



Biological & Chemical Oceanography Data Management Office

<http://bco-dmo.org>

## TUTORIAL 2017 OCB SUMMER WORKSHOP

### Table of Contents

<b>How to Submit Data</b> .....	<b>2</b>
<b>Data access: TEXT-BASED SEARCH</b> .....	<b>5</b>
<i>Scenario 1: You have a general idea of what you are looking for.</i> .....	5
<b>Data access: MAP BROWSE</b> .....	<b>13</b>
<i>Scenario 2: You are interested in data from a particular geographic region.</i> .....	13
<b>Data access: ENHANCED SEARCH BAR</b> .....	<b>22</b>
<i>Scenario 3: You are interested in data associated with a keyword.</i> .....	22
<b>Glossary of Terms</b> .....	<b>25</b>
<b>Acknowledgments</b> .....	<b>25</b>
<b>Follow BCO-DMO</b> .....	<b>25</b>



## TUTORIAL 2017 OCB SUMMER WORKSHOP

### How to Submit Data

BCO-DMO works with investigators to publish data from research projects funded by the NSF Geosciences Directorate (GEO) Division of Ocean Sciences (OCE) Biological and Chemical Oceanography Sections and the Office of Polar Programs (OPP) Antarctic Sciences (ANT) Organisms and Ecosystems Program. Once published, BCO-DMO also fulfills NSF requirements for long-term preservation by submitting data to the appropriate national data center for archive (e.g. [National Centers for Environmental Information, NCEI](#)). Getting started submitting project information or data takes only a few steps. Before you begin however, you may need to determine if BCO-DMO is the appropriate repository for your data management needs. Information on alternate repositories is available on the BCO-DMO website's '[How to Get Started Contributing Data](#)' page.

We are in the process of redesigning this information page in an effort to make submitting your data even easier! Therefore, we welcome your feedback on the following information currently under development.

# STEPS FOR DATA CONTRIBUTORS



## 1 **Register a Project**

- Complete a [Project Metadata Form](#) (.rtf) to provide information about projects that are not already registered at BCO-DMO.
  - A project oversees a collection of one or more datasets.
  - A project may or may not be part of a larger program.
  - There is most often one project per NSF award, with the exception of Collaborative Research awards, where one project is funded by multiple awards. Some time-series projects may contain multiple awards as well.
  - If you do not yet know the NSF award number, please provide as much information as possible including the project title and investigator contact information.
- Please have a copy of the award's [NSF Data Management Plan](#) ready to submit along with the Project Metadata Form.
- Once this information is ready, go to Step 3 'Submit'.

## 2 **Prepare Data and Metadata**

- Prepare the data files
  - We accept data in any format, but comma- or tab-delimited (preferred) ASCII files or Excel spreadsheets are most common. If contributing data as an Excel file, please see our [tips for submitting data in a spreadsheet](#).
  - Please send us your processed data files when pertaining to **acoustics**, **CTD**, and **ADCP** data.

- **Sequence accession numbers** and the associated data can be contributed to BCO-DMO and we can provide links to the sequence repository (such as NCBI's GenBank). Please see "[Contributing Sequence Accession Numbers](#)" for more information.
- Complete a [Dataset Metadata Form](#) (.rtf) to provide information about each unique dataset collected within a project.
- If data were collected from a research vessel, mooring, glider, or other unique deployment, complete a [Deployment Metadata Form](#) (.rtf).
  - Complete this form only if it is applicable to the dataset(s) you are submitting.
  - Deployments help describe the geographic and temporal scale of datasets.
  - Deployments provide context for mapping the associated data.

### 3 **Submit Applicable Metadata Forms and Files to [info@bco-dmo.org](mailto:info@bco-dmo.org).**

- You will receive a reply from one of our Data Managers confirming receipt of your forms and data files, if applicable.
- If a data set is too large to send as an email attachment, please [contact us](#) for instructions on the best way to contribute your data.
- **NOTE:** We strongly encourage you to submit data at least one month in advance of any pressing deadlines (e.g. NSF reports, manuscript publication) to provide adequate data processing time.

### 4 **Collaborate**

A Data Manager will begin the process of making the data available online. We strive to develop robust metadata that will ensure the data are easily discoverable and reusable. Your Data Manager will contact you with follow-up questions or requests for more information to ensure that the metadata is complete. This may be an iterative process, so your patience and cooperation are greatly appreciated.

### 5 **Validate**

Once your datasets are online, you'll be asked to review the data and metadata for completeness and accuracy. This validation stage is the final step in the process, and necessary for assignment of DOIs and long-term archival.

Once datasets are reviewed and validated by the contributor, BCO-DMO ensures that the data are archived properly at the appropriate National Data Center (e.g. [National Centers for Environmental Information, NCEI](#)).

## Data access: TEXT-BASED SEARCH

### Scenario 1: You have a general idea of what you are looking for.

Go to: <http://bco-dmo.org>

DATABASE	
Programs	24
Projects	239
Deployments	1695
Datasets	6451
Instruments	307
Parameters	1318
People	1334
Affiliations	341
Funding	47
Awards	591

The DATABASE links in the left navigation area provide an idea of how the data are organized. Data sets are grouped by Program (largest collection), Project (smaller in scope than a Program), Deployment (cruise, mooring, and many other examples), Dataset (a logical collection of data).

One could start with any of those navigation links and search to find the data of interest. If you know you are interested in data from an OCB project (for example, “CoFeMUG”) you may start at the top level “Programs”.

Select Programs from the left navigation area. Enter OCB in the search box. Click the Search button.

Select “Ocean Carbon and Biogeochemistry” from the Program list.

URL: <http://www.bco-dmo.org/program/2015>

Your browser display should look like the image on the next page, showing a brief description of the OCB program.



**BCO-DMO**  
Biological & Chemical Oceanography Data Management Office

HOME DATA RESOURCES ABOUT

**DATABASE**

Welcome	
<b>Programs</b>	<b>24</b>
Projects	238
Deployments	1695
Datasets	6449
Instruments	307
Parameters	1318
People	1334
Affiliations	341
Funding	47
Awards	591

**Program: Ocean Carbon and Biogeochemistry**

Affiliated programs: IMBER-US, US SOLAS, NACP-OCB Coastal  
Acronym: OCB  
URL: [Program Web Site](#)  
Start date: 2006  
End date:  
Geolocation: Global

**OCB**  
Ocean Carbon & Biogeochemistry

**Description:**

The Ocean Carbon and Biogeochemistry (OCB) program focuses on the ocean's role as a component of the global Earth system, bringing together research in geochemistry, ocean physics, and ecology that inform on and advance our understanding of ocean biogeochemistry. The overall program goals are to promote, plan, and coordinate collaborative, multidisciplinary research opportunities within the U.S. research community and with international partners. Important OCB-related activities currently include: the Ocean Carbon and Climate Change (OCCC) and the North American Carbon Program (NACP); U.S. contributions to IMBER, SOLAS, CARBOOCEAN; and numerous U.S. single-investigator and medium-size research projects funded by U.S. federal agencies including NASA, NOAA, and NSF.

The scientific mission of OCB is to study the evolving role of the ocean in the global carbon cycle, in the face of environmental variability and change through studies of marine biogeochemical cycles and associated ecosystems.

The overarching OCB science themes include improved understanding and prediction of: 1) oceanic uptake and release of atmospheric CO<sub>2</sub> and other greenhouse gases and 2) environmental sensitivities of biogeochemical cycles, marine ecosystems, and interactions between the two.

The OCB Research Priorities (updated January 2012) include: ocean acidification; terrestrial/coastal carbon fluxes and exchanges; climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles; mesopelagic ecological and biogeochemical interactions; benthic-pelagic feedbacks on biogeochemical cycles; ocean carbon uptake and storage; and expanding low-oxygen conditions in the coastal and open oceans.

**GEOSPATIAL ACCESS**



Scroll down and expand the Projects section below the “More Information” heading.

Select “Cobalt, Iron and Micro-organisms from the Upwelling zone to the Gyre” (CoFeMUG) from the list of project names.

California Current Ecosystem Long Term Ecological Research site (CCE LTER)
Carbon Dioxide Dynamics in Mode Water of the North Atlantic Ocean (CarboMODE)
Carbon Dioxide Information Analysis Center - Global Ocean CO <sub>2</sub> (CDIAC Ocean CO <sub>2</sub> )
CARIACO Ocean Time-Series Program (CARIACO)
<b>Cobalt, Iron and Micro-organisms from the Upwelling zone to the Gyre (CoFeMUG)</b>
Coccolithophores of the Patagonian Shelf 2008 (COPAS08)
Composition of the plankton community and its contribution to particle flux in the Sargasso Sea (Plankton particle flux)
Controls of Ross Sea Algal Community Structure (CORSACS)

The browser displays the project description page.

URL: <http://www.bco-dmo.org/project/2067>



[HOME](#)
[DATA](#)
[RESOURCES](#)
[ABOUT US](#)

**DATABASE**

Programs	33
Projects	542
Deployments	2127
Datasets	7550
Instruments	375
Parameters	1356
People	1849
Affiliations	438
Funding	67
Awards	1149

## Project: Cobalt, Iron and Micro-organisms from the Upwelling zone to the Gyre

**Acronym/Short Name:** CoFeMUG  
**Start Date:** 2005-03  
**End Date:** 2008-03  
**Geolocation:**  
 South Atlantic subtropical gyre and Benguela upwelling region  
**Datasets:** 9  
**Collections:** 9  
**Deployments:** 1  
**Cruises:** 1  
**Programs:**  
[Ocean Carbon and Biogeochemistry \[OCB\]](#)  
[U.S. GEOTRACES \[U.S. GEOTRACES\]](#)



**GEOSPATIAL ACCESS**



**CONTRIBUTE DATA**

**Getting started**

- » [How-to Guide](#)
- » [FAQs](#)

**Metadata Forms** (.rtf files)

- » [Program Metadata Form](#)
- » [Project Metadata Form](#)
- » [Deployment Metadata Form](#)
- » [Dataset Metadata Form](#)

**Description**

The geochemistries of dissolved cobalt (Co) and iron (Fe) in the oceanic water column share several characteristics such as extremely low concentrations, redox chemistry, low solubility, and utilization as micronutrients by marine microbes. Iron has been the subject of considerable research focus in recent years due to its role in limiting phytoplankton productivity in oceanic and coastal upwelling environments. Cobalt has been much less studied, but recent data show it may be important in influencing primary productivity or phytoplankton community composition in certain geographical areas.

The CoFeMUG project predated GEOTRACES, so while it is not formally recognized as a GEOTRACES section, it is considered a GEOTRACES-related project and the CoFeMUG data are GEOTRACES compliant.

State-of-the-art geochemical and molecular biological techniques were used to address biogeochemical questions in the South Atlantic, and focus especially on the two trace metals, cobalt and iron. The 27-day cruise in November and December 2007 to the South Atlantic was designed to study cobalt and iron biogeochemistry and focus on four major hypotheses.

Scroll down that page and expand the Dataset Collections section.

- ▼ **More Information**
  - ▶ **Funding**
  - ▶ **Dataset Collections**
  - ▶ **Data Management Plan**
  - ▶ **Deployments**
  - ▶ **Project Coordinators**

Select the data set of interest from the list. For this example, choose “nutrients and metals”. URL: <http://www.bco-dmo.org/dataset/3233>

▼ **More Information**

▶ **Funding**

▼ **Datasets**

- 16S rRNA clone library
- cruise\_report
- event\_log
- Fe Speciation
- INVENTORY
- Metaproteome
- nutrients and metals
- Pigments

▶ **Deployments**

▶ **Project Coordinators**

### Dataset: nutrients and metals

[Get Data](#) [Map It](#)

<b>Project:</b> Cobalt, Iron and Micro-organisms from the Upwelling zone to the Gyre (CoFeMUG)
<b>Principal Investigator:</b> <a href="#">Dr Mak Saito</a> (Woods Hole Oceanographic Institution, WHOI)
<b>BCO-DMO Data Manager:</b> <a href="#">Shannon Rauch</a> (Woods Hole Oceanographic Institution, WHOI BCO-DMO)
<b>Validated:</b> Yes
<b>Data version:</b> 7 October 2009
<b>Version Date:</b> 03/20/2013
<b>Data URL:</b> <a href="http://www.bco-dmo.org/dataset/3233/data">http://www.bco-dmo.org/dataset/3233/data</a>
<b>Current State:</b> Final no updates expected

Expand/Collapse All

▼ **Description**

**Brief Description:** Analysis of nutrients, Cobalt (total and labile), dissolved Iron, and dissolved Manganese from TM bottle samples.

Analysis of nutrients, Cobalt (total and labile), dissolved Iron, and dissolved Manganese of water samples drawn from Trace Metal Rosette (TMR) bottle casts.

**Related Publications:**

Noble, A.E., C. H. Lamborg, D. C. Ohnemus, P. J. Lam, T. J. Goepfert, C. I. Measures, C. H. Frame, K. L. Casciotti, G. R. DiTullio, J. Jennings, M. A. Saito. 2012. Basin-scale inputs of cobalt, iron, and manganese from the Benguela-Angola front to the South Atlantic Ocean. *Limnology and Oceanography*, 57(4) 989-1010. doi:[10.4319/lo.2012.57.4.0989](https://doi.org/10.4319/lo.2012.57.4.0989)

Sohm, J. A., J. A. Hilton, A. E. Noble, J. P. Zehr, M. A. Saito, and E. A. Webb. 2011. Nitrogen fixation in the South Atlantic Gyre and the Benguela Upwelling System. *Geophys. Res. Letters*. 38: L16608, doi:[10.1029/2011GL048315](https://doi.org/10.1029/2011GL048315)

▶ **Acquisition Description**

From the dataset display page, expand the **Deployments** section to see the cruises during which the nutrients and metal data were collected.

▶ **Funding Sources**

▼ **Deployments**

Deployment	Synonyms	Start Date	Platform	Investigator	
KN192-05	CoFeMUG KN192-5	16 Nov 2007	R/V Knorr	Dr Mak Saito (Chief Scientist)	<a href="#">data info</a>

▶ **Instruments**

▶ **Parameters**



These data were collected on one cruise, KN192-05. If data were collected on multiple deployments, all deployment names would be listed here (e.g. cruises, moorings, floats, gliders, etc.). To see more information about the cruise, including a description and other available data, one could click on the deployment name.

However, we want the data ...

For this dataset there are two choices: [GetData](#) and [Map It](#) displayed near the top of the page. At this point, please click the [GetData](#) button to access these data online.

Browser displays URL: [http://data.bco-dmo.org/jg/serv/BCO/CoFeMUG/KN192-5/nutrients\\_metals.html](http://data.bco-dmo.org/jg/serv/BCO/CoFeMUG/KN192-5/nutrients_metals.html) in another window or browser tab depending on the browser configuration.

## /BCO/CoFeMUG/KN192-5/nutrients\_metals ---- Level 0

Directory
Documentation
Download & Other Operations

Level 0
Next Level
Flat Listing

```

# Nutrients and metals from TMR casts
# CoFeMUG cruise KN192-05
# PI: Mak Saito (WHOI)
# Version: 20 March 2013
# Notes: 'lt' = 'less than'; refer to documentation for flag definitions.
=====
cruise_id
-----
KN192-5

```

Click on the blue cruise ID at level 0 to expand the data display. Then, click on a station number to see the data for that station.

## /BCO/CoFeMUG/KN192-5/nutrients\_metals --cruise\_id eq KN192-5,sta eq 20-- Level 2

Directory
Documentation
Download & Other Operations

Level 0
Next Level
Flat Listing

```

# Nutrients and metals from TMR casts
# CoFeMUG cruise KN192-05
# PI: Mak Saito (WHOI)
# Version: 20 March 2013
# Notes: 'lt' = 'less than'; refer to documentation for flag definitions.
=====
cruise_id
-----
KN192-5
=====
sta lat lon lon_360 depth_w
-----
20 -17.500 11.250 11.25 720
=====
depth ev_code run_id cast date year mon day time NO3_NO2 NO3_NO2_flag PO4 PO4_flag SiO4 SiO4_flag NO2 NO2_flag NH4 NH4_flag
-----
11 TMR41 MS0822B 41 20071206 2007 12 06 1724 21.90 1 1.431 1 3.12 1 0.786 1 0.175 1
29 TMR41 MS0822B 41 20071206 2007 12 06 1724 22.92 1 1.579 1 3.79 1 0.866 1 0.292 1
70 TMR41 MS0822B 41 20071206 2007 12 06 1724 25.32 1 1.723 1 4.93 1 0.919 1 0.400 1
150 TMR41 MS0822B 41 20071206 2007 12 06 1724 29.09 1 2.056 1 11.35 1 0.696 1 0.200 1
190 TMR41 MS0822B 41 20071206 2007 12 06 1724 30.60 1 1.958 1 10.88 1 0.101 1 0.117 1
239 TMR41 MS0822B 41 20071206 2007 12 06 1724 32.94 1 2.095 1 11.57 1 0.043 1 0.133 1
299 TMR41 MS0822B 41 20071206 2007 12 06 1724 36.13 1 2.258 1 15.23 1 0.054 1 0.108 1
400 TMR41 MS0822B 41 20071206 2007 12 06 1724 39.26 1 2.525 1 18.44 1 0.017 1 0.142 1
600 TMR41 MS0822B 41 20071206 2007 12 06 1724 39.75 1 2.623 1 27.16 1 0.041 1 0.000 1

```

## Explanation of buttons in the data system:

<b>Directory</b>	displays (returns to) the Data Directory listing for this cruise
<b>Documentation</b>	displays the supporting documentation for this dataset
<b>Data Display</b>	returns to data display from documentation display
<b>Download &amp; Other Operations</b>	options for download, sub-setting and reformatting of data
<b>Level 0</b>	returns to level 0
<b>Next Level</b>	expands the data to the next level of detail
<b>Flat Listing</b>	displays one record per line of the current level of data

Now that we've seen the data, let's look at it on a map. Return to the previous browser window (or tab) with the display of dataset metadata.

URL: <http://www.bco-dmo.org/dataset/3233>

Click the **Map It** button to launch the MapServer GIS for this dataset. The browser opens a new window or tab, and the display should look similar to this for URL: <http://mapservice.bco-dmo.org/mapserver/maps-ol/index.php?datasetId=3233>

The screenshot displays the BCO-DMO MapServer Geospatial Interface. The top navigation bar includes the BCO-DMO logo, the title "MapServer Geospatial Interface", and links for "Contact", "Help", and "NSF Acknowledgment".

The main interface is divided into several sections:

- BCO-DMO repository:** Contains search options: "BROWSE map", "KEYWORD search", "ADVANCED search", and "Start over". A "Quick find: enter a deployment name" search bar is also present.
- Available programs:** A table listing programs and their counts:
 

Name	#
ASCOS	1
CAMEO	1
CoML	91
Dimensions of Biodiversity	0
ETBC	4
FeSynth	15
GoMX - DHOS	17
Historical	11
- Available projects:** A table listing projects and their counts:
 

Name	#
ACIDIC	3
Active bacteria in surface waters	1
AESOPS	16
Aleutian Archipelago	0
ALEX-GoME	38
AMT	0
- Available deployments:** A table listing deployments:
 

Name
KN192-05
- Visible deployments:** A panel titled "Visible deployments" with a checkbox "Highlight selected deployments on map?". It shows a list of deployments:
 

Deployment
KN192-05 (CoFeMUG)
- Map:** A map of the Atlantic Ocean showing the deployment track (pink line) along the coast of Africa. The map includes a coordinate grid and labels for "Brazil Basin", "Angola Basin", "Atlantic Ridge", and "Cape Verde Ridge".
- Datasets:** A panel titled "Datasets" with tabs for "Available datasets" and "Mapped datasets". It shows a list of datasets:
 

Dataset	Deployment
nutrients and metals	KN192-05

Some things to notice on the map shown on the previous page:

- The KN192-05 cruise track, with the map zoomed in to the area of the cruise.
- The MapServer is in “BROWSE map” mode (shown at top left).
- Because we launched the MapServer from the text-based data discovery system, the only “Available deployment” (in the right-most panel directly above the map) is KN192-05, the only deployment contributing data to this dataset.
- The “Map options” button (upper right-hand corner of the map panel) provides options for changing the map display (e.g. base map, projection, etc.) and printing the map. Note the small button to maximize the map window above the “Map options” button.

Once again, there are many ways to access additional information from this display:

- Clicking the + box to the left of the KN192-05 cruise ID in the “Available deployments” or “Visible deployments” panels, displays metadata about that cruise including a link to the cruise report if one is available.
- In the “Visible deployments” panel (in the top-right corner of the window), right click on the cruise ID to display available options for that cruise.

“Datasets” panel (lower right panel):

- Clicking on the + symbol in the green circle, or anywhere on the row with the dataset name (nutrients and metals), requests that this dataset be ‘mapped’.

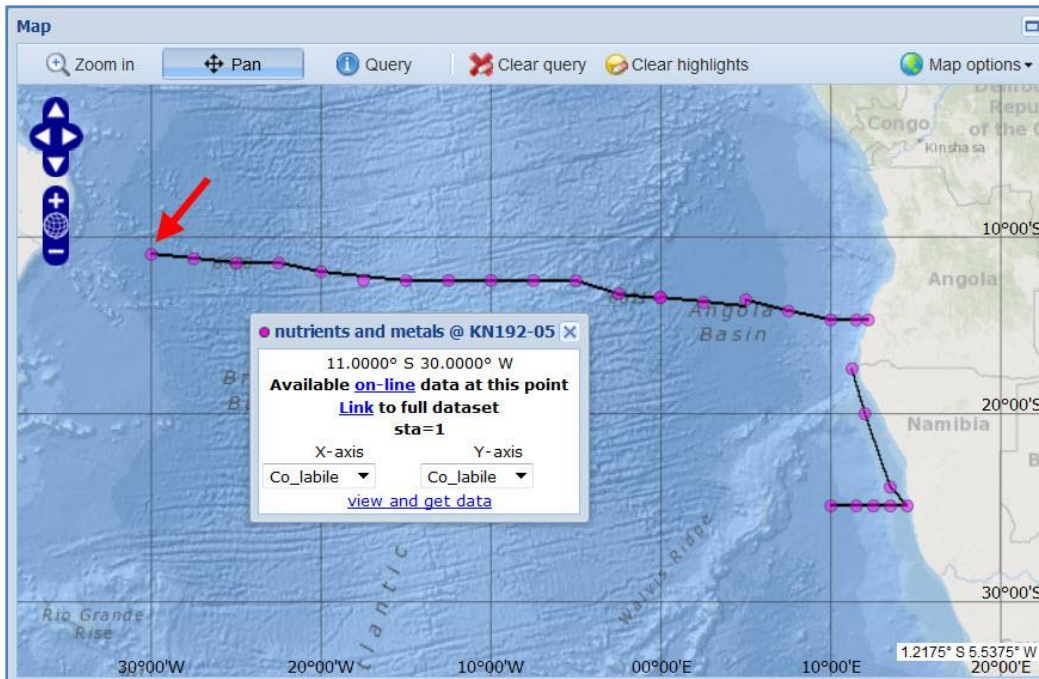
Try it ... small colored points will appear on the map, and the Datasets panel on the right has shifted to a display of “Mapped datasets” tab. The single mapped dataset is listed, with a color-coded point, the dataset name (nutrients and metals), a number (28) that indicates the number of sampling locations included in this dataset, from the selected cruise (KN192-05).

Once again, we have several ways to get more information: Right-clicking anywhere on the text in the row with the dataset name pops up a menu with several options:

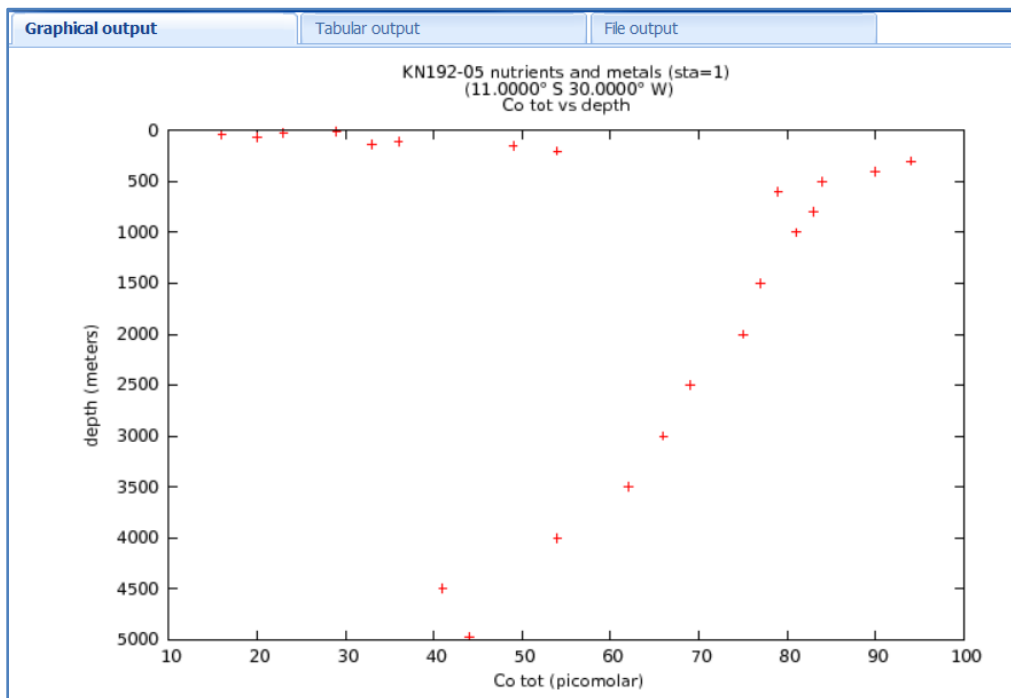
- “View/export mapped dataset” shows a tabular listing of the sampling locations, with options for data export;
- “View mapped dataset on-line” opens the full dataset online;
- “Choose a color” allows you to change the point color;
- “MapServer link to mapped dataset” gives you the ability to save/bookmark the MapServer link to this dataset (for later access)
- “Remove mapped dataset” removes this dataset from the map (removes the points). Note that unchecking the box to the left of the dataset name temporarily removes the dataset. Checking the box again displays them.

The line underneath the dataset name shows more options/information for each dataset (different options are available depending on the data type).

The MapServer also provides the ability to generate ‘quick view’ plots of the data at a sampling location. On the map, select the point for station 1 (the western-most point indicated by the red arrow in the following figure), to bring up a dialog box that offers: links to the data from the database and a way to select variables from the dataset to generate a ‘quick view’ X-Y plot. (If the dialog box ever gets in the way, just move it aside.)



Choose 'Co\_tot' for the X-axis and 'depth' for the Y-axis. Click “view and get data” at the bottom of the box to generate the plot of total Cobalt concentration vs. depth.



Notice once again, several tabs at the top make it easy to view a tabular list of the data in the graph or download the data from the “File output tab”. Close the graph.

(Note: this dataset has the option to plot data from multiple stations, as indicated by the line stating “Plot multiple records by sta on one graph.” under the dataset name in the “Mapped datasets” panel. This function will be demonstrated in part 3 of this tutorial.)

## Data access: MAP BROWSE

**Scenario 2: You are interested in data from a particular geographic region.**

Go to: <http://bcodmo.org/> the BCO-DMO home page

At the bottom of the DATABASE column on the left, click on the GEOSPATIAL ACCESS map.



The MapServer system map showing all the deployments from the BCO-DMO database opens in a new window or tab.



The screenshot displays the BCO-DMO MapServer Geospatial Interface. The interface is divided into several sections:

- BCO-DMO repository:** Includes search options (BROWSE map, KEYWORD search, ADVANCED search) and a search bar.
- Available programs, projects, and deployments:** Three tables listing various programs, projects, and deployments with their respective counts.
- Visible deployments:** A list of visible deployments with a checkbox to highlight selected deployments on the map.
- Datasets:** A section for available and mapped datasets, including a group by dropdown and a remove all button.
- Map:** A world map showing deployment locations marked by colored lines and symbols. The map includes a zoom in button, pan, query, clear query, clear highlights, and map options.

A common way to use the MapServer GIS is to define a region of interest on the map.

For example: you are interested in phytoplankton blooms in the North Atlantic.

The colored lines represent cruise tracks; triangular symbols represent fixed sampling sites (e.g. mooring locations or time-series sites).

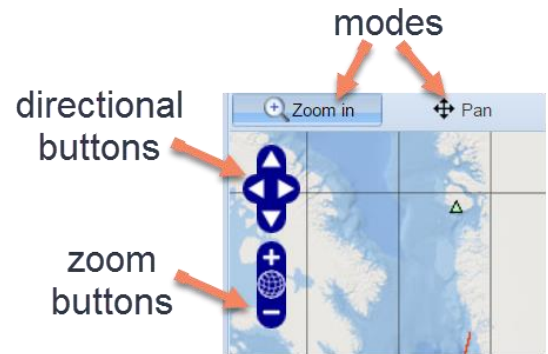
### Navigating the Map:

You can use the navy blue navigation buttons at any time to pan and zoom.

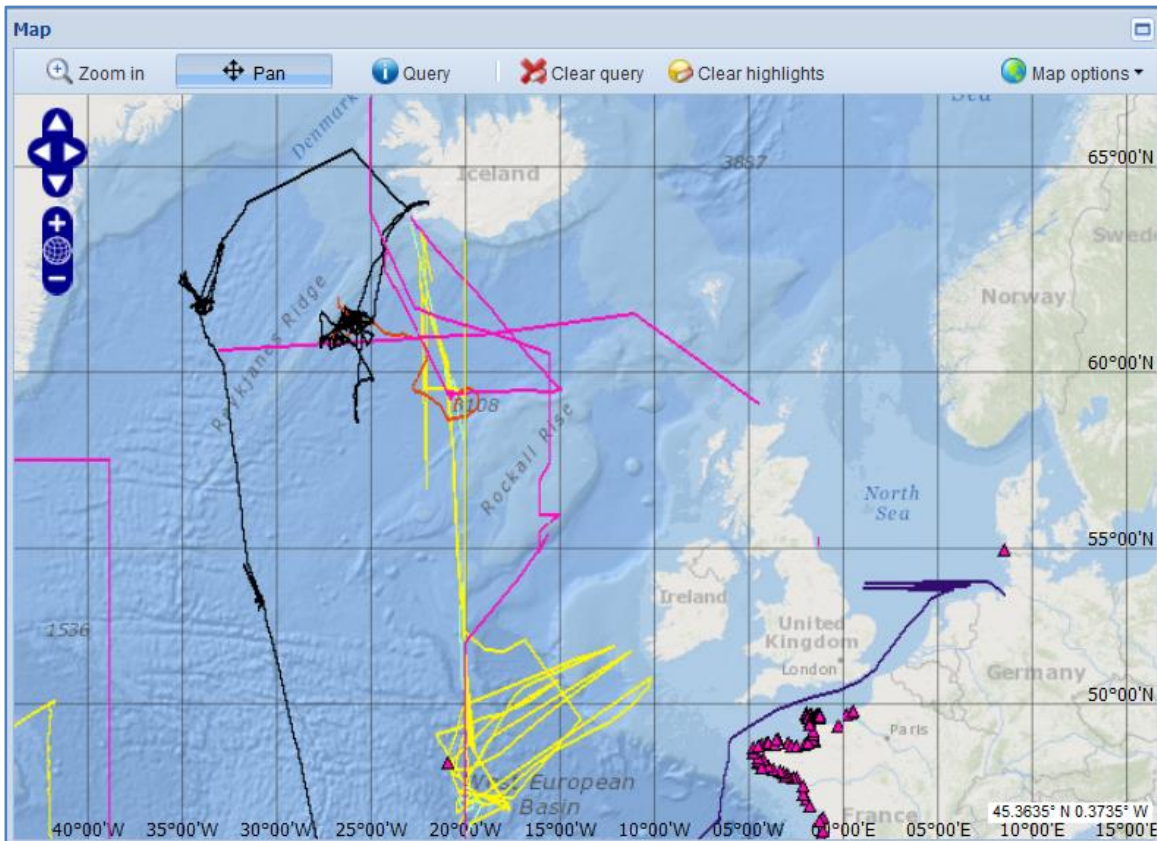
The two modes “Zoom in” and “Pan” change the behavior of mouse clicks.

Try clicking the button with the text “Zoom in.” Then click and drag to define a selection box on the map.

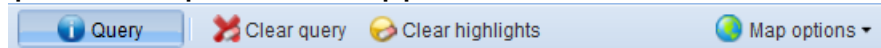
The mouse scroll wheel will zoom in or out on the map. After one use of the Zoom in mode, it will revert to Pan mode. Using the mouse scroll wheel also activates Pan mode. While in pan mode you can click+hold and drag to move the map in any direction.



Position the map until it looks something like the screen shot below just west of Europe (between the Labrador and North Sea in the vicinity of Ireland (50° N 20° W).



There is a lot of information displayed on this map and in the associated panels. We notice an assortment of cruise tracks (colored lines) and fixed sampling locations (colored triangles). The map system offers several tools for figuring out what is being shown on the map. The map controls appear in a tool bar above the map.



To find out what cruises these are, use the Query tool (click on the Query button now). Then click on a colored item on the map. For example, click on the cruise track southwest of Ireland (in the image below, this is the green line with the red X on it).

A new “Query results” window will pop-up on the map, identifying the deployment name, platform, location, and dates.

The screenshot shows the BCO-DMO MapServer Geospatial Interface. The top navigation bar includes 'BCO-DMO repository', search options (BROWSE map, KEYWORD search, ADVANCED search), and a 'Quick find' field. Below are three panels: 'Available programs', 'Available projects', and 'Available deployments'. The 'Map' panel shows a map of the North Atlantic Ocean with a query results window open. The query results window displays the following information:

Field	Value
location	U.S. JGOFS North Atlantic
end_date	1989-06-03
deployment_name	Aircraft_P3_NABE
start_date	1989-04-26
platform_name	NASA P3 aircraft
	<a href="#">single-out deployment</a>

The 'Visible deployments' panel on the right lists various deployment names, and the 'Datasets' panel shows 'Available datasets' and 'Mapped datasets'.

The results of the Query tool indicate that the selected navigation track is from a deployment called “Aircraft\_P3\_NABE”. The results window also reveals that this track is from a NASA P3 aircraft flight. In the results box, you could click on “single-out deployment” to remove all other deployments from the map and show only the one identified.

But let’s find some data...

Zoom in closer to the area around Iceland (as shown below).

Click the “Query” button and then click on the cruise track southwest of Iceland (the light green line next to the arrow cursor on the map).



The screenshot shows the BCO-DMO MapServer Geospatial Interface. The top navigation bar includes 'Contact', 'Help', and 'NSF Acknowledgment'. The main interface is divided into several panels:

- Available programs:** A table listing programs like ASCOS, CAMEO, CoML, etc.
- Available projects:** A table listing projects like ACIDIC, Active bacteria in su..., AESOPS, etc.
- Available deployments:** A table listing deployments like A16N (RB-03-04B), A16N (RB-03-04C), AAB704, etc.
- Visible deployments:** A list of deployments with a context menu open over 'KN193-03'. The menu options are: Single-out deployment, Zoom to deployment, View deployment metadata, Export deployment as KML, and MapServer link to deployment.
- Datasets:** A table showing datasets for deployment KN193-03, including Calibration Reports - NAB08, Cruise Track, CTD 1m averaged profiles, CTD full resolution profiles, and Niskin Bottle Hydrography.
- Map:** A map of the North Atlantic region showing deployment tracks and geographical features like the Rockall Ridge and Denmark Strait.

Click on the Query tool, then click on this deployment to identify it.

This deployment is identified as KN193-03 (as shown in the below).

The screenshot shows the BCO-DMO MapServer Geospatial Interface with the 'Query results' dialog box open. The dialog box displays the following information:

- location:** subpolar North Atlantic, Iceland Basin, 60.7 to 61.7 degrees N, 25 to 27.7 degrees W
- description:** A three-week process cruise on the R/V Knorr operated in the vicinity of five autonomous platforms that had been deployed in early April by another vessel. A total of 10 simultaneous float and CTD calibration profiles were taken to calibr more...
- end\_date:** 2008-05-22
- deployment\_name:** KN193-03
- start\_date:** 2008-05-01
- platform\_name:** Knorr
- single-out deployment:** [single-out deployment](#)

Right click on the KN193-03 line in the Visible deployments panel (see image above), and select “View deployment metadata”.

This opens up a new browser window or tab with a view of the deployment metadata/documentation (shown on the next page).

View of KN193-03 deployment (cruise) metadata (documentation) retrieved by the MapServer from the BCO-DMO database.

The screenshot displays the BCO-DMO website interface. At the top, the logo 'BCO-DMO' is accompanied by the text 'Biological & Chemical Oceanography Data Management Office'. Navigation buttons for 'HOME', 'DATA', 'RESOURCES', and 'ABOUT US' are visible. On the left, a 'DATABASE' sidebar lists various categories with counts: Programs (28), Projects (352), Deployments (1916), Datasets (6943), Instruments (345), Parameters (1315), People (1519), Affiliations (378), Funding (59), and Awards (785). Below this is a 'GEOSPATIAL ACCESS' section with a world map showing deployment tracks. The 'CONTRIBUTE DATA' section includes links for 'Getting started', 'How-to Guide', 'FAQs', and 'Metadata Forms (.rtf files)'. The main content area is titled 'Deployment: KN193-03' and includes a 'Map It' button. The deployment details are as follows:

<b>Deployment:</b> KN193-03
<b>Chief Scientist:</b> Dr Mary Jane Perry (University of Maine, U Maine DMC)
<b>Contact:</b> Dr Ivona Cetinic (University of Maine, U Maine DMC)
<b>Synonyms:</b> NAB08 Process Cruise
<b>Coordinated Deployments:</b> B4-2008 B10-2008 Biofloat_48 SG140 SG141 SG142 SG143 B9-2008
<b>Platform:</b> R/V Knorr
<b>Platform Type:</b> vessel
<b>Start Date:</b> 05/01/2008
<b>End Date:</b> 05/22/2008
<b>Location:</b> subpolar North Atlantic, Iceland Basin, 60.7 to 61.7 degrees N, 25 to 27.7 degrees W

Below the table is a 'Description' section:

▼ **Description**

A three-week process cruise on the R/V Knorr operated in the vicinity of five autonomous platforms that had been deployed in early April by another vessel. A total of 10 simultaneous float and CTD calibration profiles were taken to calibrate sensors on the Lagrangian mixed layer float (Biofloat 48) and to validate proxy measurements (i.e., optical attenuation to particulate organic carbon, etc.). One simultaneous Seaglider and CTD calibration profile was

Return to the map (the browser window with this URL address:

<http://mapservice.bco-dmo.org/mapserver/maps-ol/index.php>). Most likely this is in the browser tab that precedes the one you have been looking at with the deployment metadata (that looks like the screen shot above).

Now take the map out of Query mode by clicking on the “Pan” button (to the left of the “Query” button) and then click the “Clear query” button to remove the red X from the map.

Let’s see what data the 2008 North Atlantic Bloom Experiment (NAB 2008) investigators have shared from their KN193-03 cruise.

In the “Datasets” panel (in the lower right of the browser window), select the “CTD 1m averaged profiles” dataset from the list of available datasets from this cruise. Notice the points that appear on the map, which represent the CTD casts.

Zoom in until the spatial extent looks similar to the image below (some additional dialog windows from the next step have already been opened and are visible in the image below).

The screenshot displays the BCO-DMO MapServer Geospatial Interface. The main map shows the Aleutian Ridge with several CTD casts plotted as pink points. The interface is divided into several panels:

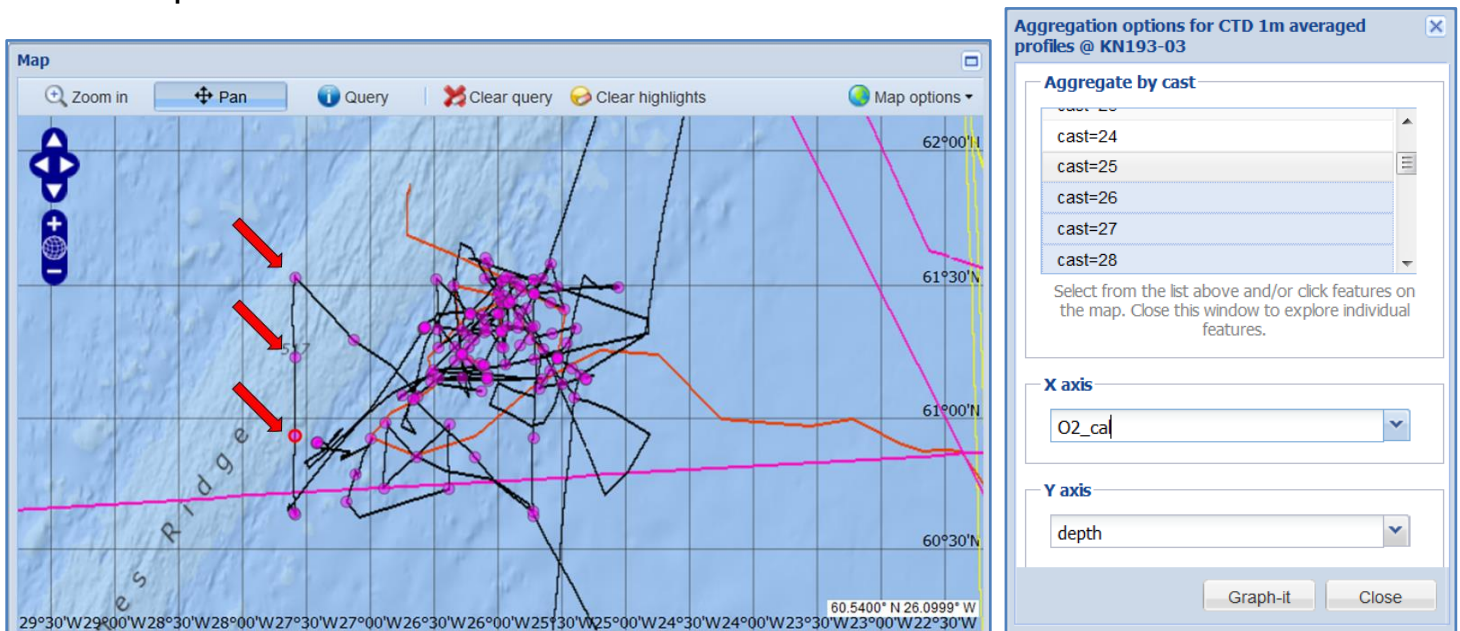
- Available programs:** A table listing programs like AON, ASCOS, BASIN, etc.
- Available projects:** A table listing projects like Arabian Sea Diapa..., ACIDIC, Active bacteria in s..., etc.
- Available deployments:** A table listing deployments like AA8704, AB\_63\_1, AB\_63\_2, etc.
- Visible deployments:** A list of deployments with checkboxes, including Biofloat\_48, EN198, FK003, KN193-03, and SJ0516.
- Datasets:** A panel showing available and mapped datasets. The selected dataset is "CTD 1m averaged profiles (133) @ KN193-03". A red circle highlights the option "Plot multiple records by cast on one graph."

This CTD dataset provides the option of making a graph containing data from multiple casts. In the “Mapped datasets” panel, click where indicated to create an aggregate graph by cast (circled in the image above).

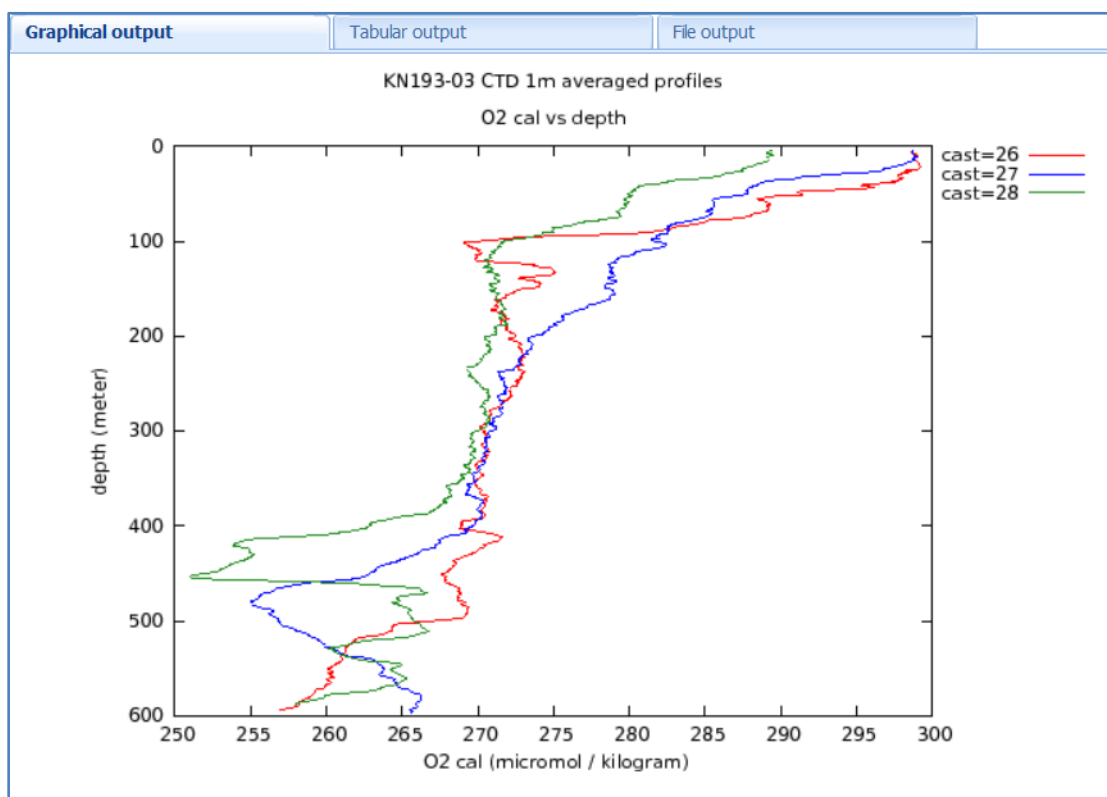
A window opens that allows you to choose the casts to include in the graph. Let’s make a graph of casts 26, 27, and 28. You can select stations in two ways:

1. Click on the points on the map. Each selected point will be highlighted in the aggregation options window; OR
2. Hold down the CTRL key and click on the station names in the aggregation options window.

Casts 26, 27, and 28 are indicated by the arrows in the image below. After selecting the stations (using either method), choose 'O2\_cal' for the X-axis and 'depth' for the Y-axis. The multiple plot options window should look like the image below. Then, click the "Graph-it" button.

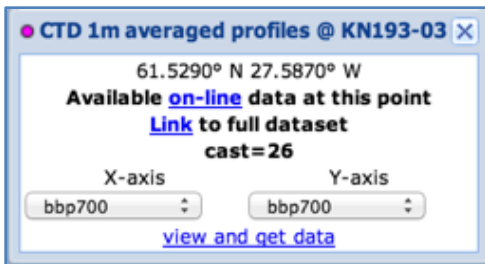


The resulting graph should look like the one below, where calibrated oxygen from 3 casts is plotted against depth. Each cast is represented by a different color, as indicated in the legend located in the upper right-hand corner.

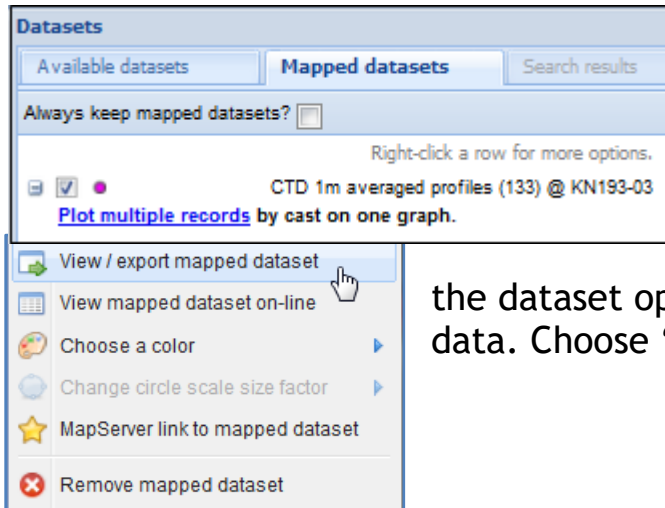


Close the graph and the aggregation options window.

The data can be downloaded using several different methods:



From the map, one can view the data from any selected point (“Available on-line data at this point”), or one can view all the records in the full data dataset (“Link to full dataset”).



Another option is to right click on the dataset line in the Datasets panel (to the right of the map display) - Mapped datasets tab.

Right clicking the dataset name brings up the dataset options menu, from which one can export the data. Choose “View/export mapped data”.

In addition to the data table display, one has the option to download the data as tab-separated values (TSV) or KML (Google Earth) formatted files.

Locate on map	On-line link	ID	cast	date	time
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=1	1	20080502 1905
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=2	2	20080504 1657
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=3	3	20080504 1921
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=4	4	20080504 2222
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=5	5	20080505 0227
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=6	6	20080505 0516
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=7	7	20080505 1002
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=8	8	20080505 1300
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=9	9	20080505 1639
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=10	10	20080506 0934
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=11	11	20080506 1118
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=12	12	20080506 1312
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=13	13	20080507 0847
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=14	14	20080507 1233
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=15	15	20080507 1546
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=16	16	20080507 2156
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=17	17	20080508 0209
<a href="#">center-map</a>	<a href="#">highlight</a>	<a href="#">link</a>	cast=18	18	20080508 0504

## Data access: ENHANCED SEARCH BAR

### Scenario 3: You are interested in data associated with a keyword.

BCO-DMO has a search bar available at the top of every page that is helpful for finding specific types of information.

The search is a very flexible tool that allows you to search by keyword, person, place, award, BCO-DMO ID number, and a variety of other parameters.

The screenshot shows the BCO-DMO website header with the logo and navigation buttons for DATA, RESOURCES, and ABOUT US. A search bar is highlighted with a red circle. Below the header is a 'DATABASE' section with a table of categories and counts, and a featured article titled 'Introduction to BCO-DMO' with a graphic and text about data impact.

DATABASE	
New Entry	
Programs	39
Projects	811
Deployments	2597
Platforms	548
Datasets	8740
Instruments	447
Parameters	1304

**RECENT DATASETS**

- OA Microbe Adaptation**  
05/25/2017  
Environmental and physical data associated with ocean acidification microbe adaptation.
- 13C Incubation Cell Counts**  
05/23/2017  
Counts of Prochlorococcus from on-deck incubations with <sup>13</sup>C-bicarbonate as part of DNA-SIP experiments

To test out the search function, enter your search terms in the Search text entry box.

For example, type in “chlorophyll” and click Search.

If you are interested in PROJECTS that generated a dataset associated with chlorophyll, then you can filter your results by selecting “Project” from the dropdown list of categories that appears in the box to the right of the search box. Multiple categories can be selected to expand the search.

The screenshot shows the BCO-DMO website with the search bar containing 'chlorophyll'. A dropdown menu is open, showing 'Project' selected. A red arrow points to the 'Project' dropdown. Below the search bar is a search result for a project titled 'Characterizing Biological Function Across A Persistent Oceanographic "Hotspot" In The NE Pacific Ocean'.

**Search**

chlorophyll Project x Search

**Characterizing Biological Function Across A Persistent Oceanographic "Hotspot" In The NE Pacific Ocean**

... "hotspot" that results from the mixing of high nutrient low **chlorophyll** waters with coastal iron rich waters. This project is appropriate ...

TYPE: PROJECT

Click Search and this will generate a list of all projects that include “chlorophyll” in their project descriptions.

Scroll down and click on the 4<sup>th</sup> project listed, titled “Mechanisms Of Nutrient Input At The Shelf Margin Supporting Persistent Winter Phytoplankton Blooms Downstream Of The Charleston Bump”

- On this page you will find information about the project such as funding, PIs, and a list of the datasets collected for this project.

## Search

### Characterizing Biological Function Across A Persistent Oceanographic "Hotspot" In The NE Pacific Ocean

... "hotspot" that results from the mixing of high nutrient low **chlorophyll** waters with coastal iron rich waters. This project is appropriate ...

TYPE: PROJECT

### Seasonal Evolution Of Chemical And Biological Variability In The Ross Sea

... salinity, winds, and current velocities) and biogeochemical (**chlorophyll**, productivity, micronutrients, higher trophic level standing ...

TYPE: PROJECT

### Climate Change And Upwelling -- Comparative Analysis Of Current And Future Responses Of The California And Benguela Ecosystems

... and oceanographic conditions, seabird demography, and lower (**chlorophyll**) and mid (forage fish) trophic data. The project will determine ...

TYPE: PROJECT

### Mechanisms Of Nutrient Input At The Shelf Margin Supporting Persistent Winter Phytoplankton Blooms Downstream Of The Charleston Bump

... off Long Bay are observed in winter in multi-year satellite **chlorophyll** imagery. This section of the shelf lies north of the "Charleston ...

TYPE: PROJECT

## Click “Expand/Collapse All”

## Project: Mechanisms of nutrient input at the shelf margin supporting persistent winter phytoplankton blooms downstream of the Charleston Bump

**Acronym/Short Name:** Long Bay Wintertime Bloom

**Project URL:** [Project Web Site](#) 

**Start Date:** 2010-10

**End Date:** 2015-09

**Geolocation:**

outer South Atlantic Bight (SAB) continental shelf off Long Bay

**Datasets:** 45

**Collections:** 12

**Deployments:** 14

**Cruises:** 5

**Glider:** 6

**Mooring:** 3

**Programs:** Unaffiliated

[Expand/Collapse All](#)



Scroll down to the section labeled “Dataset Collections”. This section has a list of all the data from this project currently online through BCO-DMO.

▼ **Dataset Collections**

Dataset Short Name	Full Dataset Title
<a href="#">LB_2012_Glider_CTD</a>	CTD data from gliders on the R/V Savannah in the South Atlantic Bight (SAB) continental shelf off Long Bay (-79W, 32N; -77W, 34 N) collected from January to April 2012 (Long Bay Wintertime Bloom project)
<a href="#">LB_2012_Ship_Ch1</a>	Chlorophyll and pheopigments from filtered water samples from R/V Savannah cruises in the South Atlantic Bight (SAB) continental shelf off Long Bay, January-April 2012 (Long Bay Wintertime Bloom project)
<a href="#">LB_2012_Ship_CTD-Optics-O2</a>	Vertical CTD profiles, bin-averaged, and downcast from the R/V Savannah cruises in the South Atlantic Bight (SAB) continental shelf off Long Bay (-79W, 32N; -77W, 34 N) (Long Bay Wintertime Bloom project)
<a href="#">LB_2012_Ship_Nuts</a>	Long Bay ship macronutrient concentrations from R/V Savannah (SAV-12-03, SAV-12-05, SAV-12-11) cruises in the South Atlantic Bight (SAB) continental shelf off Long Bay during 2012 (Long Bay Wintertime Bloom project)

Since we are interested in chlorophyll data, click the dataset called “LB\_2012\_Ship\_Ch1.”

From the “LB\_2012\_Ship\_Ch1” dataset landing page you can view the data, map it, and review the corresponding methodology.



## Glossary of Terms

BCO-DMO	Biological and Chemical Oceanography Data Management Office <a href="http://bcodmo.org/">http://bcodmo.org/</a>
GIS	Geospatial Information System; a map system to display spatial data
MapServer	Open Source software for publishing spatial data and providing interactive mapping applications via the Web <a href="http://mapserver.org/">http://mapserver.org/</a>
OCB	Ocean Carbon and Biogeochemistry research program <a href="http://www.us-ocb.org/">http://www.us-ocb.org/</a>
US GLOBEC	GLOBal Ocean ECosystems Dynamics research program <a href="http://www.usglobec.org/">http://www.usglobec.org/</a>
US JGOFS	United States Joint Global Ocean Flux Study <a href="http://usjgofs.whoi.edu/">http://usjgofs.whoi.edu/</a>

## Acknowledgments

The MapServer interface is a custom implementation of the Open Source MapServer software developed at the University of Minnesota. The BCO-DMO MapServer system is the result of collaboration between programmer Charlton Galvarino (Second Creek Consulting, Columbia, SC) and BCO-DMO staff members. In particular, BCO-DMO marine biology data specialist, Dicky Allison led this development effort. Funding for this work is provided by the National Science Foundation Division of Ocean Sciences and the Office of Polar Programs.

## Follow BCO-DMO:



[info@bcodmo.org](mailto:info@bcodmo.org)



[@BCODMO](https://twitter.com/BCODMO)



<https://www.youtube.com/user/BCODMO>

