Module 3: Geology

Topic 3 Application: A Model of Seafloor Spreading

The creation of new seafloor at mid-ocean ridges and its destruction in subduction zones is one of the many cycles that cause the Earth to experience constant change. In this activity, you will create a simple model that shows the evolution of oceanic crust through seafloor spreading and subduction.

Materials

- 2 sheets of 8.5" x 11" paper (cardboard may be substituted for 1 of the sheets)
- Metric ruler
- Colored pencils, markers, or crayons
- Scissors
- Transparent tape
- Masking tape
- Digital camera or handheld video recorder

Procedures

1. Place one sheet of paper so that the long side is towards you as shown in Figure 1.

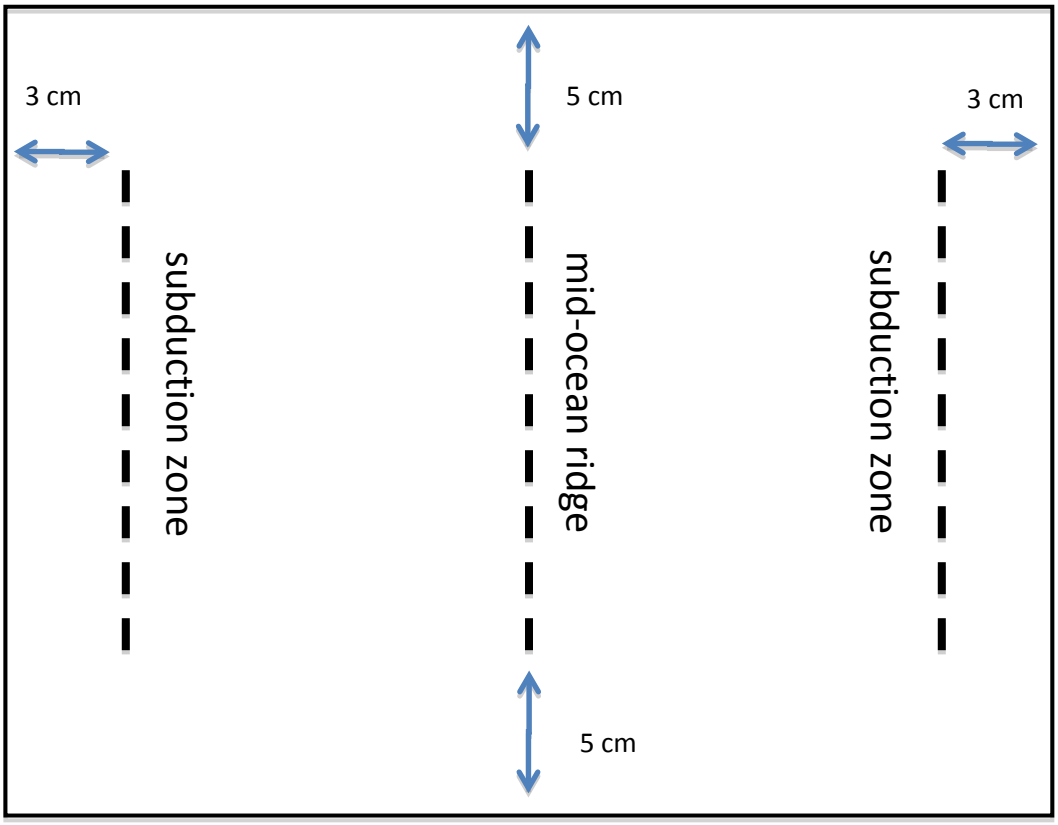

Figure 1

2. Draw a vertical line in the middle of the paper with a height of 11.5 cm, leaving 5 cm on either side of the line as shown in Figure 1. This line represents a mid-ocean spreading center.
3. Draw a second vertical line to the right of the centerline so that it lies 3 cm from the right edge of the paper as shown in Figure 1. This line represents a subduction zone.
4. Draw a third vertical line to the left of the centerline so that it lies 3 cm from the left edge of the paper as shown in Figure 1. This line represents another subduction zone.
5. Label the mid-ocean ridge and subduction zones as indicted in Figure 1.
6. With a pair of scissors, cut the vertical lines so there will be three slits on the paper all the same length and parallel to each other. To reinforce the slits you have made, place masking tape over each one and re-cut the slit though the tape.

7. Place the second sheet of paper so that the long side is towards you as shown in Figure 2.

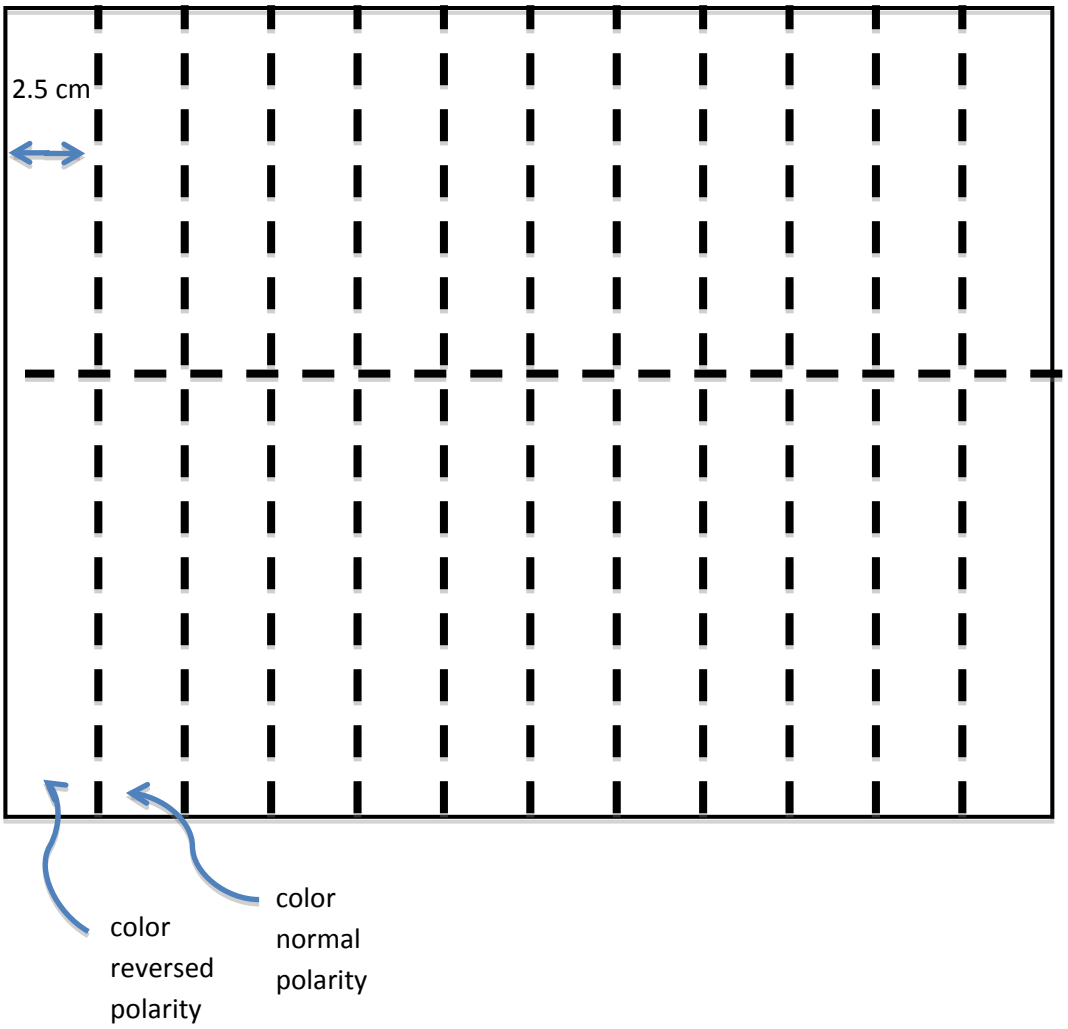

Figure 2

8. Draw a horizontal line down the exact center as shown in Figure 2.
9. Draw 11 bands each 2.5 cm wide perpendicular to the long edge of the paper as shown in Figure 2.
10. Choose one color to represent normal polarity and a second to represent reversed polarity. Color the first band on the far left as reversed polarity. Alternate band colors until you've colored all bands as either normal or reversed polarity.

11. Cut the paper in half parallel to the long edge to get two strips of paper as shown in Figure 3. Beginning on the left with the reversed polarity band, mark the bands on each strip with arrows to indicate alternating periods of normal (up arrow) and reversed (down arrow) polarity.

12. Mark ‘A’ and ‘B’ labels on the strips as indicated in Figure 3.

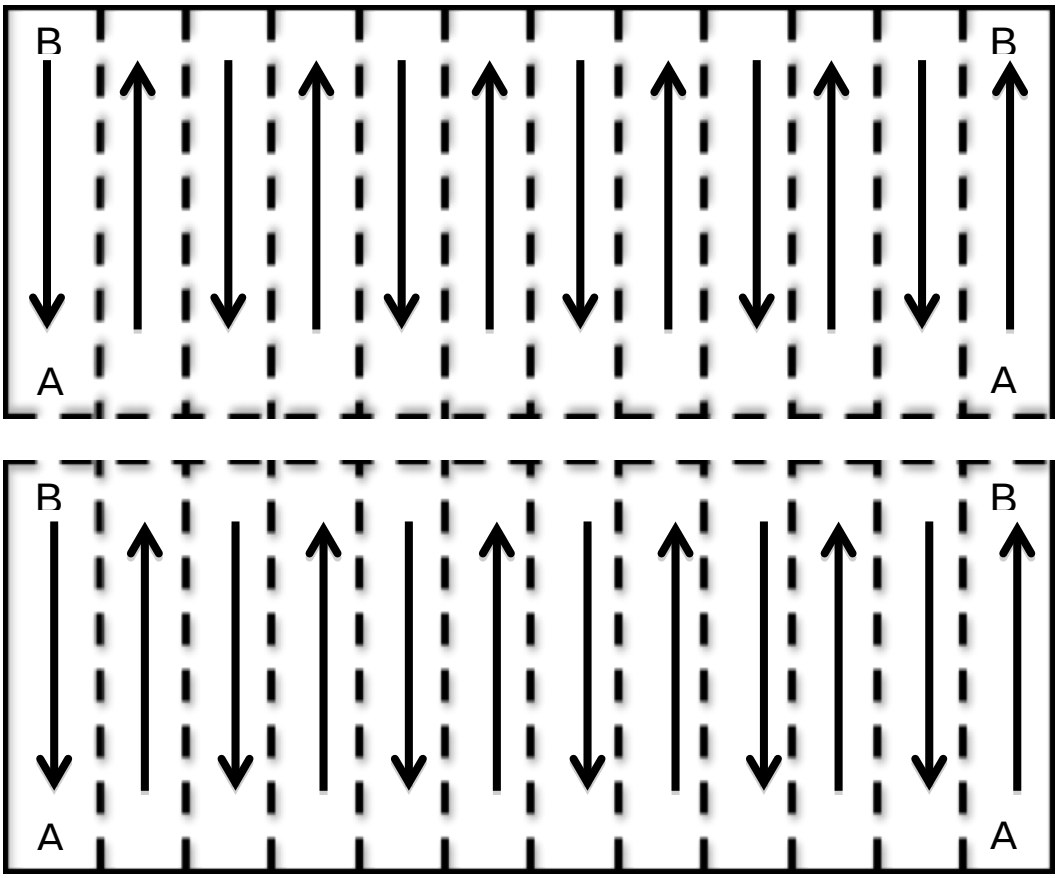

Figure 3

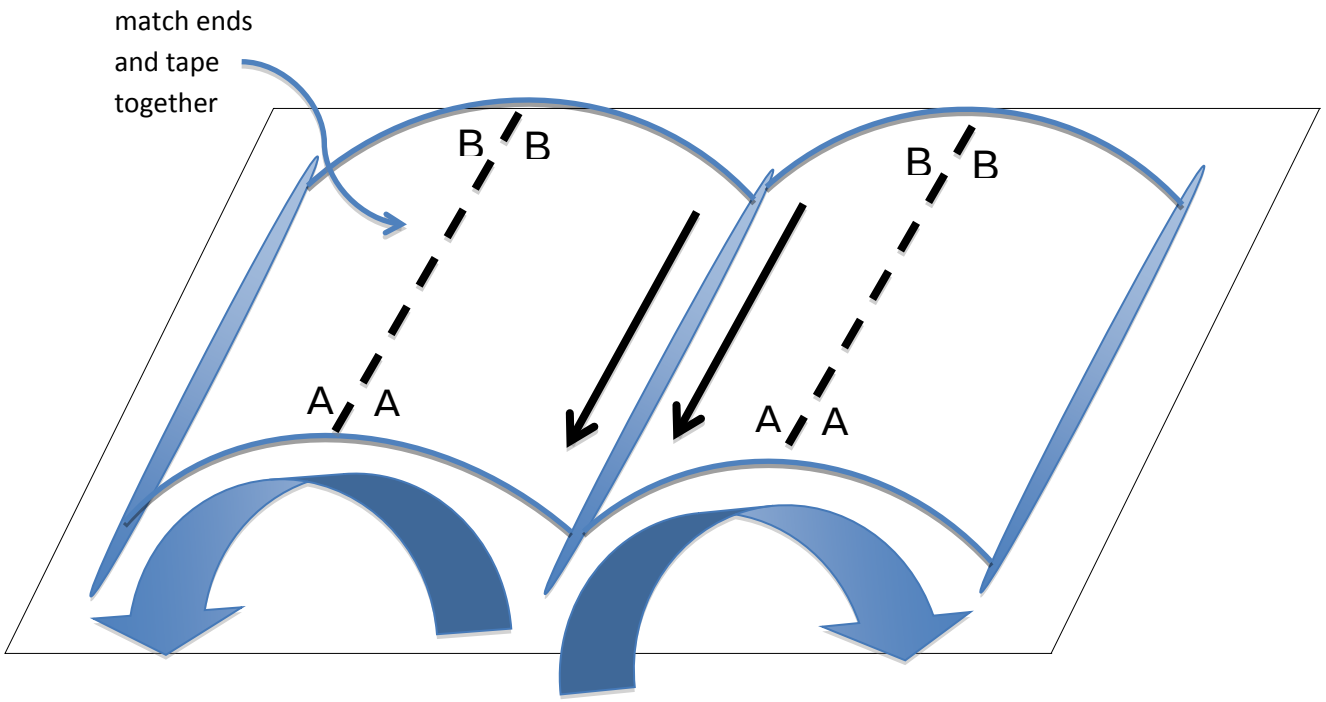

Figure 4

13. From underneath the first sheet of paper, push one end of each strip of paper you made in the previous steps through the mid-ocean ridge centerline as shown in Figure 4. Make sure the colored sides and arrows face up and outward.

14. Pull each strip of paper towards the subduction zone slits near the edges of the paper.

15. Match the ‘A’ and ‘B’ ends of each strip to make a loop. Tape along the seams to form continuous loops as shown in Figure 4.

16. Rotate the loops of paper so that the normal polarity arrow on one loop matches at the mid-ocean ridge with the normal polarity arrows on the other loop as shown in Figure 4.

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Observations

The loops you created represent oceanic crust. Slowly circulate the loops away from one another to simulate the movement of seafloor emerging up through the mid-ocean ridge in the center and down into the subduction zones on the edges.

As you circulate the loops, try to keep the polarities matched between them.

Questions

1. According to scientists, the Earth is about 4.6 billion years old. Based on observations of your seafloor spreading model, why do you think that the oldest ocean floor is only about 200 million years old?

2. In the real ocean seafloor, alternating patterns of normal and reversed polarity are not all of equal width. What does this tell you about the length of time represented by normal and reversed polarity?

3. Do you think it would be possible for the polarity of seafloor on one side of the mid-ocean ridge to get out-of-sync with polarity of seafloor from the other side? Why or why not?

How to Complete this Assignment

Take a digital picture of your constructed seafloor spreading model in use and submit this picture to the dropbox along with your responses to the questions above. Alternatively, if you use a video recorder post the video online and include a link to the video in your paper. Alternatively, you may upload the video along with your question responses if it is not too large.