Seafloor Spreading: Divergent Plate Boundaries

A Carolina Essentials™ Activity

Student Worksheet

Overview

Early in the twentieth century, German meteorologist Alfred Wegener proposed the theory of continental drift based on the coastal geography of continents, geologic patterns in folded rock bands, and the occurrence of the same fossils on continents that are on opposite sides of an ocean. Wegener's theory faced harsh criticism because he couldn't explain the mechanism by which continents move.

In the mid-twentieth century, measurements of ocean depth led to the discoveries of ocean ridges, trenches, and transform faults that now determine types of tectonic plate boundaries. Additionally, a magnetic field survey of the Pacific Ocean floor identified regular patterns of greater-than-average field strength, then less-than-average field strength in line with and parallel to the ocean ridge, giving rise to the theory of seafloor spreading.

One of the most widely known ocean ridges is the Mid-Atlantic Ridge that separates the North American plate on the west from the Eurasian and African plates to the east. A unique feature of the ridge is that it surfaces on Iceland, resulting in fissure volcanoes where the tectonic plates are spreading apart or diverging and increasing the surface area of the country. In this activity, you will construct a model of seafloor spreading at a divergent plate boundary with accompanying changes in magnetic field strength.

SAFETY REQUIREMENTS

No PPE is required for the activity.

MATERIALS

Sheet of card stock

Tissue paper

White printer paper

Ruler

Scissors

Transparent tape

2 pens, pencils, or markers (different colors)

Phenomenon

What internal and surface geologic processes are at work here?

Laki craters, Iceland

Thingvellir National Park, Iceland

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Essential Question

How do surface features provide evidence of Earth's internal processes?

Activity Objectives

1. Construct a model of seafloor spreading.
2. Explain surface features in Iceland based on your sea floor spreading model.

Activity Procedures

1. Fold the printer paper in half lengthwise, twice. Unfold the paper and cut along the crease lines making 4 strips (11 inches). Tape the 4 strips together to make a 44-inch strip.
2. Cut out a 4-inch square of tissue paper. In the center of the square, cut a slit the exact width of the strip of paper. Mark the ends of the slit with a $^1/_2$-inch line (see Figure 1).
3. Cut a 3-inch square from the center of the card stock (see Figure 2).
4. Securely tape the tissue paper over the square in the card stock (see Figure 3).
5. Fold the 44-inch strip of printer paper in half to make a 22-inch piece. Do not crease the paper.
6. Insert the ends of the printer paper into the tissue paper slit until 1 inch of paper is above the slit. Hold the card stock up so the paper strip hangs freely (see Figure 4). Sketch the model and label what each piece represents.
7. Slide the paper strip up 3 inches. Gently separate the strip into 2 pieces. Color the inside faces of the strips the same color.
8. Push the paper strip up an additional 3 inches. Select a second color and color the uncolored sections of the inside faces of the strips. Sketch and label the model.
9. Repeat steps 7 and 8 until the paper strip has been pulled through the slit in the tissue paper. Sketch the final model, paying close attention to any changes in the tissue paper.

Figure 1.

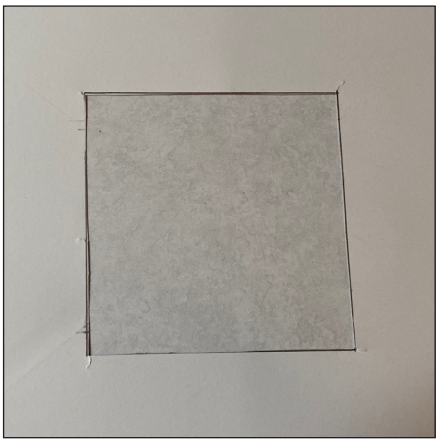

Figure 2.

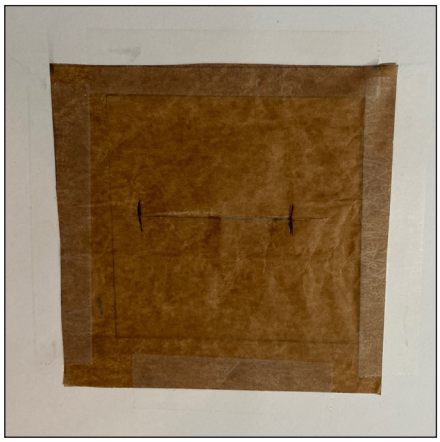

Figure 3.

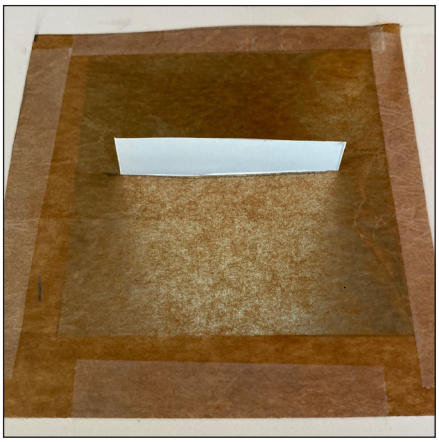

Figure 4.

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Data and Observations

Model Development

Initial Model: Sketch and Label

Intermediate Model: Sketch and Label

Final Model: Sketch and Label

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Analysis and Discussion

1. What does each type of paper represent in the model?

2. The colored bands represent the Earth's changes in magnetic field strength. How can this information be used as evidence for convection currents in the mantle?

3. Use the model you constructed for the Mid-Atlantic Ridge and apply it to explain differences and similarities between the rift valleys in Iceland and East Africa.

Thingvellir National Park, Iceland

Great Rift Valley, Kenya