

# Welcome to *PolarConnect*

**Thwaites Offshore Research**

**With Sarah Slack from JHS 223 in Brooklyn, NY**

**& Dr. Frank Nitsche from Lamont-Doherty Earth Observatory**

**RV/IB Nathaniel B. Palmer**

**Cruise NBP20-02**

**Amundsen Sea, Antarctica**

**MONDAY, MARCH 9, 2020 11:15 AM EDT**

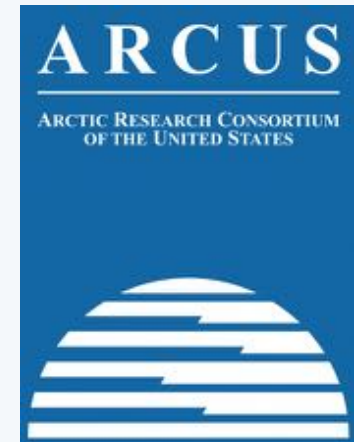
# Participant Introductions

**In the Chat box, please introduce yourself by typing in your:**

- ✓ Name
- ✓ School or Institution
- ✓ The number of students and adults participating with you in the same location

# What is PolarTREC?

- Since 2004, the Arctic Research Consortium of the United States (ARCUS), a non-profit organization, has been administering the PolarTREC Program.
- PolarTREC is professional development for U.S. middle and high school teachers and informal STEM educators. They are paired with researchers for 3-6 week research experiences in the polar regions.
- Over 150 educators from around the United States have joined scientists in the Arctic and Antarctica to learn about science and the polar regions, and to share what they have learned with their students and communities.



*25 Years of Connecting Arctic Research*  
[www.arcus.org](http://www.arcus.org)

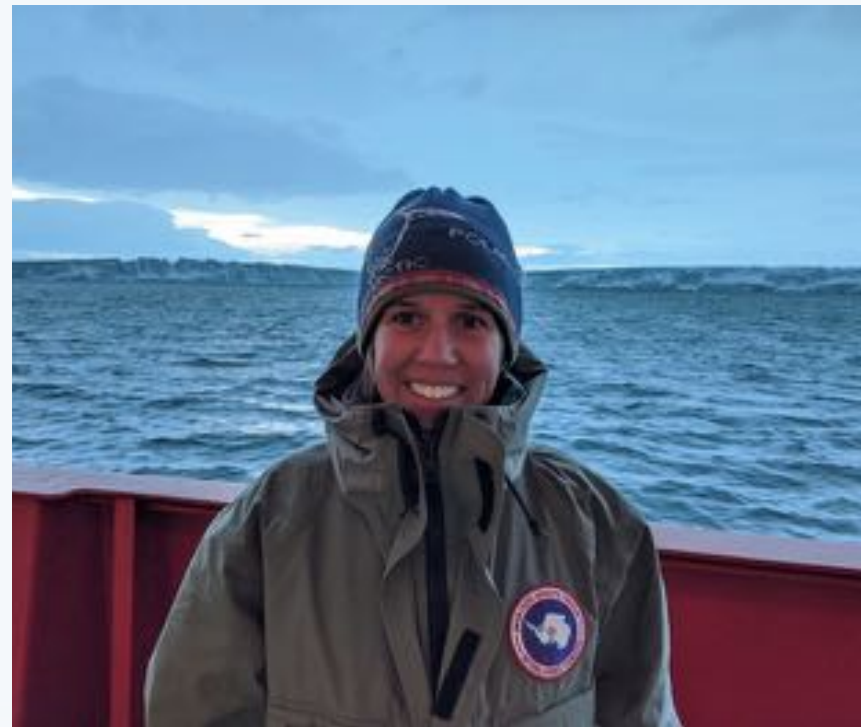
# Questions

## During the Presentation:

- Type your question into the text chat box and we will insert your question when the right opportunity arises.
- Don't worry! If we haven't been able to ask your question during the presentation, we will save it for the end.
- At the end of the presentation, we often open the webinar up to family and friends who want to say "Hello" or have any last minute questions for the presenters.

# Meet the Educator – Sarah Slack

- I'm a STEM teacher in Brooklyn, NY
- I've been teaching for eleven years, the past three at JHS 223 – The Montauk School
- The hardest part about being gone for two months is being away from my dogs, Ted and Ellsie (*sorry, family*) and not being able to go for long walks



# Meet the Researcher – Frank Nitsche

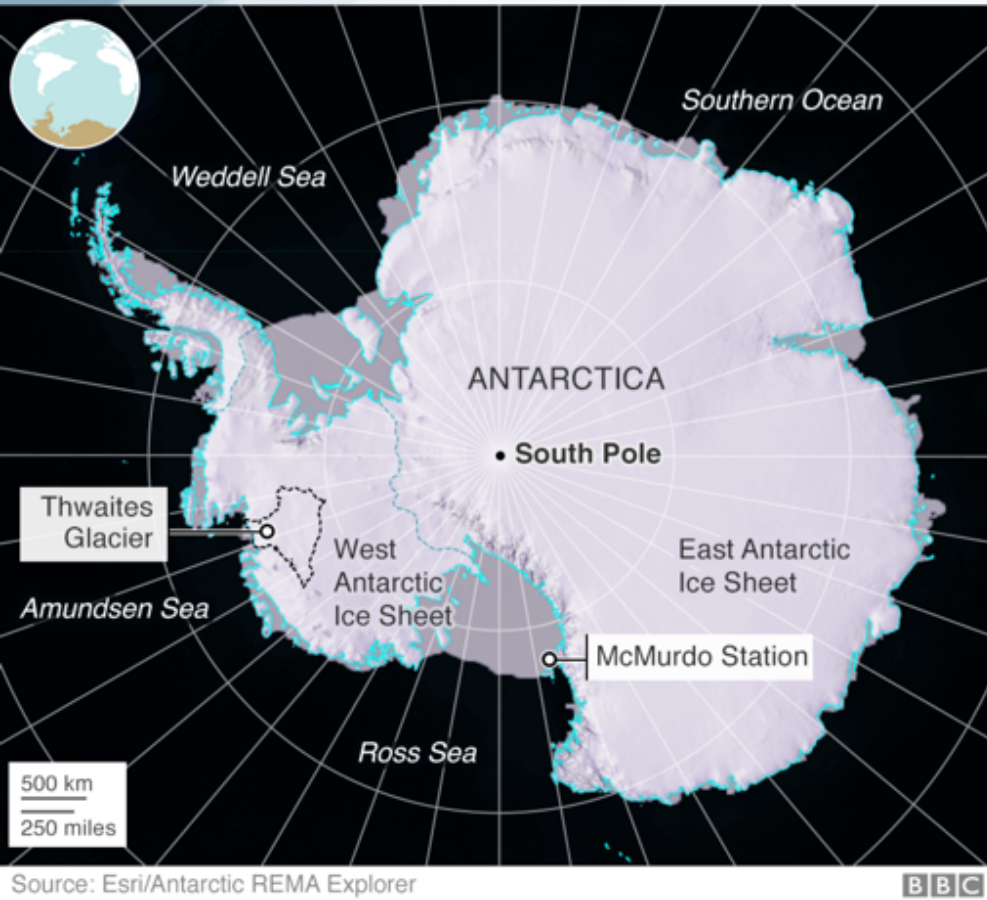


- I'm a research scientist at Lamont-Doherty Earth Observatory of Columbia University
- This is my 8<sup>th</sup> expedition to Antarctica to study the past and present processes that shape the Antarctic continental margin
- Like Ms. Slack, I'm also a Brooklyn resident

# Why Thwaites?

- In the farthest reaches of Antarctica, a nightmare scenario of warming water and crumbling ice could spell disaster for coastal residents around the world
- A glacier the size of Florida is on track to change the course of human civilization
- The catastrophic collapse of Thwaites would add TWO FEET to global sea level
- Thwaites is the backstop for four other glaciers that combined hold an additional 10-13 feet of sea level rise, making Thwaites the largest single driver of sea level rise in the 21<sup>st</sup> century.
- The trouble with Thwaites is that it's a "threshold system," so instead of melting slowly (like an ice cube on a summer day), it is more like a house of cards: it's stable until it is pushed too far, then it collapses.

# The Expedition



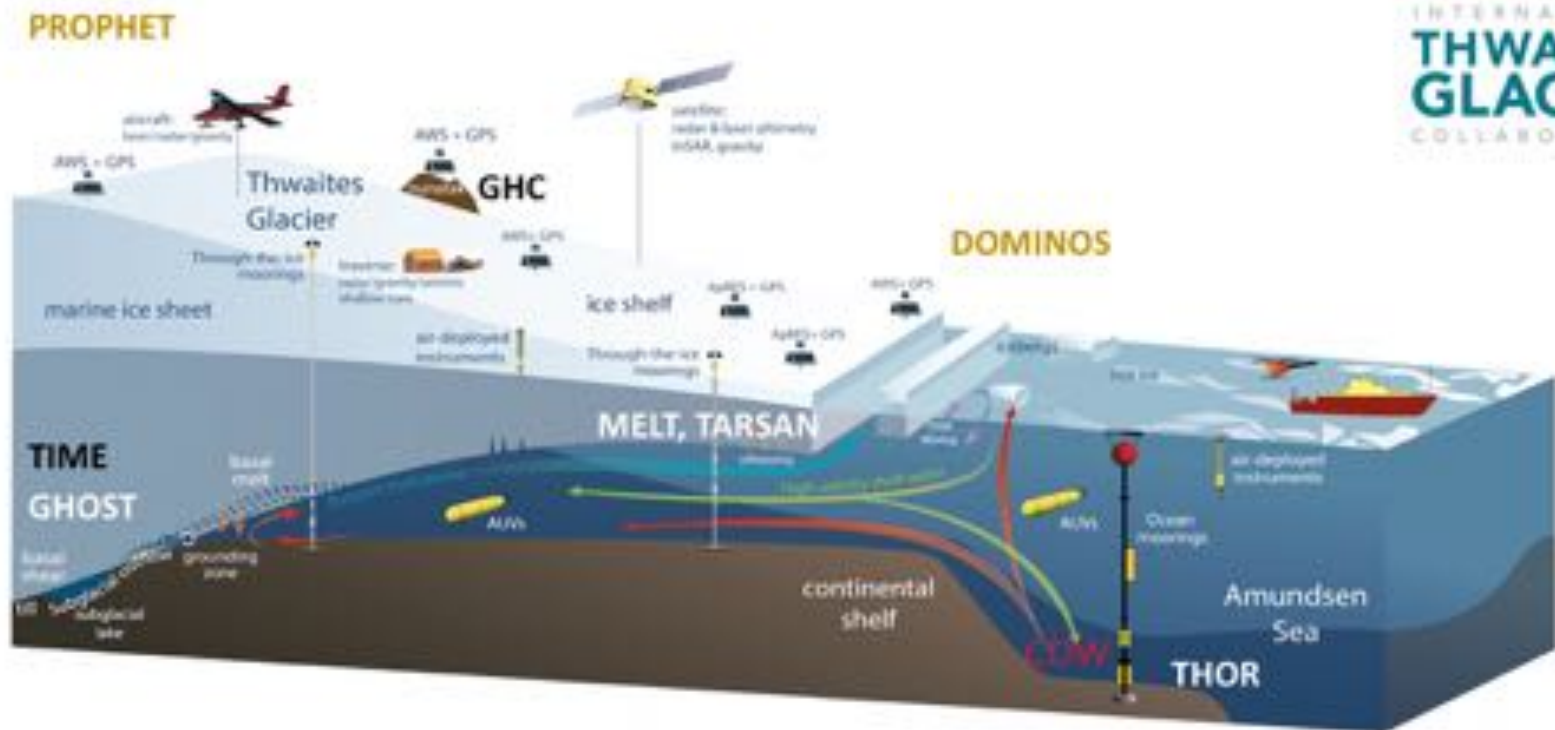
- We boarded the R/V Nathaniel B. Palmer icebreaker in Punta Arenas, Chile on January 25.
- It took nearly 11 days for us to go the 2000 miles from Chile to the Amundsen Sea off the southwest coast of Antarctica
- We will return to port on March 25



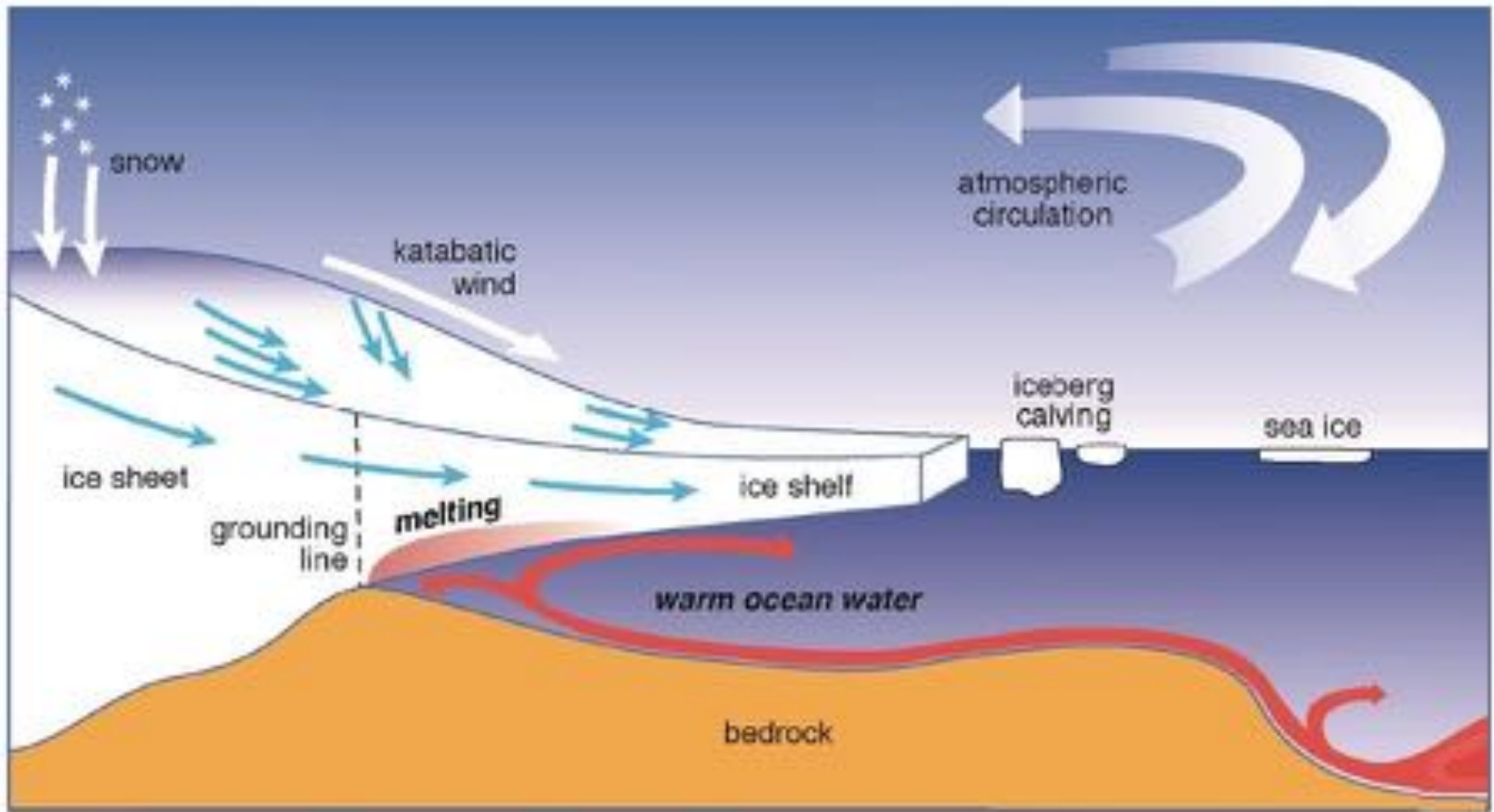
# Part of Team THOR

- Thwaites Offshore Research (THOR) is one of eight research teams attempting to learn more about the glacier as part of the International Thwaites Glacier Collaboration (ITGC)

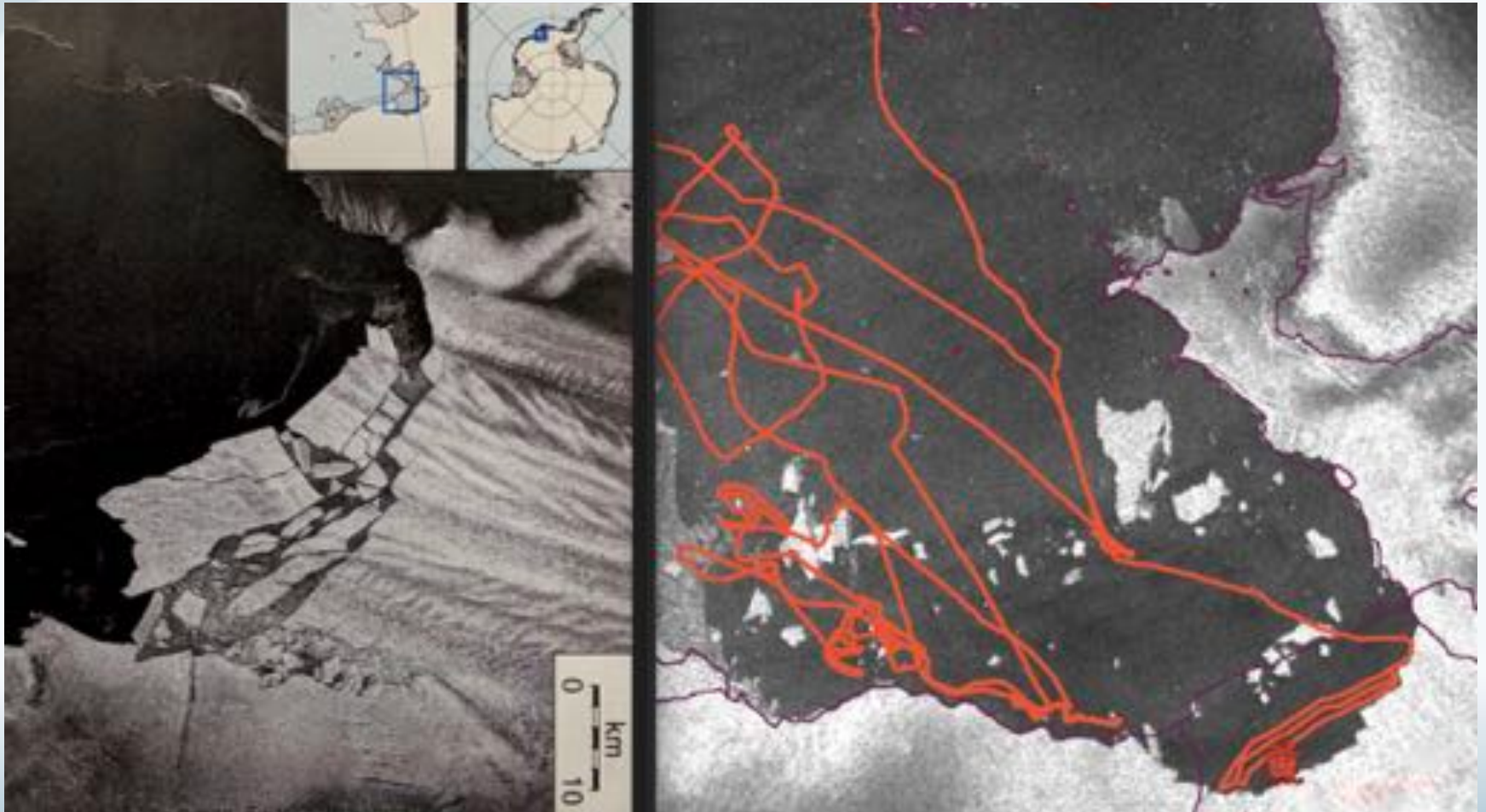
The Thwaites Project: 8 targeted multi-disciplinary research proposals



# Thwaites Dynamics



# Changes to the Ice Sheets



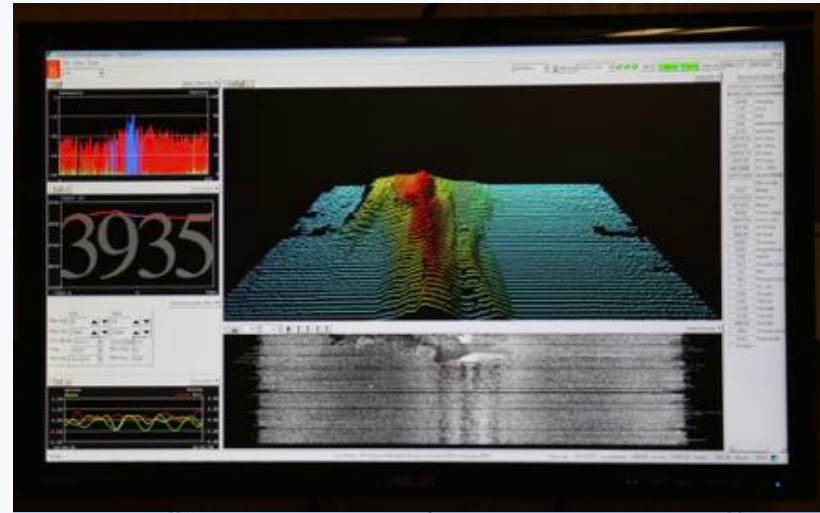
# Sif Island



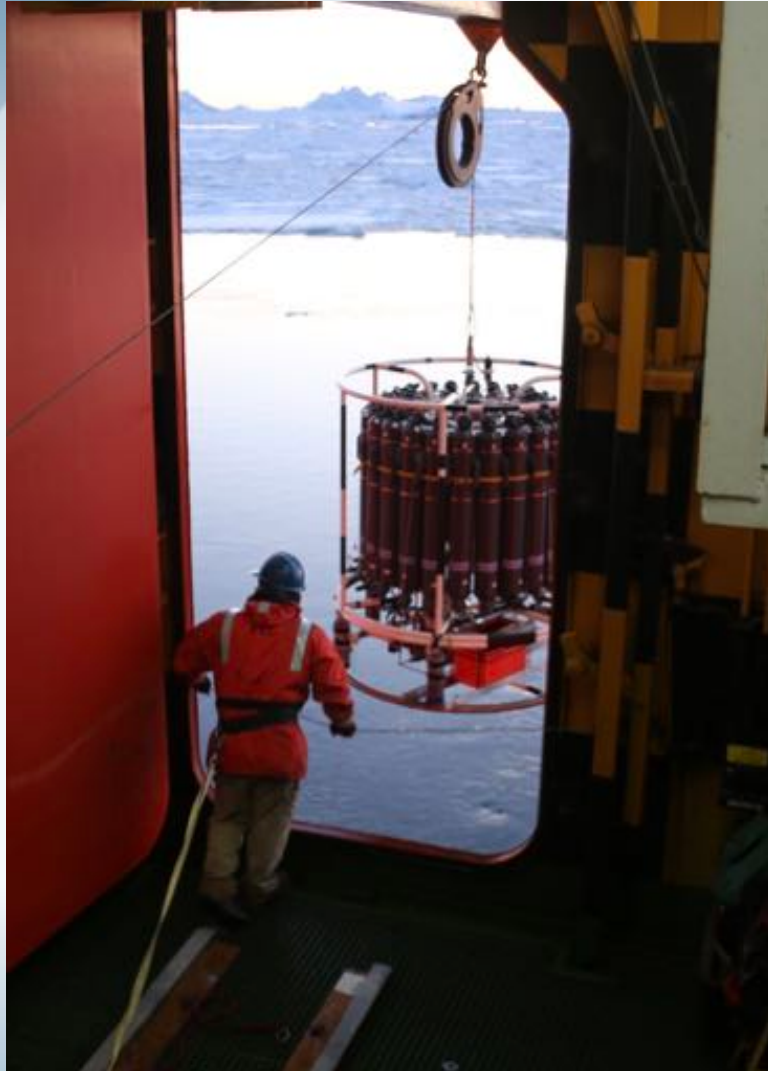
- Evidence of melting ice comes from satellite photos and from field observations
- The team onboard the Nathaniel B. Palmer discovered a new island, which was revealed as the ice perched on top of it melted away

# Why is Thwaites melting so fast?

- Changes in water temperature and flow of the CDW (Circumpolar Deep Water) are having the greatest impact on glacial melting
- By understanding the seafloor, we can better understand how the glacier has changed over time, the movement of the CDW, and how it might continue to impact Thwaites Glacier



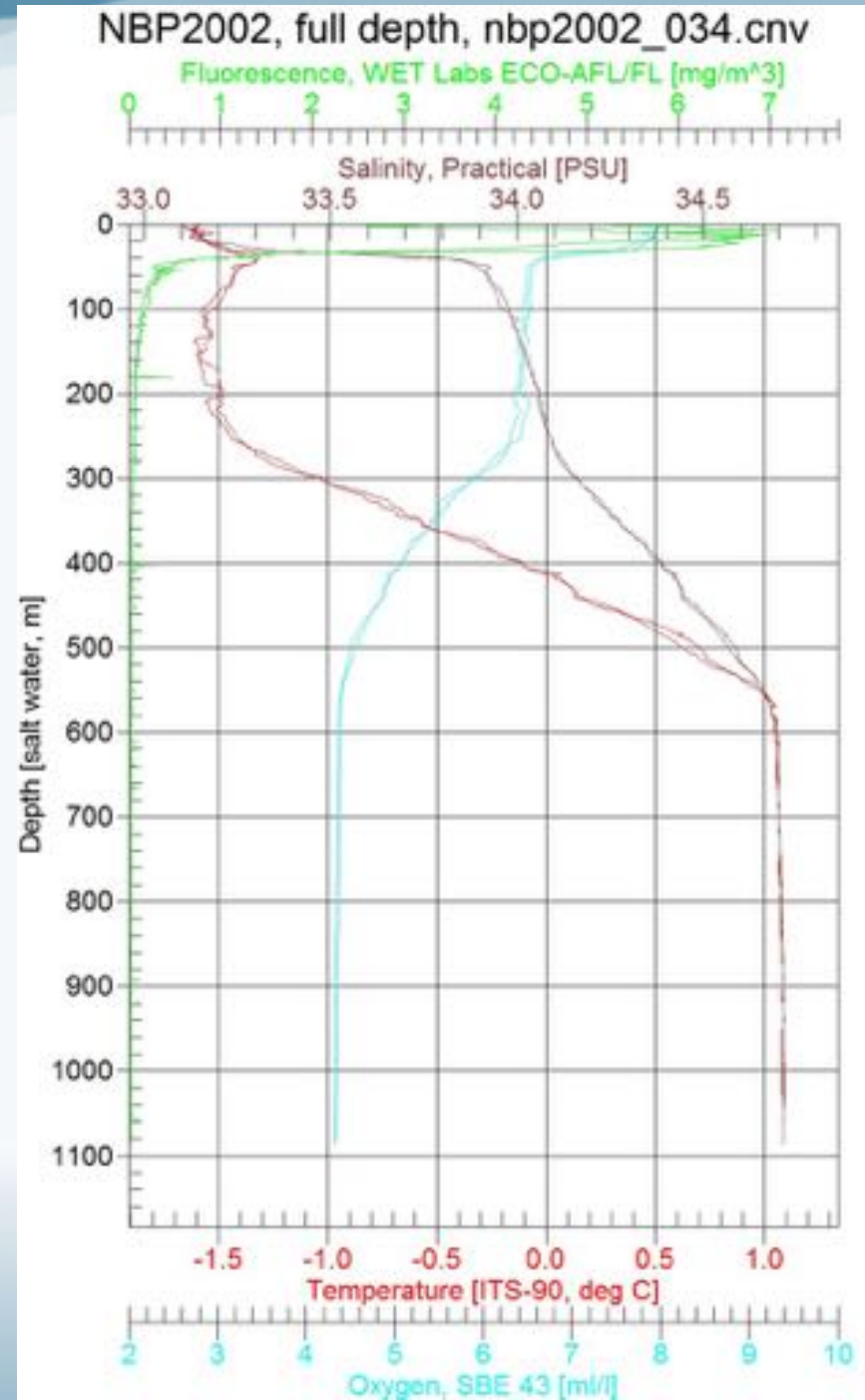
# CTD Array



- The Conductivity-Temperature-Depth Array is a data collection system that measures water chemistry and collects water samples at specified depths as it is lowered to the seafloor and raised back up.
- We often do CTDs in a transect, or along a line drawn on a map to discover how the water changes across a series of locations all in the same area of the Amundsen Sea.

# What does the graph show?

- The increase in temperature and salinity below a depth of approximately 50 meters shows the presence of the Circumpolar Deep Water

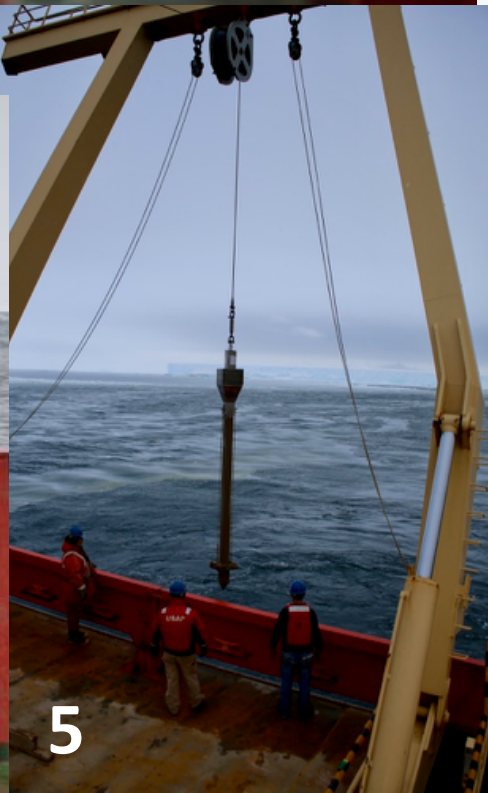
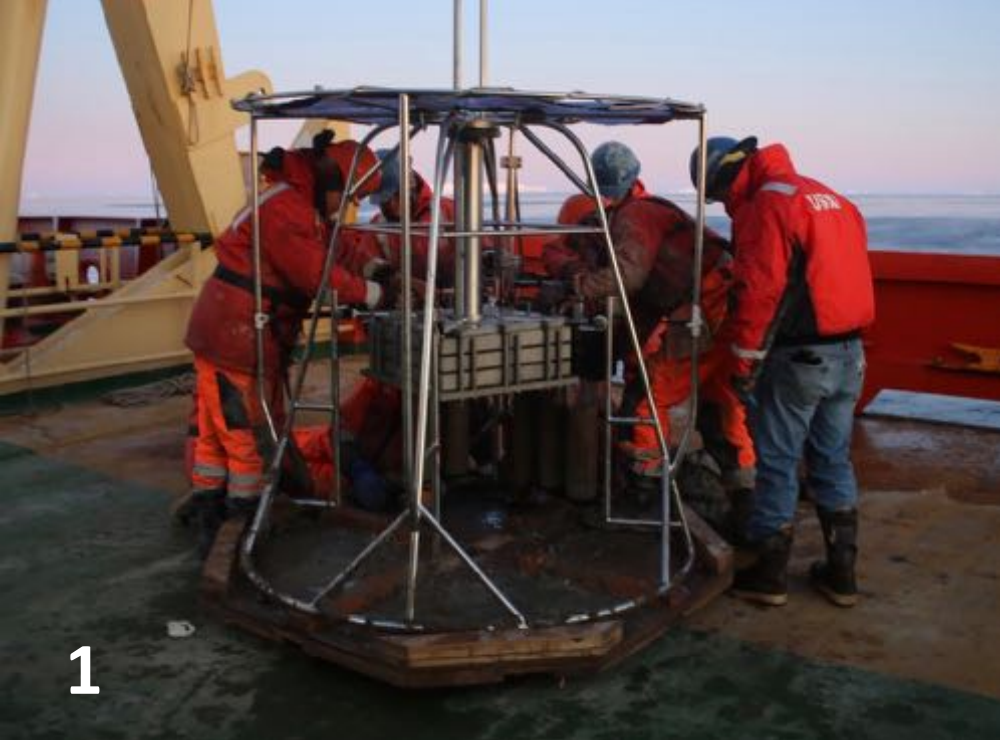


# Sediment Cores

- A core is collected by pushing a hollow cylinder into the sediments on the seafloor
- When the coring device is retrieved, the column of sample collected contains vast amounts of information







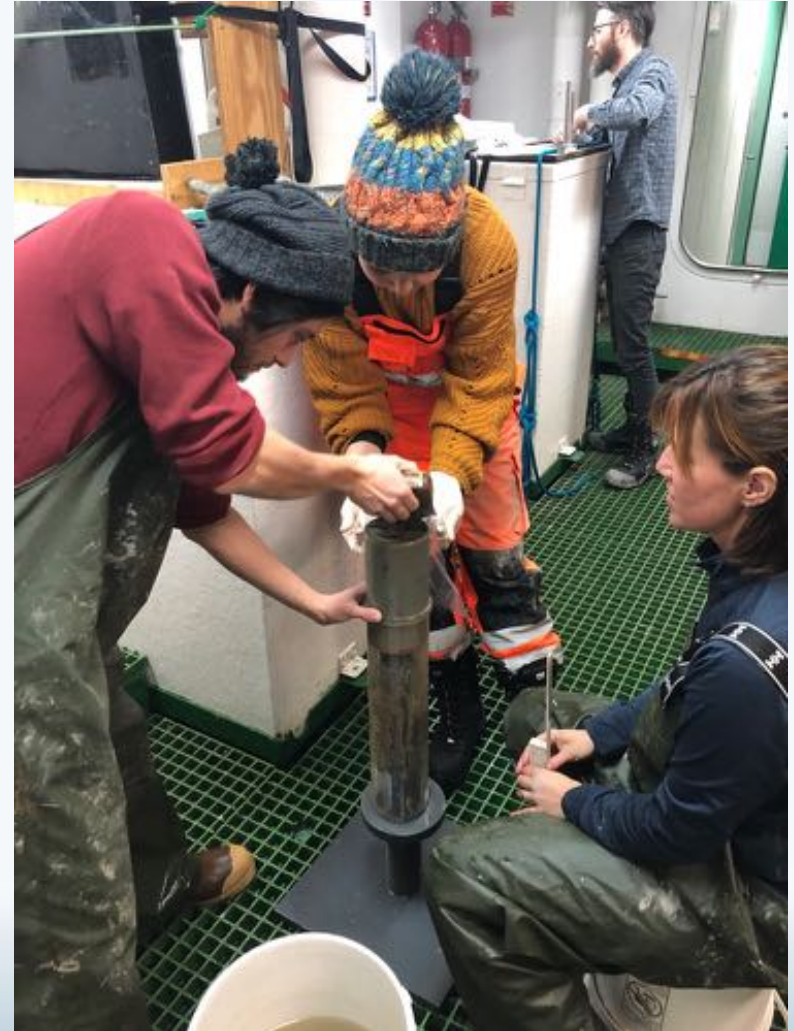
# Reading the Sediments



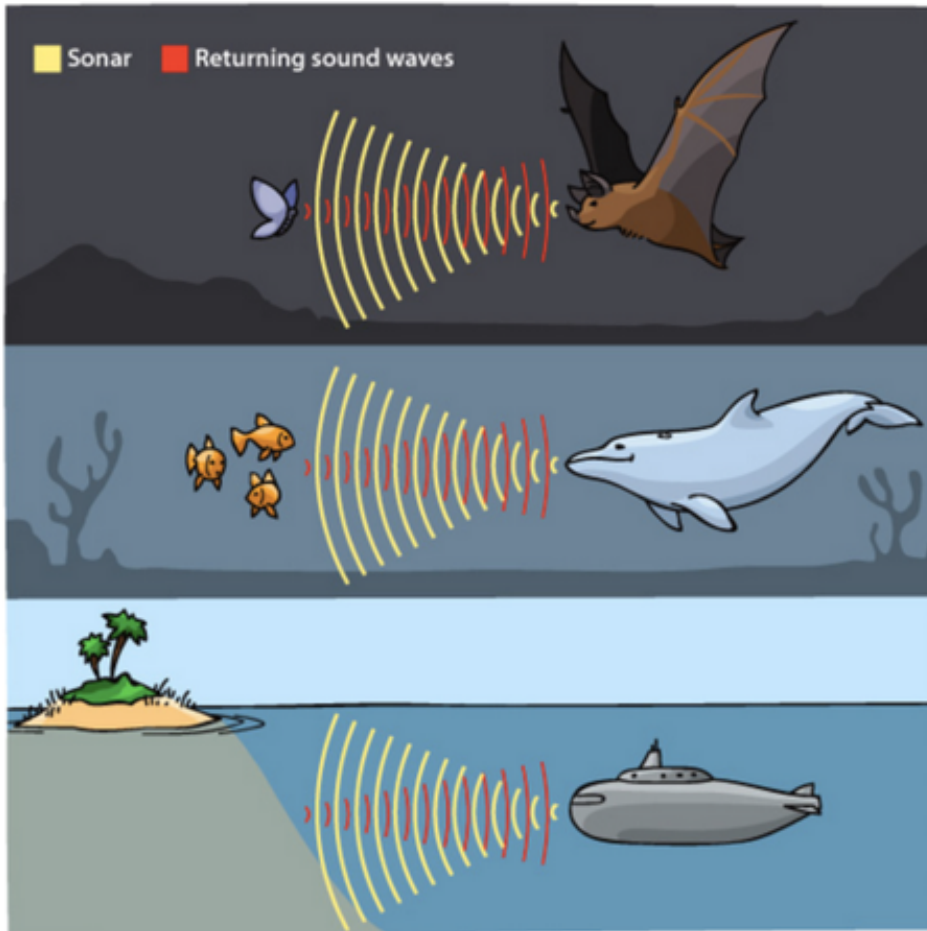
- Marine sediments can provide a look back in time
- Over tens or hundreds or thousands of years, new layers of sediment are deposited, and can reveal information about the position of the glacier, the temperature of the water, or rate at which ice was melting at the time they drifted to the seafloor.

# Processing the sediments

- Sediments are sampled for many things, including: shear strength, forams, grain size, trace metals, carbon and nitrogen, diatoms, and lead-210
- We use plastic spoons, metal spatulas, and scrapers to divide up and collect samples
- Samples are sealed in plastic bags and will be brought home to research institutions for analysis



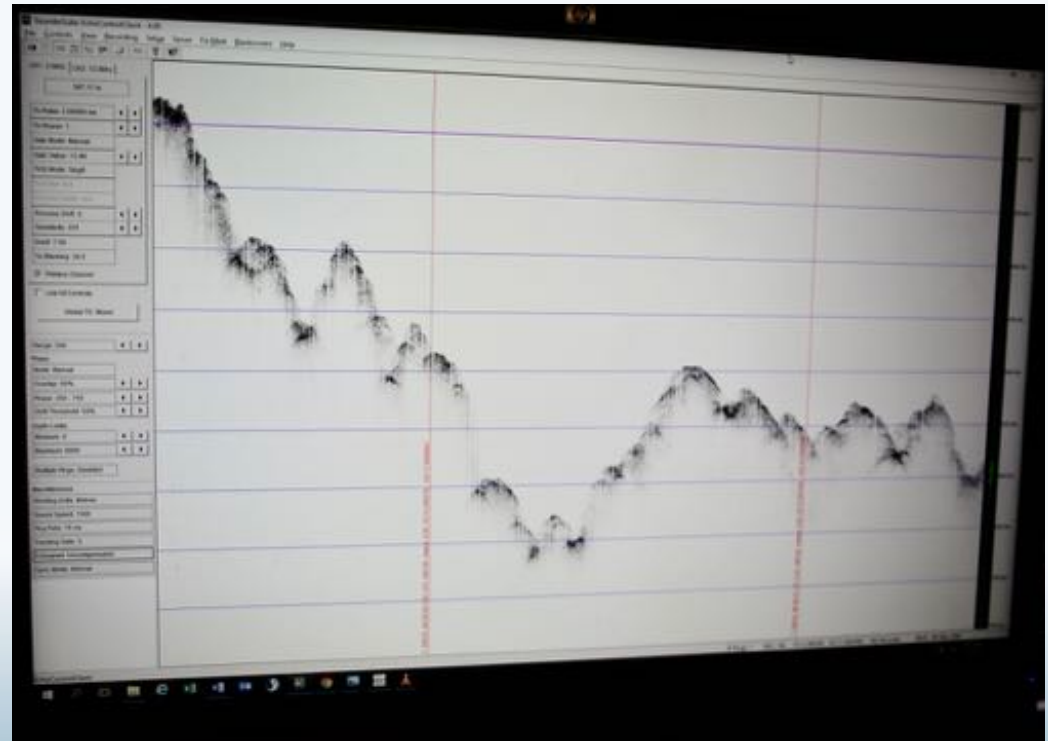
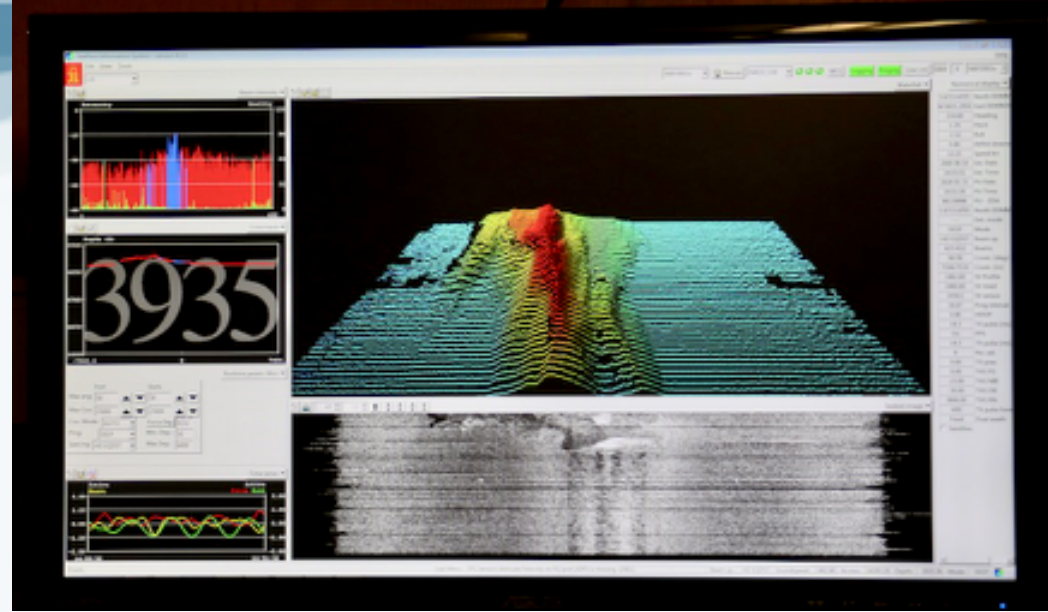
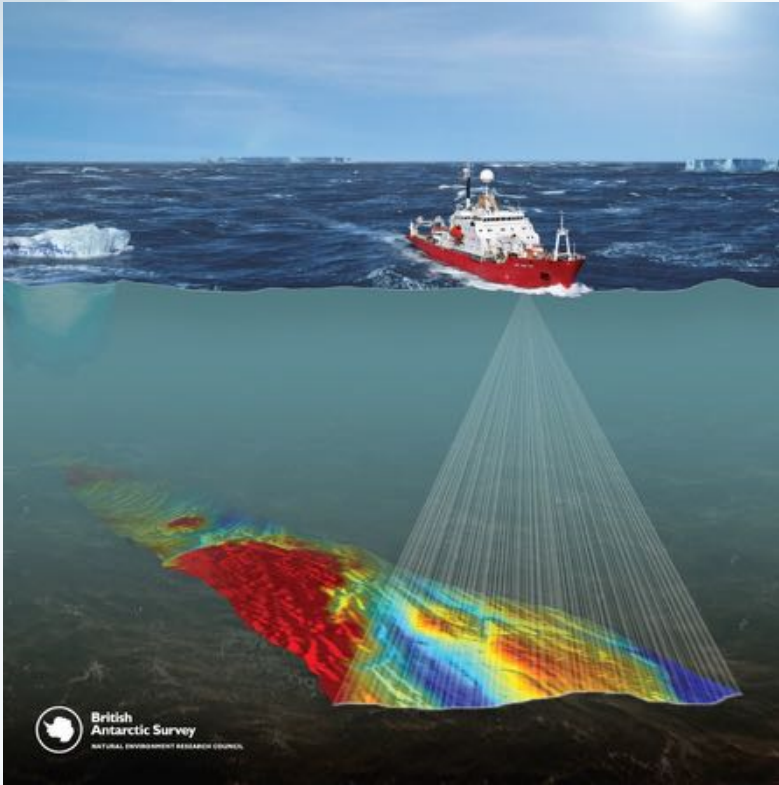
# Seafloor mapping



- We use two different sonar systems to map the seafloor and identify sites with layers of sediments
  - Knudsen
  - Multibeam

Sound waves and sound reflection is used by bats and dolphins to echolocate; this process was studied and used to develop underwater sonar that we use in submarines and other water vessels.

# Seafloor mapping



# Finally... Seal tagging



- Two species of seals found in Antarctica are incredibly good at diving- Weddell seals frequently dive up to 2000 feet beneath the surface, and the larger, uglier elephant seals often dive to depths greater than **3000 feet**
- Seals also have to come back to the surface to breath- and when they do, the data transmitter they are carrying can send information up to a satellite

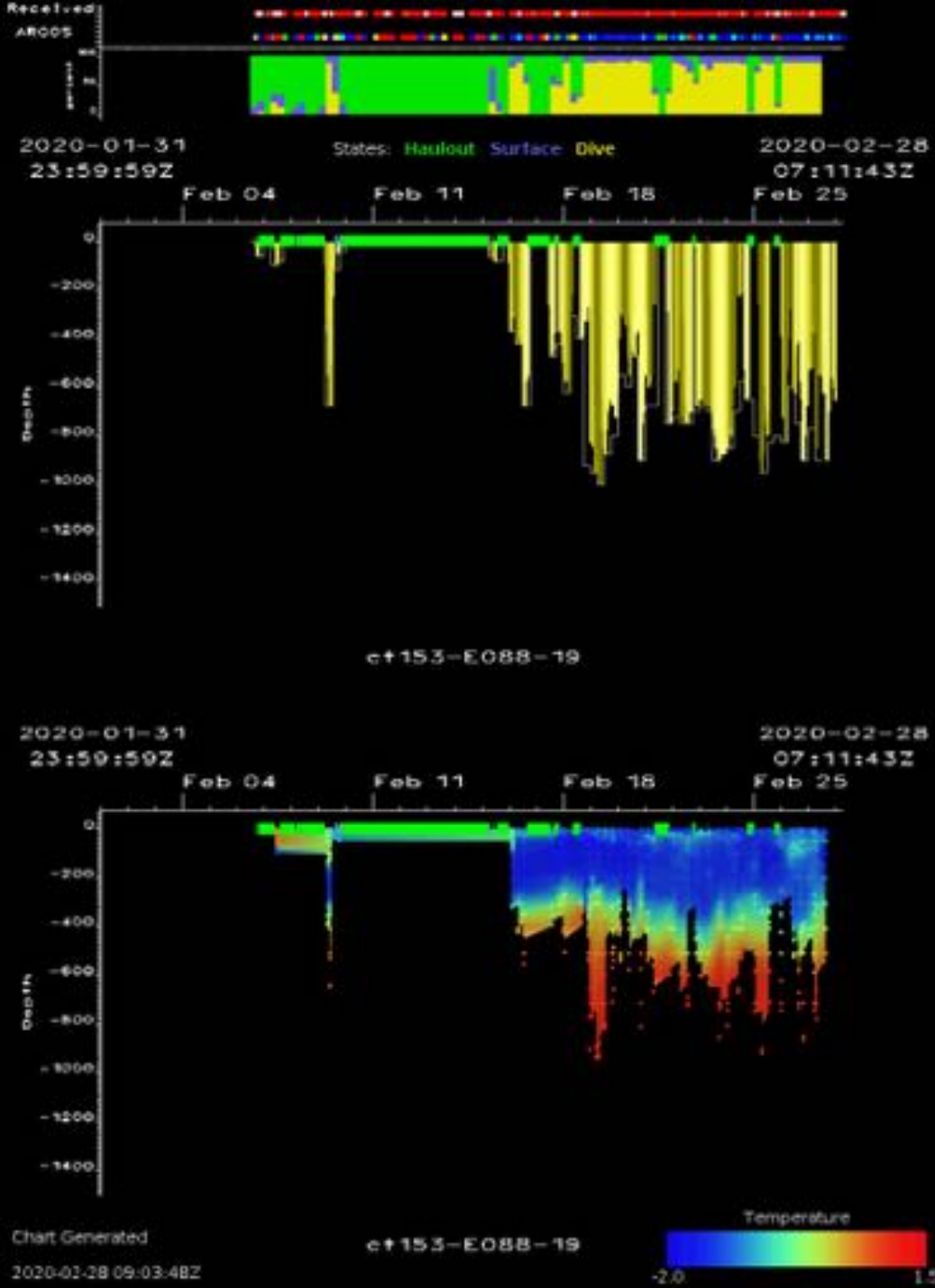
Seal tagging done under Permit FCO  
No. 03/2019-20



Seal tagging done under Permit FCO No. 03/2019-20

# Seal data

- Each seal can provide a wealth of information about the water it explores
- This shows three weeks of information collected by one elephant seal





# Adélie Penguins





# The galley



# Safety Gear and Drills





# Traveling through the Southern Ocean



# Time for Questions!

- We are happy to answer questions about:
  - Life onboard the research vessel
  - The types of equipment and technology we are using
  - The sights and sounds of our days here
  - How we work ties into the larger International Thwaites Glacier Collaboration
  - What it is like to be gone for so long and how we stay in touch with family and friends
  - *Do NOT ask about the cribbage tournament*

# Join PolarTREC!

[www.polartrec.com/about/join](http://www.polartrec.com/about/join)

Everyone can participate in different ways:

- **Follow Expeditions**
- **Participate in PolarConnect Events**
- **Join the Polar Education Email List**
- **Check out the great resources**
- **Become a PolarTREC Teacher or Researcher**
- **Become a member of ARCUS**



# Thank You!

*An archive of the event will be available shortly.*

<http://www.polartrec.com/polar-connect/archive>



*25 Years of Connecting Arctic Research*  
[www.arcus.org](http://www.arcus.org)