

# Exploring Ocean Observing Systems

## Objective

To investigate the many uses of ocean observing systems (OOS).

## Correlations

National Science Education Standards

Grades 5-8: A, B, D, E

Grades 9-12: A, D, E

California State Science Education Standards

Grade 6: 4a, d, e, 7b, h

Grade 7: 7a, b, c

Grades 9-12: Life Sciences 6b, Earth Sciences 5a, d, f, g, 6a, b, Investigations and Explorations 1a, h, i

Ocean Literacy Principles and Fundamental Concepts

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## Introduction

The ocean occupies more than 70% of the Earth’s surface. Surface waters are constantly in motion and the circulation patterns of these waters greatly affect global and regional climate and weather. Winds created by differences in solar heating of the earth, drive the ocean’s surface currents. The Earth’s rotation (Coriolis effect) and the continents shape global surface circulation. The deep circulation of the global ocean is driven by density differences between the cold polar regions and the rest of the ocean. Warm, salty water delivered to the polar regions is cooled, forming dense water that sinks to the depths and then spreads throughout the world ocean. The interaction between the atmosphere and the ocean creates year-to-year changes that can have strong effects on our weather. One of the better-known changes is the El Niño Southern Oscillation (ENSO), which results from fluctuations in wind and leads to changes in ocean surface temperature. Now scientists use real-time data and information from ocean observing systems to interpret the ocean conditions and make predictions about weather and climate.



The ocean observatory websites listed below can deliver ocean currents and circulation data in real-time. The purpose of this exercise is to a) provide major ocean circulation patterns information, b) explore ocean observing systems and the types of information they provide, and c) investigate ENSO data from observing systems.

## Materials

- Computer
- Internet access

## Exploring OOS Worksheet

### Procedure

#### Part A

##### **Ocean Currents of the World**

Go to the websites below for information on ocean circulation patterns.

[http://www.windows.ucar.edu/cgi-bin/tour\\_def/earth/Water/ocean\\_currents.html](http://www.windows.ucar.edu/cgi-bin/tour_def/earth/Water/ocean_currents.html)

<http://www.onr.navy.mil/Focus/ocean/motion/currents1.htm>

Observe and record the flow direction of the major ocean currents.

Suggested questions:

1. Which current flows off the southeast coast of the United States? What is the temperature of this current? What direction does it flow?

2. Which current flows off the California coast? What is the temperature of this current? What direction does it flow?

3. What current is responsible for El Niño events off the coast of South America? Is it a warm or cold current?

#### Part B

##### **Observing systems locations and information**

As an introduction to ocean observing systems (OOS), explore the NOAA National Data Buoy Center website to familiarize yourself with OOS and the parameters they measure.

1. Divide into teams. Each team will be assigned one of the following parameters:

Wind speed, gusts, and direction

Currents

Salinity

Temperature: air & water

Pressure: atmospheric, tendency

Chlorophyll A

Tided/Water level

Dissolved oxygen (DO)

Waves: height, period, direction

2. With your team member(s), define your assigned parameter by using web resources. Be prepared to report out on your assigned parameter.
3. Go to the NOAA National Buoy Data Center website: [www.ndbc.noaa.gov](http://www.ndbc.noaa.gov)
4. Click on the area of the map nearest you. Choose a buoy and click on it.
5. Answer the questions below. If your buoy does not report your assigned parameter, go to back to the home page and locate another ocean observing system buoy to address the questions.

Suggested questions:

1. List several types of information provided by the ocean observing system buoys.
2. What parameters are found at the buoys and what do they mean?
3. What is the ocean temperature off the coast nearest your home or your favorite ocean area?

### **Part C**

#### **Ocean movement measurements using observing systems**

In the Equatorial Pacific ocean, water movement is measured by an array of buoys which can predict events, such as El Niño. Visit the following website to investigate how data from observing systems can help predict changes in ocean circulation patterns and the resulting effects on climate and weather. <http://www.pmel.noaa.gov/tao/index.shtml>

Suggested critical thinking questions:

1. Are sea surface temperatures warmer in the eastern or western Pacific Ocean? What technology did you use to answer this question?
2. Explain how ocean temperatures and surface currents change during El Niño events. What effects could this temperature change have on local weather?