

Adopt-a-Float Starter Lesson

Miriam Sutton, M.A., NBCT

Summary

Ocean chemistry, referred to as biogeochemistry, varies throughout the different oceans of the world, not only among the different climate zones (i.e., Polar, Temperate, Tropics) but also within smaller geographic regions of each ocean basin. The depth and width of our oceans requires scientists to develop new technologies that can provide valuable information about the current status and fluctuations in Earth's ocean chemistry. The Global Ocean Biogeochemistry Array is designed to assist researchers as they monitor the health of our oceans and, subsequently our planet. This activity is designed as a "starter lesson" to familiarize students with the Global Ocean Biogeochemistry Array (GO-BGC) Adopt-a-Float program and to gain an understanding of the various ocean chemistry variables being collected to assist scientists in assessing our ocean's health and productivity. Students will access real data from one of the profile floats deployed through GO-BGC's Adopt-a-Float program and generate graphs to analyze and discuss variability among sea temperature, chlorophyll-a concentration, and nitrate concentration recorded as the float drifts across an ocean basin. Students can build from this lesson to analyze float data from various regions of the world's oceans and investigate the role that ocean upwelling plays in ocean productivity.

[TAGS: biogeochemistry; upwelling cycle; ocean productivity]

Key Concepts

- Ocean Productivity
- Ocean Exploration Technology
- In Situ Data Collection
- Ocean Upwelling Cycle
- Biogeochemical Cycle

Objectives

Students will:

- Explore the in situ data collection array developed by the GO-BGC.
- Interpret the GO-BGC Data Table and generate graphs for Temperature, Chlorophyll-A, and Nitrate concentration.
- Analyze and interpret variations in Temperature, Chlorophyll-A, and Nitrate concentration at various ocean depths.
- Engage in discussions to communicate their analysis of the data.
- Express higher-order thinking to discern the impact of ocean upwelling processes on the biogeochemical cycle.

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Miriam Sutton, M.A., NBCT – Owner/Director

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Materials

- DATA SHEET FOR BGC-ARGO FLOAT #5906296 STUDENT
- DATA SHEET FOR BGC-ARGO FLOAT #5906296 TEACHER
- Computer with Internet access

Procedure

- Introduce students to the Global Ocean Biogeochemistry Array (GO-BGC) Adopt-a-Float program using the video and information posted on the GO-BGC website: <u>https://www.mbari.org/project/go-bgc/</u>.
- Preview each website and the data sheet used in this lesson with students to familiarize the students with the objectives of the lesson.
- Assist students as they complete the data sheet independently or in small teams.
- Facilitate team or class discussions based on the students' analysis of the data.
- Assess student understanding and mastery of the lesson objectives based on their completed data sheet and communication of the concepts explored in the analysis and discussion.



Assessment (Describe suggestions for assessing the success of the lesson.)

Use the Data Sheet and Discussion Questions to assess student understanding and mastery of the objectives listed above.

Additional Resources

- <u>https://www.vesselfinder.com/vessels/details/8000898</u> (Research Vessel Kaharoa page includes images and information for the ship used to deploy Float **#5906577** and many others.)
- <u>https://www.mbari.org/project/go-bgc/</u> (Video (@2.30 minutes) explains GO-BGC program and how the profile floats work.

Extensions or adaptations

Extension activities include:

- Investigating other profile floats in other oceans and regions of the world for comparison among the various climate zones and ocean basins.
- Exploring regional and historical profile float data collected while environmental events were active; such as hurricanes, typhoons, or cyclones to investigate profile changes before, during, and after the event.



DATA SHEET FOR BGC-ARGO FLOAT #5906577 - STUDENT

Background Information: Ocean chemistry, referred to as biogeochemistry, varies throughout the different oceans of the world, not only among the different climate zones (i.e., Polar, Temperate, Tropics) but also within smaller geographic regions of each ocean basin. The depth and width of our oceans requires scientists to develop new technologies that can provide valuable information about the current status and fluctuations in Earth's ocean chemistry. The Global Ocean Biogeochemistry Array, using Profile Floats, is designed to assist researchers as they monitor the health of our oceans and, subsequently our planet. This lesson will introduce you to this array and the types of data scientists are collecting to analyze the health of our oceans. Use the websites provided to complete the DATA SHEET FOR BGC-ARGO FLOAT #5906577.

Float Information: #5906577

Go to: <u>http://go-bgc.ucsd.edu/GOBGC_Adopt-a-Float.html</u> to locate the GOBGC Adopt-a-Float Reference Table. Scroll through the list to locate the *Science by the Sea*[®] Float #5906577. Select the *Science by the Sea*[®] link to see an image of Float #5906577. Select the #5906577 link to locate Background Information, Data, and a Map showing the track of Float #5906577. Record the Background information and location on the **DATA SHEET FOR BGC-ARGO FLOAT #5906577**.

1. Information for Float: #5906577

DEPLOYMENT (DATE):	SHIP:	-			
LATITUDE:	LONGITUDE:				
STATUS: AGE: LAST	STATION DATE:	CYCLE#			
OCEAN WHERE FLOAT: #5906577 IS LOCATED:					
NUMBER OF CYCLES COMPLETED BY FLOAT: #5906577:					

2. Investigating Ocean Chemistry with Float #5906577: Locate the FloatViz Data Visualization page here: <u>https://www.mbari.org/data/ocean-float-data/</u>. Scroll through the list of float numbers in Column 2 to locate the *Science by the Sea*[®] Float#5906577. Next, select one X-axis variable and one Y-axis variable. Click the SEND button (top-left of Column 1) to generate a graph of your selected variables.

2A: Insert the image of your graph into the Investigating Ocean Chemistry with Float: #5906577.

2B: Use your graphs to compare changes in Temperature, Chlorophyll-A, and Nitrates at various depths as recorded by Float **#5906577**. Record the changes observed in the table located below your graphs.

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2A. Investigating Ocean Chemistry with Float: #5906577

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2B. Investigating Ocean Chemistry with Float: #5906577

DEPTH/VARIABLE	TEMPERATURE (C)	CHLOROPHYL-A (µmg/L)	NITRATES (µmol/kg)
2000m			
1000m			
500m			
250m			
100m			
0m			

3. Discussion:

Why does the ocean's temperature vary throughout the different depths of the ocean?

Why does the concentration of Chlorophyll-A vary throughout the different depths of the ocean?

Why does the concentration of Nitrates vary throughout the different depths of the ocean?

How does ocean upwelling contribute to the aquatic food web?