

RESOURCE LIBRARY  
ACTIVITY : 30 MINS

## Undersea Geology

Students locate and label geologic features of the ocean and explore the relationship of these features to plate tectonics.

### GRADES

3 - 8

### SUBJECTS

*Earth Science, Geology, Oceanography, Geography, Physical Geography*

### CONTENTS

1 Video, 1 Link, 1 PDF

## OVERVIEW

Students locate and label geologic features of the ocean and explore the relationship of these features to plate tectonics.

For the complete activity with media resources, visit:

<http://www.nationalgeographic.org/activity/undersea-geology/>

## DIRECTIONS

### 1. Brainstorm and define underwater landforms.

Explain to students that they will be exploring Earth's ocean floor and the types of geologic activity that occur there. Have students imagine what the ocean floor might be like. Ask: *What types of landforms are there on the ocean floor?* Students may suggest there are mountains, valleys, or flat areas. Explain that geologists and oceanographers often use different terms for ocean floor formations and terrestrial formations. Define on a whiteboard the terms below, creating a key using a different color to represent each term.

A trench is a long, deep depression in the ocean floor.

A trough is a gently sloping depression in the ocean floor.

An island is a body of land surrounded by water.

A ridge is long, narrow elevation of earth.

A gap is a steep-sided opening through a mountain ridge.

A seamount is an underwater mountain.

A rise is an underwater mountain range located where tectonic plates are spreading apart. A rise is also known as a mid-ocean ridge.

A plateau is a large region that is higher than the surrounding area and relatively flat.

## **2. Locate underwater geologic features on the maps tiles.**

Divide the class into eight small groups. Give each group a tile from the World Physical MapMaker Kit tabletop map and markers for each color in the key created in Step 1. Looking for the terms in Step 1, have each group locate the undersea landforms on their tiles, highlighting or underlining the names using the color previously assigned in the key. Have each group say out loud the names of a few undersea features on their tile.

## **3. Locate volcanic eruptions and earthquake locations on the map.**

Give each group the Data Sheet: Volcanic Eruptions and Earthquakes handout. Have each mark historic volcanic eruptions and earthquakes on their tile using the list provided. Have students mark historic volcanic eruptions with an "X" and earthquakes with an "O."

## **4. Explore patterns in the Earth's geologic features.**

Have student groups bring their tile map to the front of the class and place them next to each other to create a complete World Physical map. As a class, observe the map. Ask: *Which areas have the most historic activity of volcanoes and earthquakes? Where are earthquakes and volcanoes in relation to the geologic features your group located earlier? What patterns, if any, do you see in the locations of the geologic features, volcanoes, and earthquakes?*

## **5. Define plate tectonics.**

Display the Tectonic Plate Interactive Map layer from the Resource Carousel. Explain that the earth's crust, or outer covering, is divided into a number of pieces called plates. In total, there are about 15 of these plates. Earth's plates can be terrestrial or oceanic plates. These plates move very slowly and are in constant motion. They move the way ice slabs float and move on water. The plates can separate from each other, collide with each other, sink under each other, and grind against each other. This movement is called plate tectonics.

## **6. Discuss the relationship of plate tectonics with earthquakes, volcanoes, and undersea geologic features.**

Have students compare the Tectonic Plates image to the locations of the geologic features, volcanoes, and earthquakes. Ask: *What similarities do you notice between the locations of the plates and the locations of the geologic features, volcanoes, and earthquakes?* Explain that many geologic features are created as a result of Earth's shifting tectonic plates. To fully demonstrate the connection between tectonic plates, earthquakes, and volcanoes, turn on the Volcano and Earthquake layers within the Interactive Map and look for patterns. On the Interactive Map and on the World Physical map tiles, students will see alignment of plate boundaries, earthquakes, volcanoes, and underwater geologic features.

## **Tip**

Laminate the individual sheets of the MapMaker Kit map so you can re-use it for several years.

## **Modification**

You can adapt the activity for different MapMaker Kit sizes as needed for different settings.

## **Extending the Learning**

The earthquake located at 38 N, 142 E seriously impacted parts of Japan on March 11, 2011. Use the MapMaker Interactive to find this location and discuss relationships among plate tectonics, earthquakes, tsunamis, and human settlement.

## OBJECTIVES

# Subjects & Disciplines

### Earth Science

- Geology
- [Oceanography](#)

### Geography

- [Physical Geography](#)

# Learning Objectives

Students will:

- identify ocean floor's geologic features
- explain how certain ocean features and geologic events such as volcanoes and earthquakes are related to plate tectonics

# Teaching Approach

- Learning-for-use

# Teaching Methods

- Brainstorming
- Cooperative learning
- Discovery learning
- Discussions
- Research

# Skills Summary

This activity targets the following skills:

- Critical Thinking Skills
  - Analyzing
  - Applying
- Geographic Skills
  - Acquiring Geographic Information
  - Analyzing Geographic Information

# National Standards, Principles, and Practices

## NATIONAL GEOGRAPHY STANDARDS

- Standard 1:

How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information

- Standard 3:

How to analyze the spatial organization of people, places, and environments on Earth’s surface

- Standard 4:

The physical and human characteristics of places

## OCEAN LITERACY ESSENTIAL PRINCIPLES AND FUNDAMENTAL CONCEPTS

- Principle 1b:

An ocean basin’s size, shape and features (such as islands, trenches, mid-ocean ridges, rift valleys) vary due to the movement of Earth’s lithospheric plates. Earth’s highest peaks, deepest valleys and flattest vast plains are all in the ocean.

### Preparation

### What You’ll Need

### MATERIALS YOU PROVIDE

- Markers

### REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per classroom, Projector
- Plug-Ins: Flash

## PHYSICAL SPACE

- Classroom

## SETUP

Student groups at tables with printed tabletop maps

## GROUPING

- Large-group instruction
- Small-group instruction

## OTHER NOTES

Print several tabletop maps for the students to use in small groups. This activity may be adapted for use with the World Physical MapMaker Kit mega map.

## BACKGROUND & VOCABULARY

### Background Information

There are many geologic features on the ocean floor. Trenches, ridges, rises, and islands are the result of continental or oceanic plate movement. Volcanic eruptions and earthquakes are also the result of tectonic plate movement.

### Prior Knowledge

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### Recommended Prior Activities

- [One Ocean](#)

### Vocabulary

Term	Part of Speech	Definition
earthquake	<i>noun</i>	the sudden shaking of Earth's crust caused by the release of energy along fault lines or from volcanic activity.
gap	<i>noun</i>	steep-sided opening through a mountain ridge.
geology	<i>noun</i>	study of the physical history of the Earth, its composition, its structure, and the processes that form and change it.
island	<i>noun</i>	body of land surrounded by water.
landform	<i>noun</i>	specific natural feature on the Earth's surface.
marine geology	<i>noun</i>	study of landforms in the ocean.
ocean	<i>noun</i>	large body of salt water that covers most of the Earth.
plateau	<i>noun</i>	large region that is higher than the surrounding area and relatively flat.
plate tectonics	<i>noun</i>	movement and interaction of the Earth's plates.
ridge	<i>noun</i>	long, narrow elevation of earth.
rise	<i>noun</i>	underwater mountain range where tectonic plates are spreading apart. Also known as a mid-ocean ridge.
seamount	<i>noun</i>	underwater mountain.
trench	<i>noun</i>	long, deep depression, either natural or man-made.
trough	<i>noun</i>	a gently sloping depression in the ocean floor.
volcano	<i>noun</i>	an opening in the Earth's crust, through which lava, ash, and gases erupt, and also the cone built by eruptions.

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## For Further Exploration

### Maps

- [USGS: World Map of Volcanoes, Earthquakes, Impact Craters, and Plate Tectonics](#)

### Websites

- [National Geographic: The Ocean](#)

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