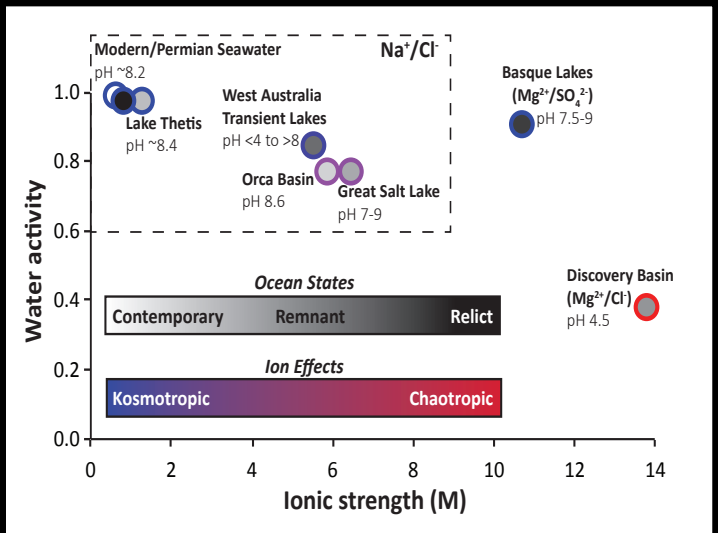
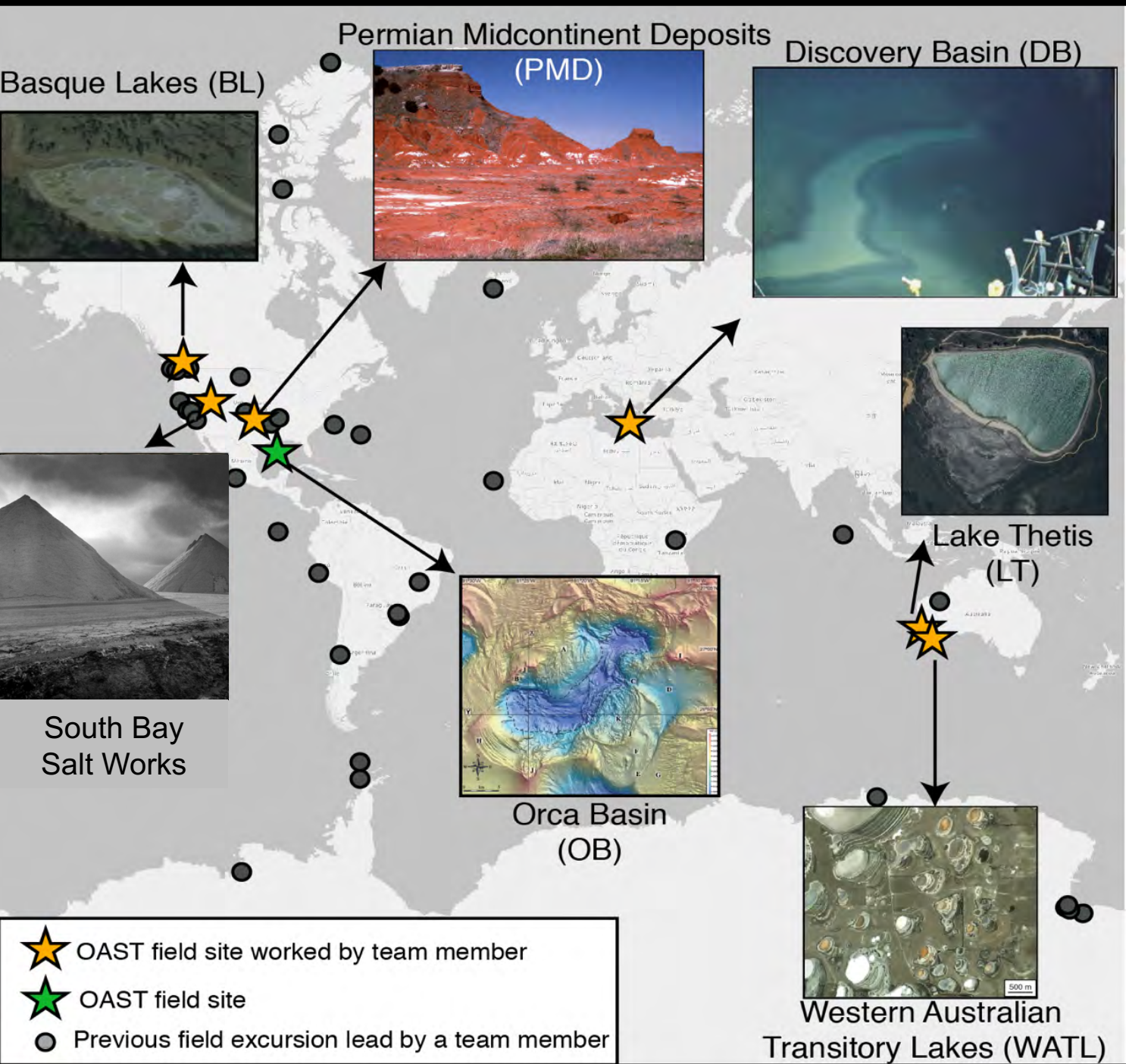


Britney E. Schmidt
britneys@eas.gatech.edu, @icefinrobot

Planetary Habitability And Technology Field Programs

Dr. Britney Schmidt & Colleagues



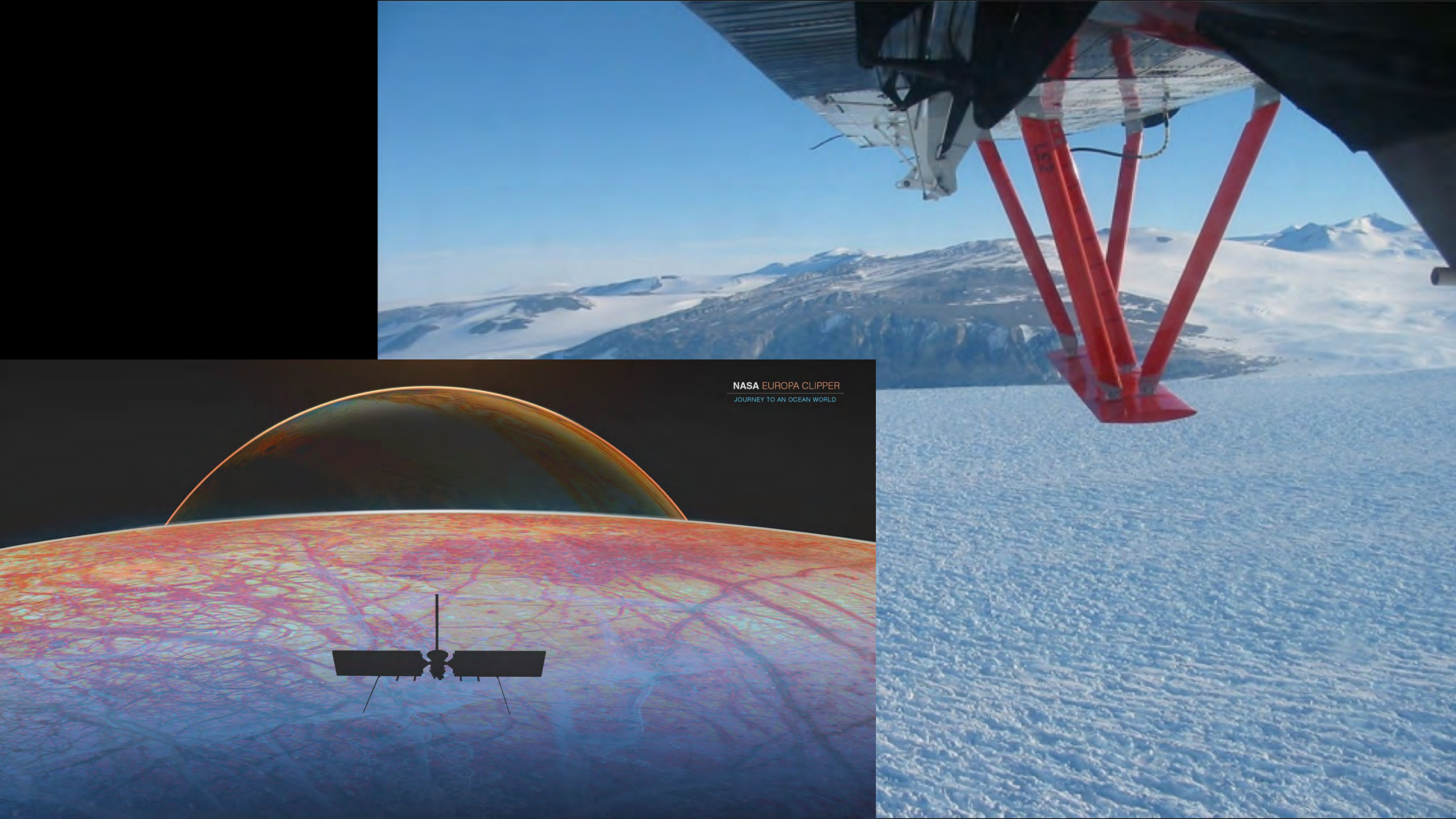


Basque Lakes

Expanded our studies of the effects of seasonality, hydrology, and composition, especially the ice

- Together with A. Pontefract's Exobiology program
- High S, High Mg systems
- Added groundwater measurements
- Expanded study of ice cover
- Some work on ice free conditions
- This morning



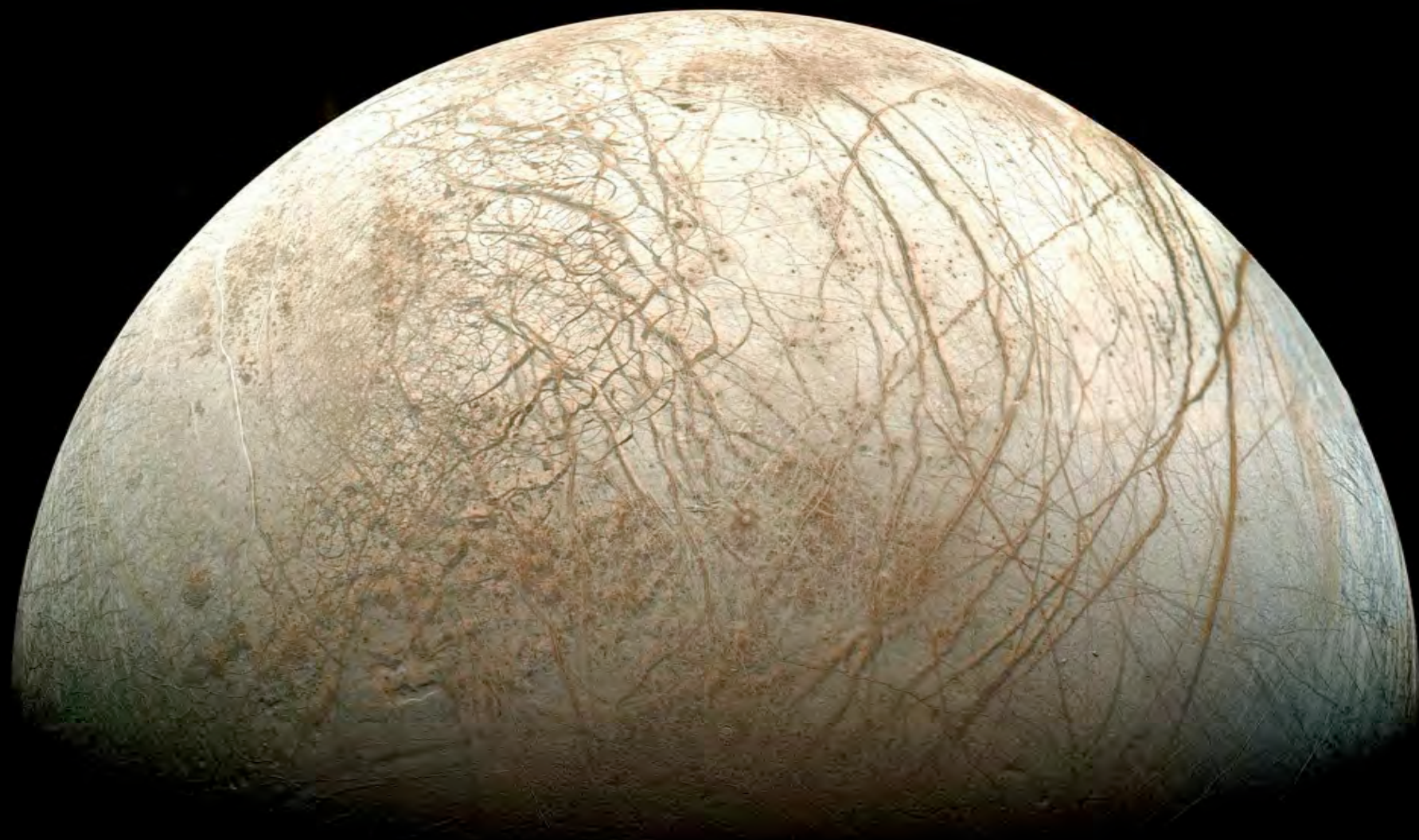


NASA EUROPA CLIPPER
JOURNEY TO AN OCEAN WORLD

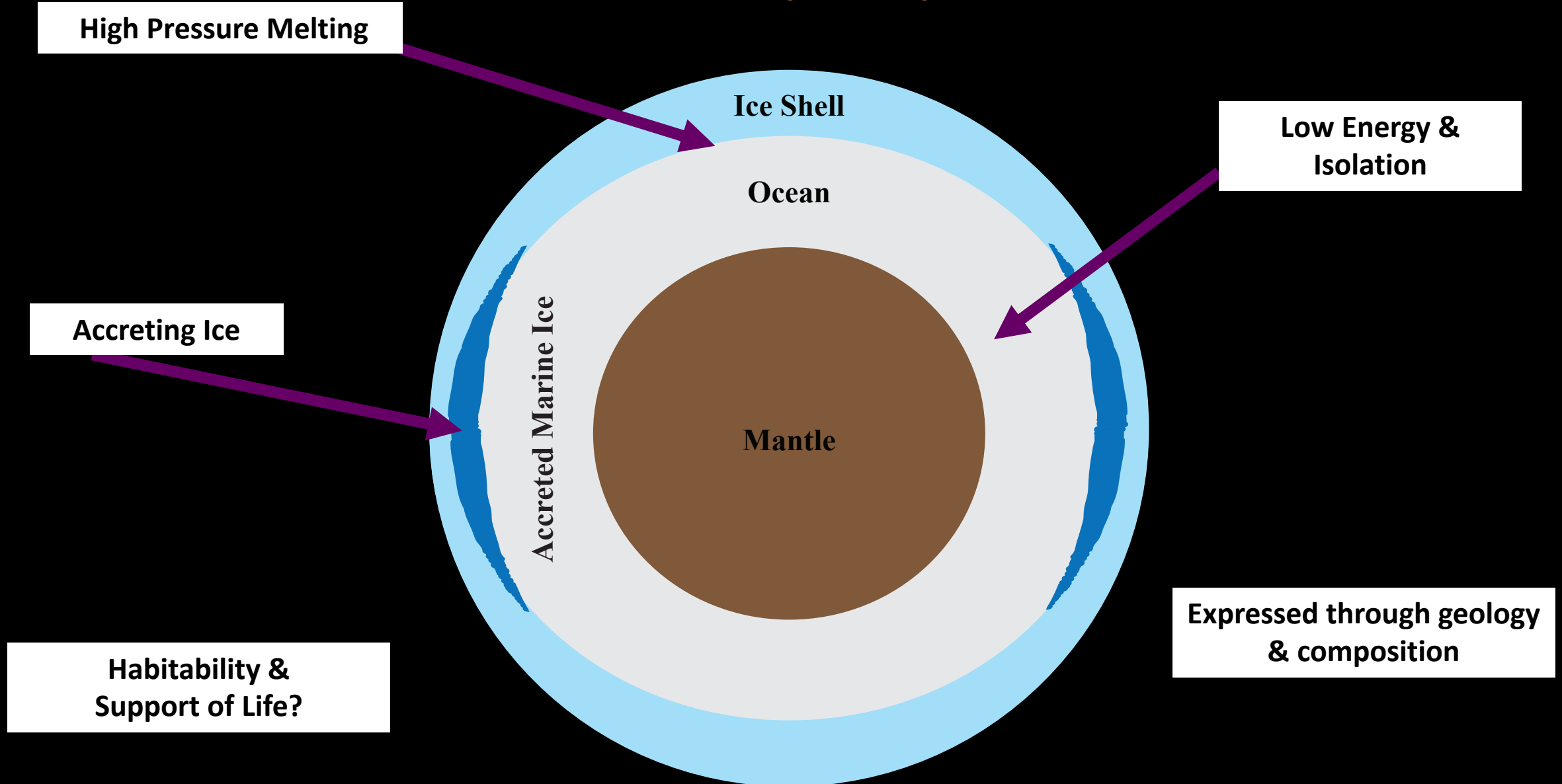
Planetary Habitability And Technology

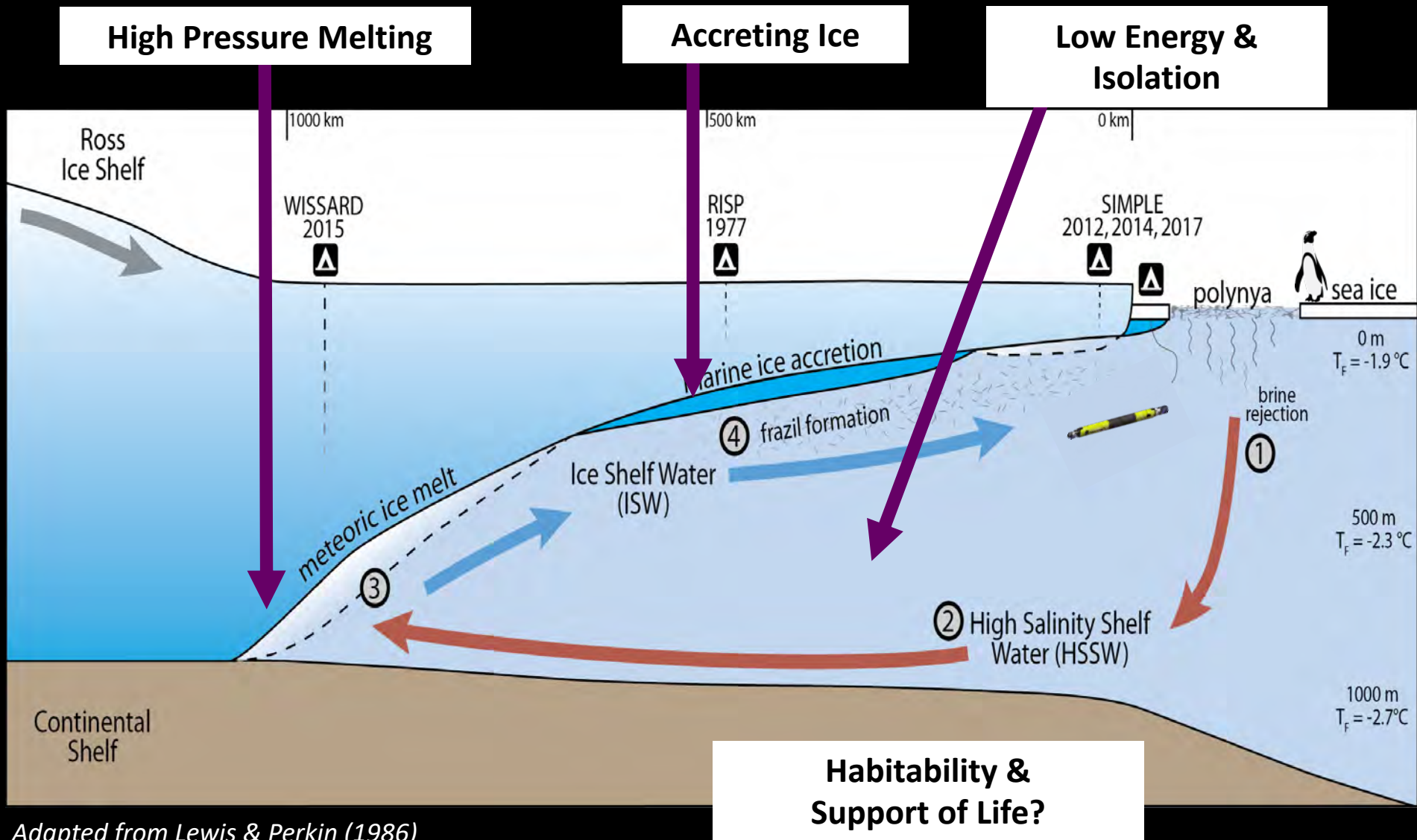
Field Robotics Programs





The Europa System

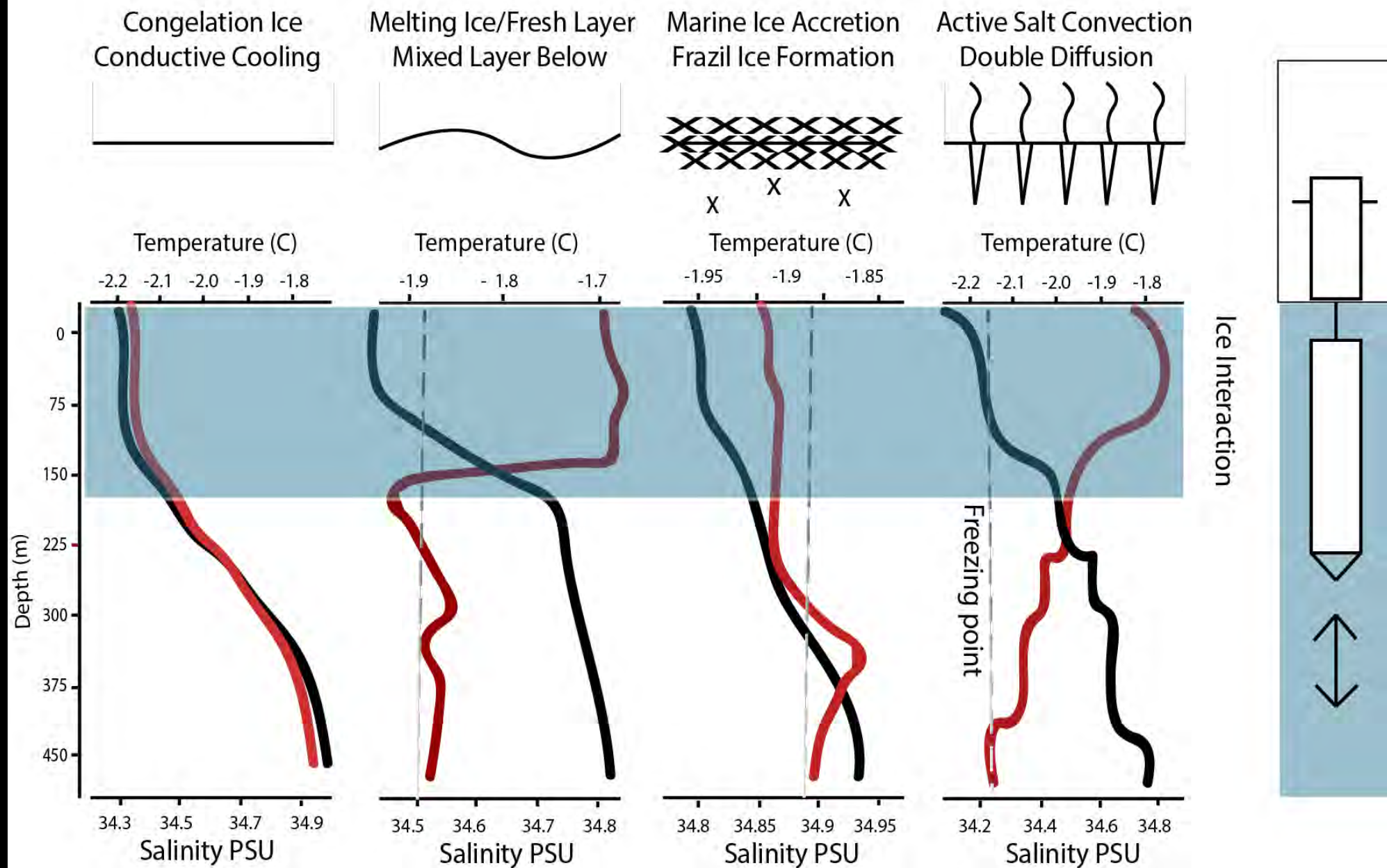




Adapted from Lewis & Perkin (1986)

Ice-Ocean Interface and Interactions

Schmidt et al 2021





Amery
Ice Shelf

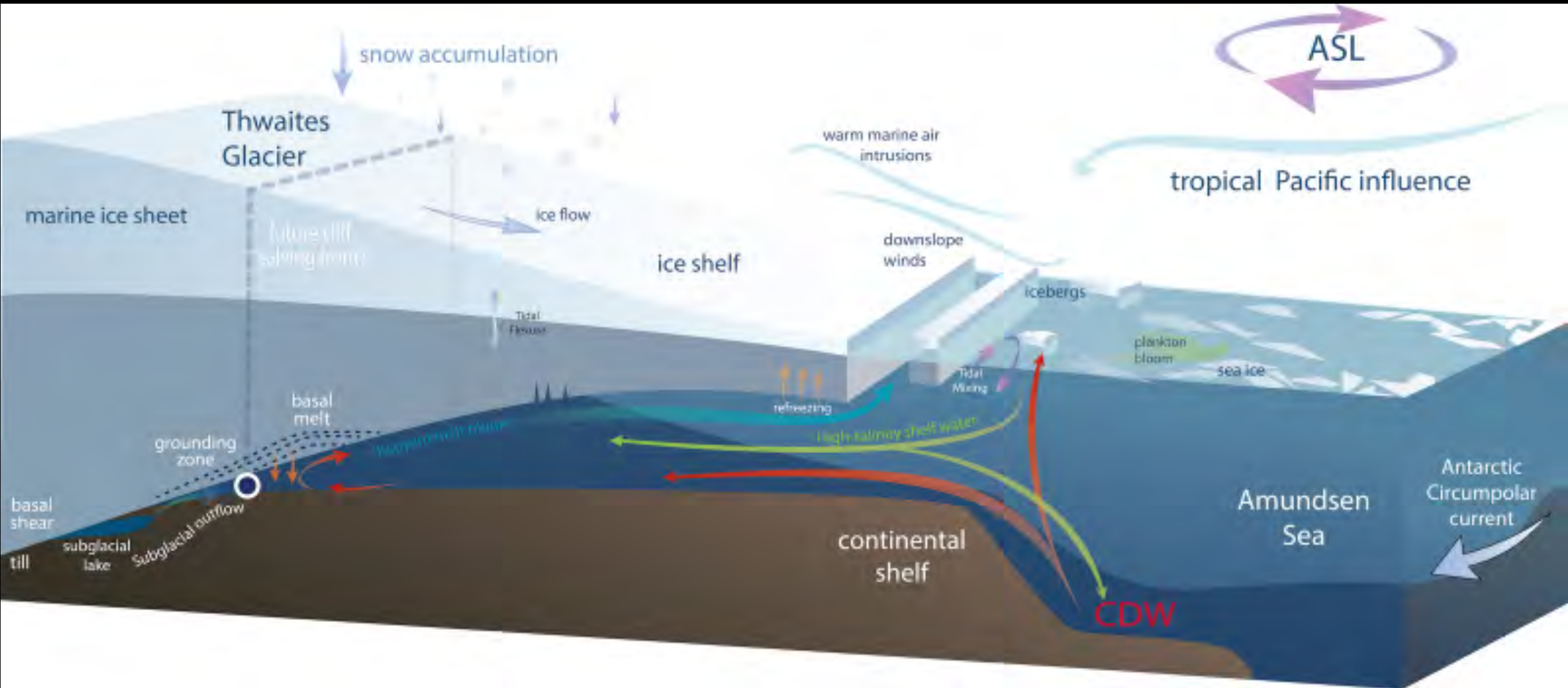
Thwaites, PIG, &
West Antarctica

Filchner-Ronne
Ice Shelf

Subglacial
lakes

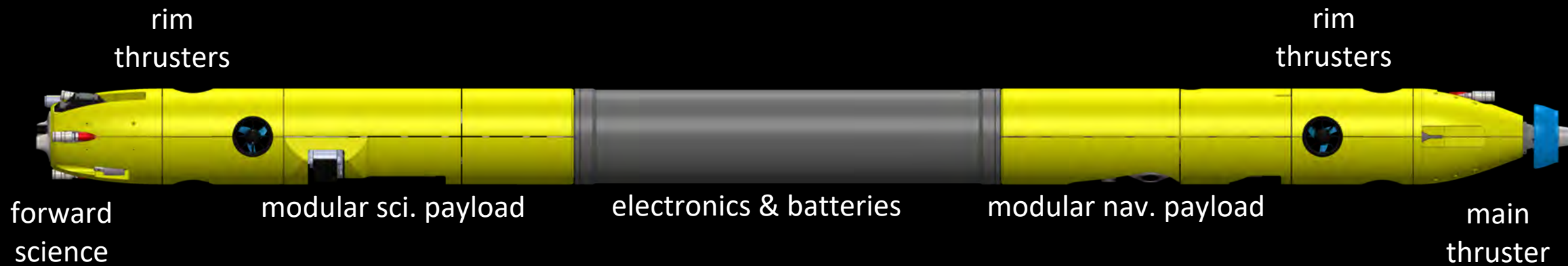
Ross
Ice Shelf

Marine Ice Shelves



ROV Icefin

1500 m depth, 3.5 x 0.24 m, 110 kg, 3 km fiber tether range
airline transportable (in seven pieces)



Instrumentation: salinity, temperature, dissolved oxygen, pH, redox, dissolved organics, scattering, chl-1 forward 2D multibeam, up+down altimetry, fore/aft/down imaging



2018-20 Seasons: 175+ hours, 41 missions, 85 km of survey transects under ice

Highlights: down to >800 m, under 600 m of ice, multiple GZs

RISEUP/Schmidt/M. Meister

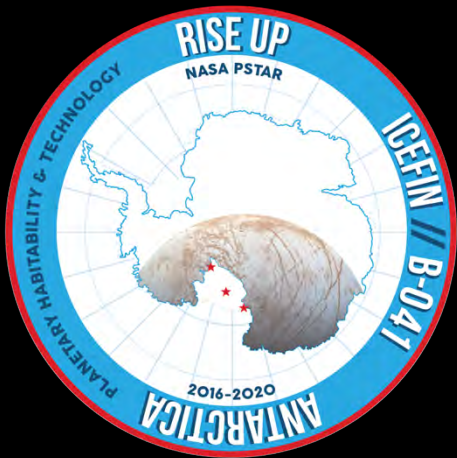
Current Access to Antarctica



Icefin Field Team 2019-2020

NASA RISE UP: Ross Ice Shelf and Europa Underwater Probe 2016-2020

NERC/NSF ITGC Thwaites MELT Project 2018-2022



Thwaites GZ Team:

Dr. Britney Schmidt, PI

Dr. Andrew Mullen Postdoc, Science & Operations Team

Dan Dichek, Electrical Lead

Kamb Ice Stream Team:

Matthew Meister, Lead Engineer

Justin Lawrence, PhD Student, Science & Operations Team

Dr. Enrica Quartini, Science & Operations Team

Dr. Peter Washam, Postdoc, Science & Operations Team

Benjamin Hurwitz, PhD Student, Electrical Team

MCM Team:

Dr. Anthony Spears, Software Lead





Field Team 2019-2020

Thwaites MELT Field Team Members:

David Holland & Keith Nicholls PIs

Pete Davis

Paul Anker

James Smith

Aurora Basinski-Ferris

Catrin Thomas, James Wake, BAS Mountaineers

John "Loomy" Loomis, Seth Campbell, Safety Team

Kiya Riverman, Seismic



Ross Ice Shelf Programme & Ice Dynamics Kamb Ice Stream Team:

Christina Hulbe & Huw Horgan, PIs

Darcy Madeno, Craig Stevens

ANZ Drilling Team

Shul Gordon, ANZ



Icefin Team

Field Team 2018:

Charles Ramey, PhD Student, Software Team
Frances Bryson, PhD Student, Electrical & Mechanical Teams
Tiegan Hobbs, PhD Student, Science & Operations Team

Field Team 2017:

Joshua Lutz, Past GT Undergrad, Software & Mechanical Teams
Jade Lawrence, MSc, Science & Operations Team

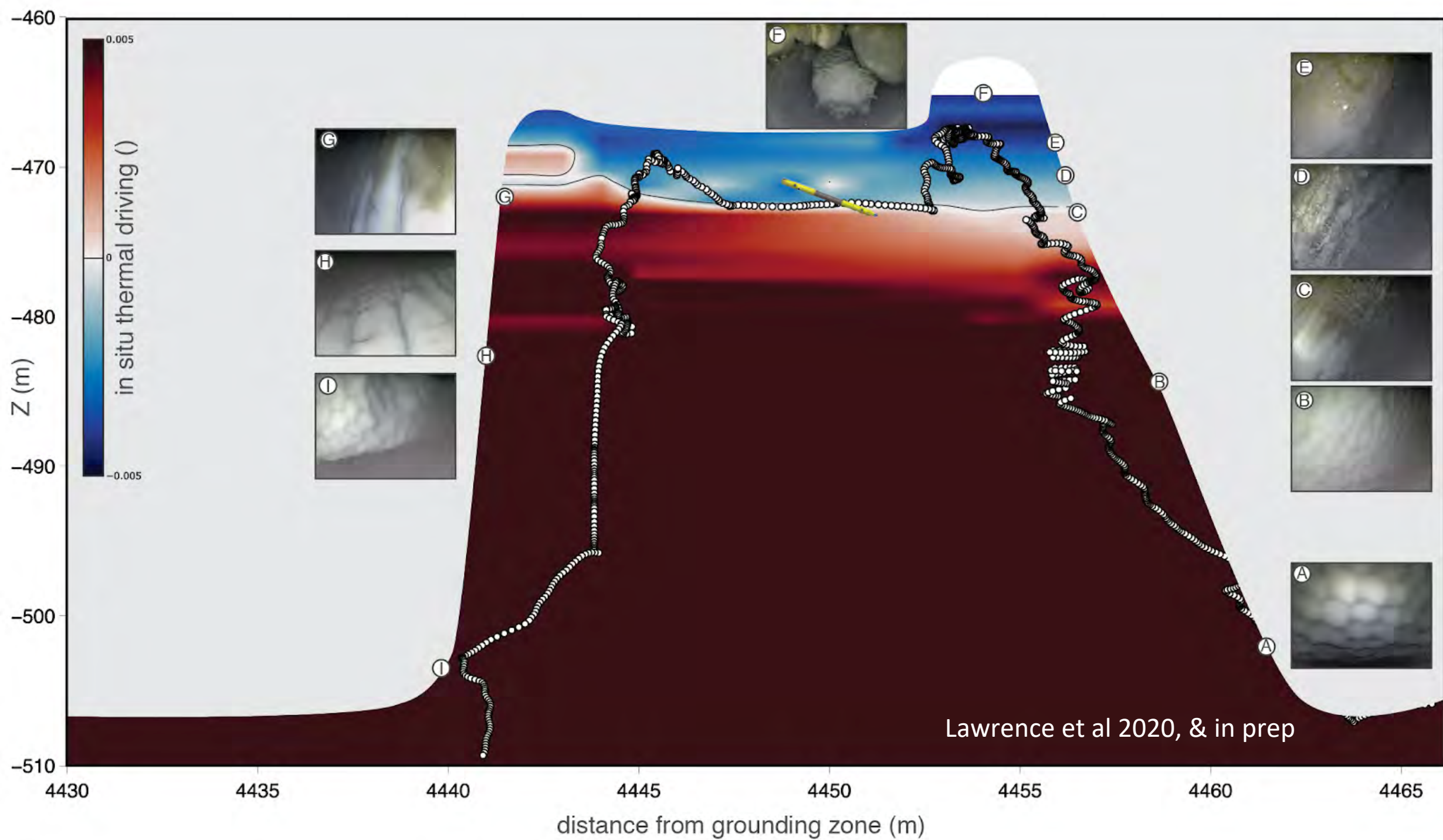
Other Contributors:

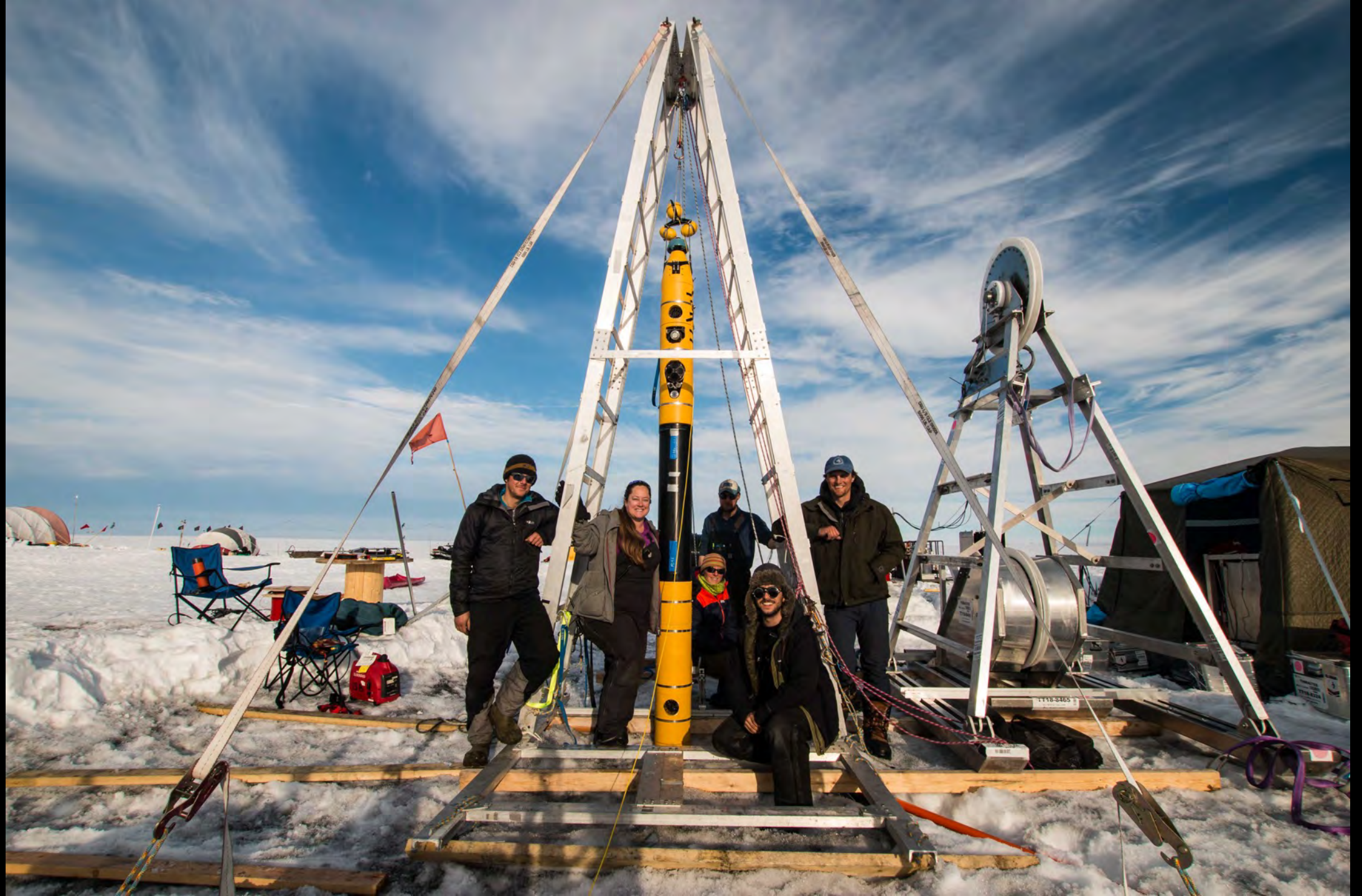
Dr. Jennifer Glass, Co-I, Science Team
Dr. Amanda Stockton, Co-I, Cell Counter Instrument Team
Dr. Nicholas Speller, Cell Counter Instrument Team
Dr. Jeff Bowman, Collaborator, Science Team
Lara Kassabian, GT Undergrad, Former HS Intern, Electrical Team
Sebastian Lopez, GT Undergrad, Mechanical Team
Scott Gilliland, MS, Software Team
Jacob Buffo, PhD Student, Science & Operations Teams
Kit Philleo, GT Undergrad, Mechanical Team



NASA PSTAR RISEUP/Schmidt









How do you currently fund your field research?

- PSTAR for Pingo research, NASA ICAR/RCN for hypersaline research
- Our PSTAR funding (for Antarctica) is expiring—we've been able to eek it out, but not having a call last year was devastating after having a VG proposal in the prior competition
 - Hard to get SSW or Hab Worlds since the scales of the work are often different
- NSF science grants—we were able to participate because we already had the vehicles, but technology + science grants are something that NASA funds more often
- Working with other nations—we don't receive funding, but if we have other sources/related objectives or we have time to respond, we can make it happen
- *We know what we want to do and where it fits programmatically, and we find a way to make it happen*

What are the primary barriers you face to successfully conducting your field research?

- Rules, goals and processes are always changing (i.e. documents required, eligible programs)
 - Challenging to establish and maintain a program
 - But we make it work!
- PSTAR and other technology programs are hard to come by, and have mostly been housed in Astrobiology programs that have seen significant recent cuts, despite interest
 - Decreased PSTAR funding and infrequent calls will only make this worse
- Keeping engineers & young scientists employed
 - Our teams are all home grown, diverse and working at the frontier
 - Strong support for continuing technology & field research grants in R&A
- We have many stakeholders but still a challenge to having the work understood and keeping everyone happy!
 - This work is expensive and complex, multi-agency, and involves many contractors

Barriers for increasing NSF-NASA collaboration in the next decade?

- We have many stakeholders but still a challenge to having the work understood and keeping everyone happy!
 - This work is expensive and complex, multi-agency, and involves many contractors
 - Aligning agency missions and expectations

NASA & NSF Have Science & (some) Technology Interests in common

- Oceans—how do they work? *How do we measure this?*
- Ice—what lives there? How? *How do we measure this?*
- Ice dynamics—How does the ice rebuild itself or melt? How do fractures form & propagate? *How do we measure this?*
- Fundamental laws of Life—NASA Astrobiology & NSF
- We all live here—planetary protection
 - Antarctica—care of the environment and of resources
 - NASA Missions—techniques for cleanliness
- Power, Mass, Cost drivers
 - Different missions, need to respect this

Let's Work Together

Antarctica is a unique and special place, a world almost in itself with immense value, both scientific and otherwise. It is a life changing experience to work there, and a true honor. It is in the best interest of all stakeholders that responsible, sustainable partnerships for scientific study of Antarctica from all perspectives be maintained. The ideas here are not the only possible answers, but are offered as food for thought for important conversations that should occur in order to continue this important work, such that “the substantial contributions to scientific knowledge resulting from international cooperation in scientific investigation in Antarctica” continues to extend beyond the reaches of our own planet.