

GEO LAB

MODEL PLATE BOUNDARIES AND ISOCHRONS

Background: Isochron maps of the ocean floor were first developed using data from oceanic rocks and sediment. Isochrons are imaginary lines on a map that show the parts of Earth's surface that are the same age. When geologists first analyzed isochron maps of the ocean floor, they discovered that Earth's crust is formed along ocean ridges and recycled at the edge of oceanic crust. This discovery led to the theory known as plate tectonics. Geologists continue using maps to study the motion of tectonic plates.

Question: Can you determine the age of the crust and type of plate boundaries?

Materials

paper
colored pencils
scissors
metric ruler
calculator

Safety Precautions

Procedure

1. Read and complete the lab safety form.
2. **Figure 1** shows Plate B relative to Plate A. Draw or trace the plates onto a separate sheet of paper and cut them out.
WARNING: Scissors can cut or puncture skin.
3. The arrow shows the movement of the plates relative to each other. Move Plate A as shown in each part of **Figure 1**.
4. Use the symbols shown in the legend to indicate the type of plate boundary and the relative motion across the boundary for each part of **Figure 1**.
5. **Figure 2** shows two plates, A and B, separated by two ocean ridges at a transform boundary. Plates A and B are moving apart at 2 cm/y. Convert the speed 2 cm/y to km/y.

6. Trace **Figure 2** onto a separate sheet of paper. Assume the geometry of the boundaries in **Figure 2** has not changed over time. Draw isochrons on 10, 20, 30, and 40 million years.
7. Color the crust based on its age: 0–10 million years old red, 10–20 million years old yellow, 20–30 million years old green, and 30–40 million years old blue.

Analyze and Conclude

1. **Determine** the motion of a plate that would have each of the A sites that moved relative to the B plate.
2. **Apply** From your map of isochrons, what is the easiest way to identify the location of transform boundaries?
3. **Interpret** Look at **Figure 3**. From the pattern of isochrons on the ocean floor, identify the divergent plate boundaries along the Atlantic Ocean and along the Pacific Ocean.
4. **Differentiate** Which ocean is marked by wider isochrons? Based on the amount of oceanic crust produced in a given period of time, along which plate boundary is divergence happening more rapidly?
5. **Infer** The spreading center in the Pacific Ocean is not centered in the same manner as the Atlantic Ocean. Explain how this indicates the presence of convergent plate boundaries.

WRITING in Earth Science

Write a Letter Alfred Wegener never convinced the scientific community of continental drift. He died shortly before the ocean floors were mapped. Imagine you could send a message to the past. Explain to Wegener what ocean floor mapping revealed, and how plate tectonics was discovered.

Key

Use the following symbols to indicate the type of plate boundary:

|| Divergent boundary

▶▶▶ Convergent boundary (triangles point to the plate that stays on the surface)

||| Transform; arrows indicate the relative direction of motion across the boundary

Figure 1

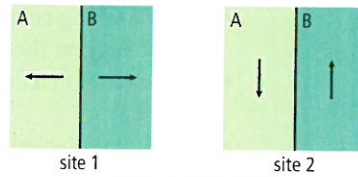


Figure 2

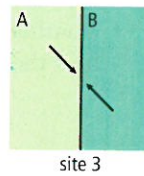
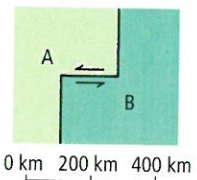
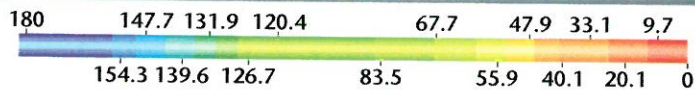
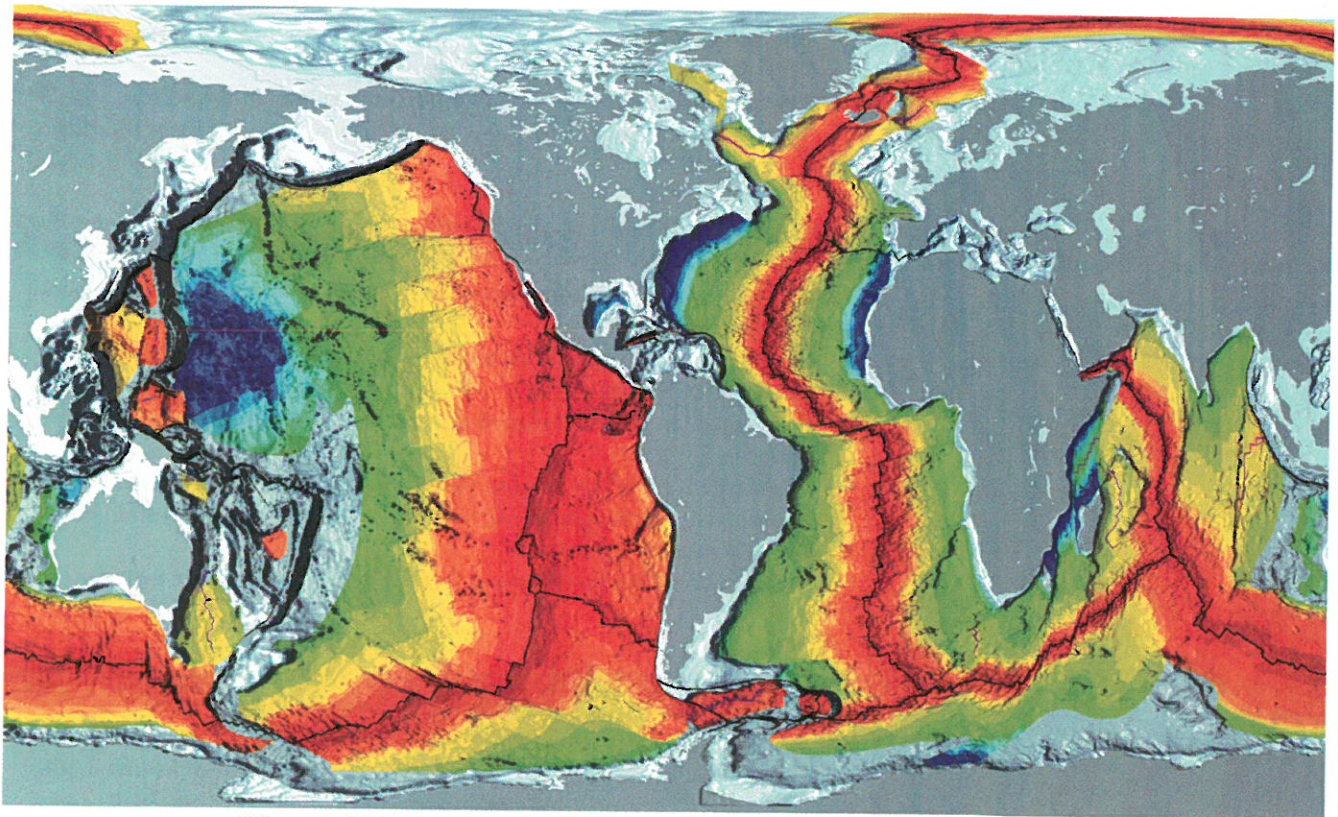


Figure 3



Millions of years before present