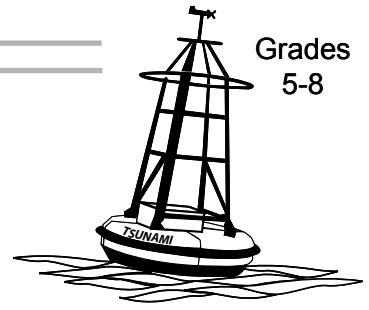


# Sliding Plates

Grades  
5-8



## Overview:

Tsunami triggers are often the result of actions at plate boundaries. In this lesson, students investigate plate behavior at boundaries by creating and analyzing models.

## Targeted Alaska Grade Level Expectations:

### *Science*

- [5-8] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.
- [7] SD2.2 The student demonstrates an understanding of the forces that shape Earth by describing how the movement of the tectonic plates results in both slow changes (e.g., formation of mountains, ocean floors, and basins) and short-term events (e.g., volcanic eruptions, seismic waves, and earthquakes) on the surface.

## Objectives:

The student will:

- model divergent, convergent and transform boundaries; and
- analyze the models to identify components and actions at plate boundaries.

## Materials:

- Wax paper
- Plastic knives
- Frosting
- Graham crackers
- Tortillas
- Water
- Bowls
- MULTIMEDIA FILES: “Active Earth: Moving Crust,” “Sliding Plates,” “Plate Tectonics,” “Divergent,” “Convergent,” and “Transform,” on the ATEP Website: <http://www.aktsunami.org/multimedia>.
- STUDENT WORKSHEET: “Sliding Plates”

## Science Basics:

Earth’s crust and the top of Earth’s mantle form a solid layer called the lithosphere. Below this layer, lies the asthenosphere, which is soft and jelly-like. The convection currents within this layer cause the lithosphere to break into plates and slide along the surface of the asthenosphere.

Plate behavior at boundaries can be characterized as transform, where two plates slip or slide past each other; divergent, where two plates move away from each other; or convergent, where two plates collide. These actions result in different formations on Earth’s surface. Volcanic eruptions and earthquakes are examples of abrupt changes on the surface. Other changes are the result of long-term action of the plates. Oceanic plates are thinner and denser than continental plates. Two oceanic plates moving away from each other create a ridge. Two continental plates at a divergent boundary create a rift valley. Because of the difference in density, subduction occurs at the convergent bound-

ary of an oceanic and continental plate forming a trench. At a convergent boundary of continental plates, mountains form.

### Activity Procedure:

1. Explain that tsunami triggers are often the result of actions at plate boundaries. Access MULTIMEDIA FILES: “Active Earth: Moving Crust,” “Sliding Plates,” “Plate Tectonics,” “Divergent,” “Convergent,” and “Transform” on the ATEP Website: <http://www.aktsunami.org/multimedia>.
2. View these files as a class and discuss or ask students to view them individually.
3. Then distribute STUDENT WORKSHEET: “Sliding Plates” and review part A. To carry out the procedure, each student should have a sheet of wax paper, a dollop of frosting, a plastic knife, two graham crackers, and a tortilla. Pairs or groups of students should have a bowl of water.

### Extension Idea:

Research and share information about well-known plate boundaries. Examples include the Great Rift Valley in Africa, The Mid-Atlantic Ridge, The Mariana Trench or Challenger Deep, and the San Andreas Fault.

### Answers:

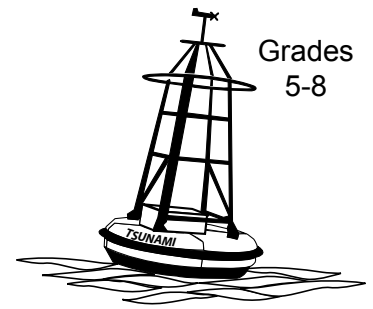
- A. Divergent boundary observations should note that the frosting rises up between the two plates. Convergent boundary observations should note that the graham crackers rise up at the boundary.
- B. 1.F      2.D      3.E      4. G      5.A      6. C      7. B
- C. 1. convergent, mountains, trench, more, below, subduction  
2. divergent, rift valley, mid-ocean ridge  
3. convergent

Name: \_\_\_\_\_

# Student Worksheet

## Sliding Plates (page 1 of 2)

Grades  
5-8



- A. After viewing the MULTIMEDIA FILES: “Active Earth: Moving Crust,” “Sliding Plates,” “Plate Tectonics,” “Divergent,” “Convergent,” and “Transform,” use the materials listed below to form models of the three different types of boundaries.

**Materials:**

- Wax paper
- Frosting
- Tortilla (1 ½)
- Plastic knife
- Graham crackers (2)
- Water

### Transform Boundary

Transform boundaries form where two plates slip or slide past each other.

Model transform boundaries by doing the following:

1. Smooth frosting on the wax paper so that it is about ¼ inch thick.
2. Break a graham cracker in half and place the two halves on the frosting so that their edges are next to each other.
3. Slowly push the two graham crackers so that they slide past each other.

### Convergent Boundary

Convergent boundaries form where two plates collide.

#### *Continent-Oceanic*

The graham cracker is of a lesser density than the tortilla just as continental plates are of a lesser density than oceanic plates. Density affects how two plates interact in a collision.

Model continent-oceanic convergent boundaries by doing the following:

Slowly push half of a tortilla toward and underneath one half of the graham cracker.

#### *Continent-Continent*

Model continent-continent convergent boundaries by doing the following:

1. Break the second graham cracker in half and wet one edge of each piece.
2. Place the graham crackers on the frosting with the wet edges facing each other.
3. Gradually push the graham crackers towards each other.
4. Record observations of the wet edges of the graham crackers below.

**Observations:**

### Divergent Boundary

Divergent boundaries form where two plates move apart from each other.

Model divergent boundaries by doing the following:

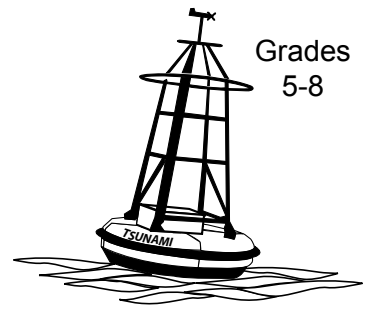
1. Cut a tortilla in half and place both halves next to each other on the frosting.
2. Push the two pieces of tortilla downward and away from each other.
3. Record observations of the frosting between the pieces of the tortilla below.

**Observations:**

Name: \_\_\_\_\_

# Student Worksheet

## Sliding Plates (page 2 of 2)



**Directions:** Use the information from the ATEP Multimedia Files and the modeling exercise to complete the following vocabulary match.

**B.** Match the elements of the models to the vocabulary listed in the box on the right.

1. \_\_\_\_ frosting
2. \_\_\_\_ graham crackers
3. \_\_\_\_ tortilla
4. \_\_\_\_ graham crackers and tortillas
5. \_\_\_\_ graham crackers sliding past each other
6. \_\_\_\_ tortillas moving apart
7. \_\_\_\_ graham cracker and tortilla moving towards each other

- |                        |
|------------------------|
| A. transform boundary  |
| B. convergent boundary |
| C. divergent boundary  |
| D. continental crust   |
| E. oceanic crust       |
| F. asthenosphere       |
| G. lithosphere         |

**C.** Complete the following sentences with words from the word bank below. (NOTE: Some words are not used at all. One word is used more than once.)

WORD BANK				
more	less	above	below	transform
convergent	divergent	mid-ocean ridge	rift valley	trench

1. A collision of two plates represents a \_\_\_\_\_ boundary. A collision of two continental plates produces \_\_\_\_\_. Whereas, a collision of oceanic crust and continental crust produces a \_\_\_\_\_. Oceanic crust is \_\_\_\_\_ dense than continental crust. Therefore, in a collision of these two types of plates, the oceanic plate moves \_\_\_\_\_ the continental plate. The downward motion of the oceanic plate below the continental plate is called \_\_\_\_\_.
2. Separating plates represent a \_\_\_\_\_ boundary. When continental plates separate, a \_\_\_\_\_ forms. When oceanic plates separate, a \_\_\_\_\_ forms.
3. The Aleutian trench was formed as a result of a \_\_\_\_\_ boundary.