How to Use the Ocean Explorer Digital Atlas

NOAA Ocean Explorer missions are always full of surprises, because they often occur in places where literally no one has gone before. To help share the excitement of ocean exploration, NOAA's National Coastal Data Development Center (NCDDC) provides a map-based atlas that links to information about past expeditions of NOAA's Ocean Explorer program that began in 2001 (see the Ocean Exploration Digital Atlas at *http://www.ncddc .noaa.gov/website/google_maps/OE/mapsOE.htm*). This atlas is an excellent teaching tool to orient students to expedition locations and provide experiences exploring data and associated discoveries from specific expeditions.

This Supplement describes how geographical and mapping data marry with expedition website data and selected interactive scene files from key discoveries. The Digital Atlas can be used to obtain information about past NOAA Ocean Explorer expeditions, education resources associated with the expeditions, ship tracks, bathymetric maps, dive tracks, and more.

The following example shows how the Digital Atlas can be used to find out exactly where specific expeditions were taking place and information about discoveries, and shares methods for exploring scientific data collected by the ship. Begin here and then, to explore additional explorations using the digital atlas and seafloor structures using the Fledermaus software, try the additional activities focused on other seafloor features linked at the end of this supplement.

In preparation for using Fledermaus in the supplements, you will need to download the free iView4D software from *http://www.qps .nl/display/main/download*. You will need to fill in the contact form, then select the version appropriate to your operating system (Windows, Mac, and Linux versions are available; this download may take some time, so plan ahead!).

A screen grab from the map on the Digital Atlas web site. The database can be searched by Expedition, Year, Theme, Text or Custom Search.
https://www.ncddc.noaa.gov/website/google_maps/OE/mapsOE.htm

**INDEX-SATAL Expedition 2010**
Kawio Barat Volcano

This *Digital Atlas* exploration is a supplement to the *Watching in 3D* lesson.

1. Open the Ocean Explorer Digital Atlas at *http://www.ncddc.noaa .gov/website/google_maps/OE/mapsOE.htm*

2. In the left column click on the Search by Text tab at the bottom. In the text box type Indonesia. The dots that will appear on the map are the *Okeanos Explorer* expeditions in the Pacific region in 2010.
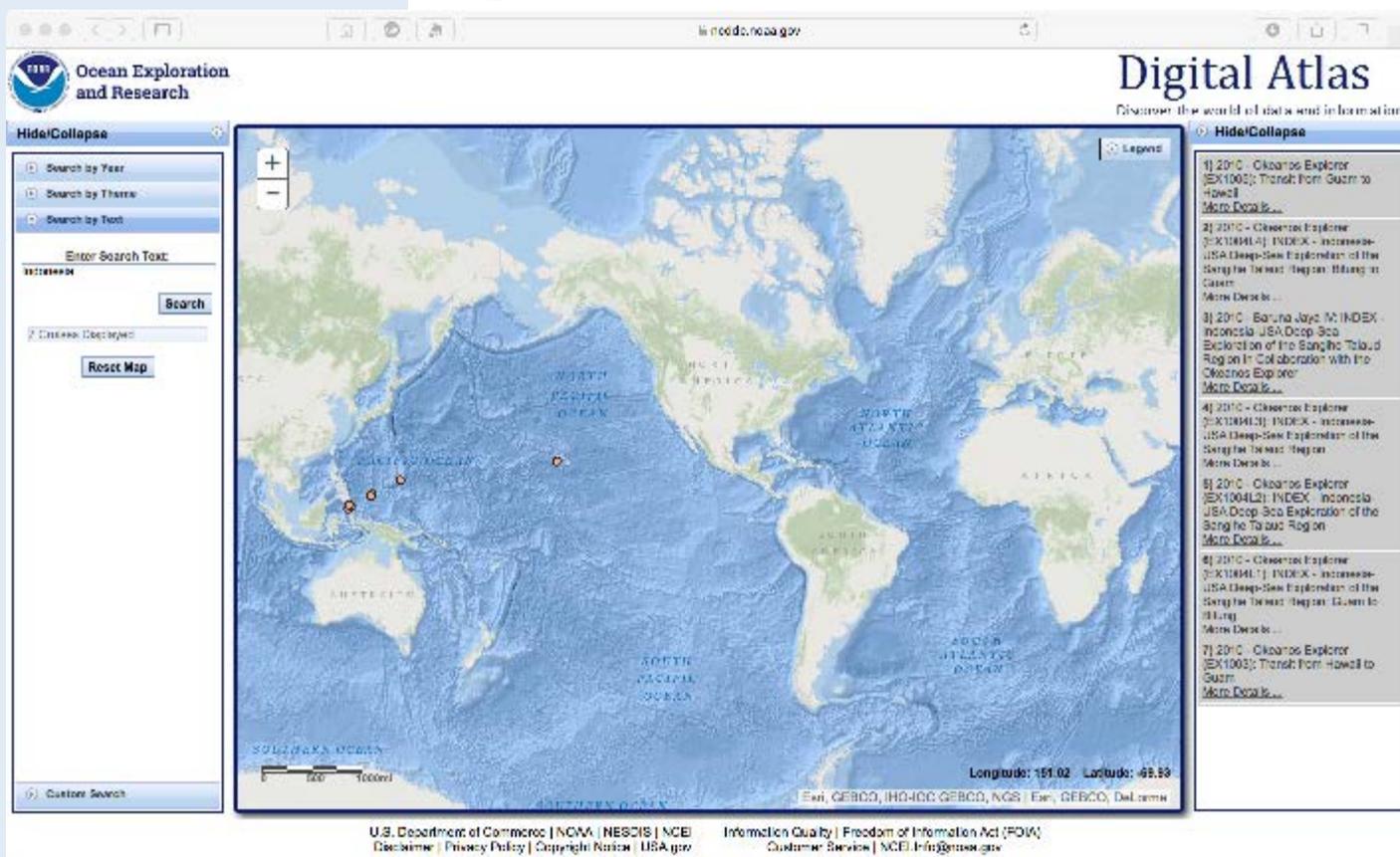

3. In the column on the right, find the 2010 *Okeanos Explorer* INDEX-Indonesia-USA Deep-Sea Exploration of the Sangihe Talaud Region (EX100402). This is #5 in the list. Tell students that cruises are named with an abbreviation of the ship name ("EX" is used as an abbreviation for *Okeanos Explorer*), the last two digits of the year in which the cruise took place ("10"), the number of the cruise (this was the fourth cruise for 2010), and the segment or leg (this was the second leg of cruise 04). Click on this cruise and you will see a pop up box as illustrated in the figure on the next page.

Notice the tabs provided at the top of the pop up window. For educator information related to this cruise click on the Education tab. This will take you to several educational resources
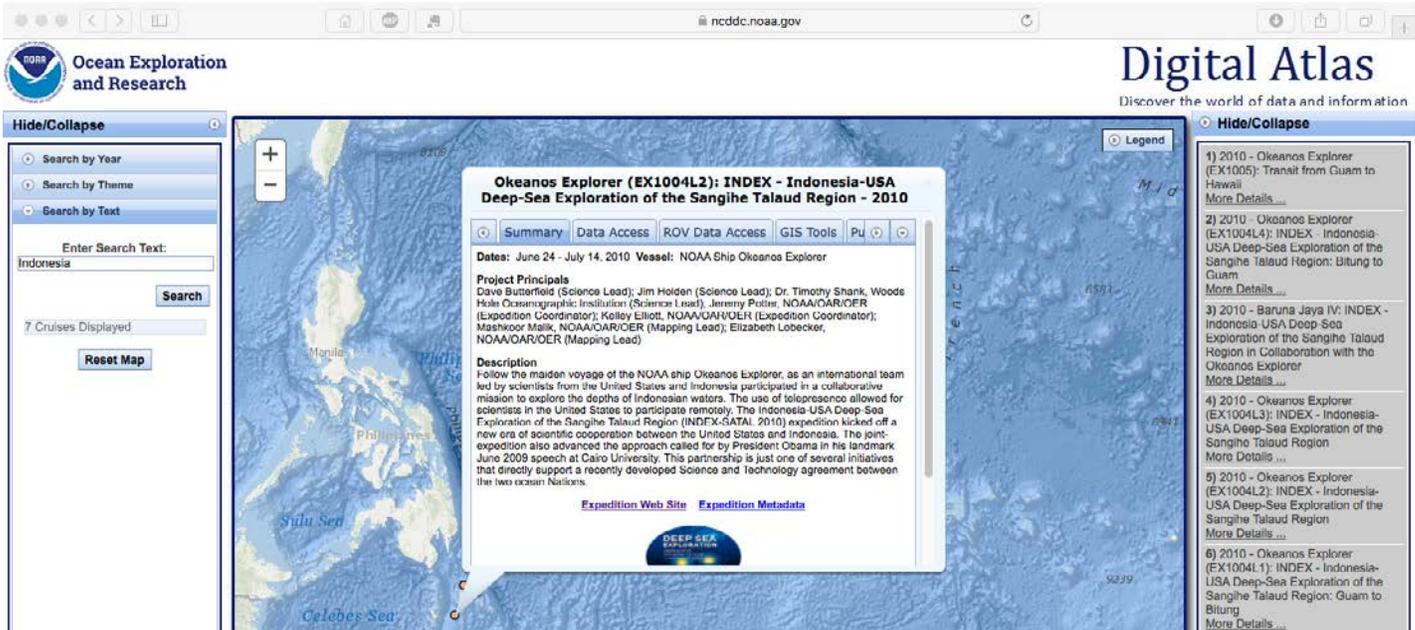
available on the Ocean Explorer website related to this expedition including an Expedition Education Module, which provides background information, lessons, and more resources associated with the expedition.

4. Now click on the **GIS Tools** tab in the pop up window, select the first four boxes (see screen shot at right), and click **Plot on Map**. Give the map a moment to load and what appears should look like the figure below. This shows the ship's entire cruise track and the bathymetric mapping work done throughout the expedition. Point out the light pink lines, which show the ship's track, and ask students why the ship seems to be tracking back and forth. Explain to students that the first step in the ship's exploration strategy is mapping and that the ship is obtaining high-resolution multibeam maps of the area being explored (this is called "mowing the lawn," for obvious reasons). The stars are locations where the Remotely Operated Vehicle (ROV) dove during this expedition.
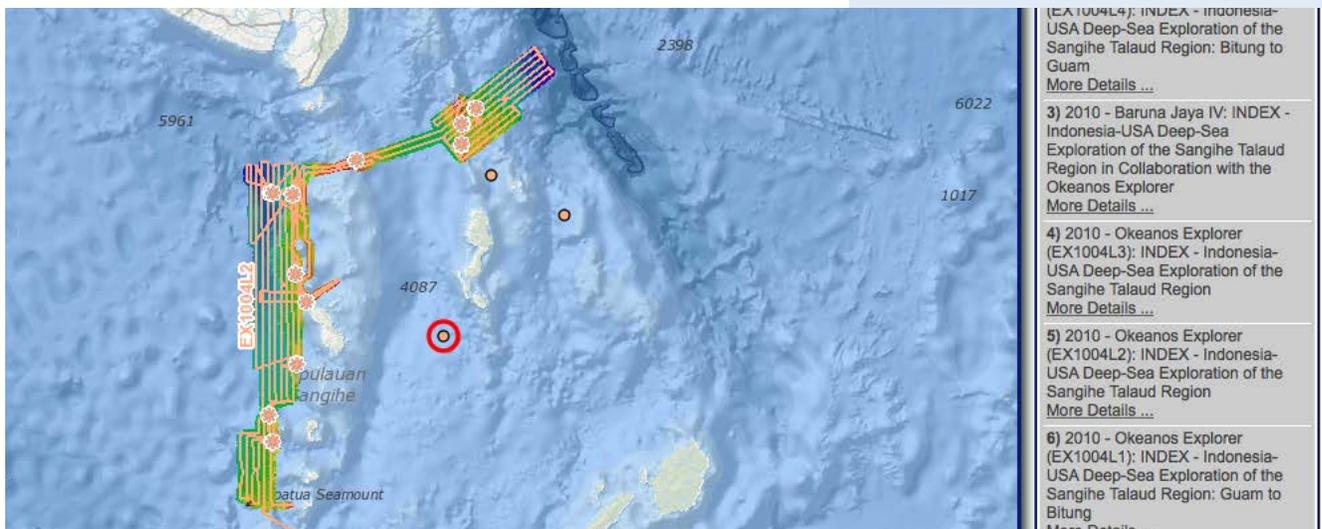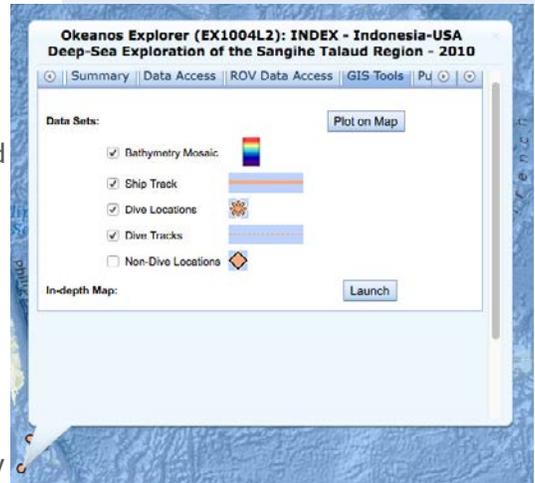
5. Using the center mouse button, zoom in until you see the names of the dives appear. Look for EX1004L2 Dives 1 and 2. (Latitude 4.69, Longitude 125.08) Hint: Hold the left mouse button down to move the map around.
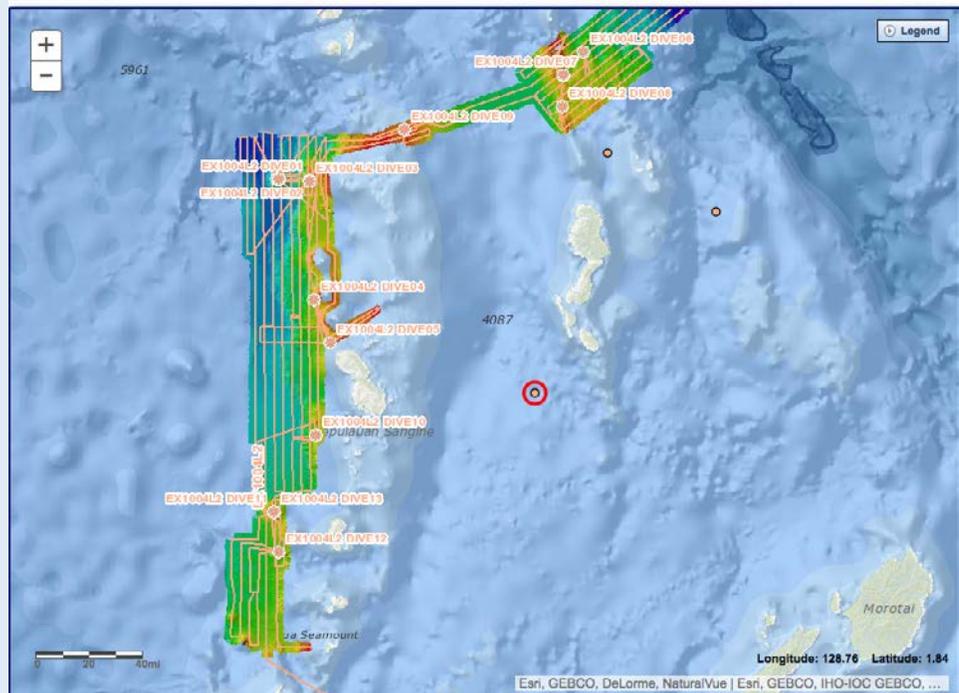
6. Zoom in closer until you see the formation of a seamount at these two dive sites. Your screen should look something like the image below.
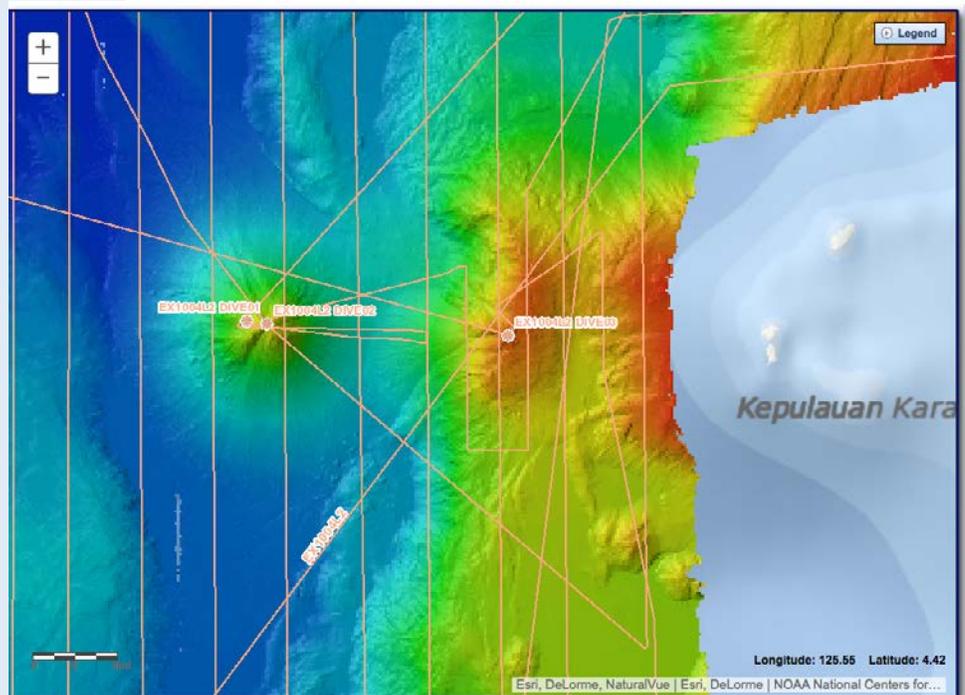
7. *Optional:* This is an ideal point to do the Introduction to Multibeam Imagery Worksheet in the *Watching in 3D* lesson.

8. After students complete the Multibeam Imagery Worksheet from *Watching in 3D*, go back to the Digital Atlas and click on the EX100402 expedition box on the right, #5, again. In the pop up window Summary tab will be a link to the expedition on the Ocean Explorer website. Click on Expedition Website. This is the main INDEX-SATAL 2010 Expedition webpage. Notice the Daily Logs on the right side of the page. Click on June 26. This log corresponds to the Dives 1 and 2 found within the Digital Atlas.

Have students:
 • Read the log.
 • Click on the fly through animation of the multibeam sonar data (in this animation you will see one dive track of the ROV on this volcano.)
 • After reading the log and watching the video, ask students:
   – What types of ocean scientists were participating in this exploration? Why are a variety of scientists necessary to fully explore an area?
   – If you could go back now, what would you want to explore further? Why?

Extensions

1. Have students read the Daily Log from June 27, 2010, the day after the ROV explored the Kawio Barat volcano. What else were they looking for? (new hydrothermal vents)
2. Try the lesson *The Oceanographic Yo-yo* http://oceanexplorer .noaa.gov/okeanos/edu/collection/media/hdwe-WCYoYo78.pdf to see what they found! (evidence of a hydrothermal vent and vent community)

Additional Resources

Ocean Explorer Seamounts Theme page
http://oceanexplorer.noaa.gov/edu/themes/seamounts/welcome.html
This page compiles some of the best ocean explorer education resources on seamounts including essays, lessons, multimedia activities and links to past expeditions.

Seamounts, Les Watling Ph.D., University of Hawai'i at Manoa
https://vimeo.com/88841596
In this 45 minute video, Dr. Les Watling, marine scientist at the University of Hawai'i at Manoa, provides an excellent description of the formation of seamounts, their geology and their associated ecological and biological diversity.
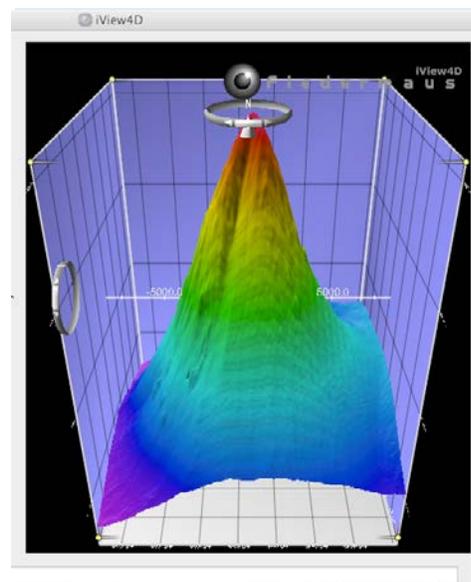
To use the Digital Atlas and learn how to to use the Fledermaus software, try the following activities:
Northeast US Canyons Expedition 2013: Mytilus Seamount
http://oceanexplorer.noaa.gov/okeanos/edu/collection/media /mytilus.pdf
Northeast US Canyons Expedition 2013: Cold Seeps
http://oceanexplorer.noaa.gov/okeanos/edu/collection/media/ cold_seeps.pdf

A multibeam sonar image of the Kawio Barat submarine volcano as viewed in iView4D software and using data collected during the INDEX-SATAL 2010 Expedition.

Notes