

The Paper Seafloor: Pull a Ridge Apart and Read Its Age Bands

Investigation question: If new seafloor forms at a ridge and moves outward, what pattern of ages should the seafloor show, how does the pattern change when one side spreads faster, and why does the ocean not get wider forever?

Physical model

Groups of 3

1 session

Setup 10 · Activity 40 · Cleanup 5 min

MS-ESS2-3 · practice

MS-ESS2-2 · supports

Name _____

Group _____

Date _____

Your role today

- ☐ **Puller:** Sits below the base and pulls each strip down through its trench slot by exactly the distance called for each tick, using the ruler marks on the strip's underside.
- ☐ **Marker:** Draws a straight line across both strips at the ridge slot after each tick, labels it with the tick number, and calls out when the line is drawn.
- ☐ **Measurer and recorder:** After the last tick of each run, measures the distance from the ridge slot to every labeled line on both sides, records it, and plots the points on the graph.

Safety

- The craft knife is used only by the teacher during prep; students never cut the cardboard.
- Paper edges can cut; pull strips slowly and keep fingers away from the slot edges.
- The elevated base can slide off its supports; tape it down and keep the Puller's head clear of the underside.
- No chemicals, heat or glass are used.

Procedure

1. Build the model: rest the base across the two book stacks and tape it down. Feed the WEST strip up through the RIDGE slot from below, lay it flat toward the WEST TRENCH slot and push its end down through that slot. Do the same with the EAST strip toward the EAST TRENCH slot. Both strips come up through the same ridge slot, back to back. Pull each strip from below until about 2 cm of each shows above the ridge slot.
2. Run 1, equal spreading. **Marker:** with the first color, draw a straight line across both strips exactly at the ridge slot and label it 0 on both strips. **Puller:** pull the WEST strip down through its trench slot by exactly 2 cm, then the EAST strip by exactly 2 cm. **Marker:** draw a new line at the ridge, label it 1. Repeat pull-then-draw until line 6 has been drawn. Alternate the two marker colors so the bands are easy to see.
3. Measure run 1. Without pulling further, the Measurer measures the distance from the center of the ridge slot to each labeled line on the west strip and on the east strip, and records them in the run 1 table. Fill

in the age column: a line's age is the number of ticks since it was drawn (line 6 is age 0; line 0 is age 6).

4. Graph run 1: plot distance from the ridge (vertical axis) against age in ticks (horizontal axis) for both sides, using different symbols for west and east. Draw a best-fit straight line through each side's points.
5. Keep pulling: do two more 2 cm ticks on each side without drawing new lines. Watch what happens to lines 0 and 1 at the trench slots. Write what you saw in question 2.
6. Run 2, uneven spreading. Before you start, predict in the run 2 table where each line will end up if the WEST strip is pulled 3 cm per tick and the EAST strip 1 cm per tick for five ticks. Then switch to pencil, draw a line at the ridge labeled A0, and run five ticks: west 3 cm, east 1 cm, draw and label A1 through A5 at the ridge after each tick.
7. Measure run 2 exactly as in step 3 and compare each measurement to your prediction.
8. Measure the distance from the ridge slot to each trench slot. Compare it with the total length of paper you pulled through on each side during the whole lab. Write both numbers beside your side-view drawing; you will use them in analysis question 6.
9. Draw the side view of the model on the recording sheet, then answer the analysis questions individually before comparing in the group.

Record your observations

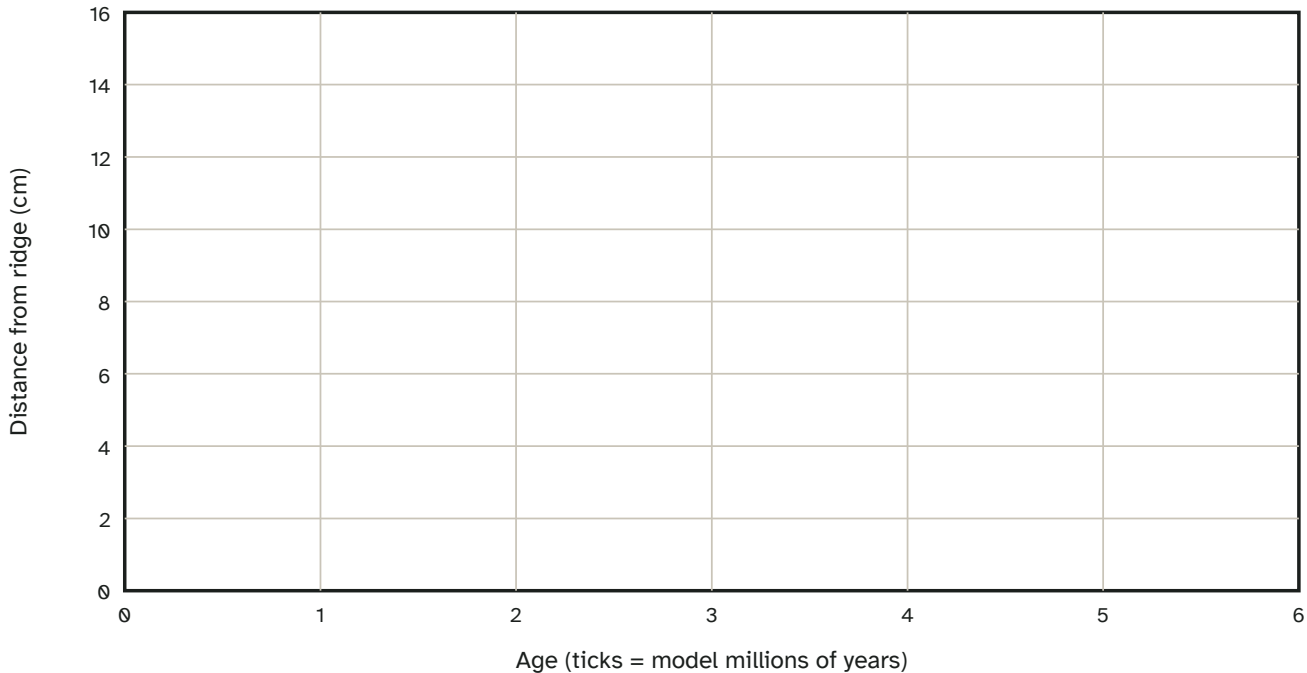
Lab 2 recording sheet: The paper seafloor

Model scale — 1 cm on the model stands for 10 km of real seafloor. One tick (one pull) stands for 1 million model years. A line's **age** is the number of ticks since it was drawn at the ridge.

Run 1: equal spreading, 2 cm per tick on each side

Line label	Age (ticks since drawn)	Distance from ridge, WEST (cm)	Distance from ridge, EAST (cm)
6	0		
5			
4			
3			
2			
1			
0			

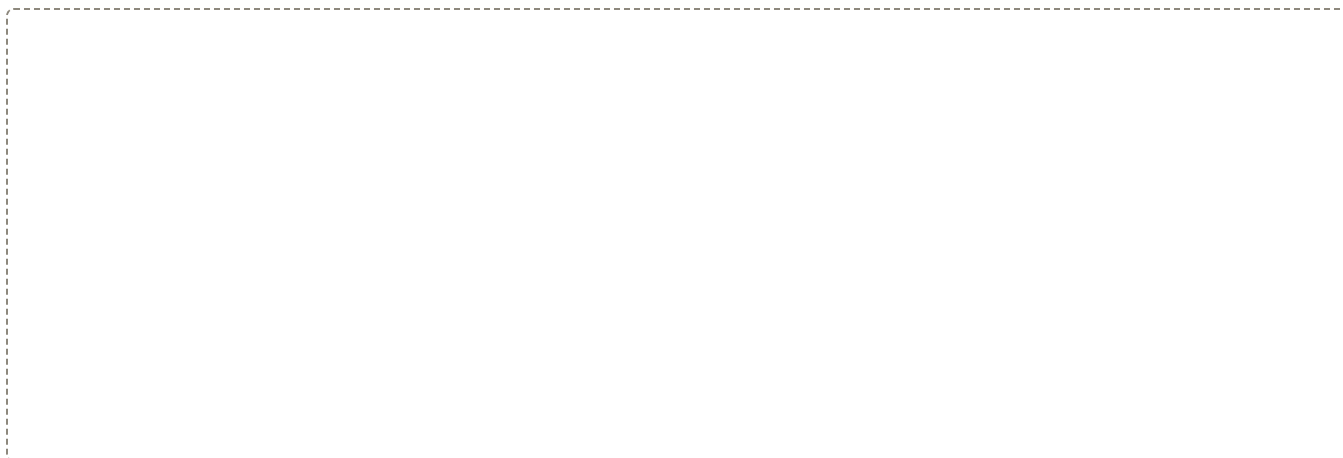
Run 1: distance of each age line from the ridge



Run 2: uneven spreading, 3 cm per tick WEST and 1 cm per tick EAST

Line label	Age (ticks)	Predicted WEST (cm)	Measured WEST (cm)	Predicted EAST (cm)	Measured EAST (cm)
A5	0				
A4					
A3					
A2					
A1					
A0					

-  Draw the model from the side: the base, the ridge slot with both strips rising through it, the two trench slots with the strips going down, and the age lines on top. Label the ridge, both trenches, the youngest seafloor and the oldest seafloor still visible.



1. Describe the pattern in the run 1 table in one sentence: where are the youngest lines, where are the oldest, and how do the two sides compare?

2. What happened to lines 0 and 1 when you kept pulling in step 5? What real-world process does the trench slot stand for?

Analysis questions

3. Use your run 1 graph to find the spreading rate of one side in cm per tick. Then convert it to a real rate using the model scale: give the answer in kilometers per million years and in centimeters per year. Show every step.

4. At the run 1 rate, how far from the ridge would seafloor that is 25 million years old be in the real world? How long would that be on the model, and what would have happened to it in your setup?

5. In run 2 the west side was pulled three times as far per tick as the east side. Did 'older with distance from the ridge' still hold on both sides? What was different, and what would an age map of a real ocean that spreads unevenly look like?

6. The ridge-to-trench distance stayed 14 cm on each side even though you pulled far more than 14 cm of paper through during the lab. Explain how the model shows why Earth does not grow, and what happens to real seafloor at the feature the trench slot represents.

7. Suppose seafloor spreading were not happening at all. Describe what age lines on the real seafloor would look like instead, and what a drill ship sampling at different distances from the ridge would find.

8. Name two ways the paper model is unlike the real seafloor, and for each say whether the difference matters for the age-pattern prediction you tested.
