Floating with PUPCYCLE

Names of group members

Summary

PUPCYCLE (Phytoplankton response to the UPwelling Cycle) is a research project to measure the physiological responses of phytoplankton to upwelling. Upwelling tends to generate regions of high productivity in the oceans that can fuel phytoplankton blooms. Locating the microscopic phytoplankton that create these blooms can be quite challenging and scientists use a variety of methods, including satellite data and in situ (in place) data to assist them in locating regions with high productivity. This activity allows students to incorporate data visualization skills to explore some of the data used to identify these highly productive regions. Students will compare BGC-Argo Float data (e.g., chlorophyll, dissolved oxygen) to Satellite data (e.g., chlorophyll) that overlaps during the PUPCYCLE II Research Cruise.

[TAGS: phytoplankton; BGC-ARGO; PUPCYCLE]

Key Concepts

- Ocean Productivity
- Ocean Exploration Technology
- Remote sensing vs. In Situ Data Collection

Objectives

Students will:

- Ask questions and construct explanations
- Define problems and design solutions
- Develop and use models
- Plan and carry out investigations
- Analyze and interpret data
- Use mathematics and computational thinking
- Engage in argument from evidence
- Obtain, evaluate, and communicate information

Materials

- Include any additional resources that educators would need to teach the lesson
    - Background information
    - **TUTORIAL for using the GO-BGC website to complete the Float Data Sheet**
    - **DATA SHEET FOR BGC-ARGO FLOAT #5906296**
    - **DATA SHEET FOR BGC-ARGO FLOAT #5906296 – KEY**
    - *Add additional materials with completion of activity*

Suggested Procedure

PART I: Satellite Data

> *1. Add directions for retrieving a satellite map of the PUPCYCLE Study Region.*

PART II: In Situ Data - Follow the provided tutorials to locate Float #5906296 information for the Float Data Sheet.

TUTORIAL for using the GO-BGC website to complete the Float Data Sheet:

1. Go to https://maps.biogeochemical-argo.com/bgcargo/?&txt=5906296 and locate the BGC-Argo **#5906296 Float** off the northwest coast of the United States.


2. Locate the links beneath the Float number (**N° WMO: 5906296**) and select "Euro-Argo Fleet monitoring." This will open a new window here: https://fleetmonitoring.euro-argo.eu/float/5906296. Use the information found on this page to complete the Float Data Sheet.
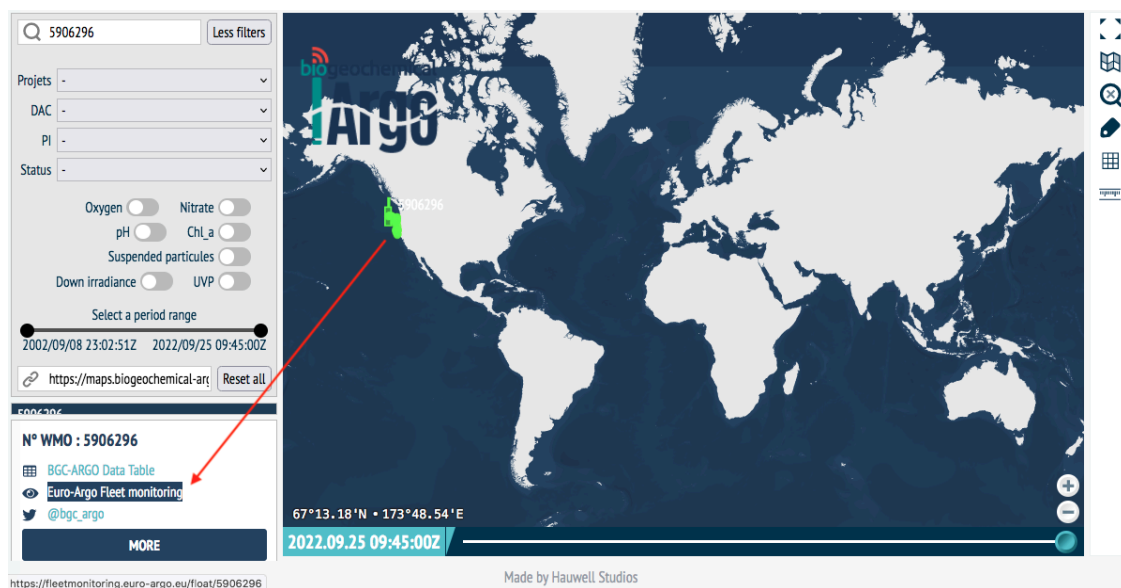
3. Use this webpage (https://fleetmonitoring.euro-argo.eu/float/5906296) to locate information about Float #5906296 and to complete the Data Sheet.
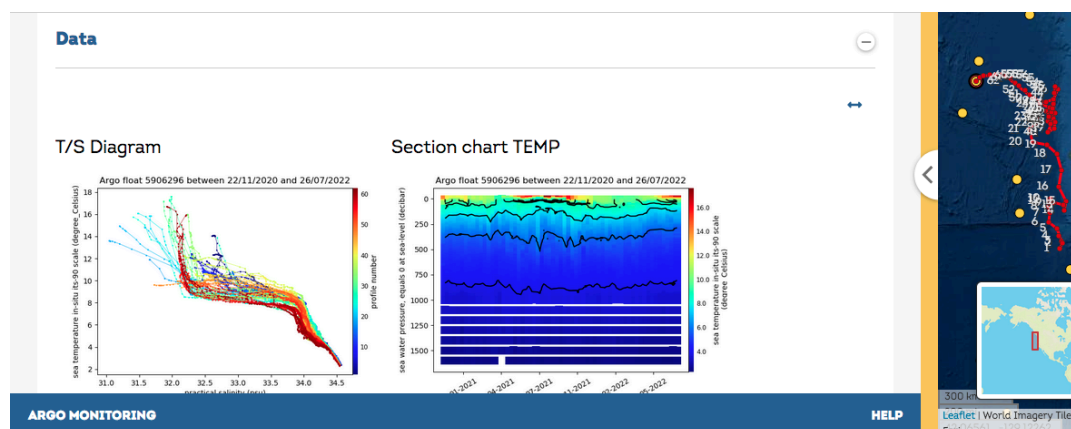
"About Float" includes the specifics for deployment, location, and status of Float #5906296.
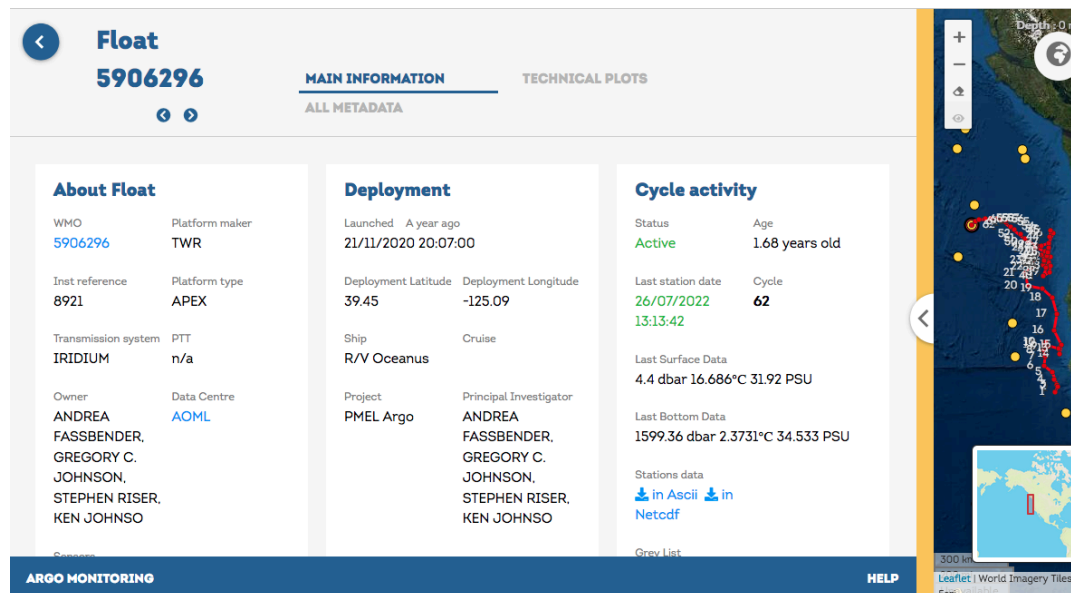
4. "Profile Data" includes each recording of data from each of the Float 5906296 cycles.

5. "Data" includes the charts/graphs illustrating the data collected by Float 5906296.

6. Graphs needed for the Data Sheet are found in the Data section. Screenshots for saving the graphs needed in the activity are shown below and also provided in the Data Sheet Key.

Overlayed Profile Graphs for DOXY (Dissolved Oxygen) and CHLA (Chlorophyll-A)
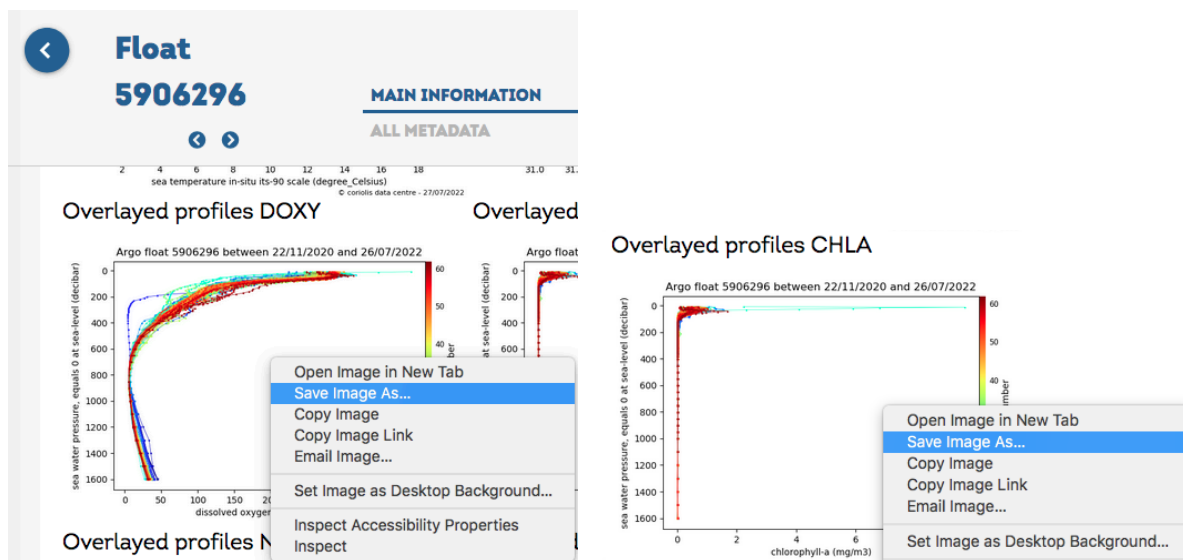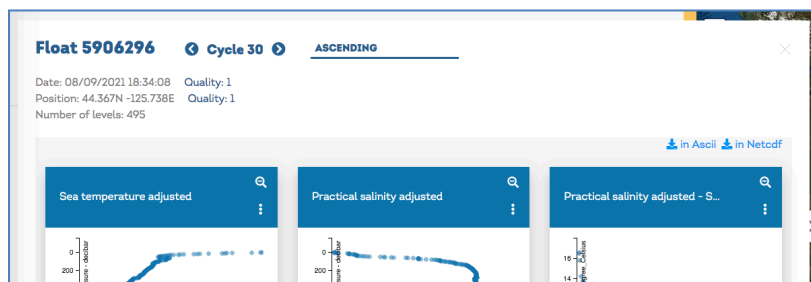

Profile 30 Graphs for DOXY (Dissolved Oxygen) and CHLA (Chlorophyll-A) are found here: https://fleetmonitoring.euro-argo.eu/float/5906296
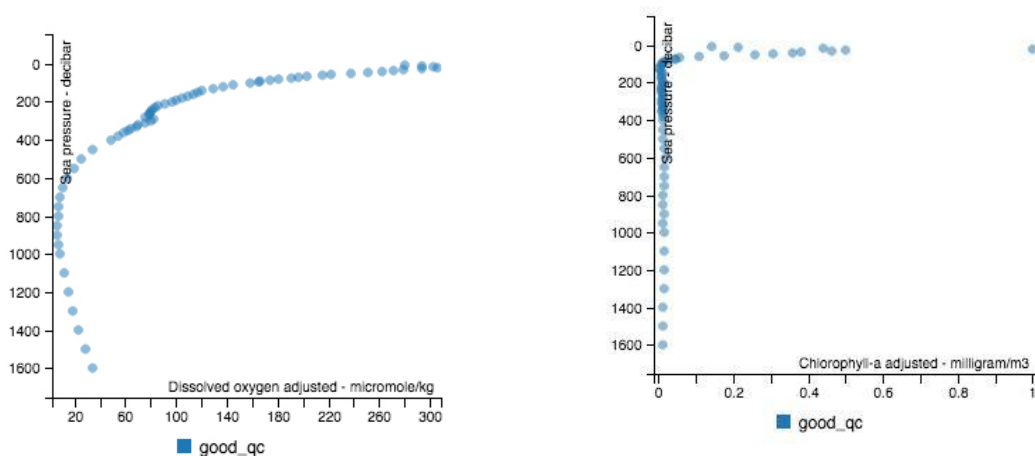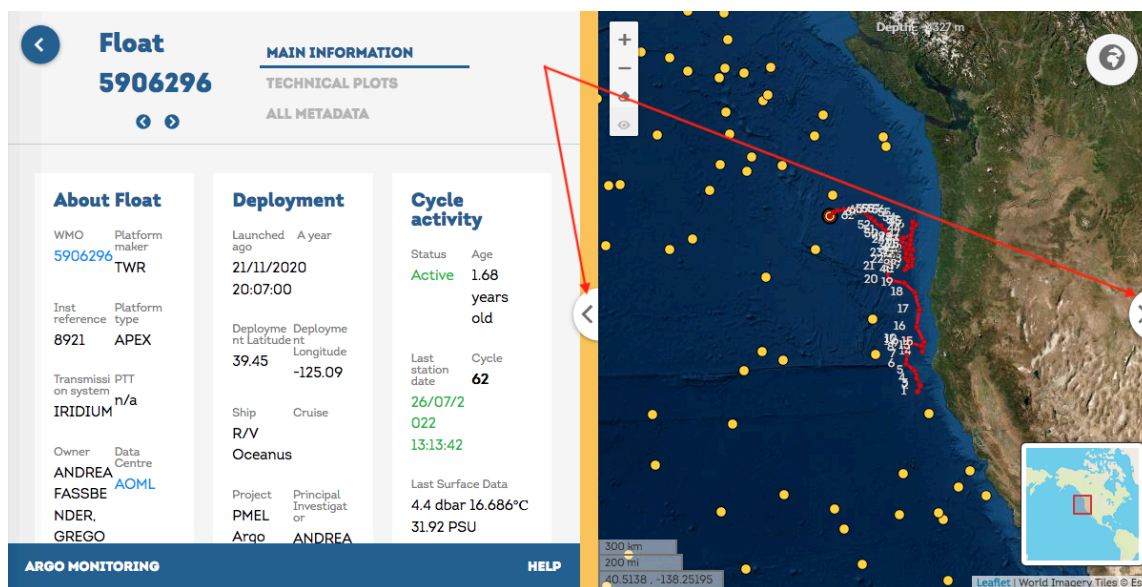

(The pop-up window of Profile 30 Graphs can be closed by clicking the X in the upper-right corner.)

7. Toggle between the Float Information panel and the GO-BGC Map by clicking the arrows on either side of the map. Use the + or – icons on the left side of the map or use the scrolling feature with a mouse to zoom-in and out on the map.

8. The date of each Float Cycle can be located by zooming in on the float track and making a single click on the Profile Cycle number. See the example using Cycle 30 below. Students can double-check their Data Sheet (Highest Concentration of DOXY and CHLA) by checking the Profiles before (<) and after (>) the Profile Cycle selected.
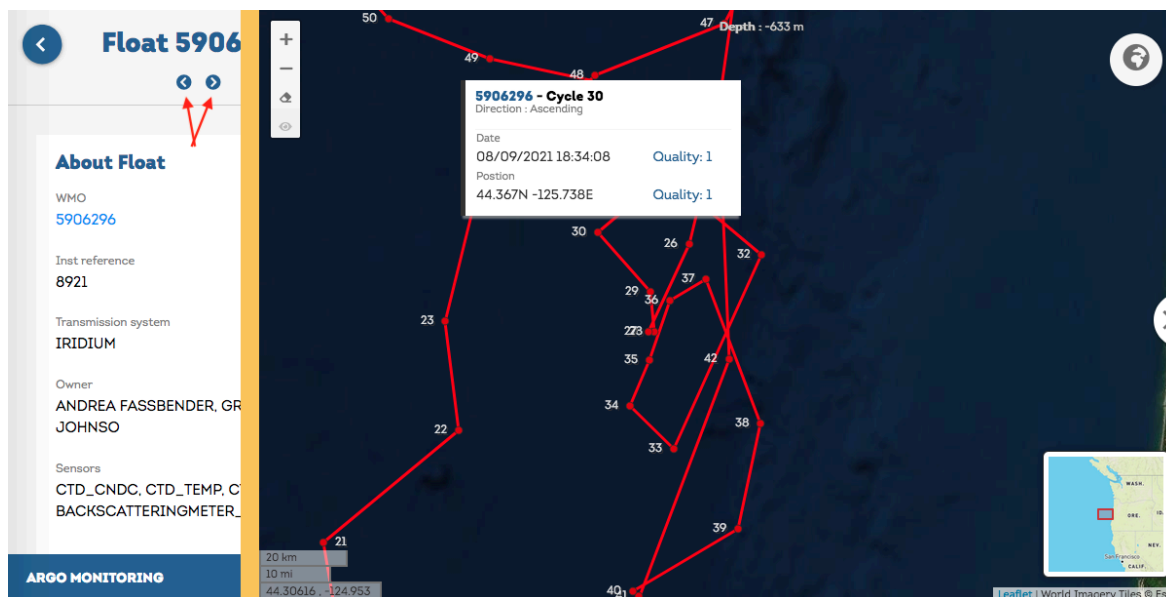
To Be Completed….

Assessment

- **Formative assessments**—used to identify areas where students are struggling so that instructors can adjust their teaching and students can adjust their studying.
- **Summative assessments**—occur at the end of an instructional unit or course and measure the extent to which students have achieved the desired learning outcomes.
- For more information: https://facultyinnovate.utexas.edu/teaching/check-learning/methods
- Assessment rubrics that you would use in the classroom are also helpful

Extensions or adaptations

List any adaptations to the lesson that will make it more accessible to a wider audience, or any extensions that will move the lesson beyond initial understanding or experience.

Prerequisite knowledge

List any specific concepts that students should have an understanding of before undertaking this lesson.

Common Misconceptions

List any common misconceptions that students may have when approaching this subject material.

Additional Resources

Please list any websites, books, publications, or other resources that would be helpful for teachers or students preparing for this lesson.

DATA SHEET FOR BGC-ARGO FLOAT #5906296 - STUDENT

QUESTION: How are Remote Sensing Data (using satellites) and In Situ Data (using BGC-ARGO floats) used to analyze ocean productivity?

HYPOTHESIS: _____

_____

PROCEDURES: Use the GO-BGC Float Data provided to organize the Dissolved Oxygen and Chlorophyll-A Data for Float #5906296

Go to https://maps.biogeochemical-argo.com/bgcargo/?&txt=5906296 and locate the BGC-Argo **#5906296 Float** off the northwest coast of the United States.

About Float

FLOAT #: _____ DEPLOYMENT (DATE): _____
LATITUDE: _____LONGITUDE: _____SHIP: _____
STATUS: _____ AGE: _____ LAST STATION DATE: _____ CYCLE #: ___

Data
Scroll to the Data section and locate the following graphs and insert them below:

Graph	Overlayed profiles DOXY	Overlayed profiles CHLA
Image of Overlayed Profiles		

Record the highest concentration level of DOXY in the Overlayed profile: _____ (µmol/kg)

Record the highest concentration level of CHLA in the Overlayed profile: _____ (µmg/L)

Record the Profile Number that coincides with the highest concentration level of DOXY and CHLA: _____

Profile Data

Complete the Profile Data Table using the Profile number selected above (Data section):

Graph	Overlayed profiles DOXY	Overlayed profiles CHLA
Profile # with Highest Recorded Value **Image of Overlayed Profiles**		

Use your Profile Data Table to answer the following:

Variable	DOXY(μmol/kg)	CHLA(μmg/L)
Concentration at 600 db of pressure		
Concentration at 200 db of pressure		
Concentration at 0 db (or near the surface) of pressure		

To Be Completed…..

DATA SHEET FOR BGC-ARGO FLOAT #5906296 - KEY

QUESTION: <u>How are Remote Sensing Data (using satellites) and In Situ Data</u>

<u>(using BGC-ARGO floats) used to analyze ocean productivity?</u>

HYPOTHESIS: _____

_____

PROCEDURES: Use the GO-BGC Float Data provided to organize the Dissolved Oxygen and Chlorophyll-A Data for Float #5906296

Go to https://maps.biogeochemical-argo.com/bgcargo/?&txt=5906296 and locate the BGC-Argo **#5906296 Float** off the northwest coast of the United States.

About Float

FLOAT #: _____ DEPLOYMENT (DATE): _____

LATITUDE: _____LONGITUDE: _____SHIP: _____

STATUS: _____ AGE: _____ LAST STATION DATE: _____ CYCLE #: __

Data
Scroll to the Data section and locate the following graphs and insert them below:

Graph	Overlayed profiles DOXY	Overlayed profiles CHLA
Image of Overlayed Profiles		

Record the highest concentration level of DOXY in the Overlayed profile: _____ (µmol/kg)

Record the highest concentration level of CHLA in the Overlayed profile: _____ (µmg/L)

Record the Profile Number that coincides with the highest concentration level of DOXY and CHLA: _____

Profile Data

Complete the Profile Data Table using the Profile number selected above (Data section):

Graph	Overlayed profiles DOXY	Overlayed profiles CHLA
Profile # with Highest Recorded Value **Image of Overlayed Profiles**		

Use your Profile Data Table to answer the following:

Variable	DOXY(μmol/kg)	CHLA(μmg/L)
Concentration at 600 db of pressure		
Concentration at 200 db of pressure		
Concentration at 0 db (or near the surface) of pressure		