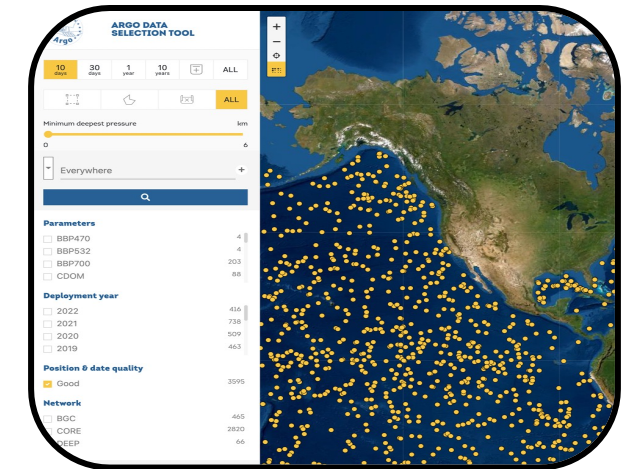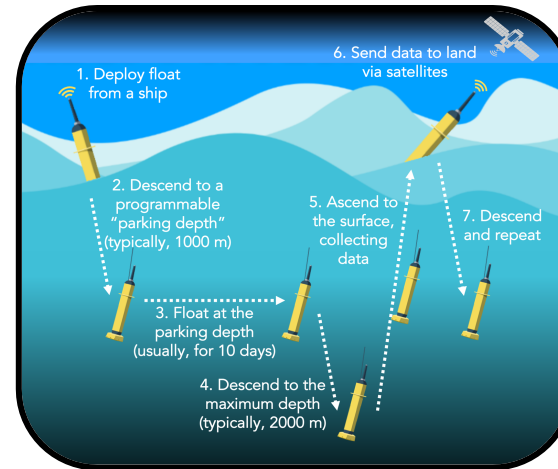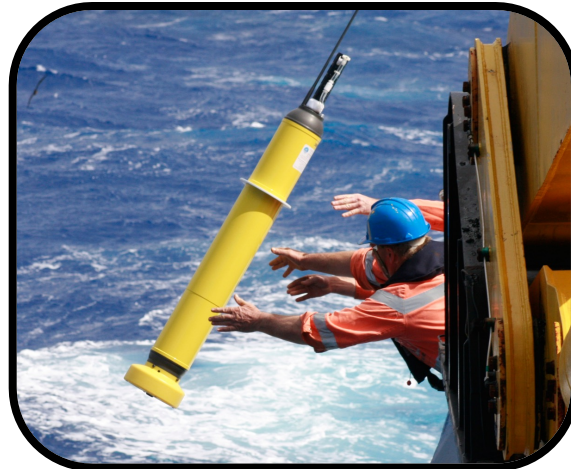# Introduction to Oceanography & BGC-Argo

ADOPT-A-FLOAT

Introduction to Oceanography and BGC-Argo

Learning Outcomes

- Describe what oceanographers do, and what BGC-Argo is
- Get to know the Adopt-a-Float program
- Learn how to access BGC-Argo float data

Introduction to Oceanography and BGC-Argo

Comprehension Activities:
- Crossword puzzle
- Web-quest & Worksheets

Other helpful links
- Adopt-a-Float Canada website:
  https://adopt-a-float.ocean.dal.ca/
- Glossary of common terms:
  https://sites.google.com/view/adopt-a-float-ca/learning-materials/glossary
- Frequently-asked-questions (FAQs):
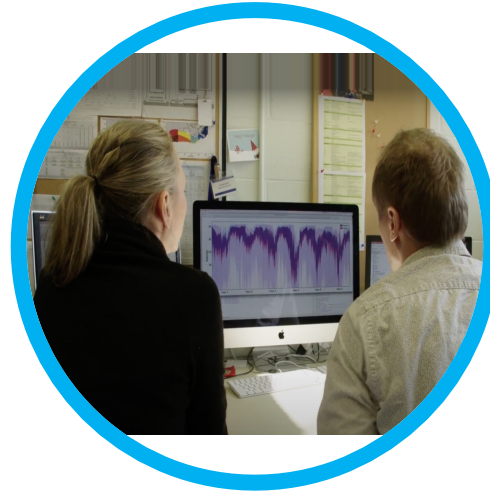 https://sites.google.com/view/adopt-a-float-ca/learning-materials/faqs

What is *oceanography?*

What do *oceanographers* do?

Introduction to Oceanography

Oceanography is the study of ocean processes and properties. A person who studies oceanography is called an *oceanographer*.

Oceanography is often confused with marine biology. But, marine biologists study the plants and animals that live in the ocean. Oceanographers, typically study thing that we can't see with a naked eye …
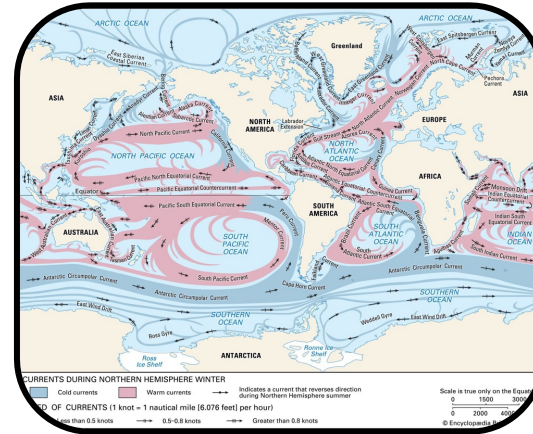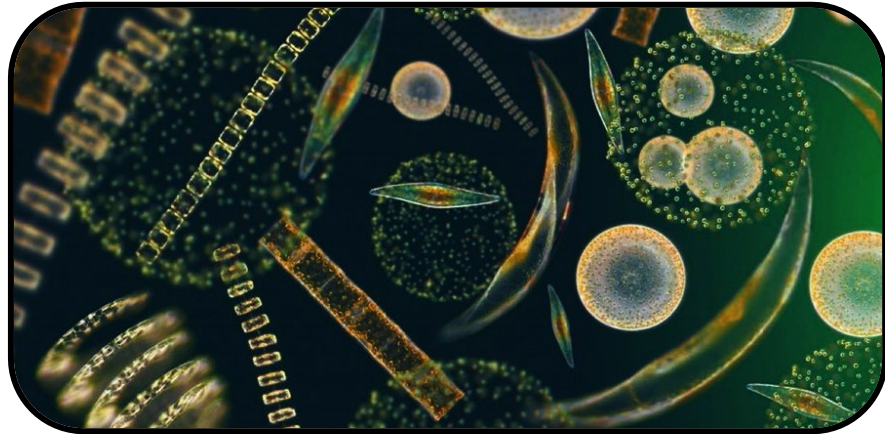
What do you think oceanographers study?

What do oceanographers study?

Some of the properties that oceanographers study include temperature, currents and waves, phytoplankton and oxygen and carbon dioxide levels.

A blown-up image of marine phytoplankton (left) and major ocean currents (right)

Many of these properties are referred to as "biogeochemical" properties. Biogeochemical refers to the <u>bio</u>logical, <u>geo</u>logical and <u>chem</u>ical components of the ocean.
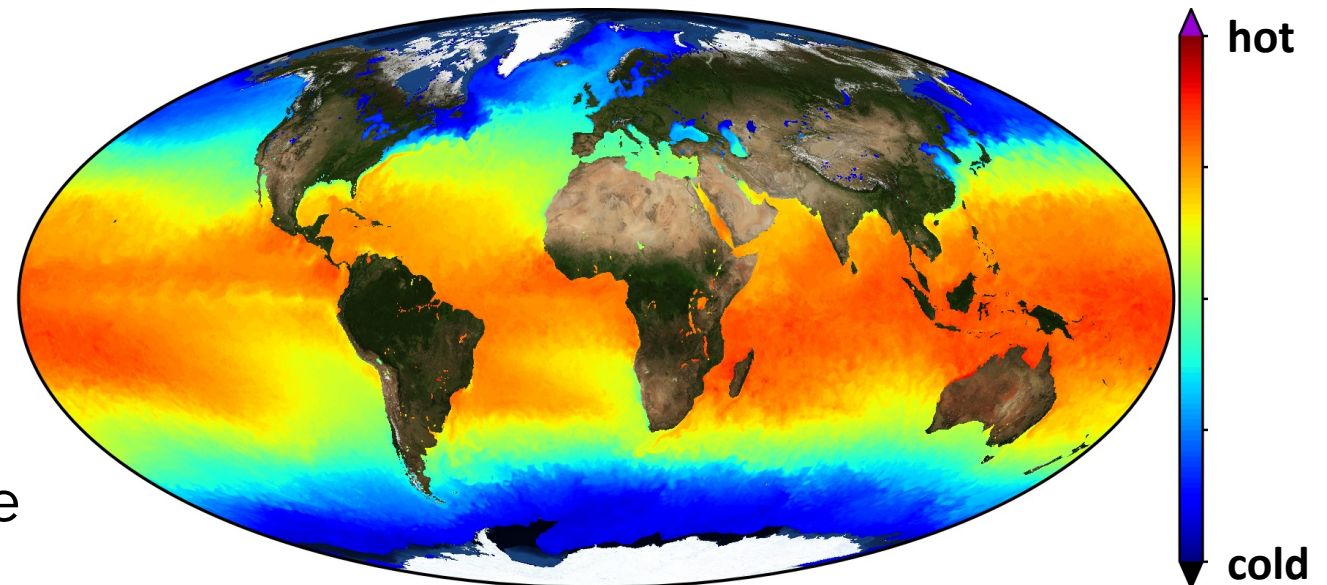
How do ocean properties change?

Ocean biogeochemical properties change with season, depth, and closeness to land. We often refer to these changes an "natural", because they occur regularly due to different environmental factors.

Just like on land, where weather and climate are different in different parts of the planet, no two ocean regions are the same!

This map, for example, shows a snapshot of the seawater temperature at the ocean's surface.

How do ocean properties change?

Climate change has also impacted many ocean properties over time. Some changes include: increasing water temperatures, increasing carbon dioxide levels and ocean acidification, and decreasing oxygen levels.
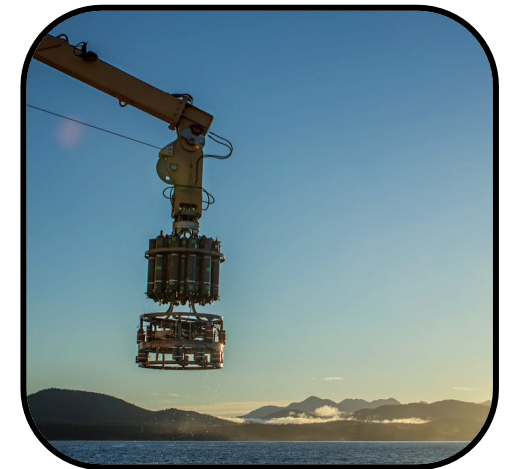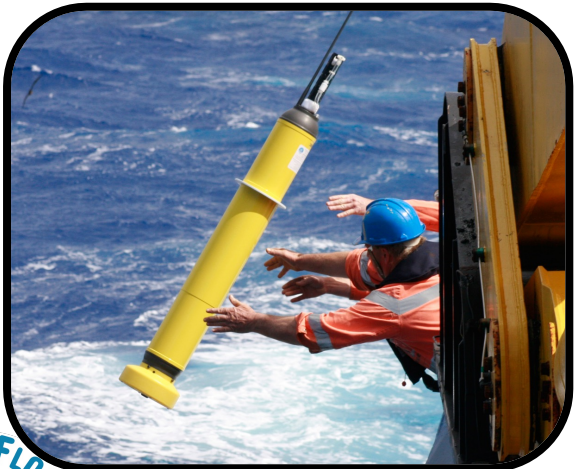
We refer to these changes as "anthropogenic" changes, meaning that they are human-caused.

How do you think oceanographers collect data to study ocean properties, and the changes they experience?
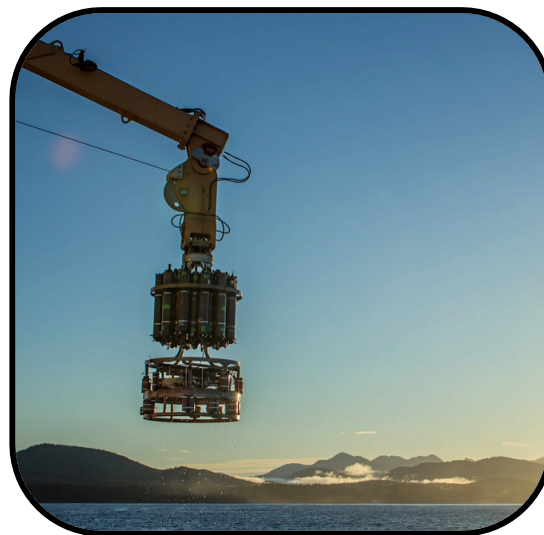
How do oceanographers collect data to study the ocean?

How do oceanographers collect data?

Traditionally, oceanographers have used ships to collect data to study the ocean. A *CTD* and *Rosette* are two useful tools that can be used on ships.

A Canadian research ship (left), and a rosette a Rosette being deployed (right)

How do oceanographers collect data?

A *CTD* is an electrical device that measures the

<u>C</u>onductivity,

<u>T</u>emperature,

and <u>D</u>epth

in the water. This is key information for understanding the *salinity* (or saltiness) and heat in the ocean.

Cage

Electronics to make it all work; at bottom of electronics housing is internal pressure sensor

Pump to provide constant flow through sensors

Temperature sensor

Conductivity sensor
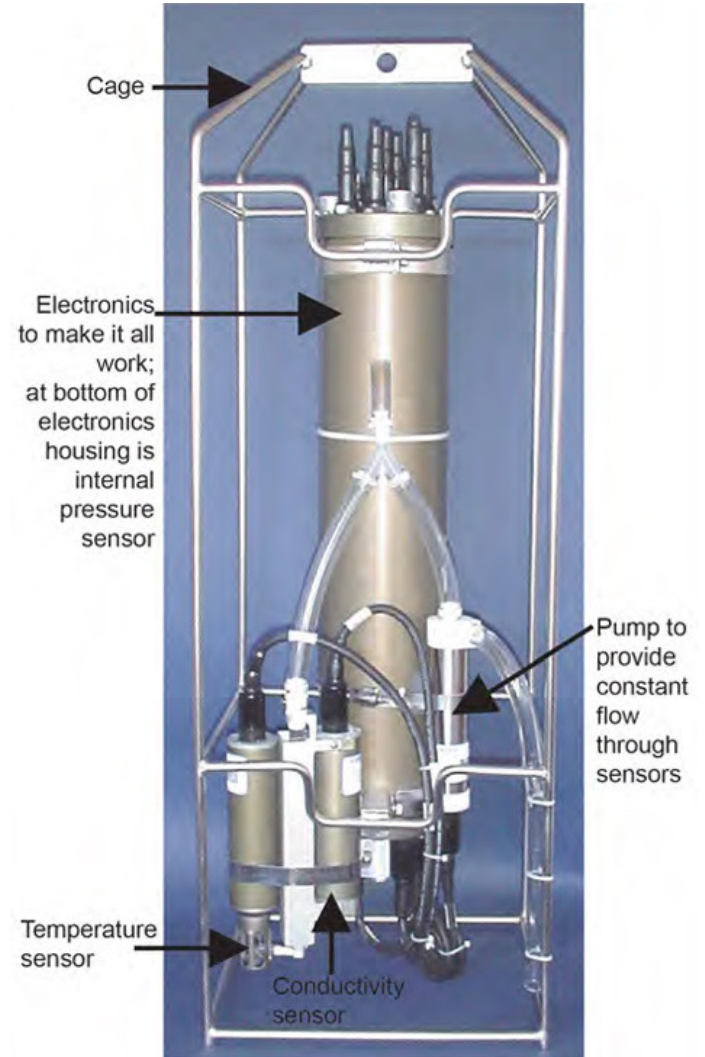
How do oceanographers collect data?

A *Rosette* is a large arrangement of bottles that is lowered over the side of the ship to collect water from different depths in the ocean.

The bottles can be closed automatically at different water depths, and that water is then brought back to the surface and analyzed for different properties.

How do oceanographers collect data?

Watch these short videos to see a Rosette in action!
(full links in teacher copy slide notes)

Water sampling in the Canadian Arctic: link
(watch closely to see a bottle close at the at the 3:23 mark!)
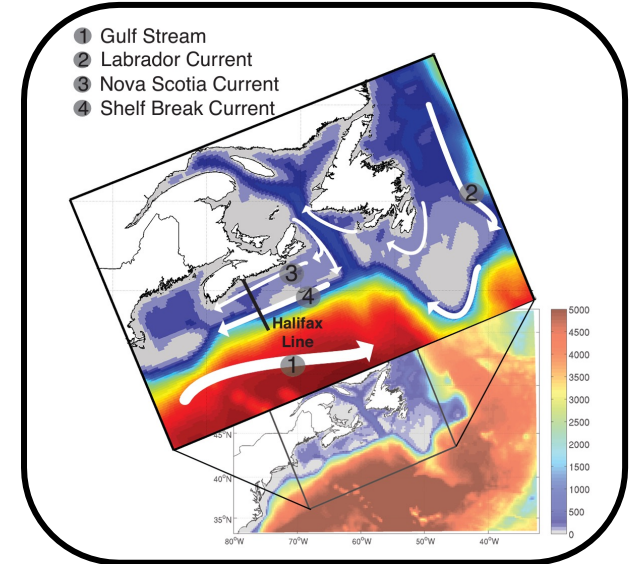
Seal's eye view of a CTD cast: link

How oceanographers sample the Arctic Ocean: link

How do oceanographers collect data?

Some oceanographers also use computer models to study the ocean.

Oceanographers studying a model of the NW Atlantic and Scotian Shelf region.

① Gulf Stream
② Labrador Current
③ Nova Scotia Current
④ Shelf Break Current

Like weather models for land, ocean models are used to simulate ocean conditions and predict future changes. Learn more here!
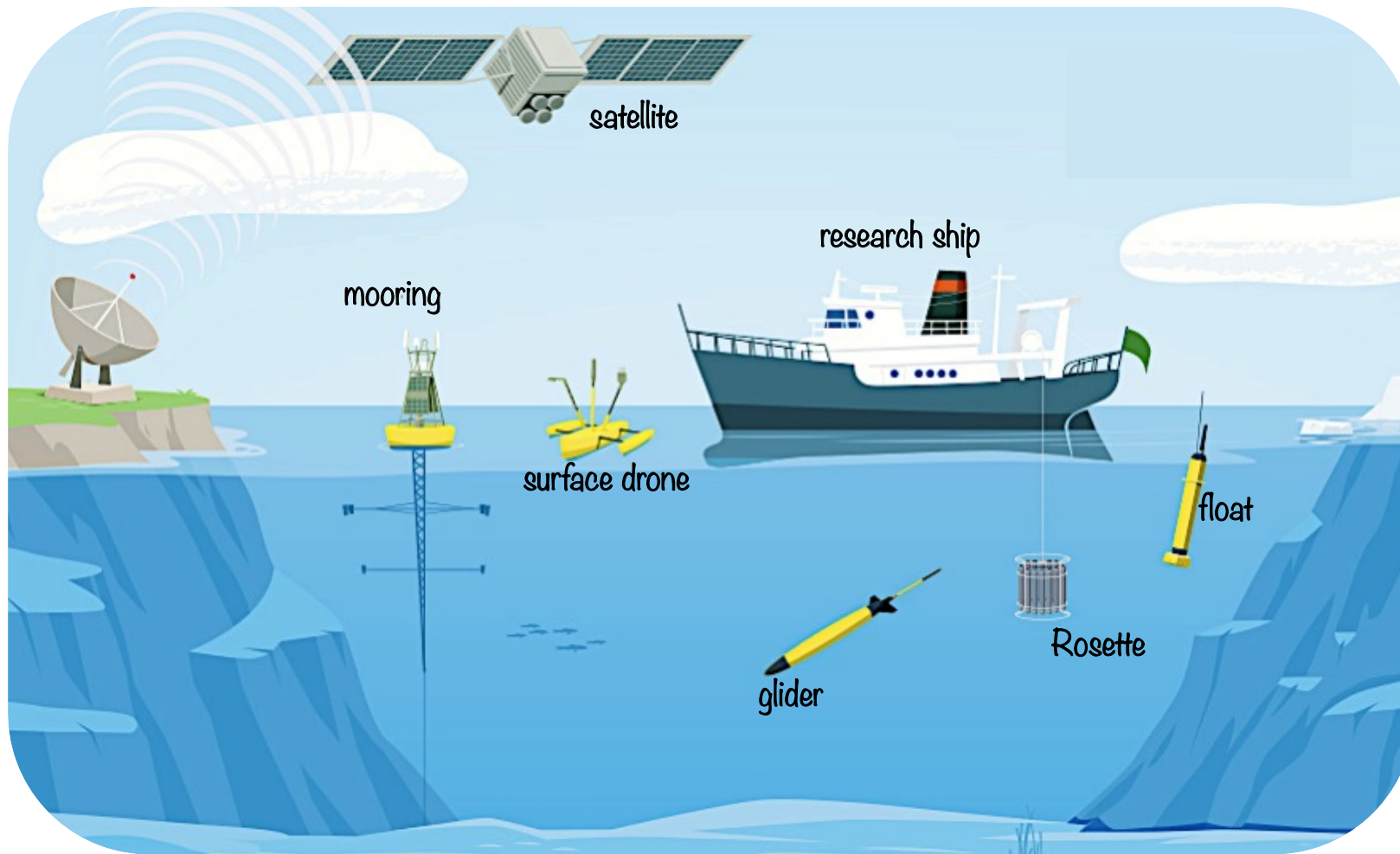
Introduction to Oceanography

Ships and models have been used by oceanographers to collect data over the past decades.

BUT, ships are expensive and can't cover all the ocean at once. And models require lots of data in order to make accurate predictions.

Clearly, oceanographers need a different way to collect data! Do you have any suggestions?

Here is an image of some of oceanographers' most common tools. Learn more about the different components at *Adopt-a-Float, France* and in the Adopt-a-Float glossary. For now, lets look more closely at what a ***float*** is …

What are Floats?

Floats are robotic instruments that measure ocean properties like water temperature, saltiness (salinity), acid, oxygen and phytoplankton abundance.

They move up-and-down in the ocean automatically, drift with currents, and collect data as they go.

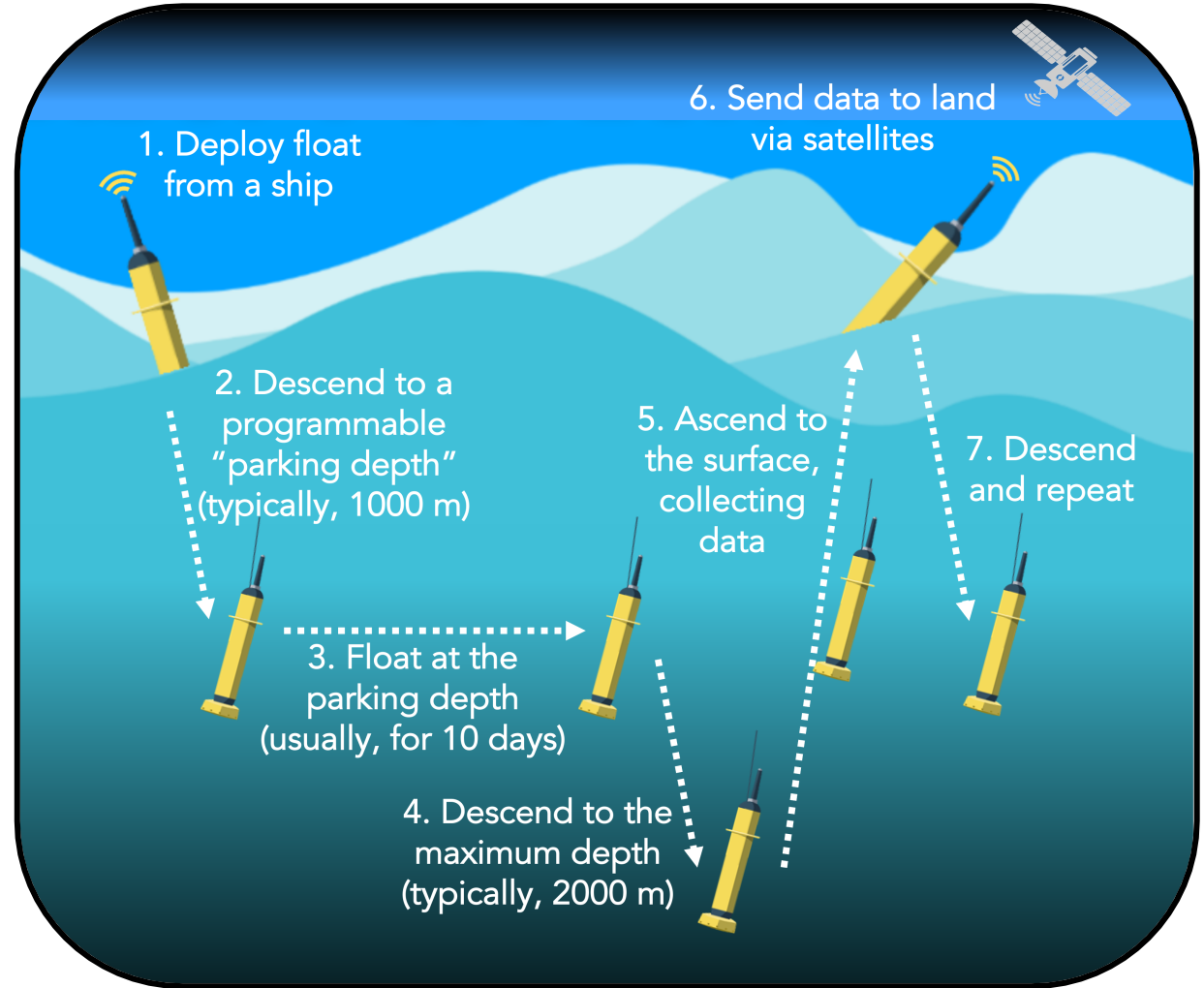Most importantly, floats allow oceanographers to collect data remotely, without having to use ships!

A float getting ready to go in the ocean!
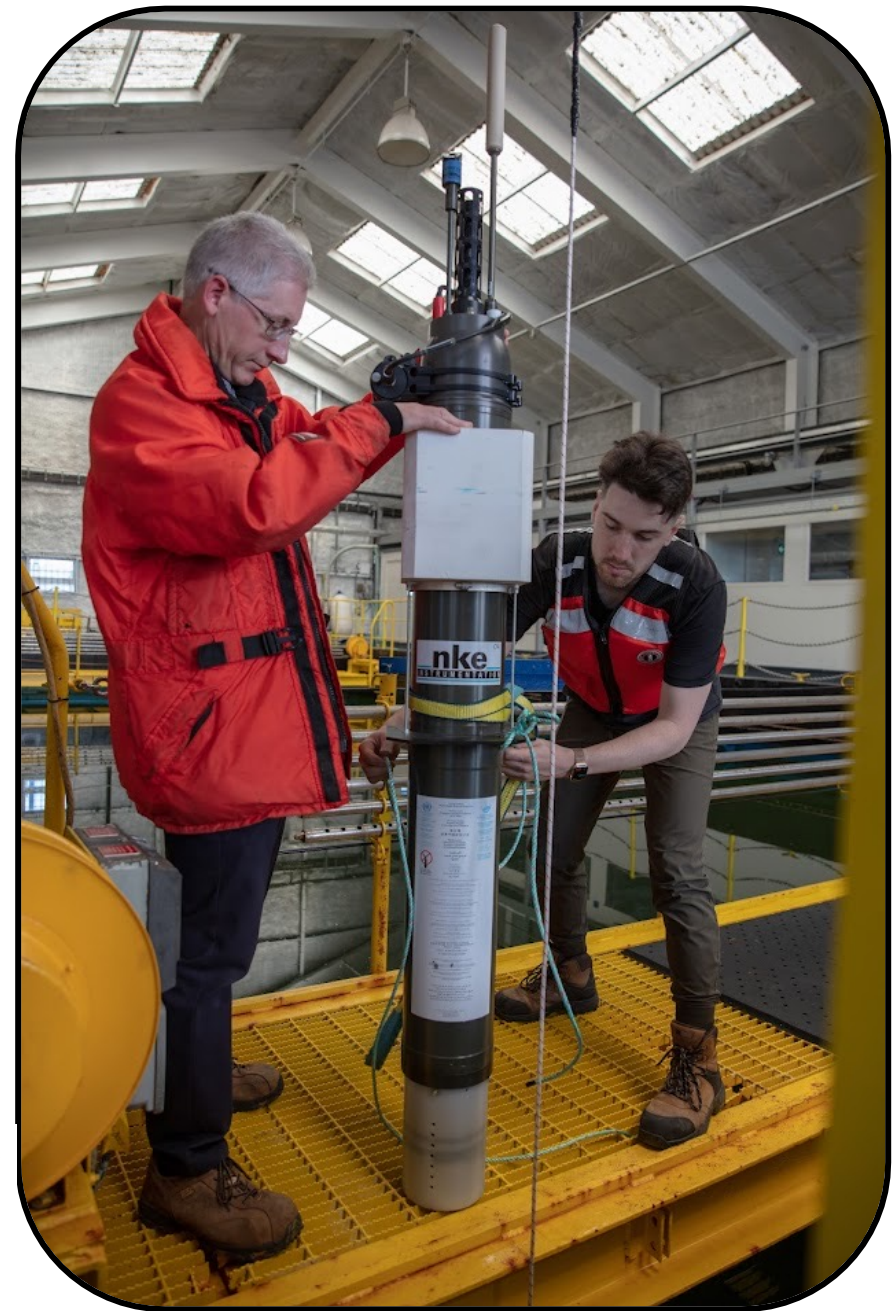
A day in the life of a float

Floats are programmable – scientists can choose the depths that floats descend to, and the time between each cycle to answer specific questions about the ocean.

Most floats cycle between the surface (0 m) and 1000-2000 m deep, at 10-day intervals.

1. Deploy float from a ship

2. Descend to a programmable "parking depth" (typically, 1000 m)

3. Float at the parking depth (usually, for 10 days)

4. Descend to the maximum depth (typically, 2000 m)

5. Ascend to the surface, collecting data

6. Send data to land via satellites
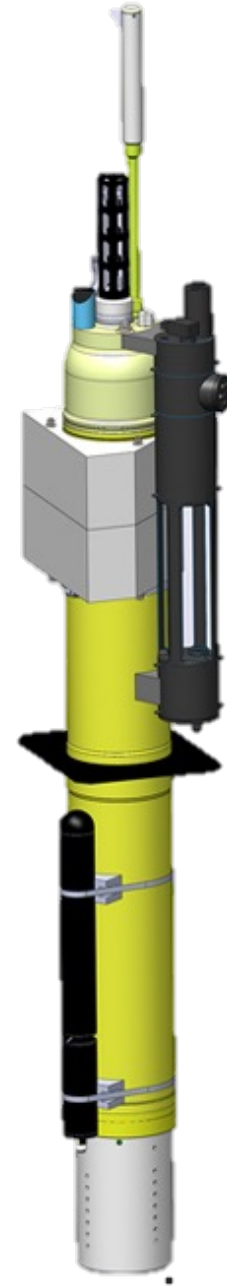
7. Descend and repeat

How do floats work?

Can you guess how the float works?

Follow these links to find out! (full links in teacher copy slide notes)

- [Interactive float description](#)

- [What is a Float?](#)

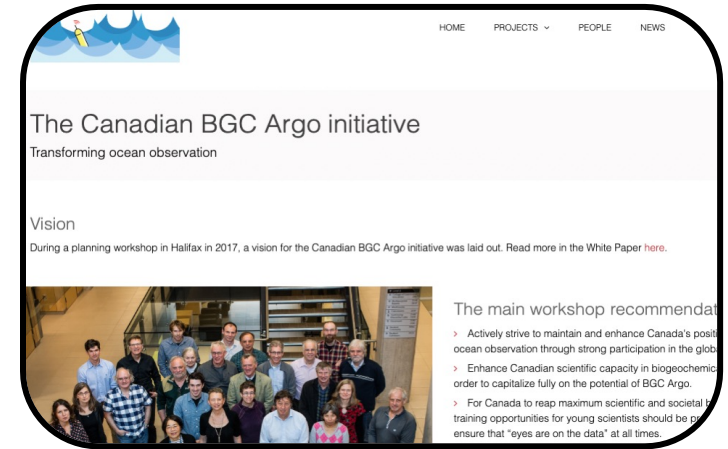- [Testing a float](#) (video)

- [Glossary of terms](#)

Introduction to BGC-Argo

A new program, called the *Biogeochemical Argo program,* is using floats to change the way that oceanographers study the ocean …

Biogeochemical Argo Floats being deployed from a ship (left). Canada's BGC-Argo website (right):
bgc-argo.ocean.dal.ca

Biogeochemical-Argo (BGC-Argo for short) is an international program of scientist that use robotic floats to study the ocean. The program includes scientist from all around the world, and Canada has its own BGC-Argo team!

Can you think of why BGC-Argo is important?

Why are BGC-Argo floats important?

The floats allow scientists to collect information from all over the ocean, and in all seasons. Usually, the high cost of research ships and bad weather prevent oceanographers from collecting much data. Imagine, for example, being an oceanographer on this ship!

Unlike ships, floats can collect data effortlessly in these conditions, and in all ocean regions.

Where do you think all the floats are?

Where are the floats?

This [interactive map](#) shows where the floats are currently located, and where they have travelled over their life-time. As you'll see, the floats aren't stationary! In fact, a float's path closely follows ocean currents.
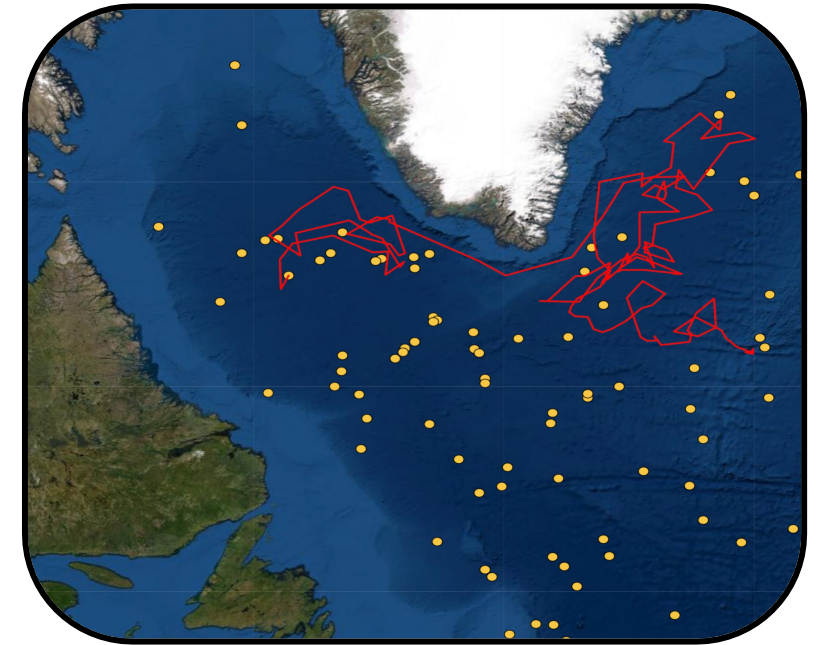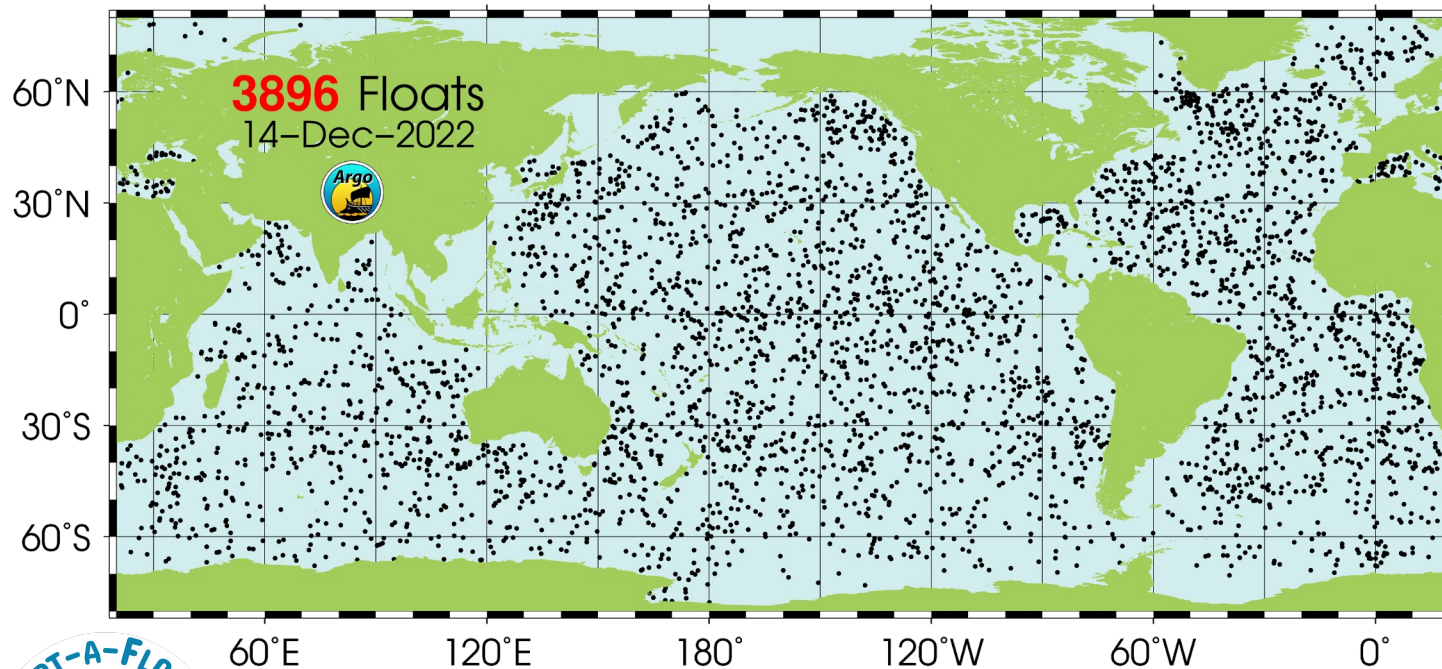
The locations of floats in Dec. 2022 (left) and the path of a single float (right).

Checking a Float's status

You can use the interactive map on the previous slide and other tools to access a float's data.

Check out our data access and analysis tutorials on the Adopt-a-Float Data Explorer page: sites.google.com/view/adopt-a-float-ca/data-explorer
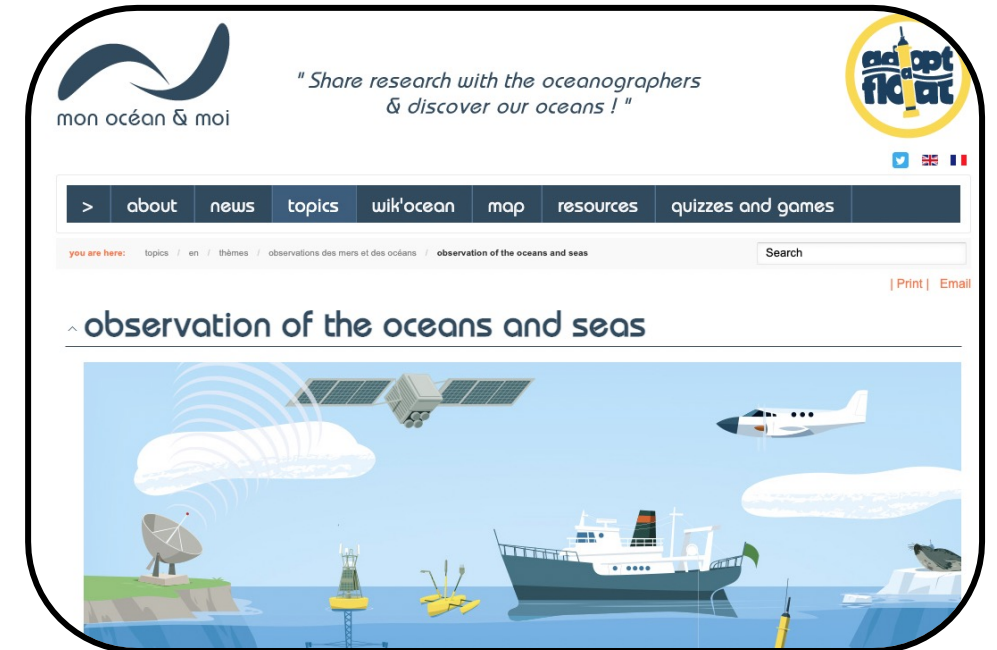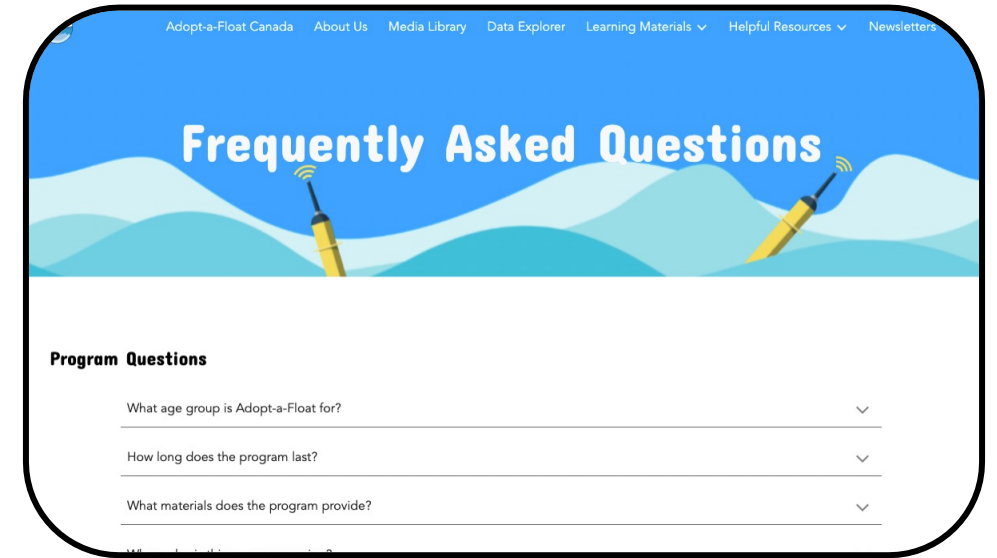
Then, try for yourself in the *What has my float been up to lately?* worksheet!

Want to learn more?

Check out or [FAQs](#) to learn how much a BGC-Argo float costs and weighs, what happens to a float when its batteries die, and if animals interfere with floats.

Go through the "[Observation of the Oceans and Seas](#)" lesson provided by Adopt-a-Float, France

Main points

- Oceanographers study ocean properties like temperature, currents and waves, phytoplankton and carbon dioxide
- BGC-Argo is a program of ocean-going robots, called "floats", that allow oceanographers to study the sea
- BGC-Argo data can be acquired online through interactive maps and data exploration tools