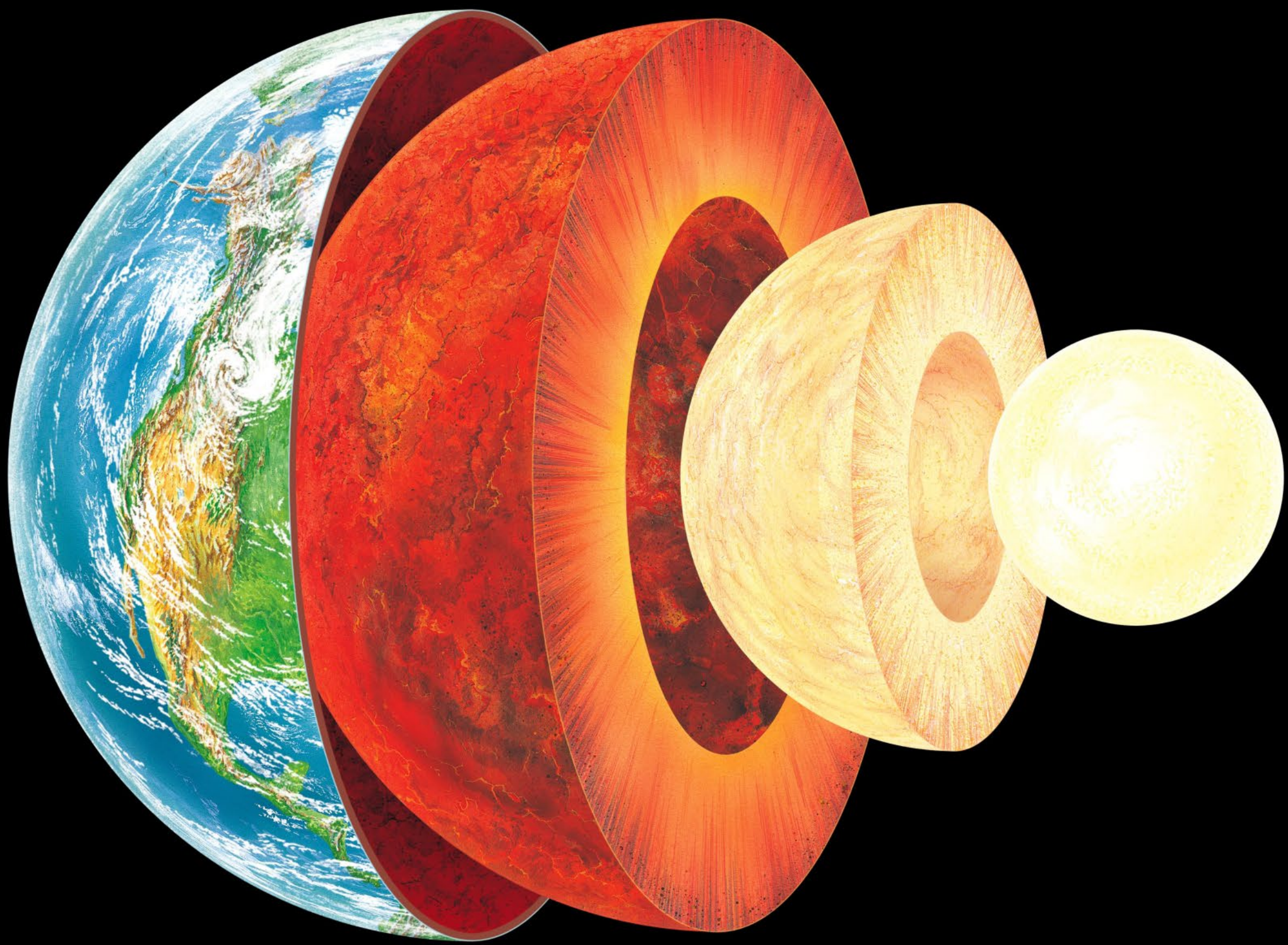
Earth's Interior

Goal: Students will be able to describe the different components of Earth's Interior, by using the "Inferred Properties of Earth's Interior" chart in the ESRT.

What is inside Earth?

Goal: Students will be able to describe the different components of Earth's Interior, by using the "Inferred Properties of Earth's Interior" chart in the ESRT.



Goal: Students will be able to describe the different components of Earth's Interior, by using the "Inferred Properties of Earth's Interior" chart in the ESRT.

How do we know what is inside Earth?

- By observing earthquake waves and the way they travel through the planet, scientists make inferences about Earth's structure.

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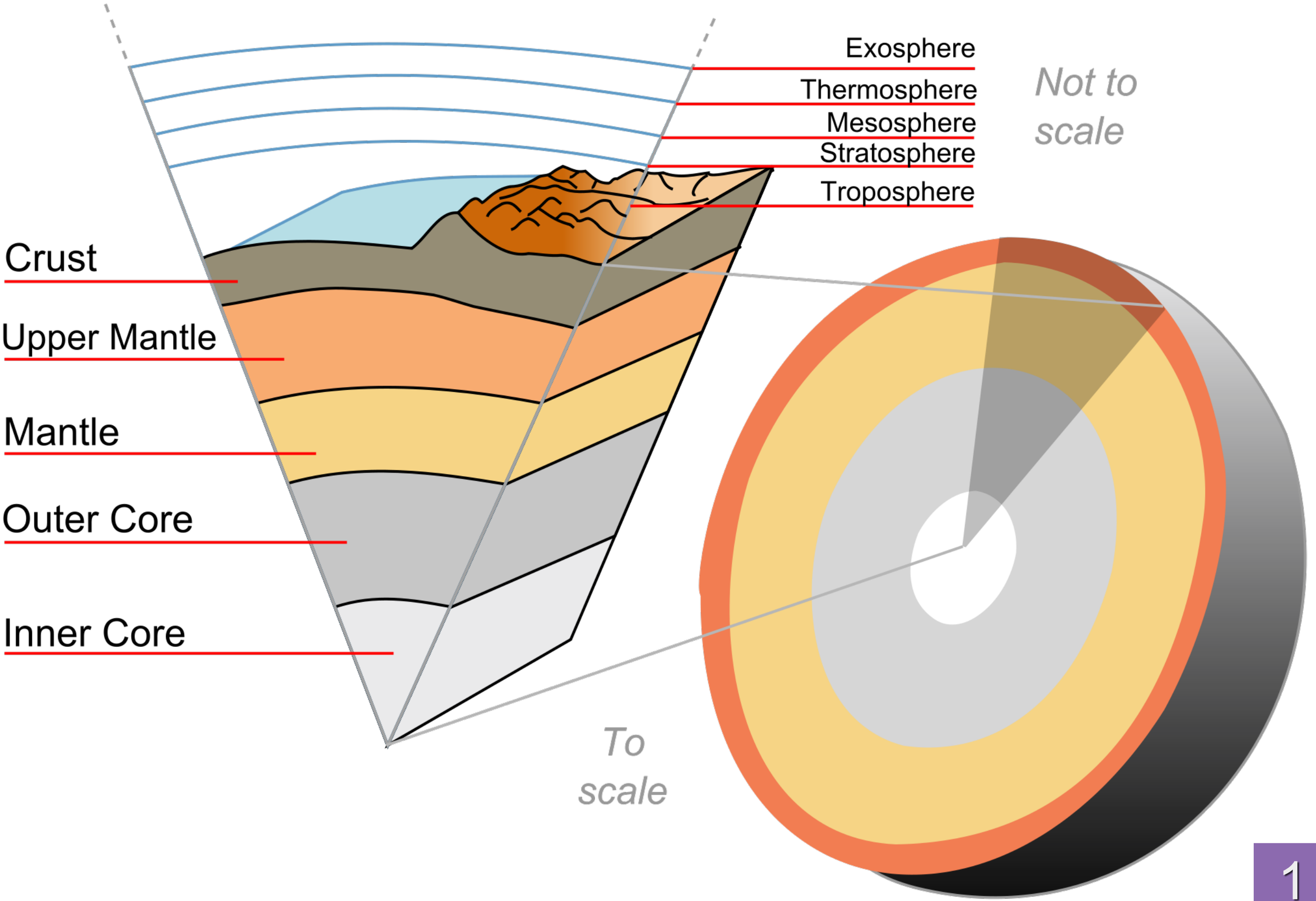

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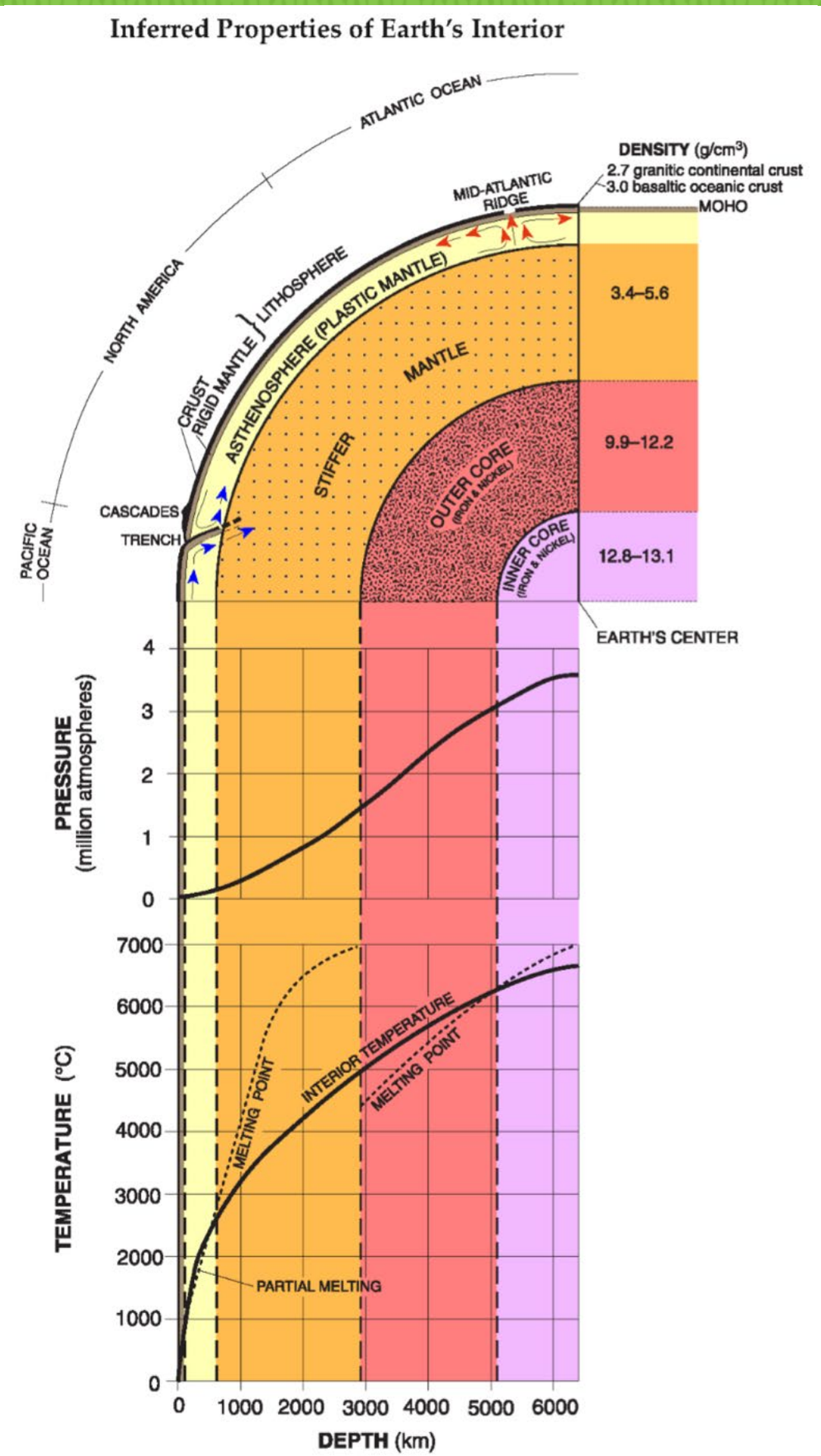

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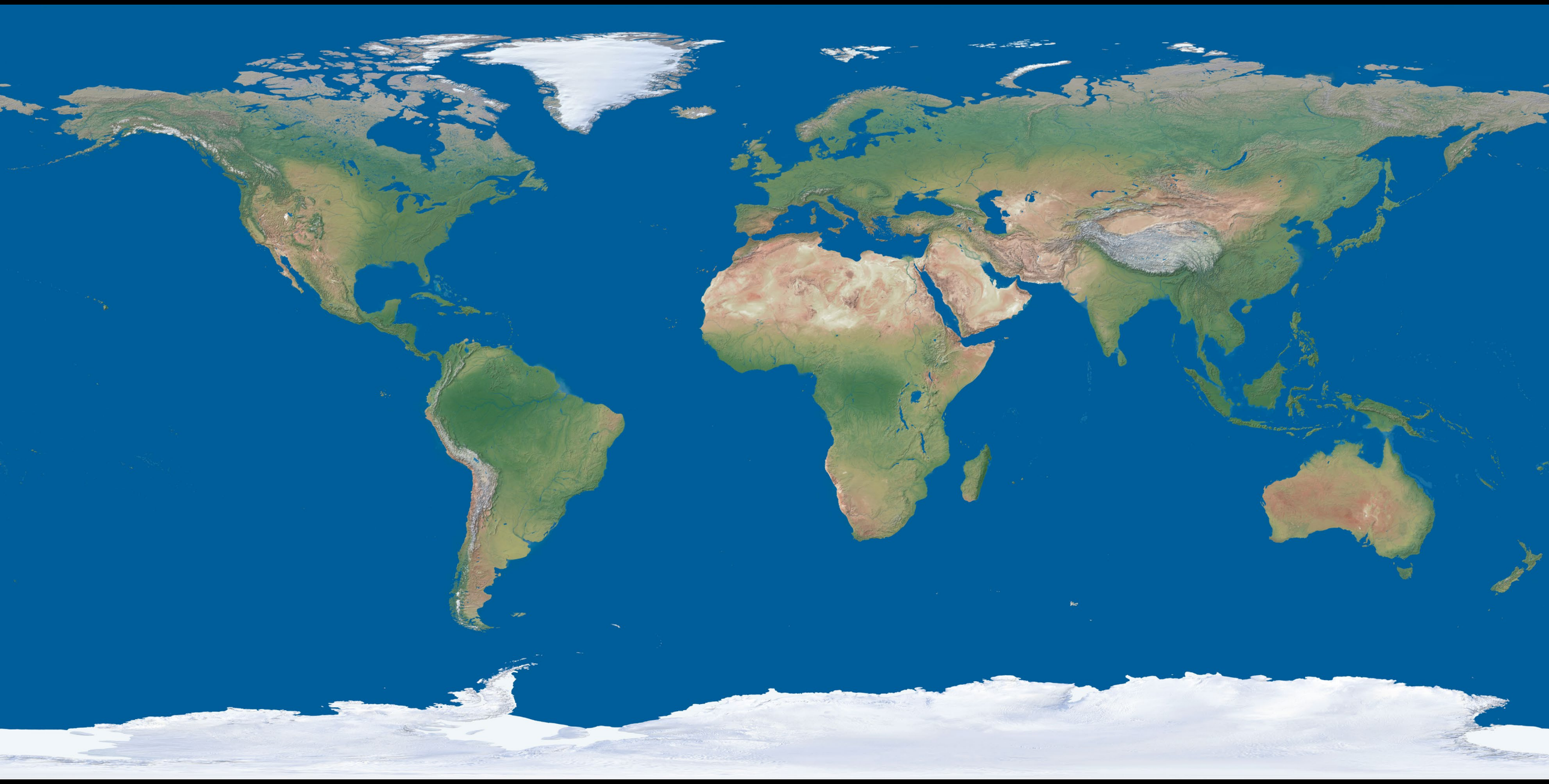

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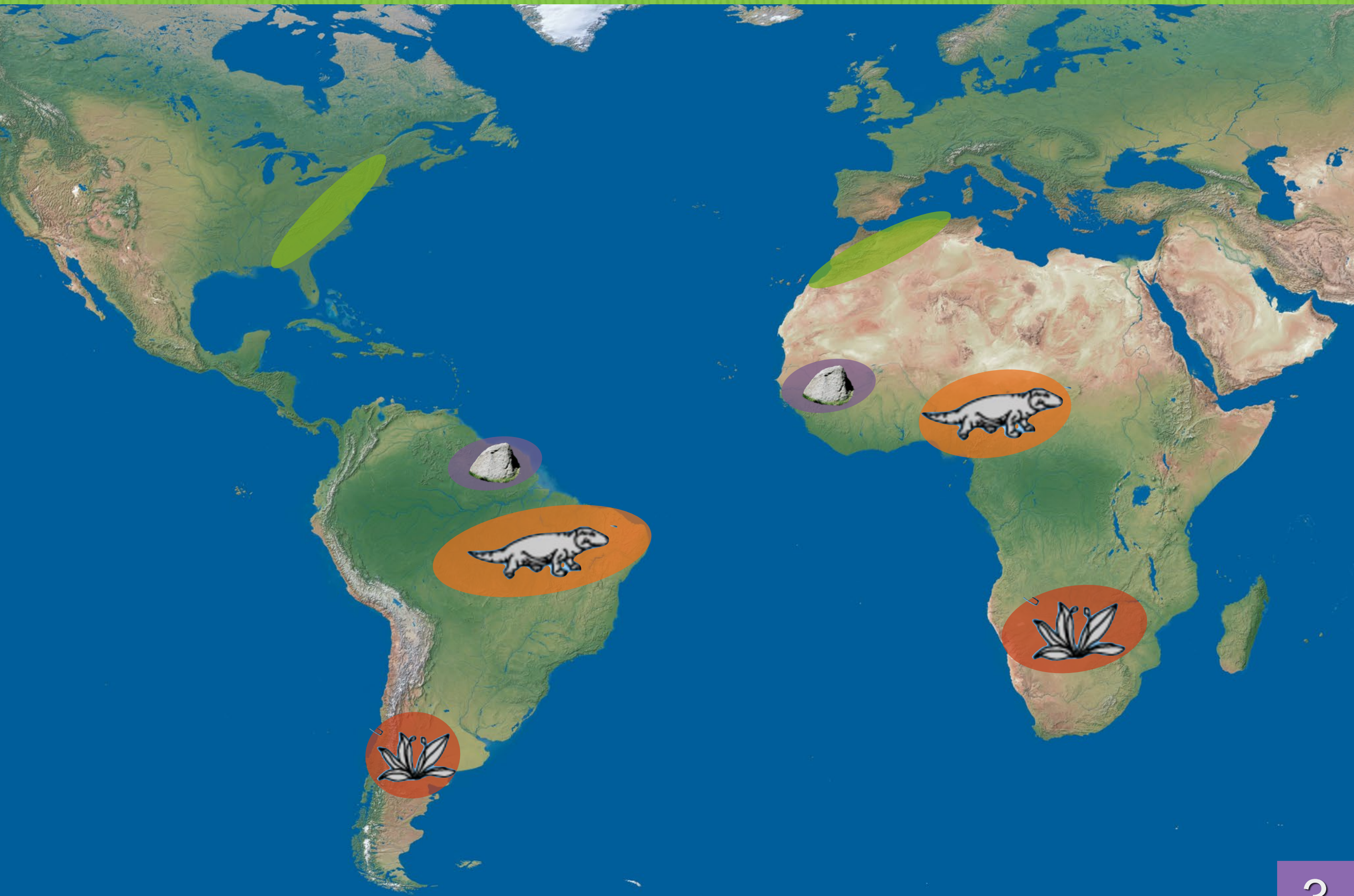

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Earth is not a completely solid planet, which means it is capable of constantly changing.

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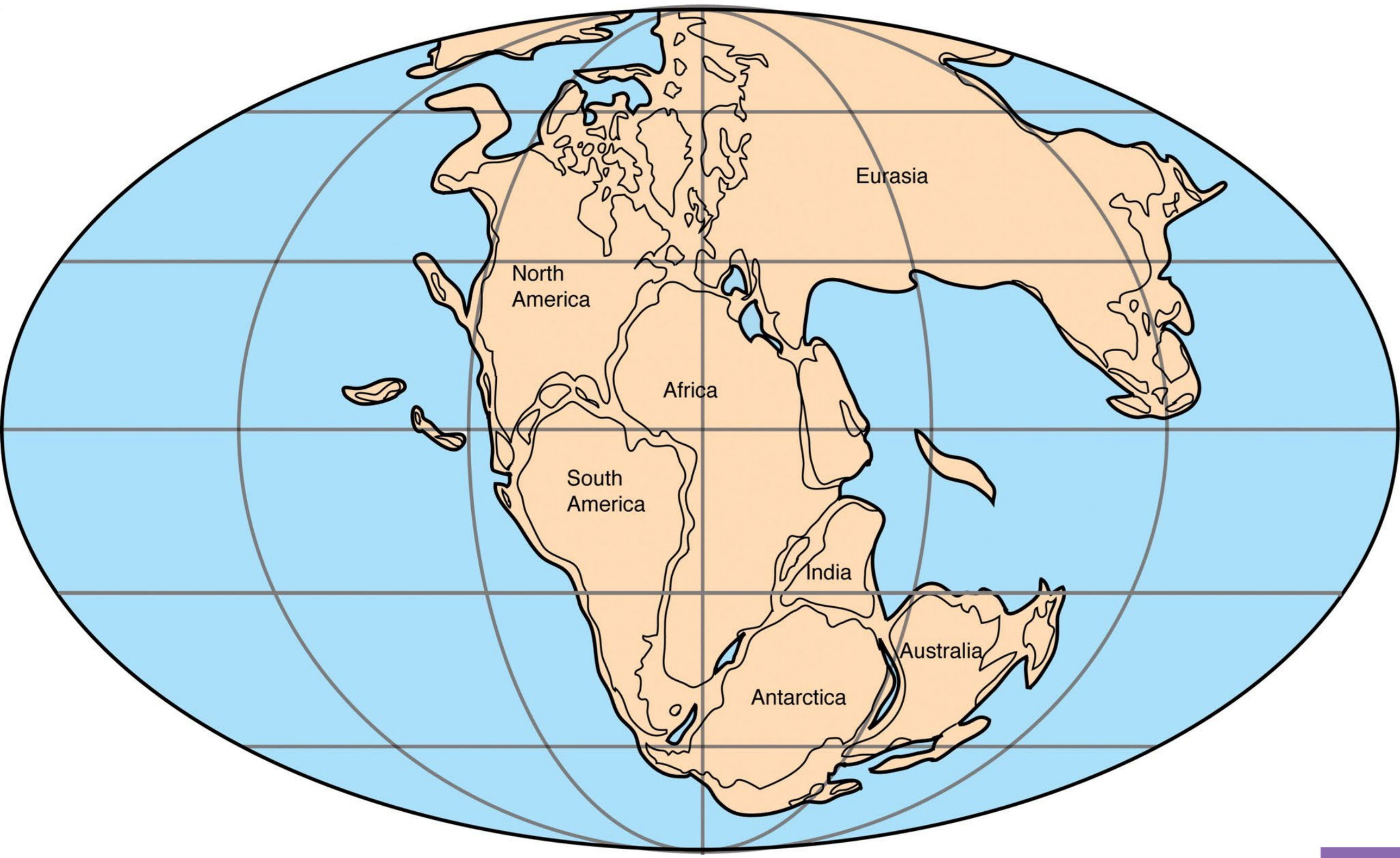

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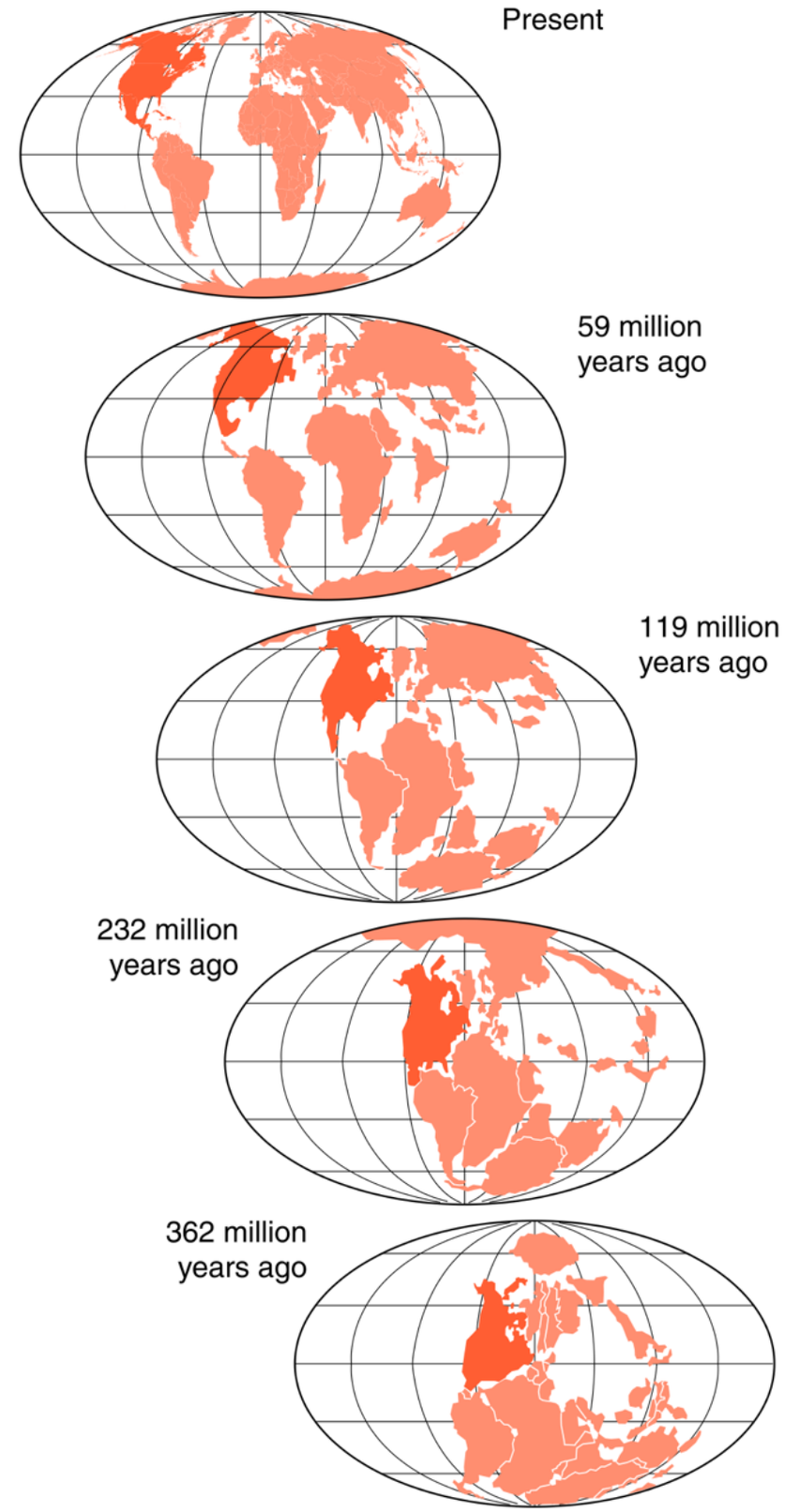

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Evidence For Continental Drift

- Fossil evidence.

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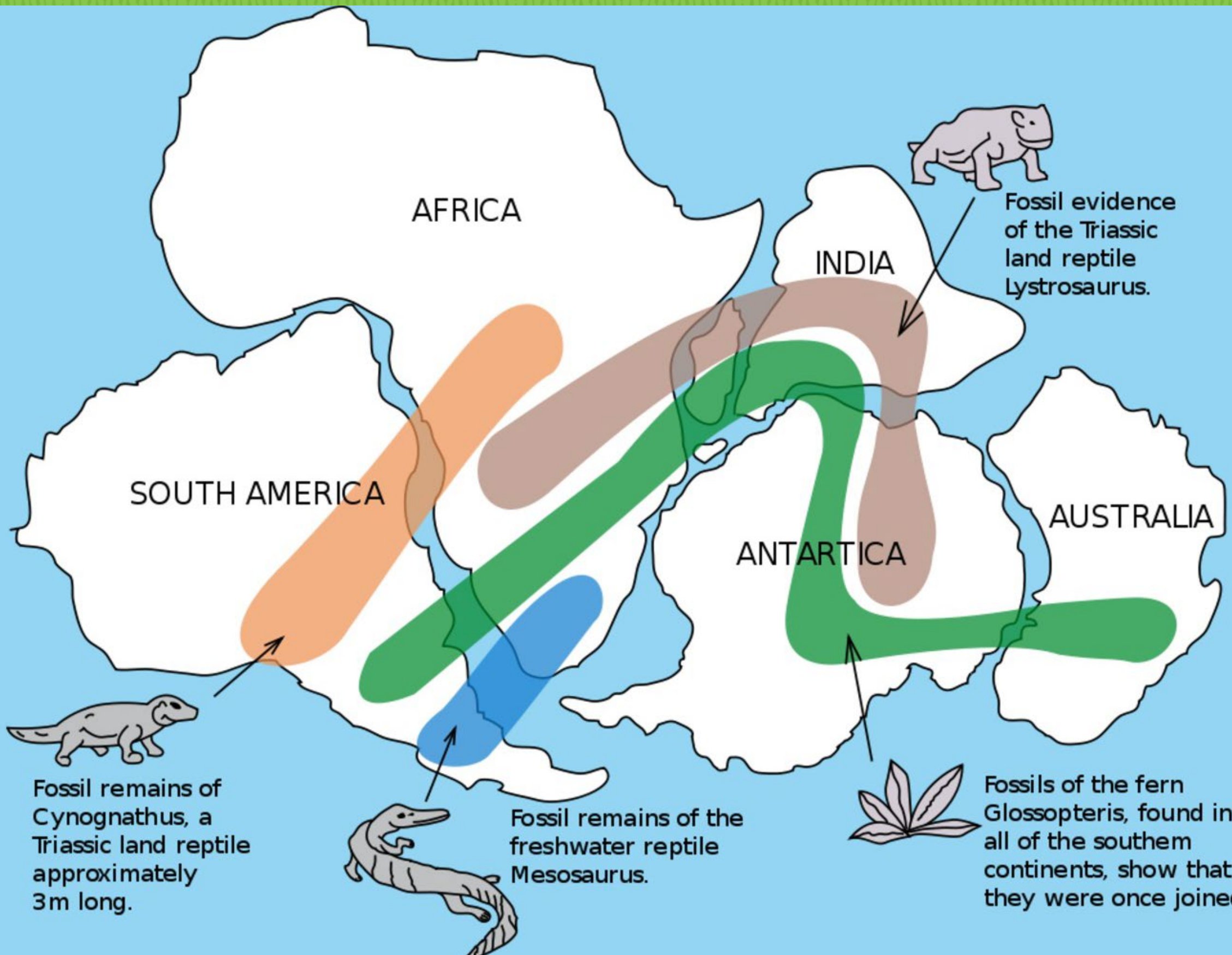

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Evidence For Continental Drift

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- Polarity of sea floor rocks.

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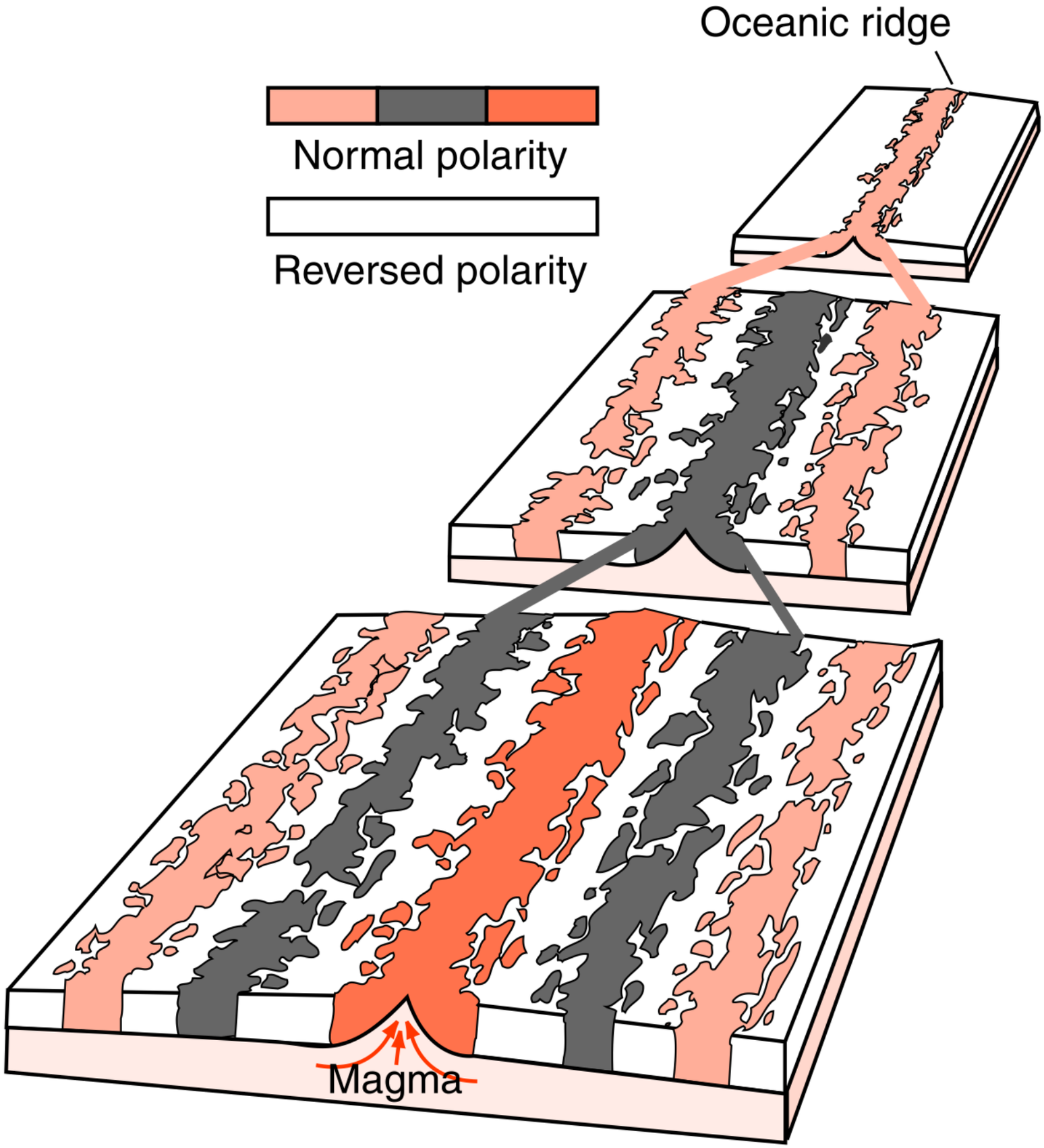

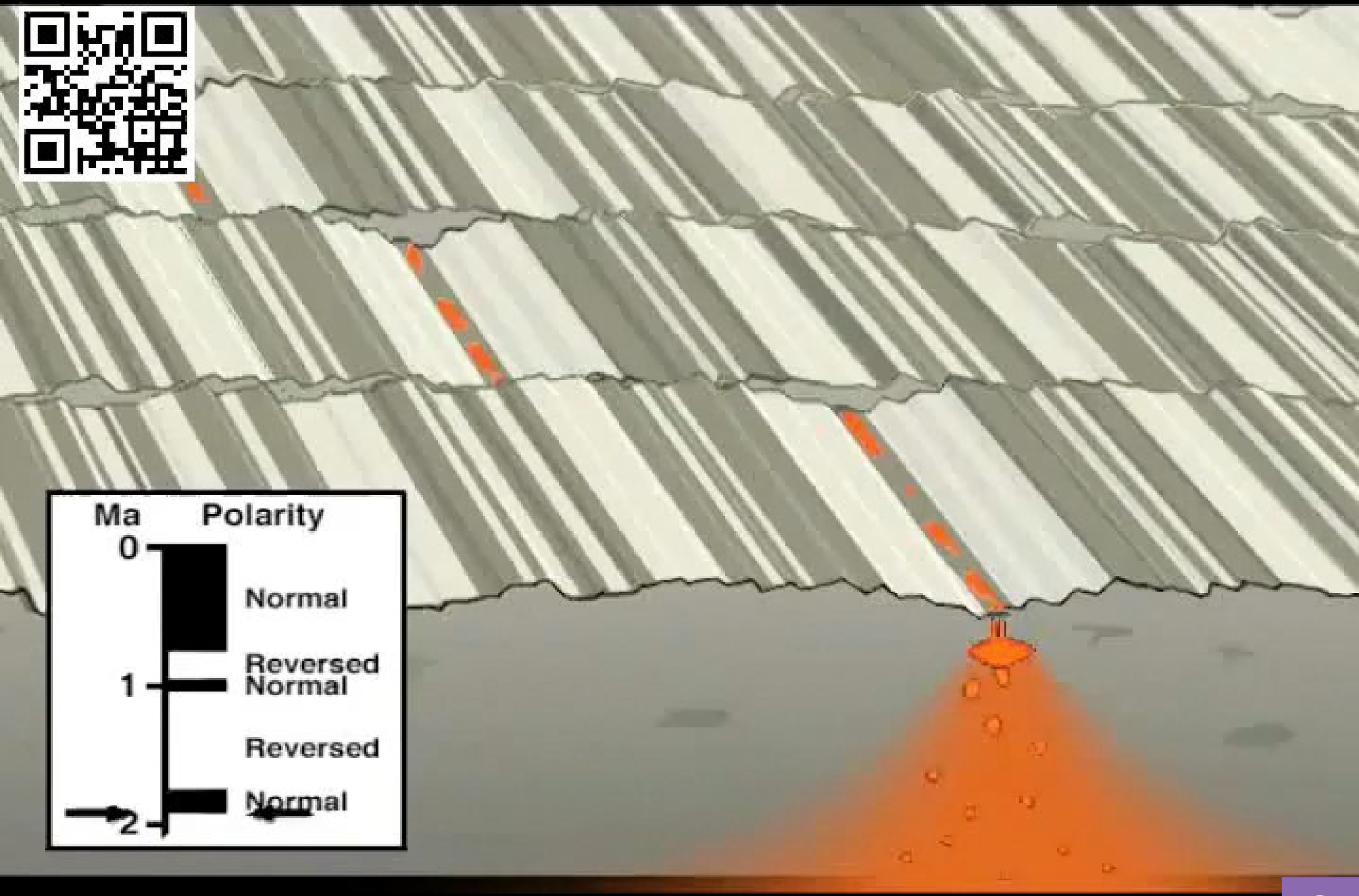
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Evidence For Continental Drift

- Fossil evidence.
- Polarity of sea floor rocks.
- Age of rocks along plates.

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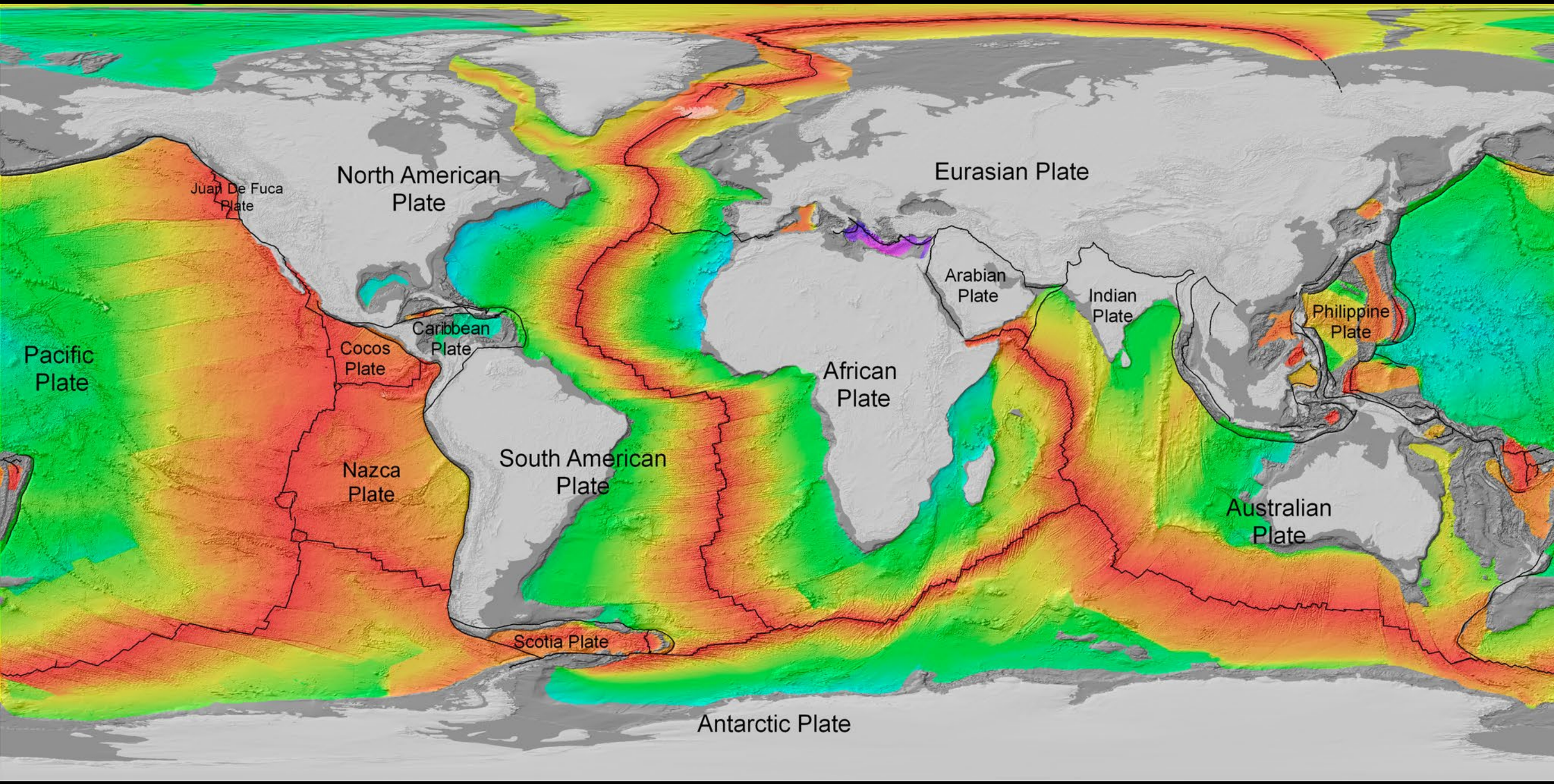

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Why do continents move?

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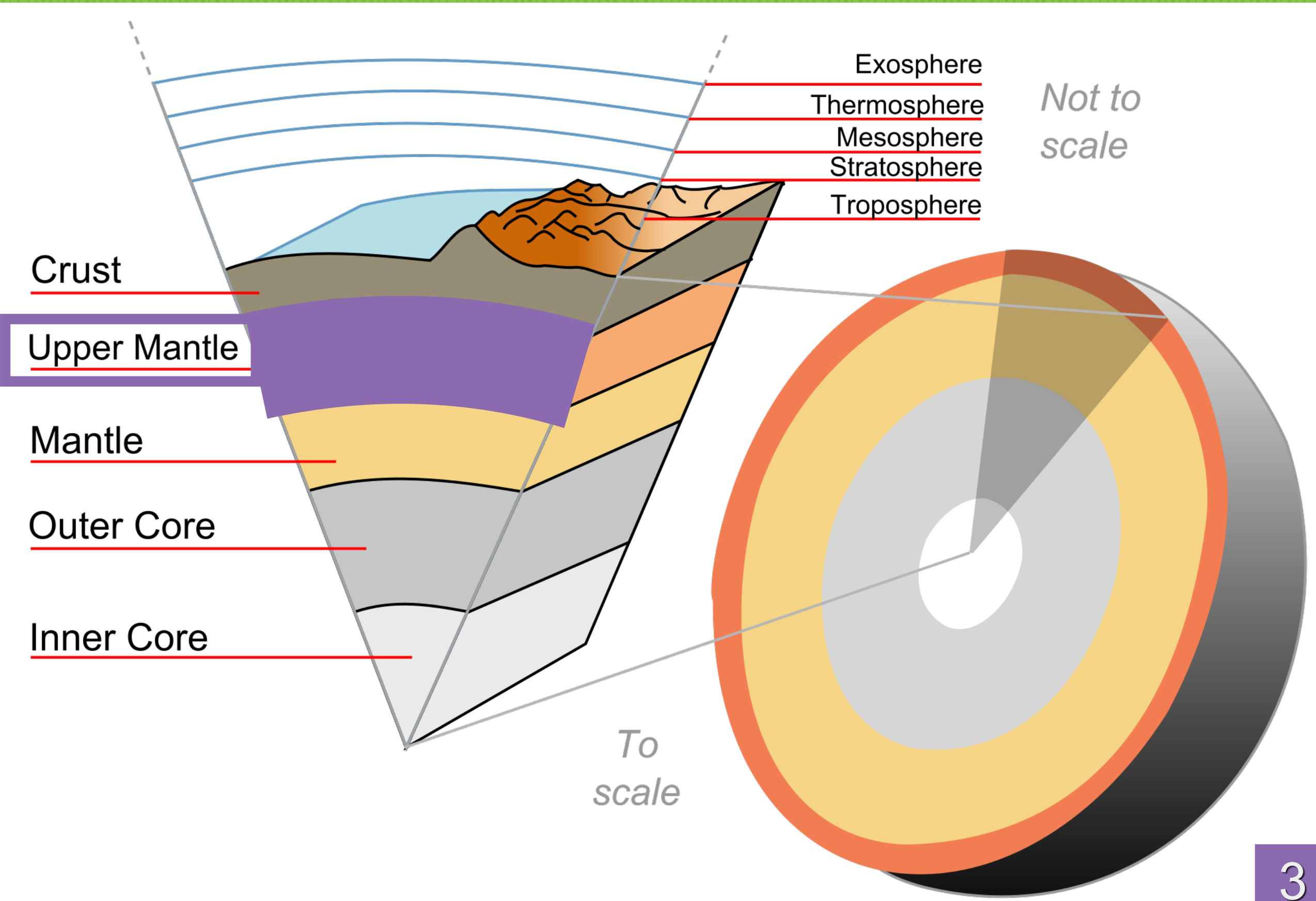

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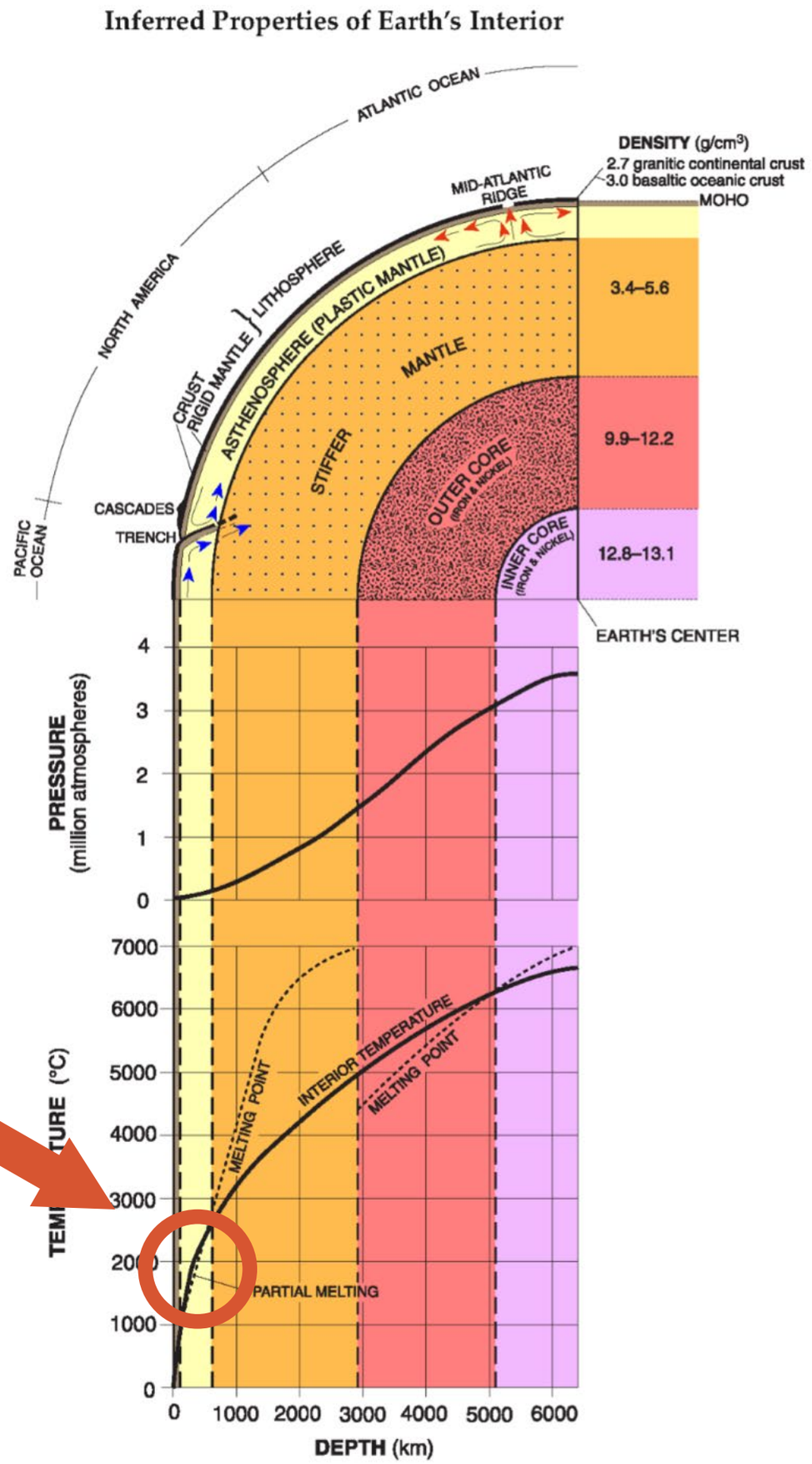

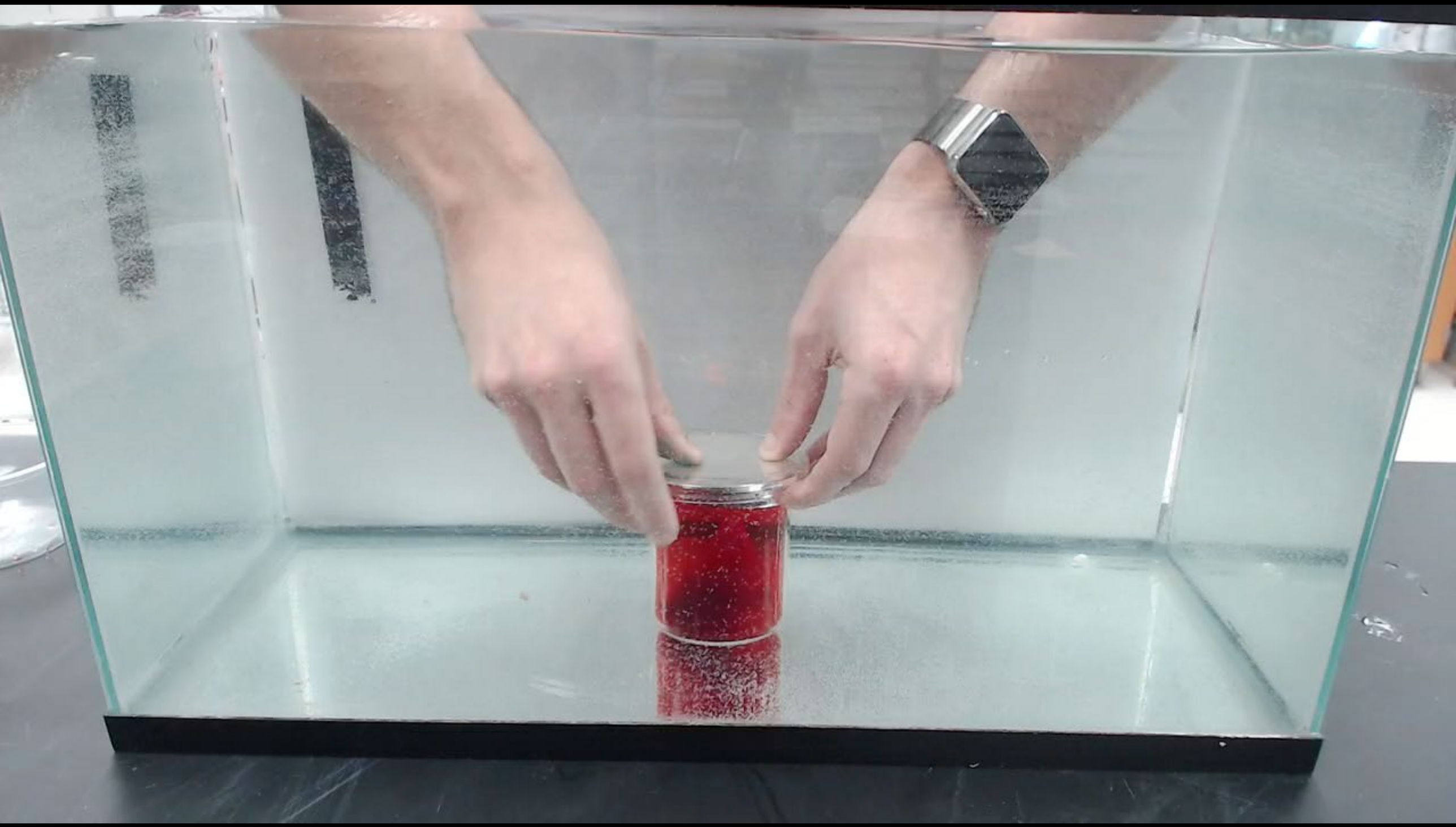

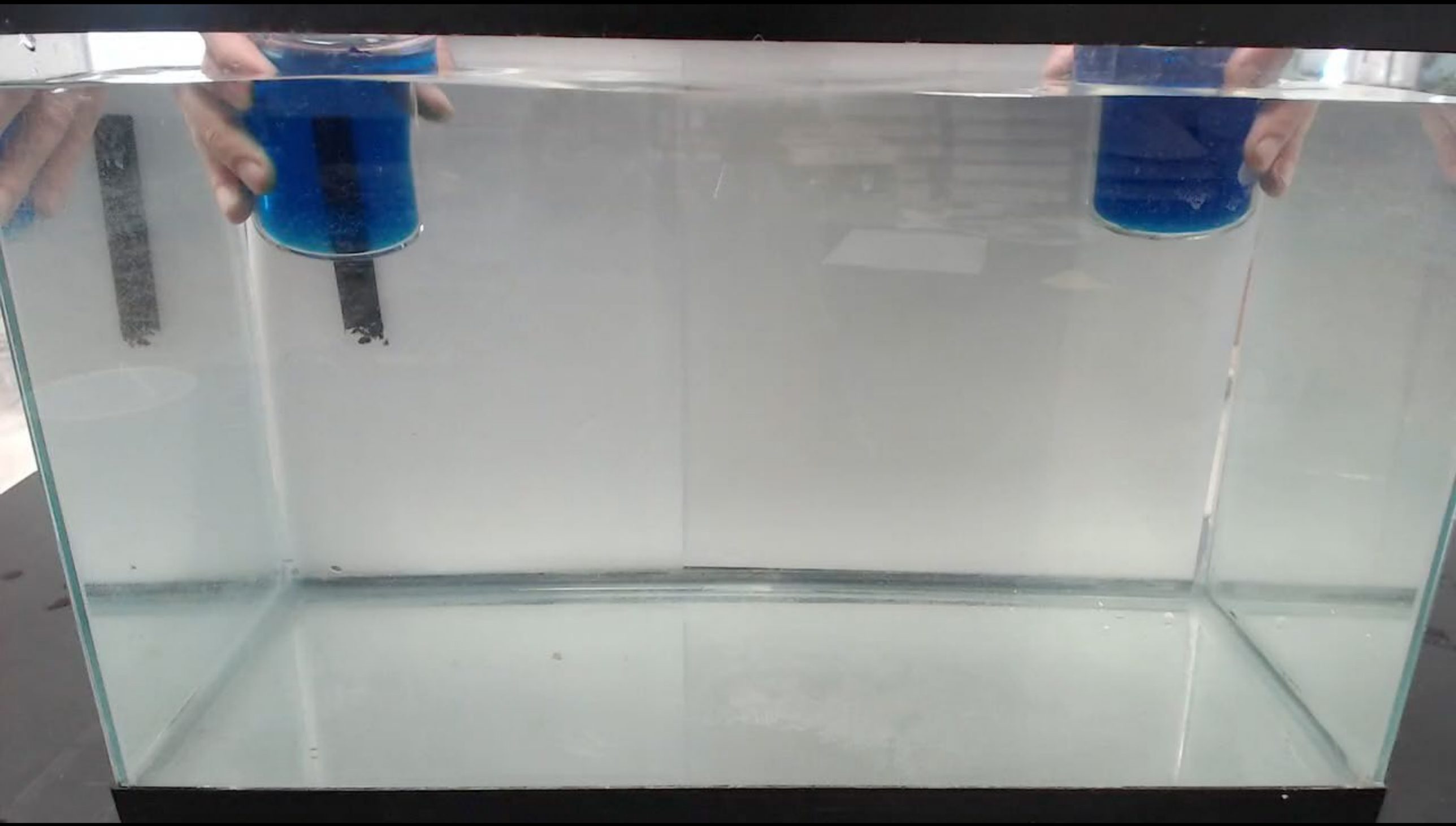

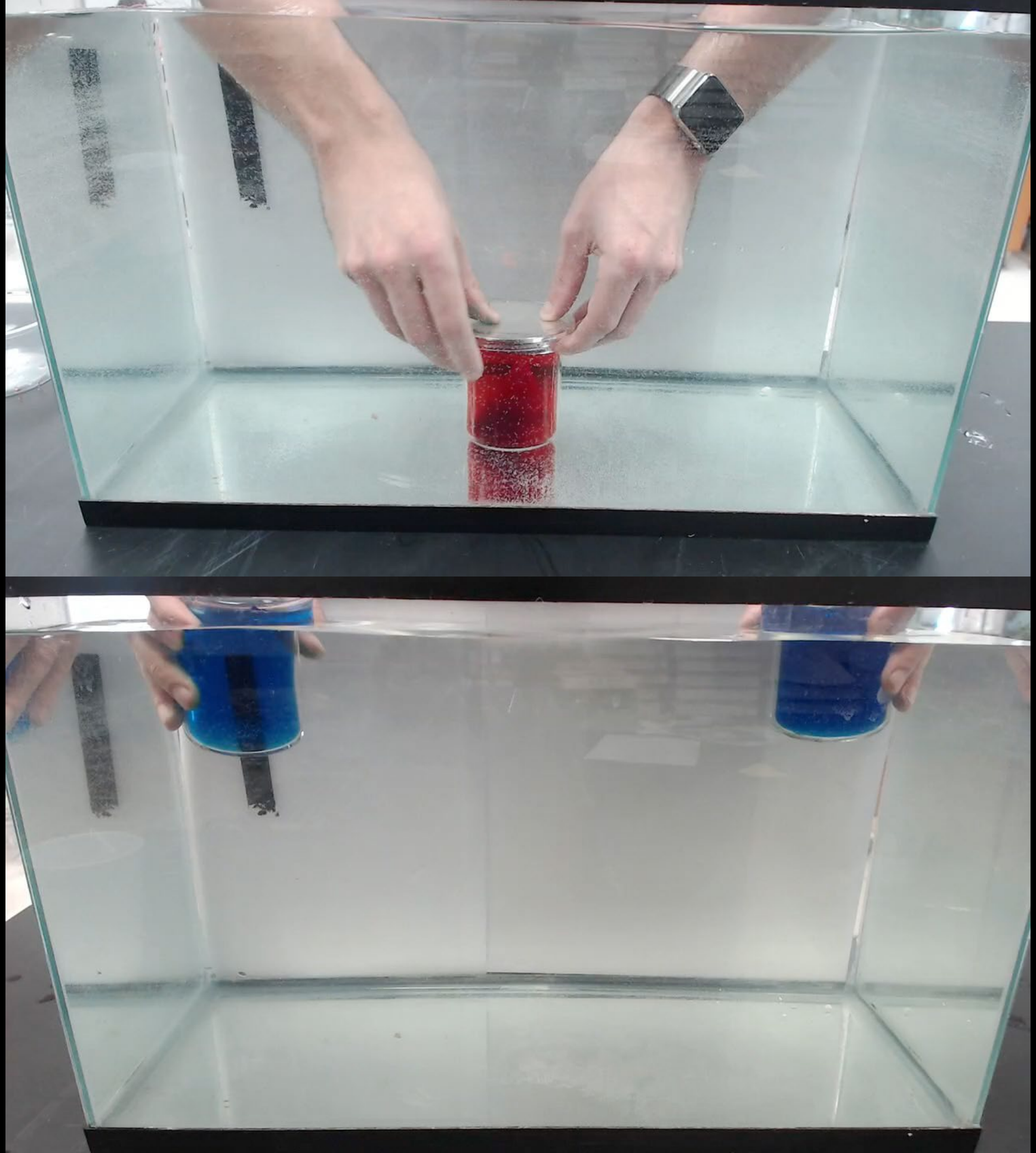

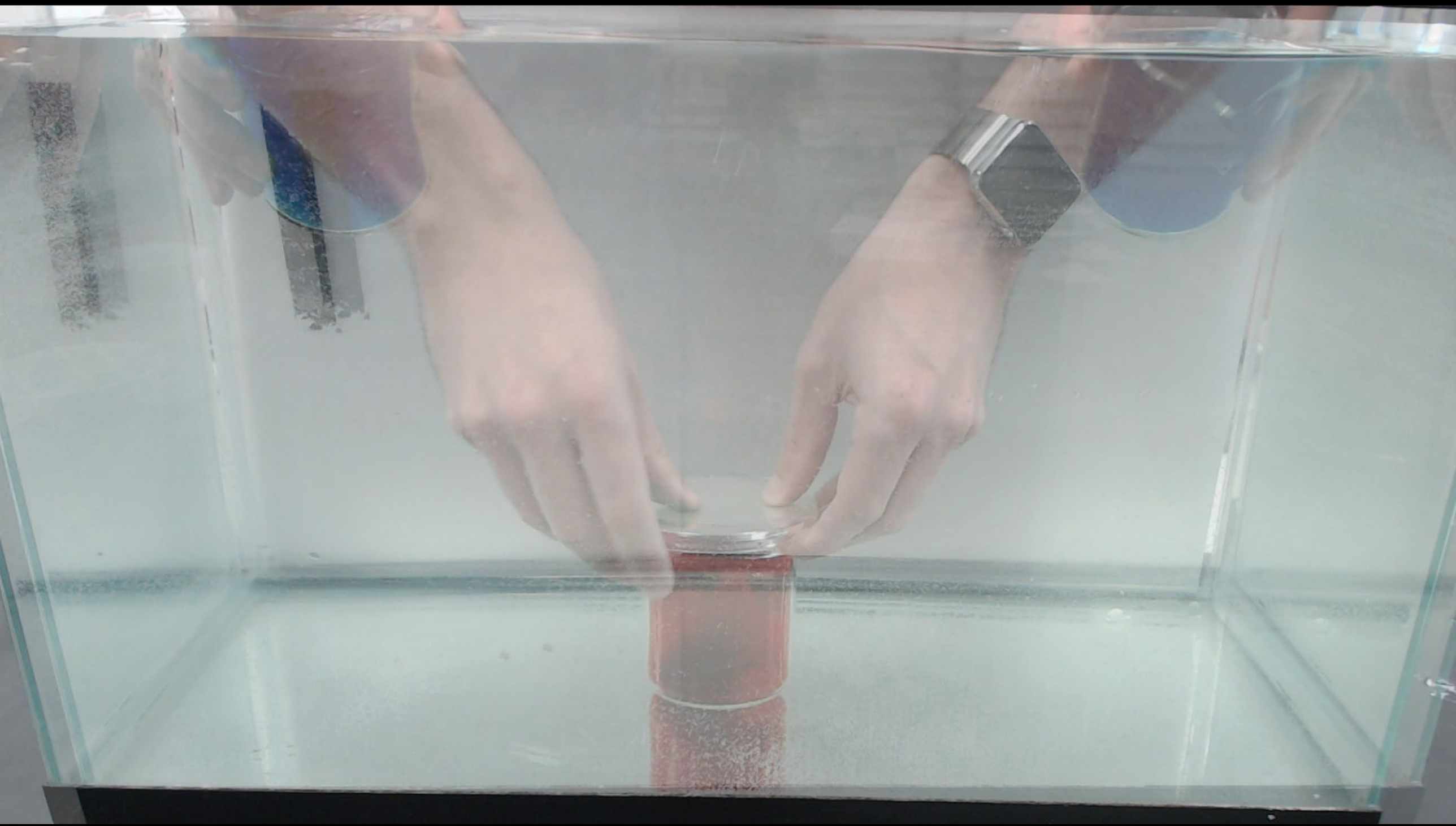

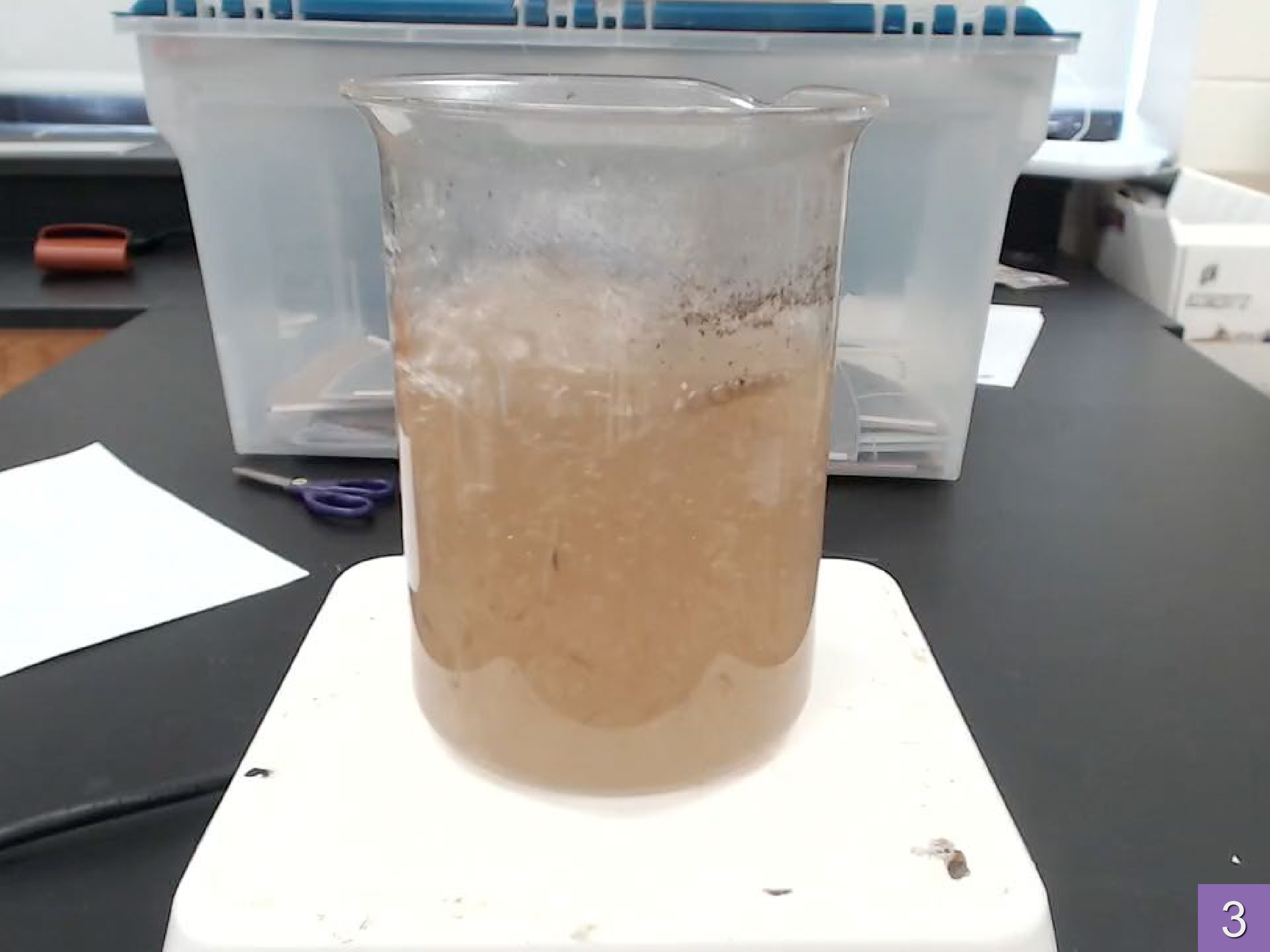

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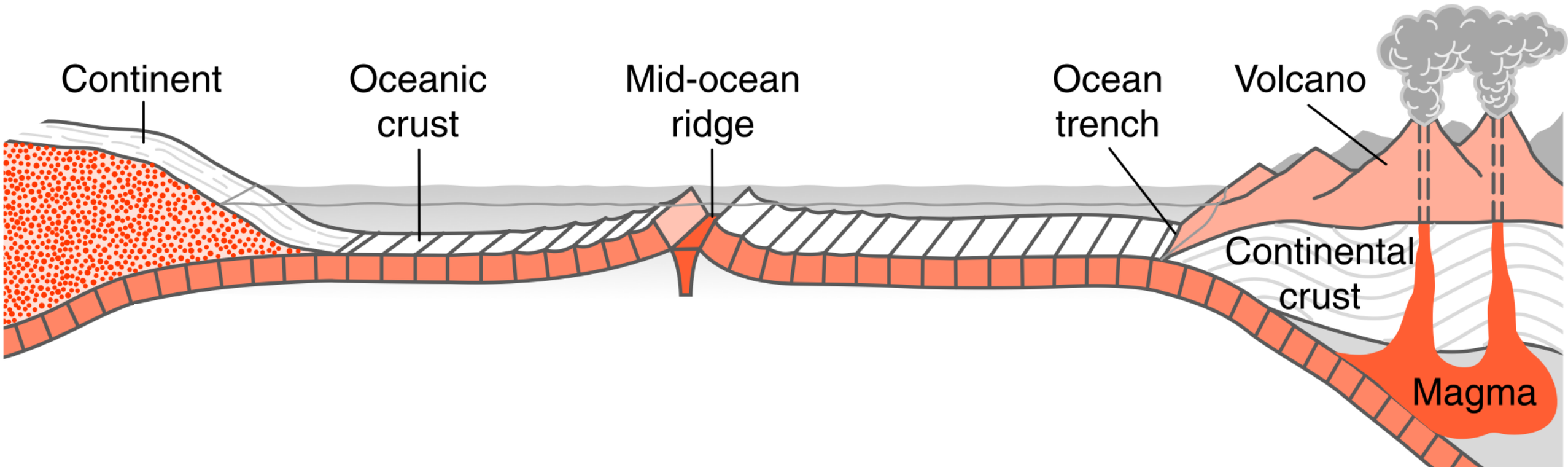

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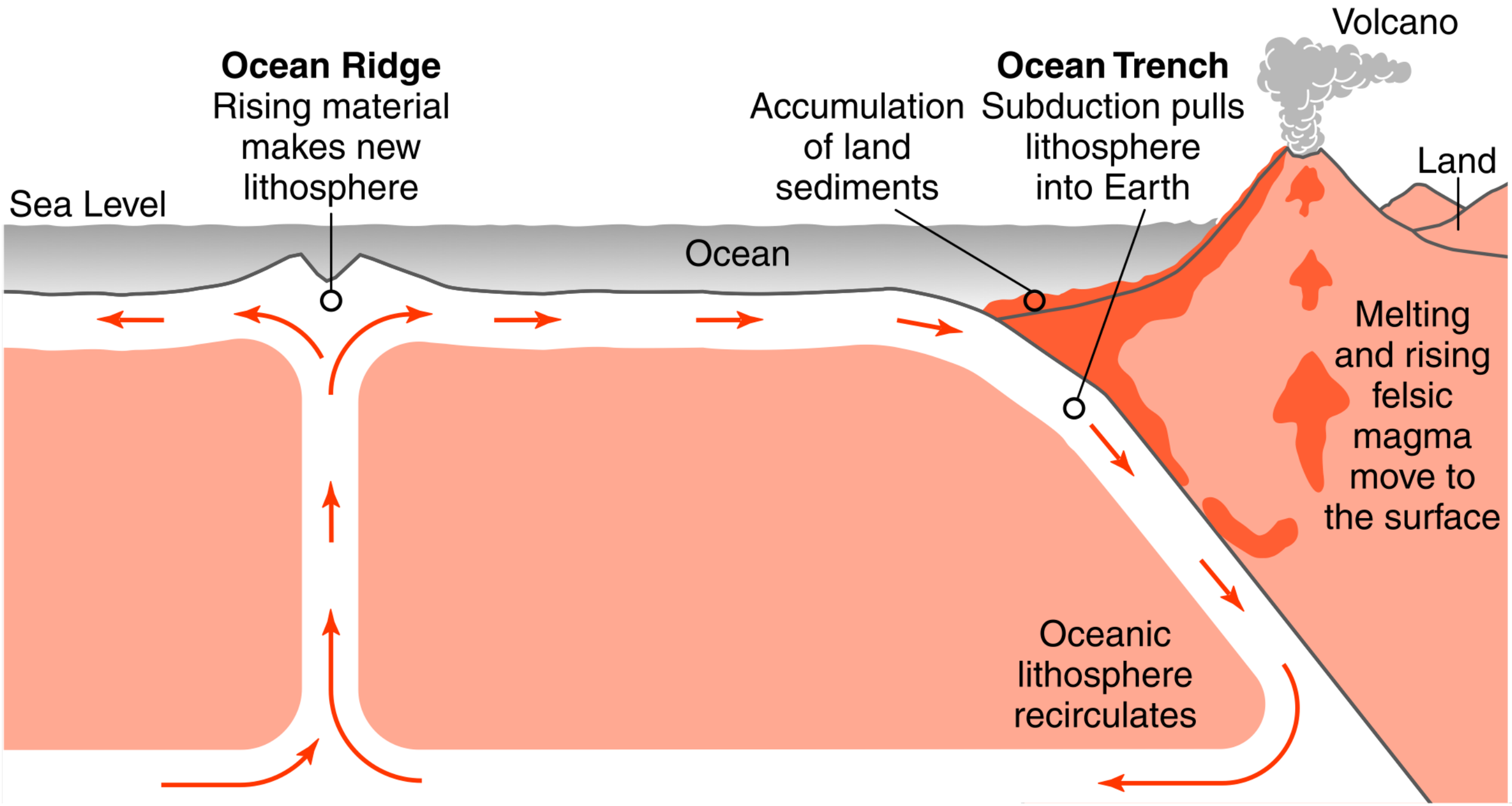

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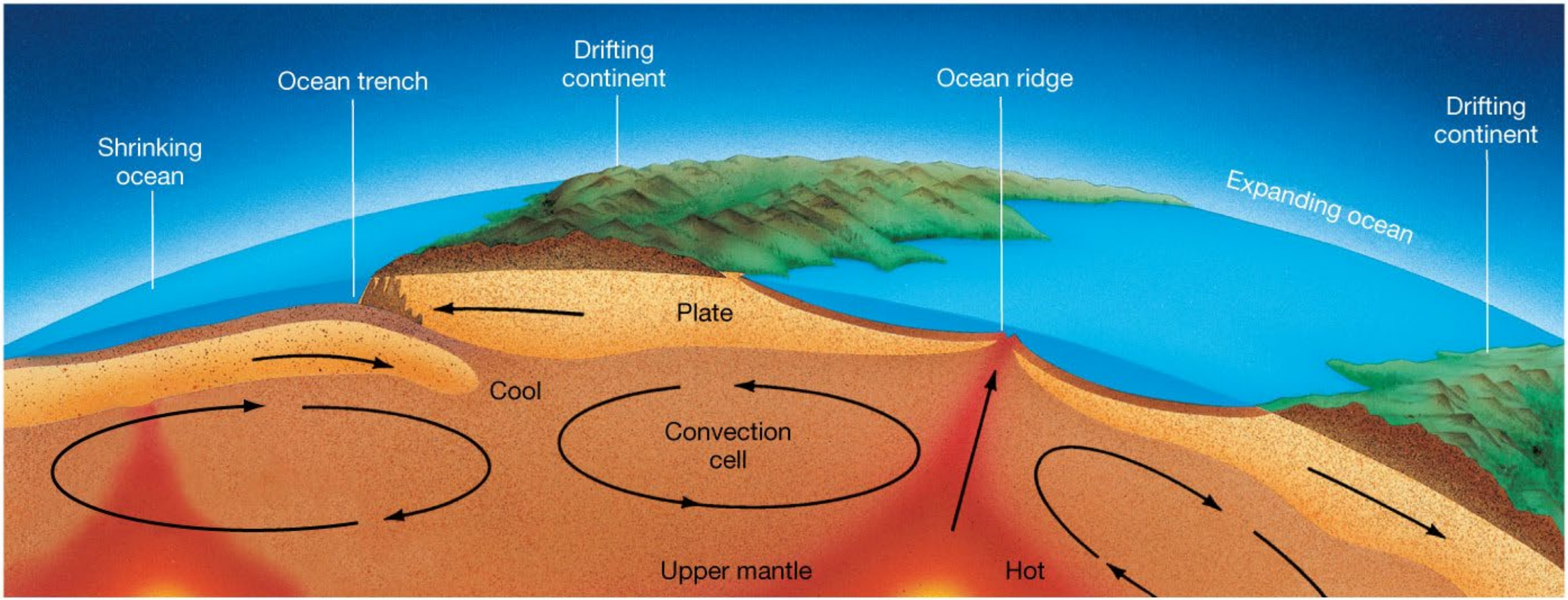

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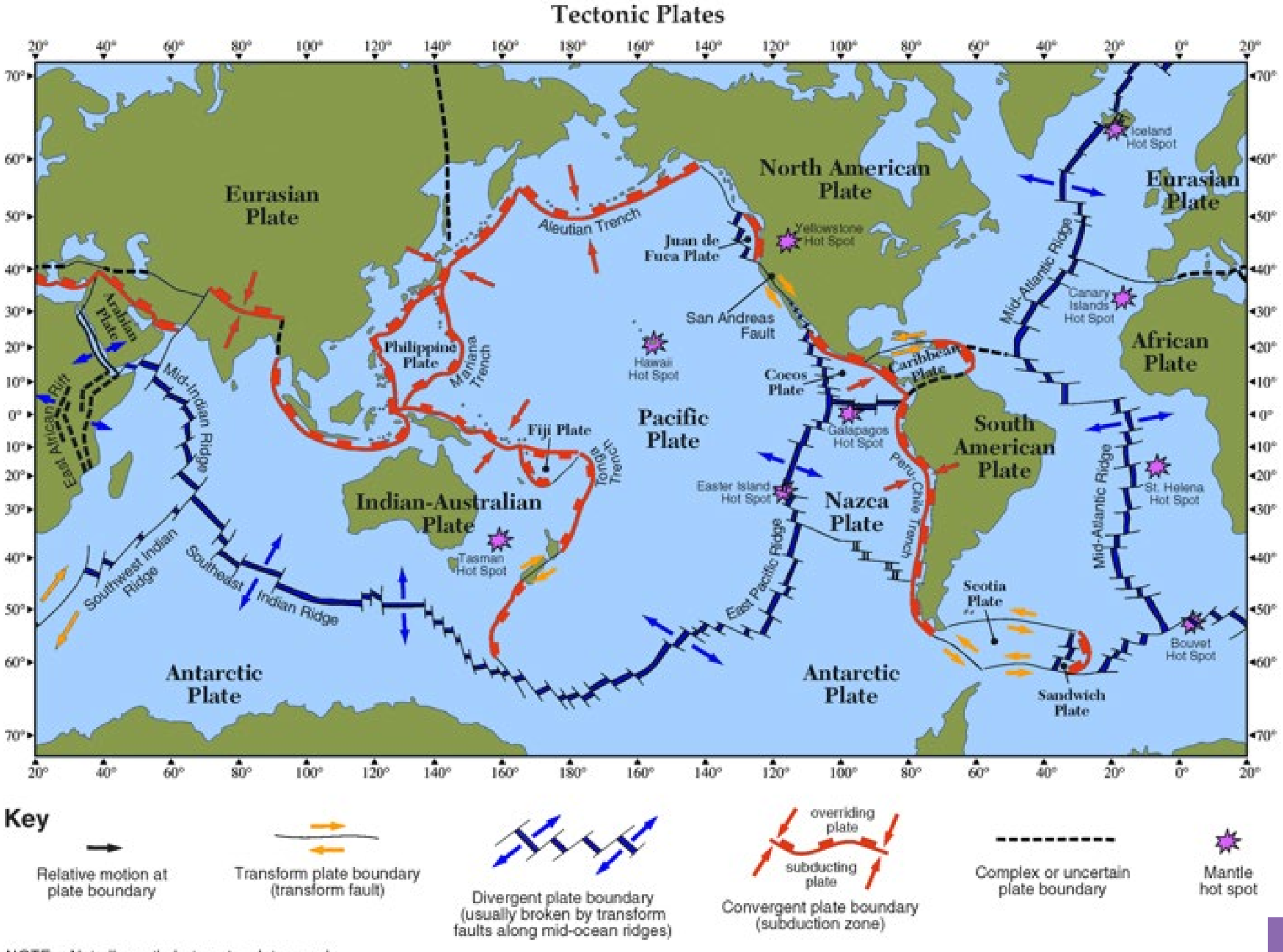

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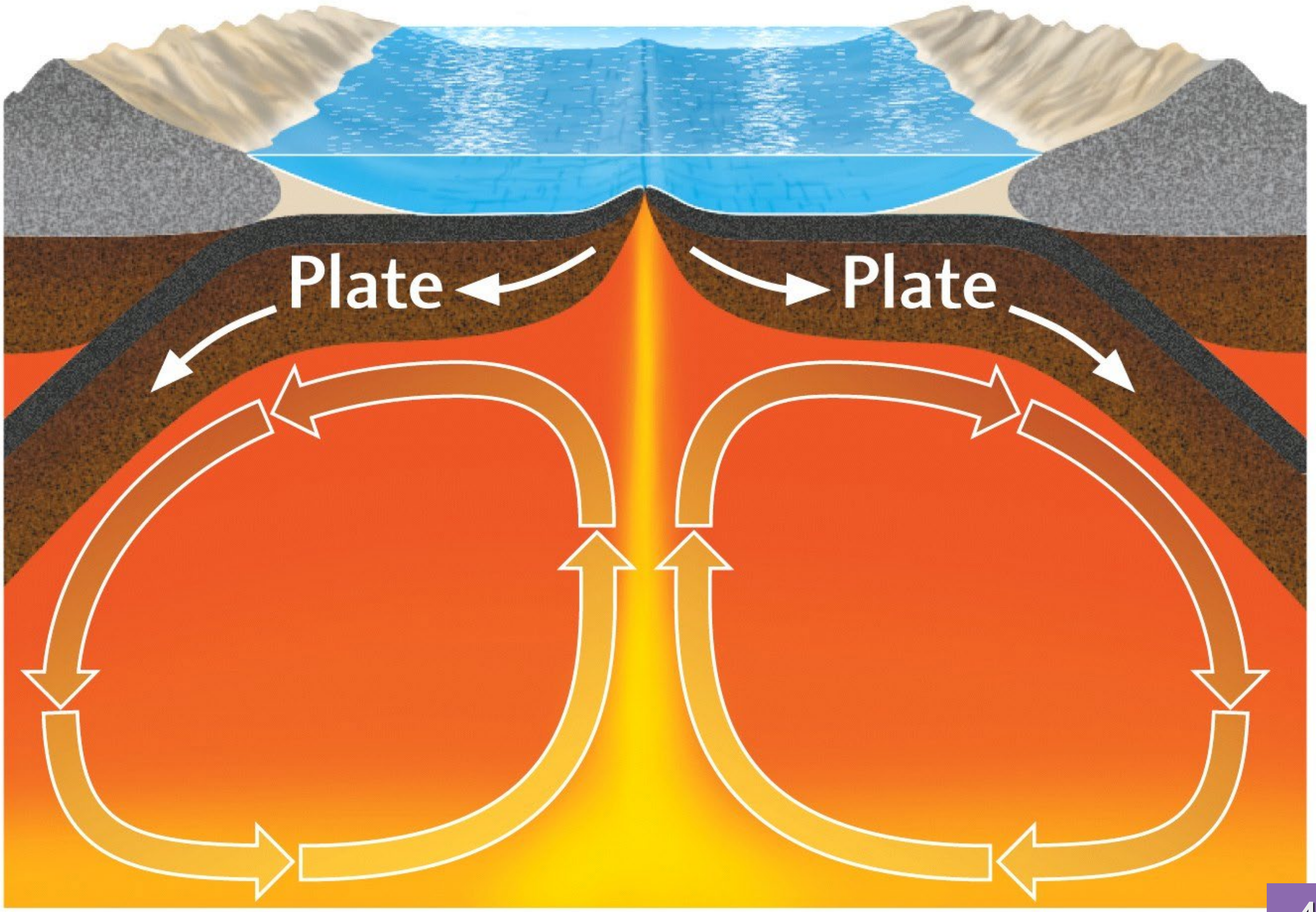
Plate Boundaries

- Divergent - area where two plates move apart.
- Convergent - area where two plates move together.
- Transform - area where two plates slide alongside each other.

Goal: Students will be able to describe the types of plate boundaries that can exist.



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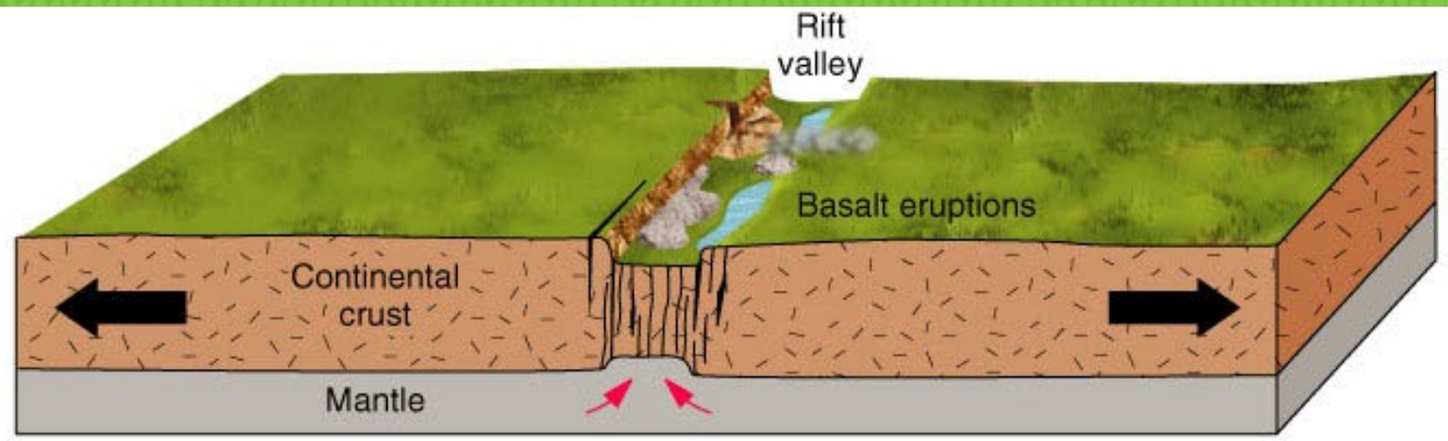

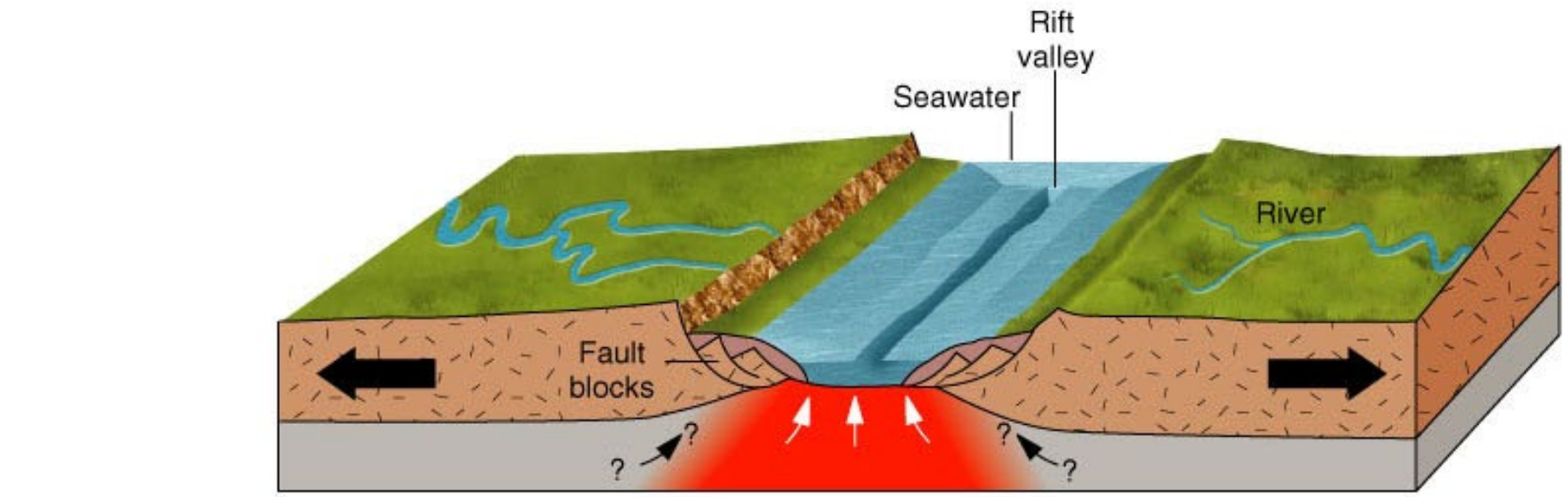

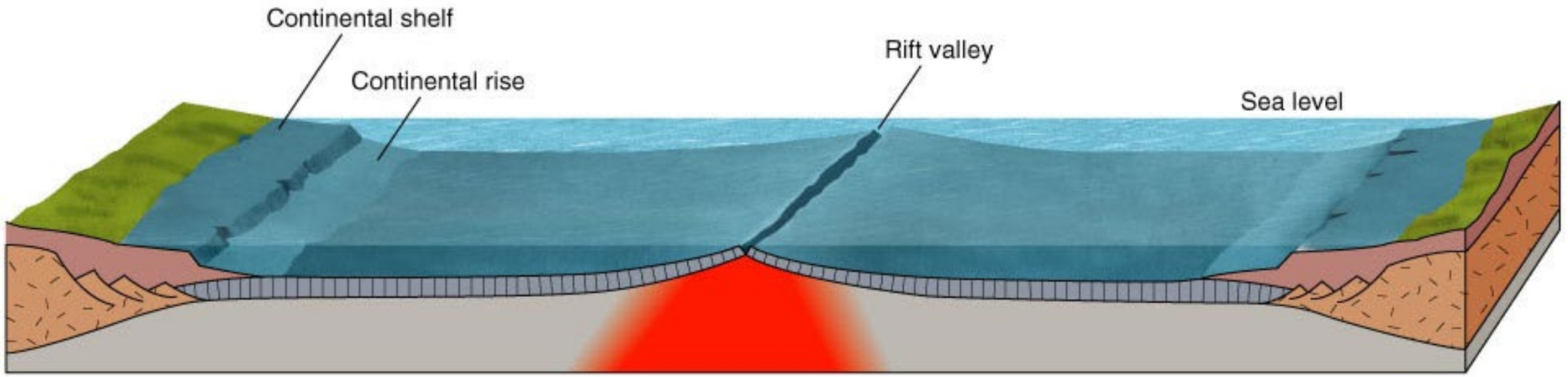

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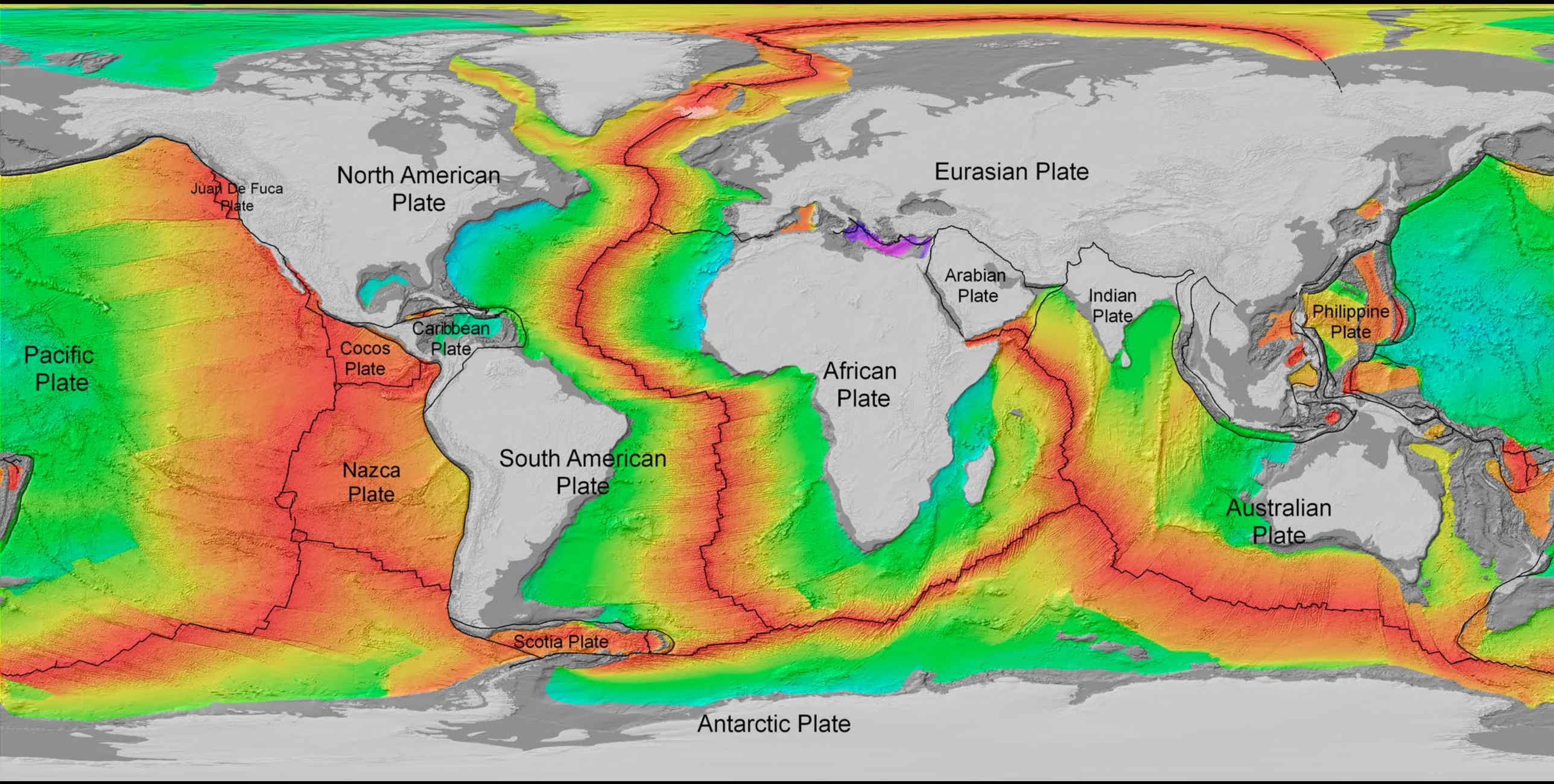

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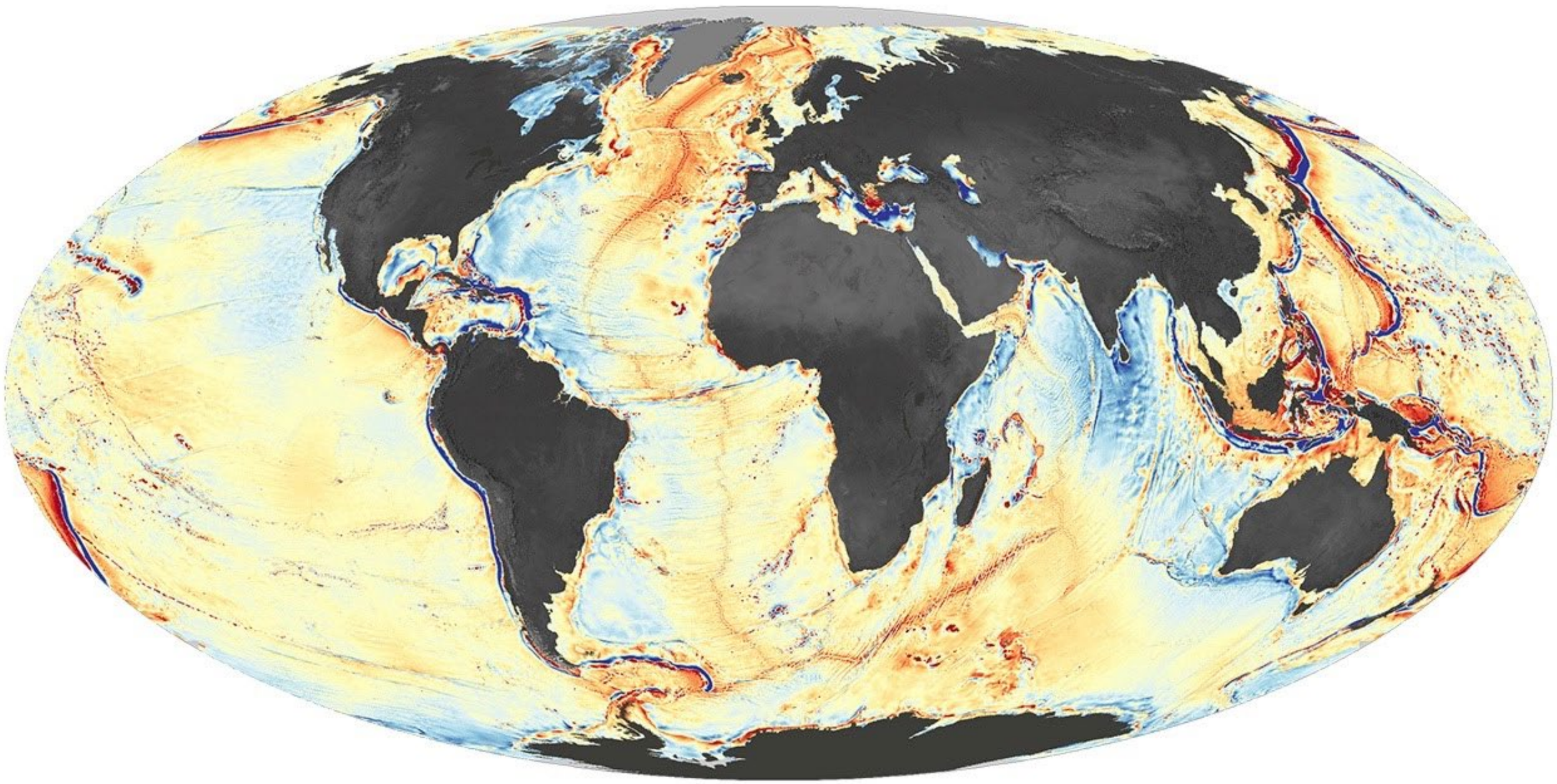

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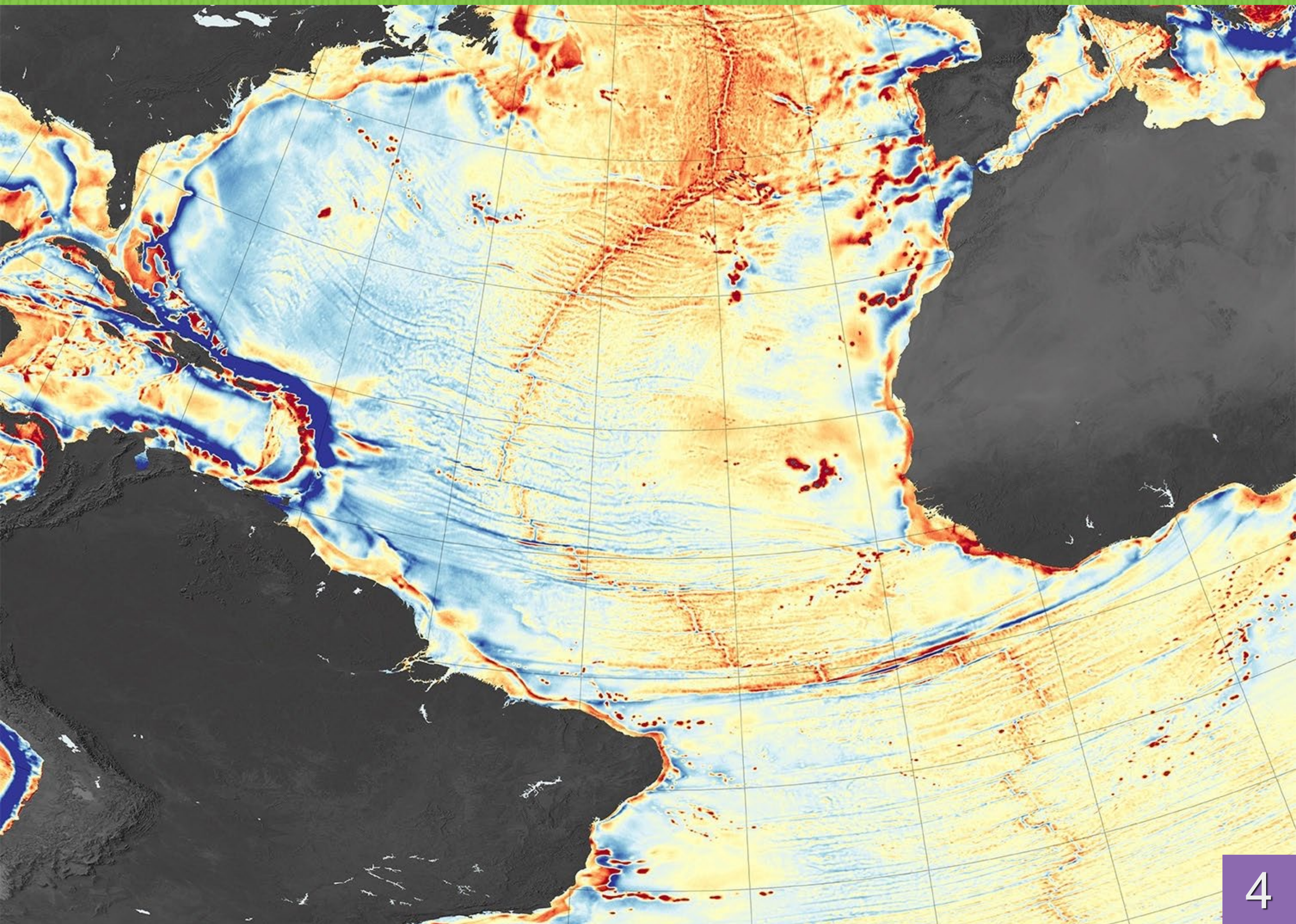

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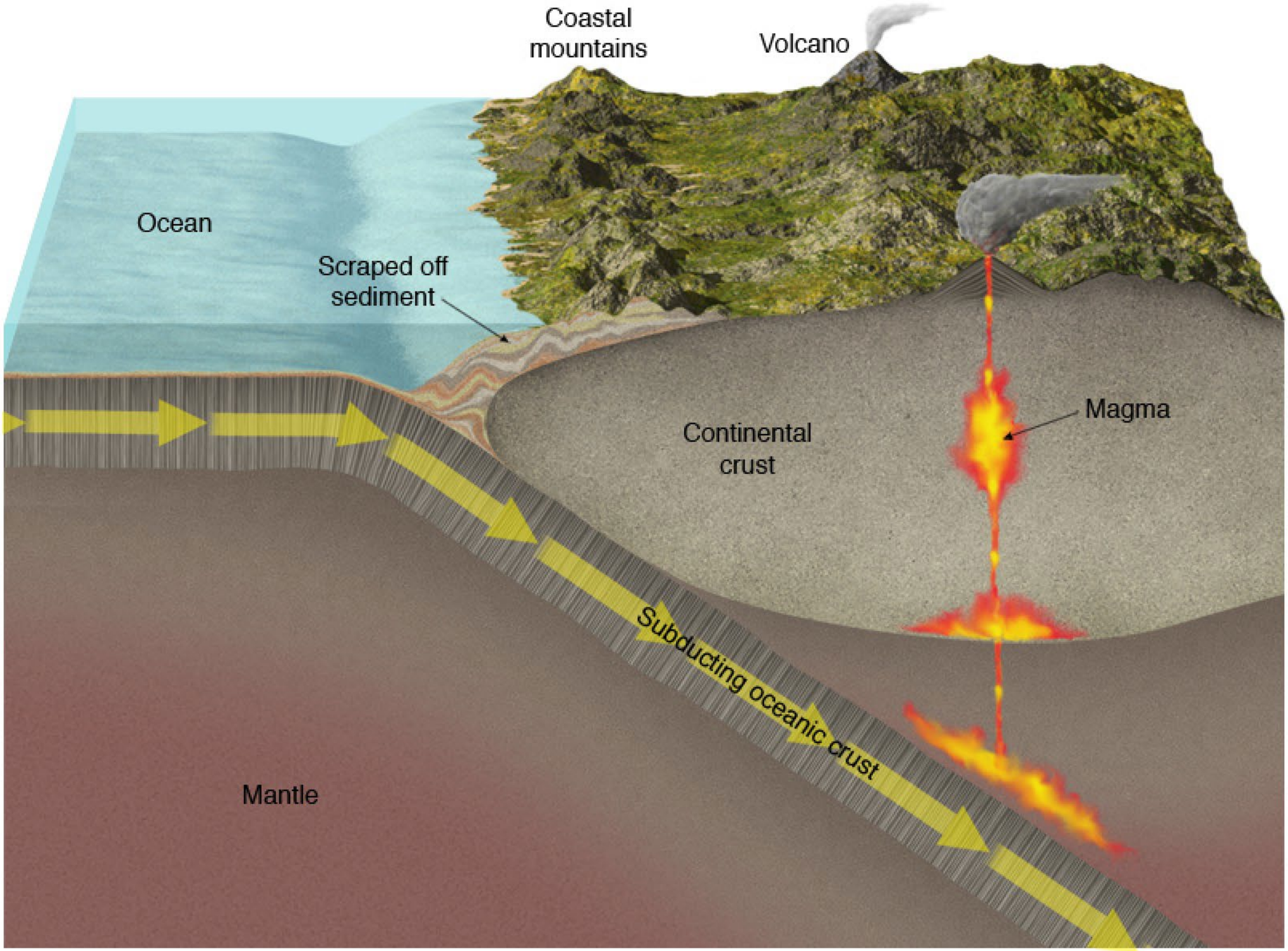

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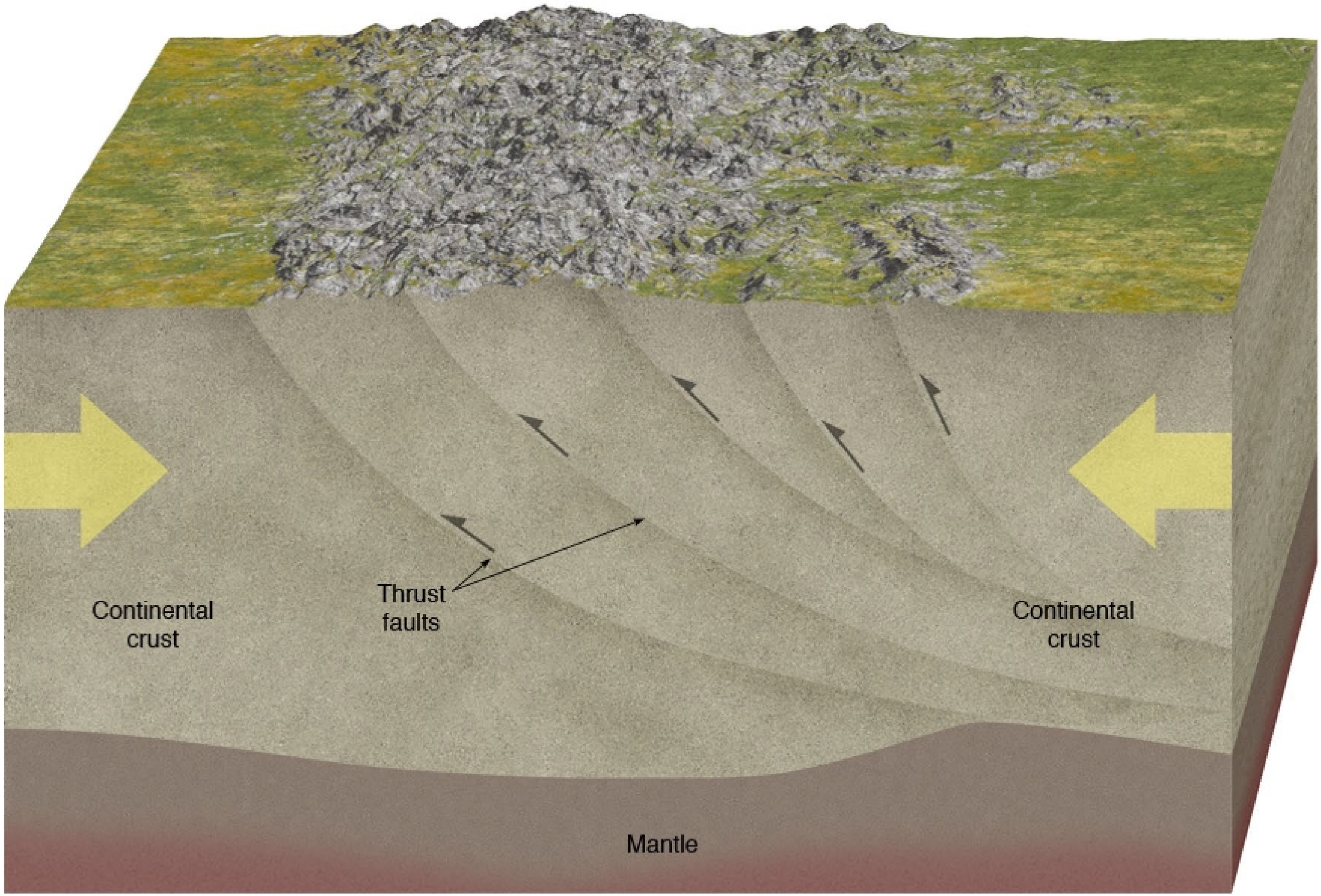

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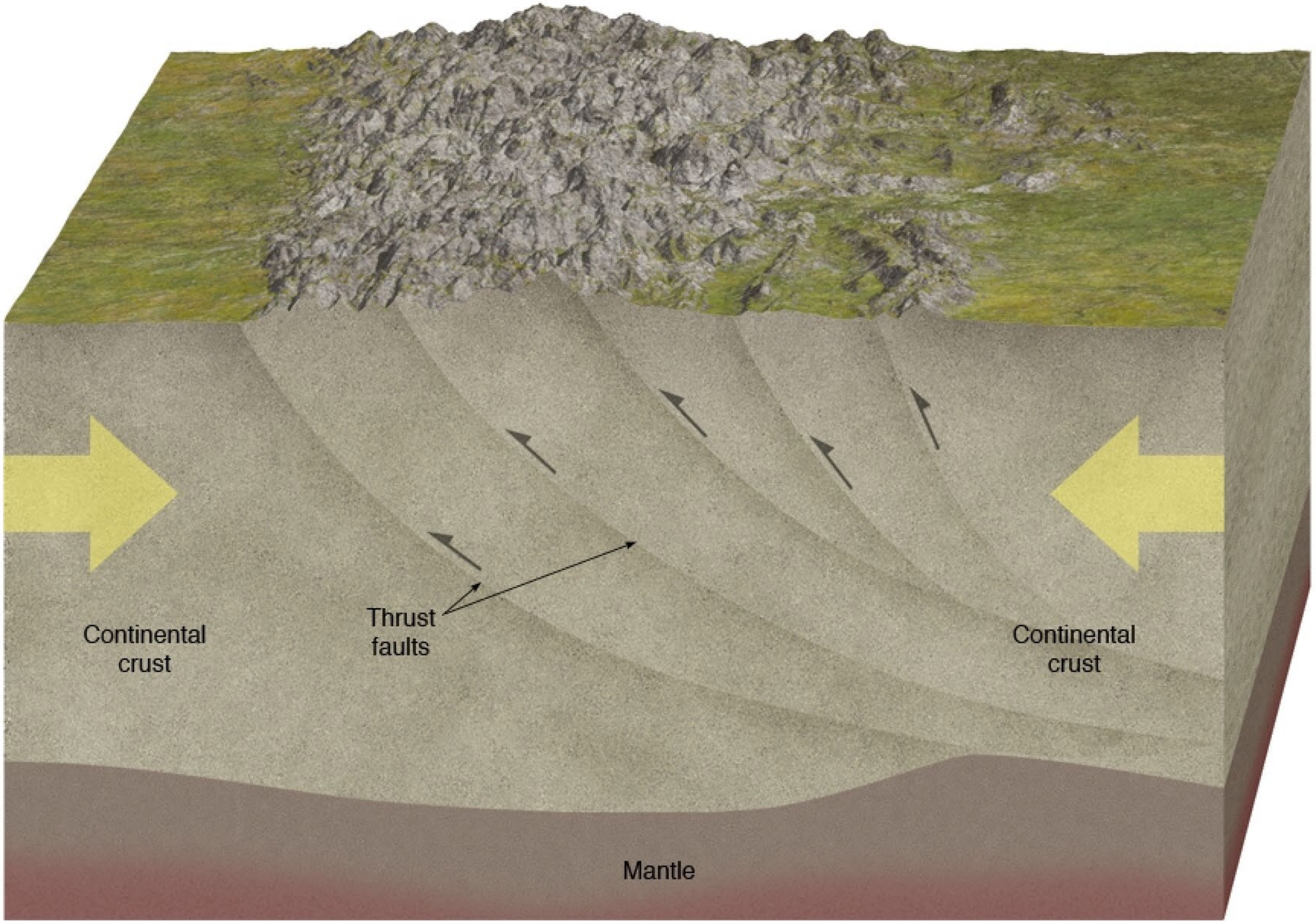

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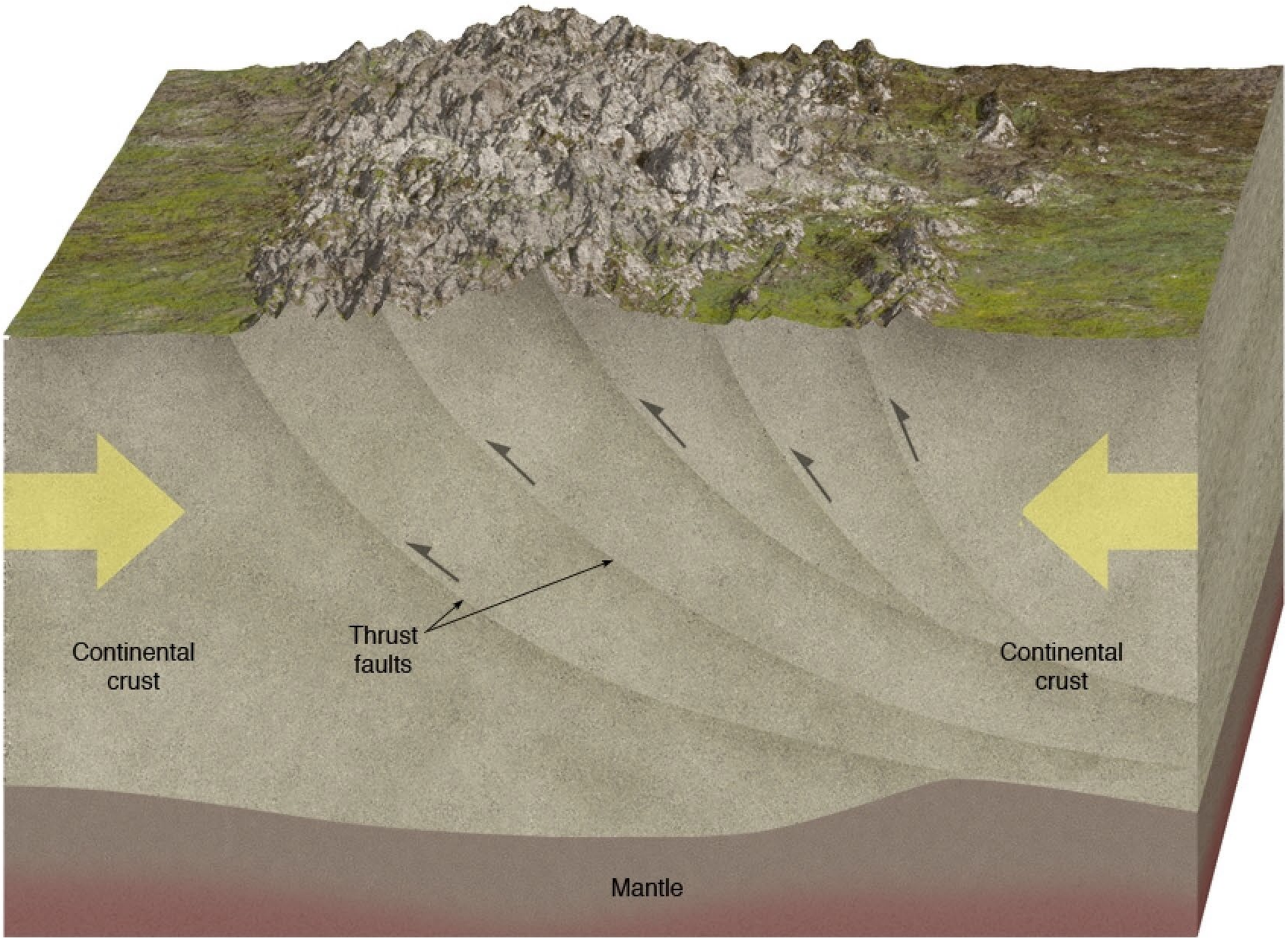

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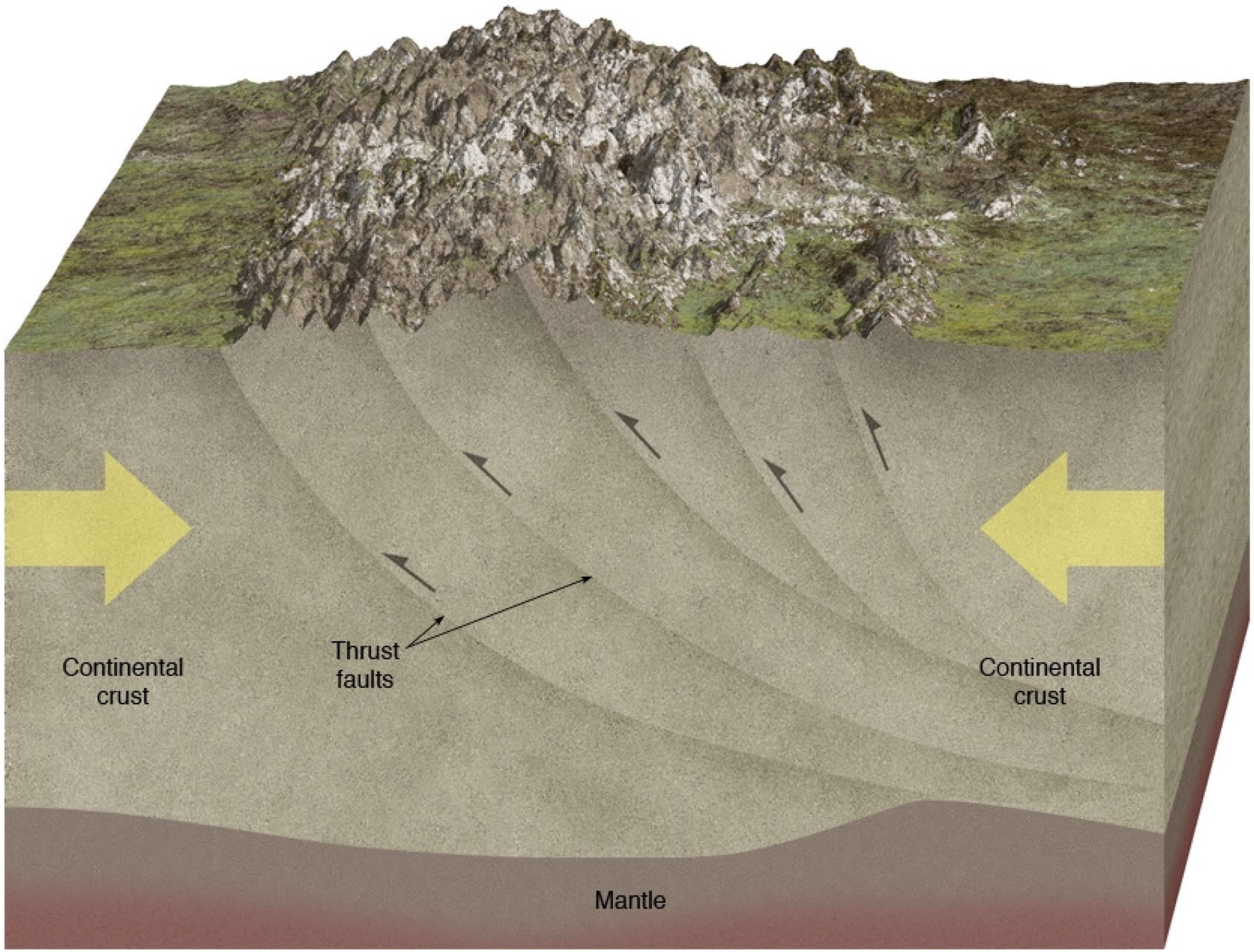

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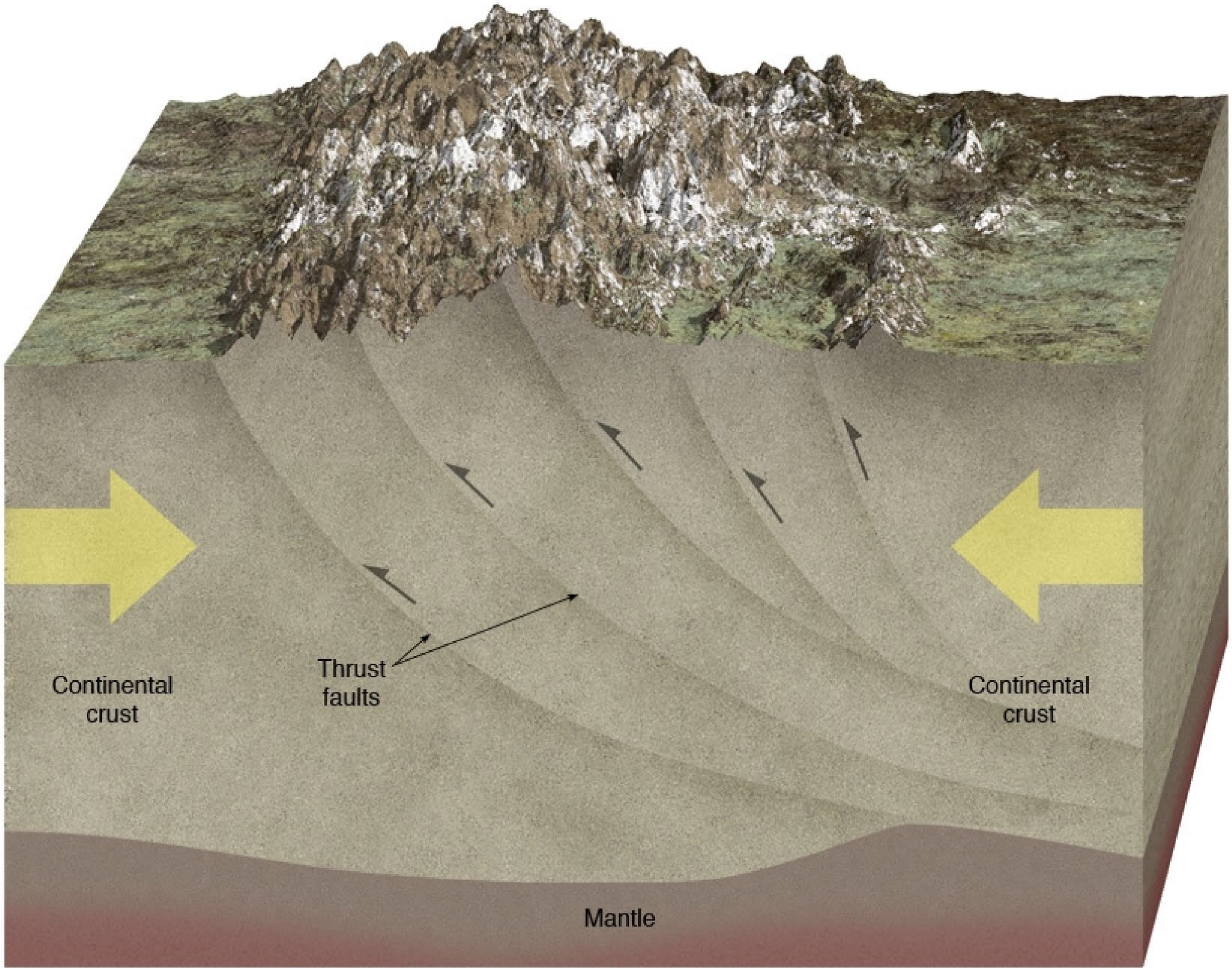

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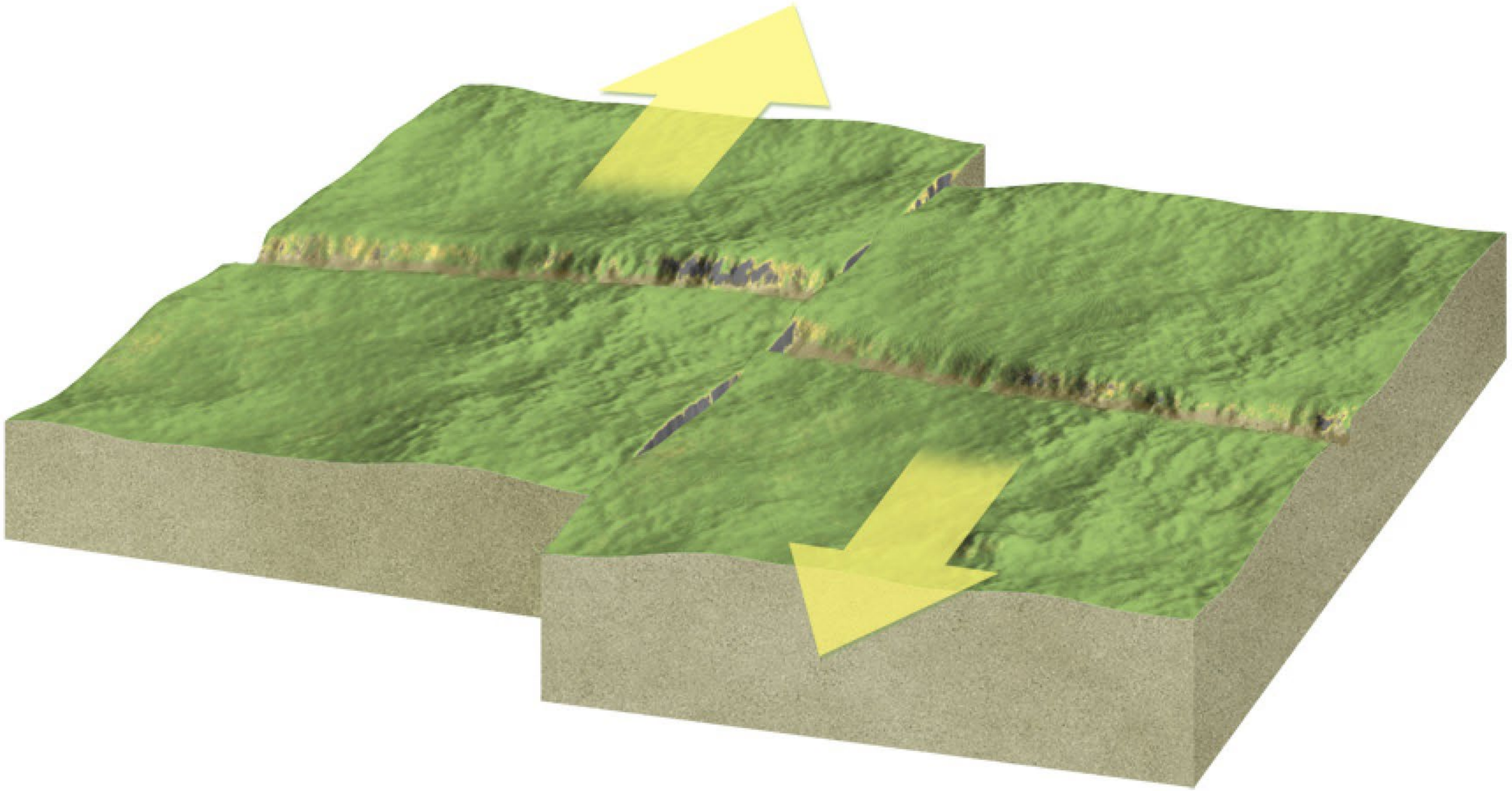

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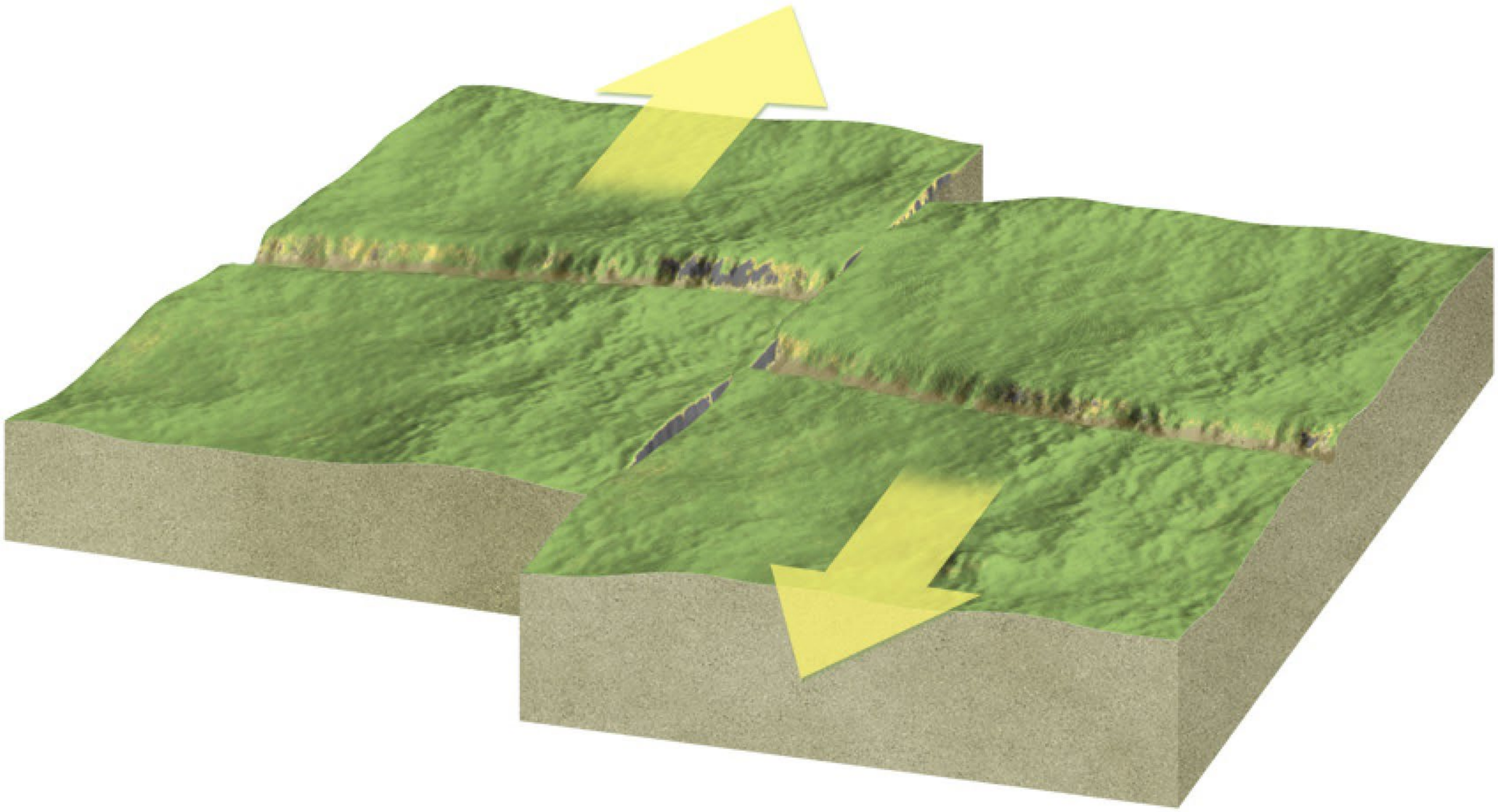

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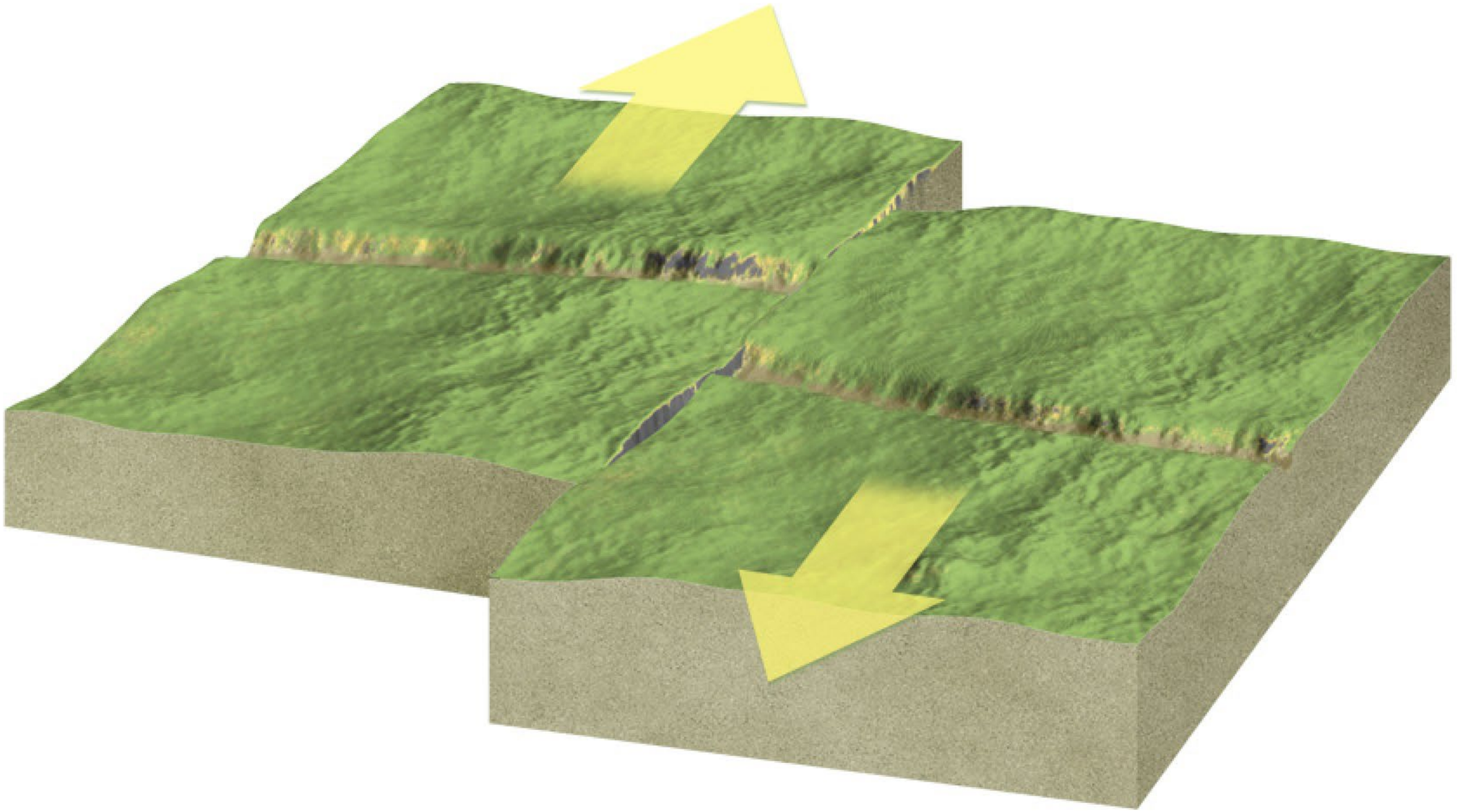

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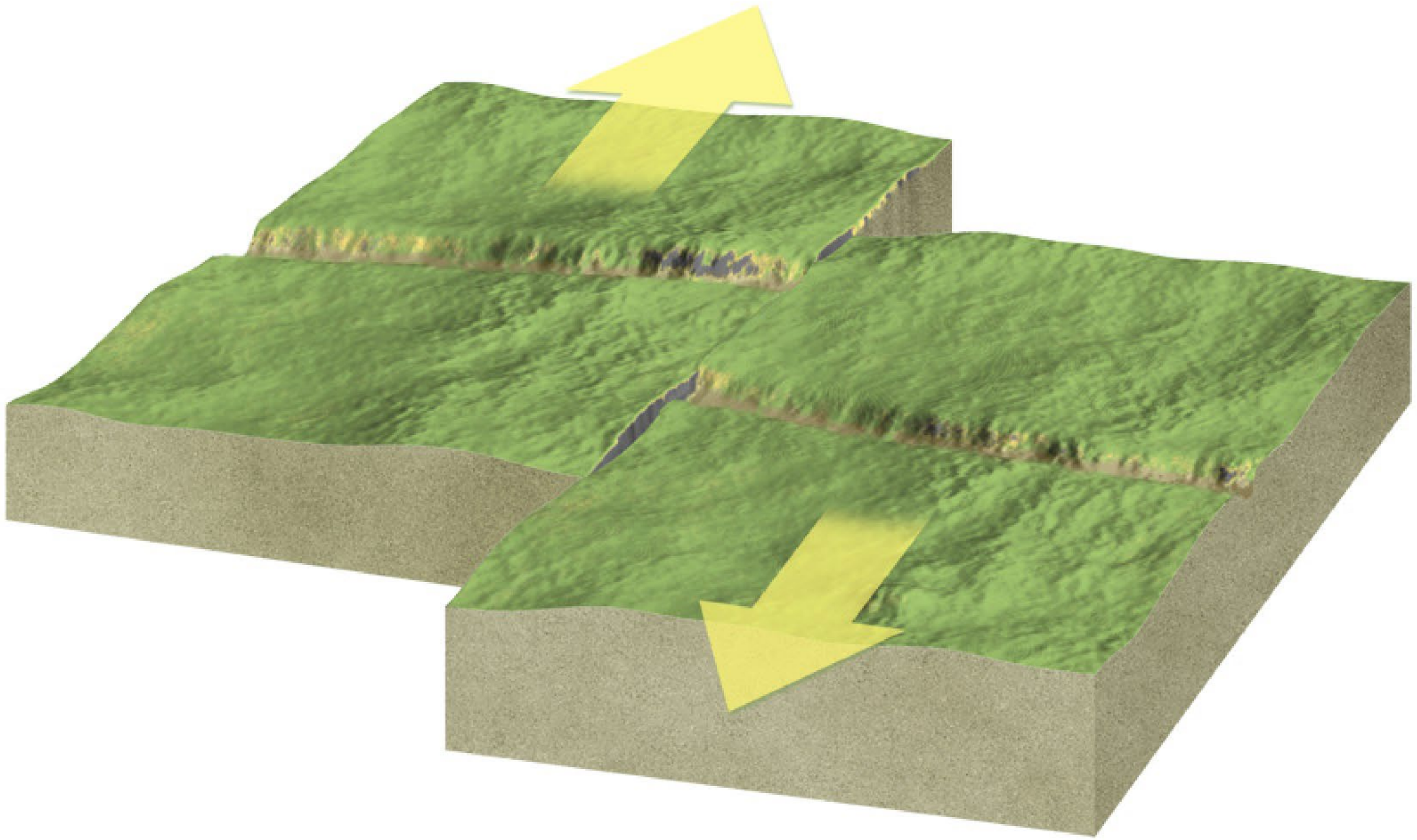

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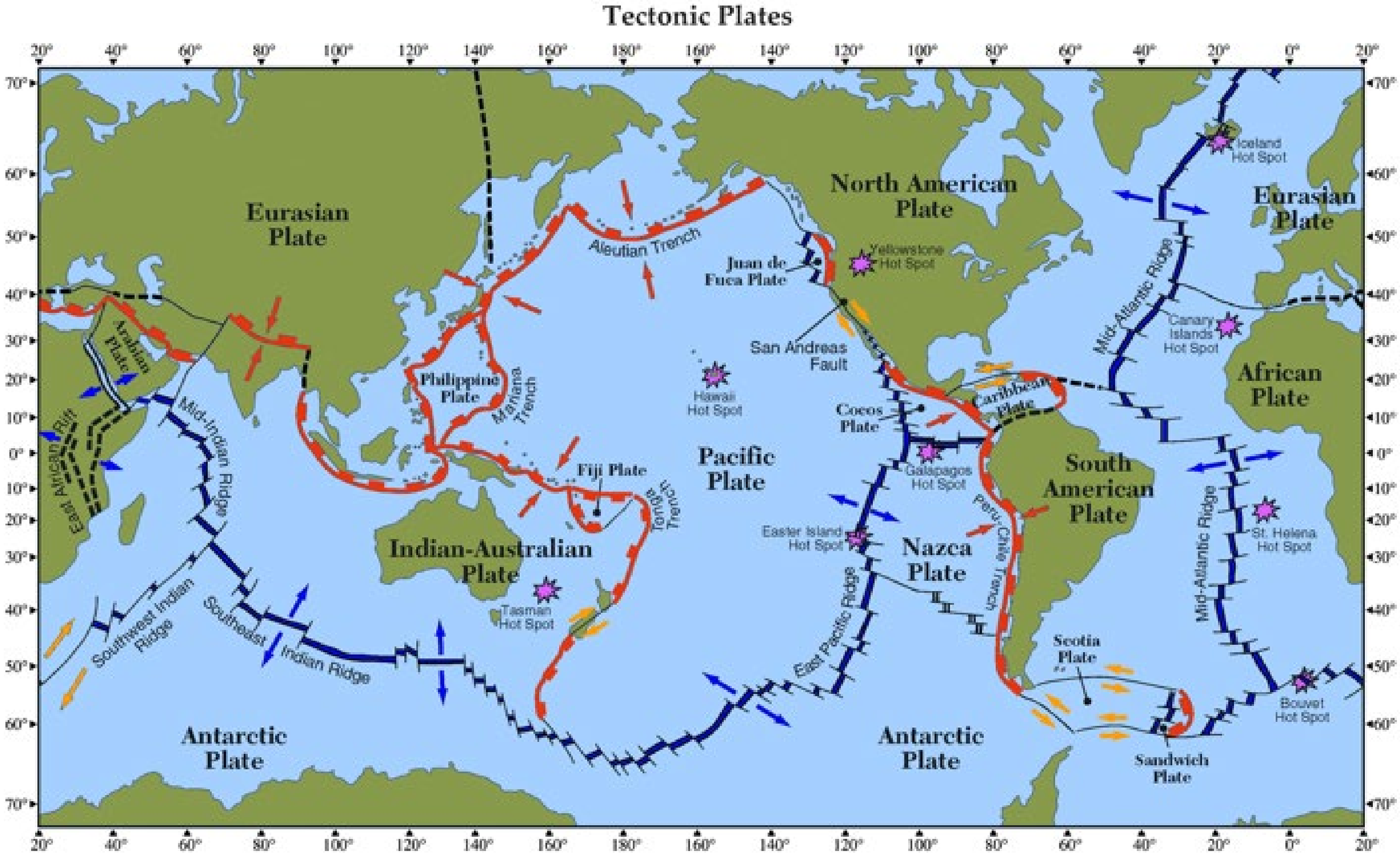

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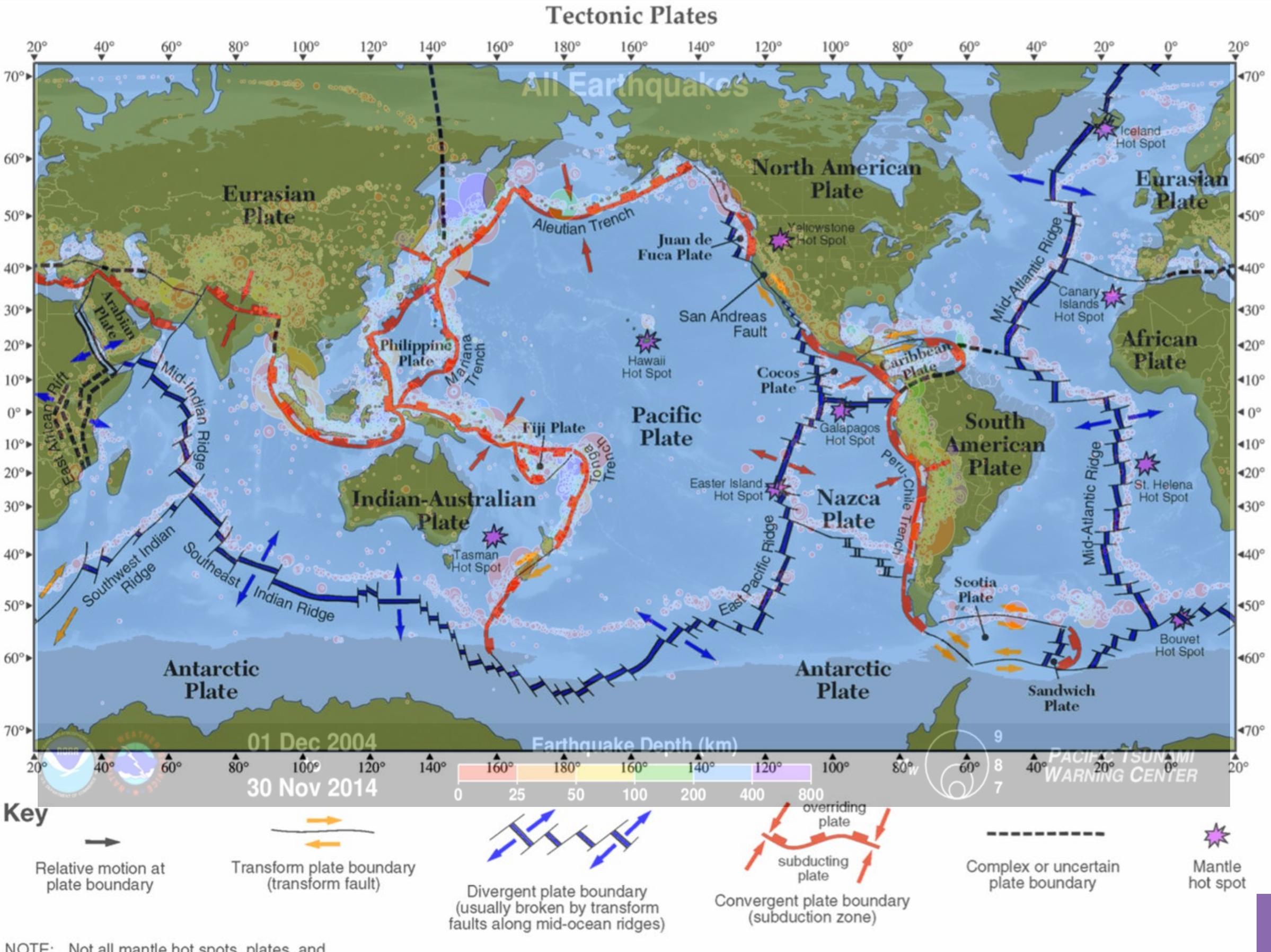
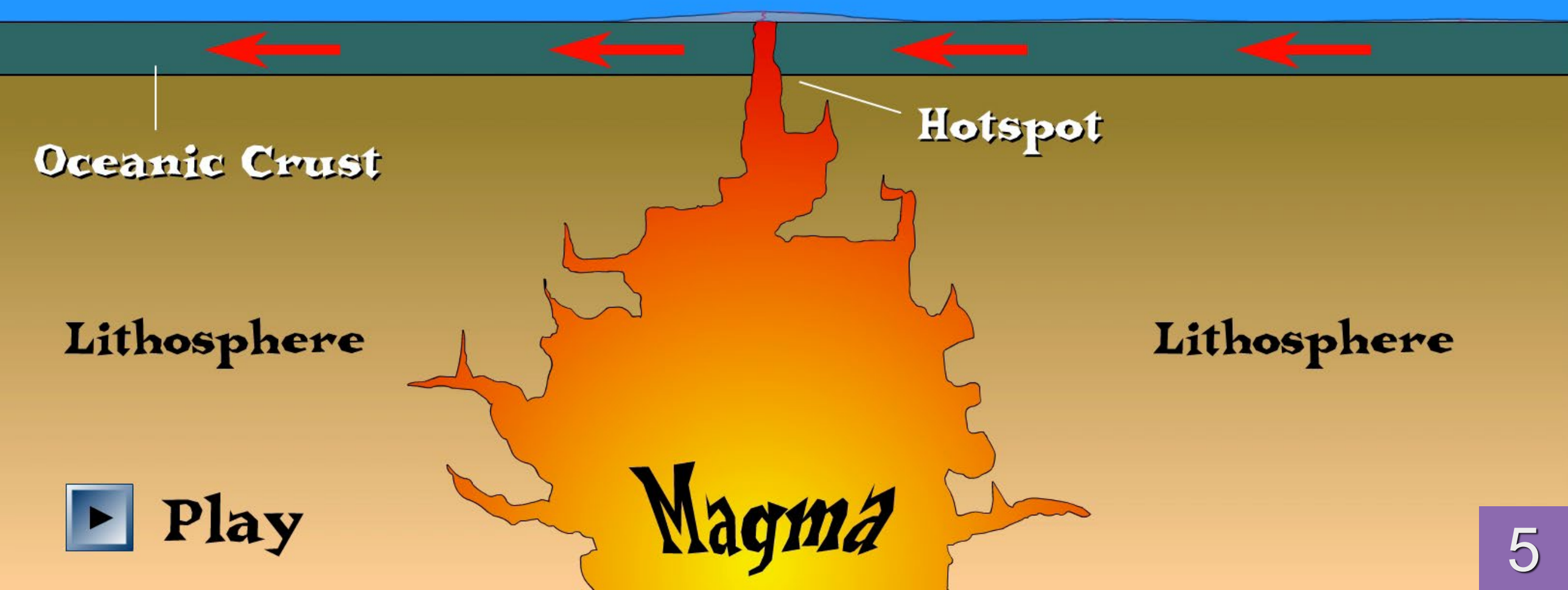


Goal: Students will be able to describe the types of plate boundaries that can exist.

What is a hot spot?

- Hotspot - a long-lived source of magma within the asthenosphere and below the moving lithospheric plates.

Hotspots and the Hawaiian islands



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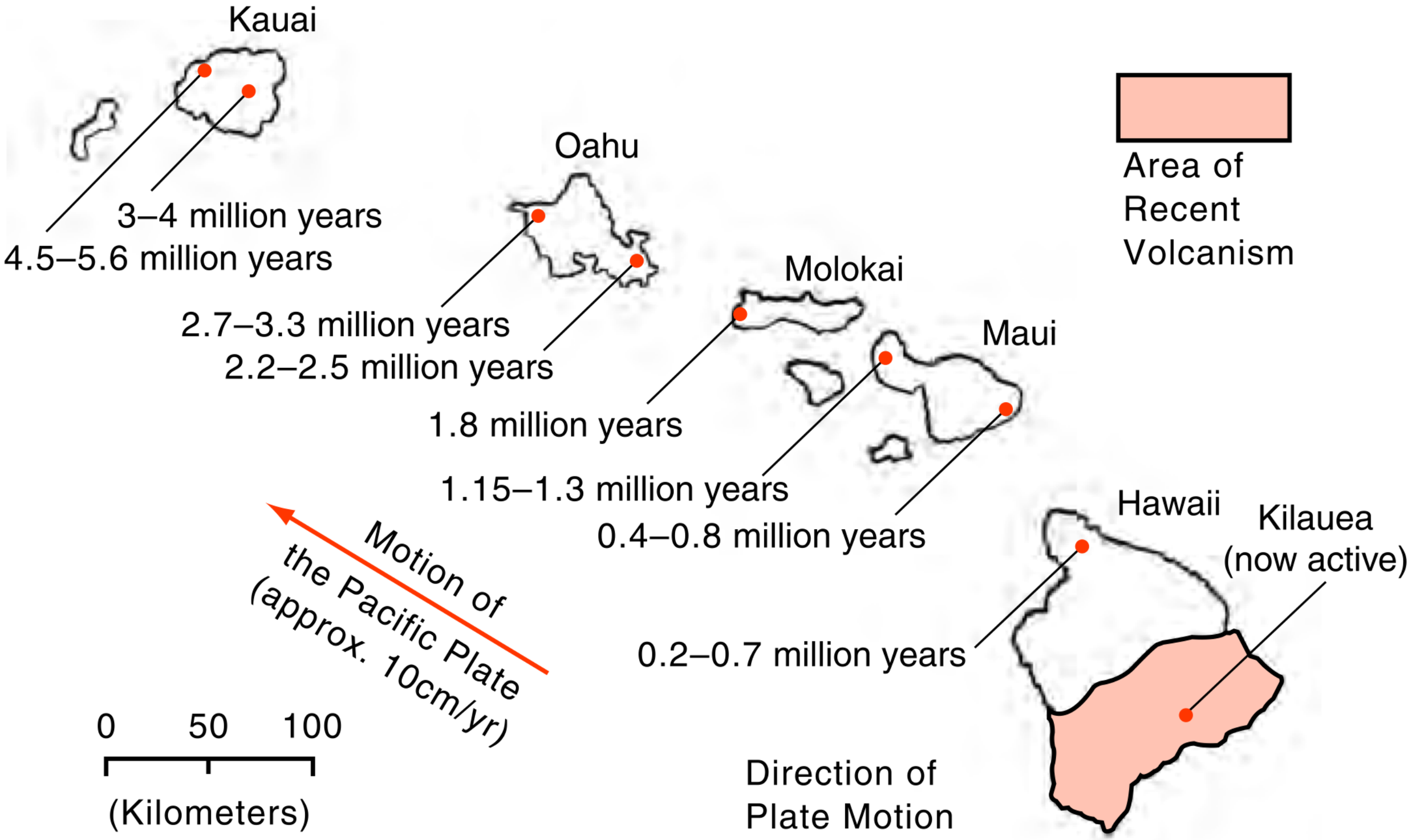

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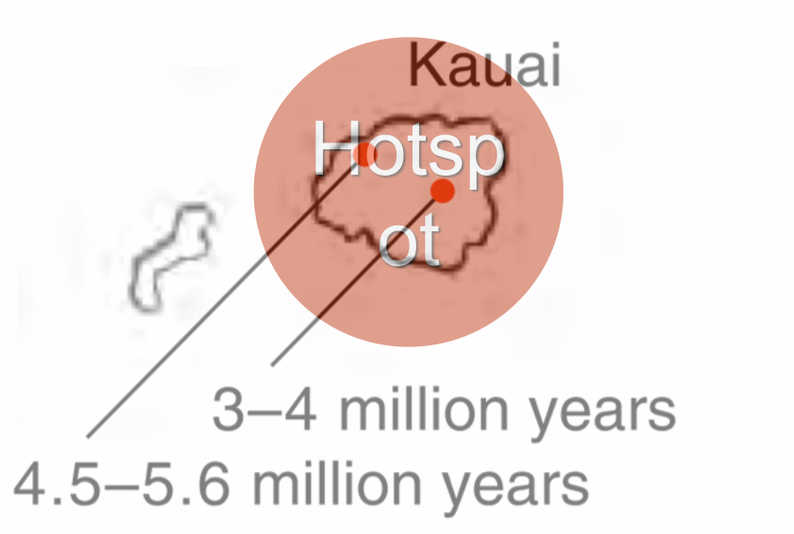

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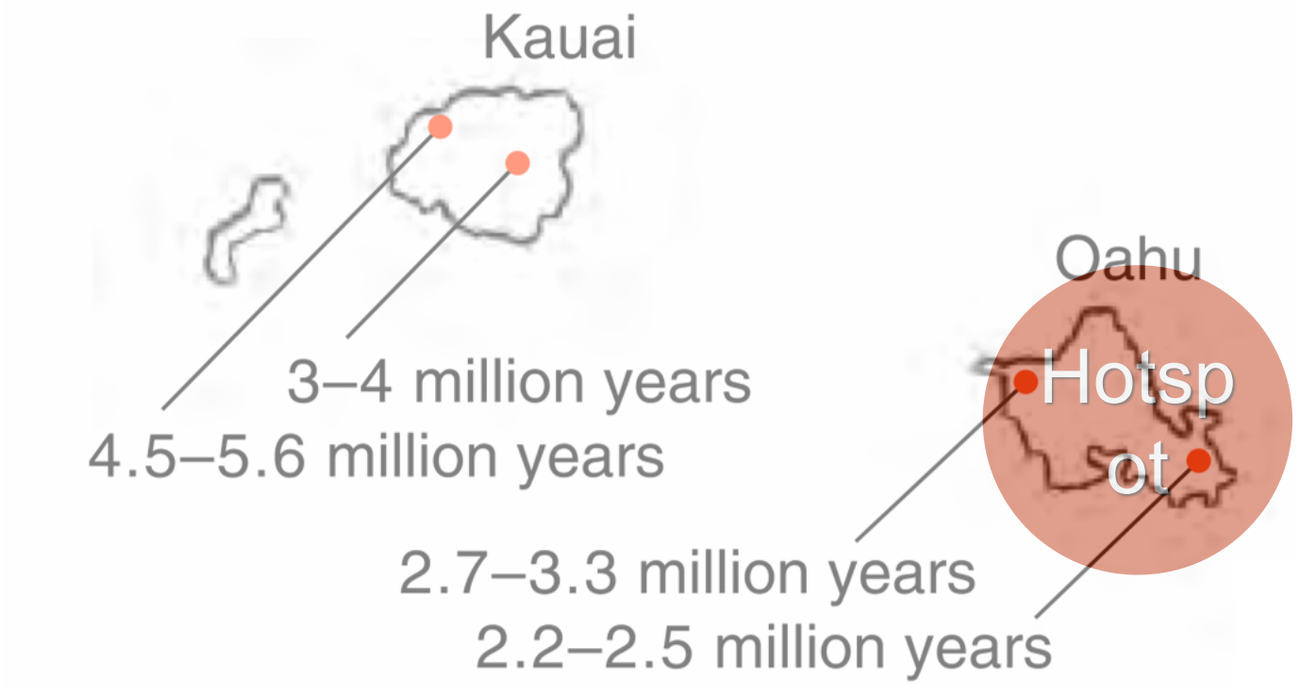

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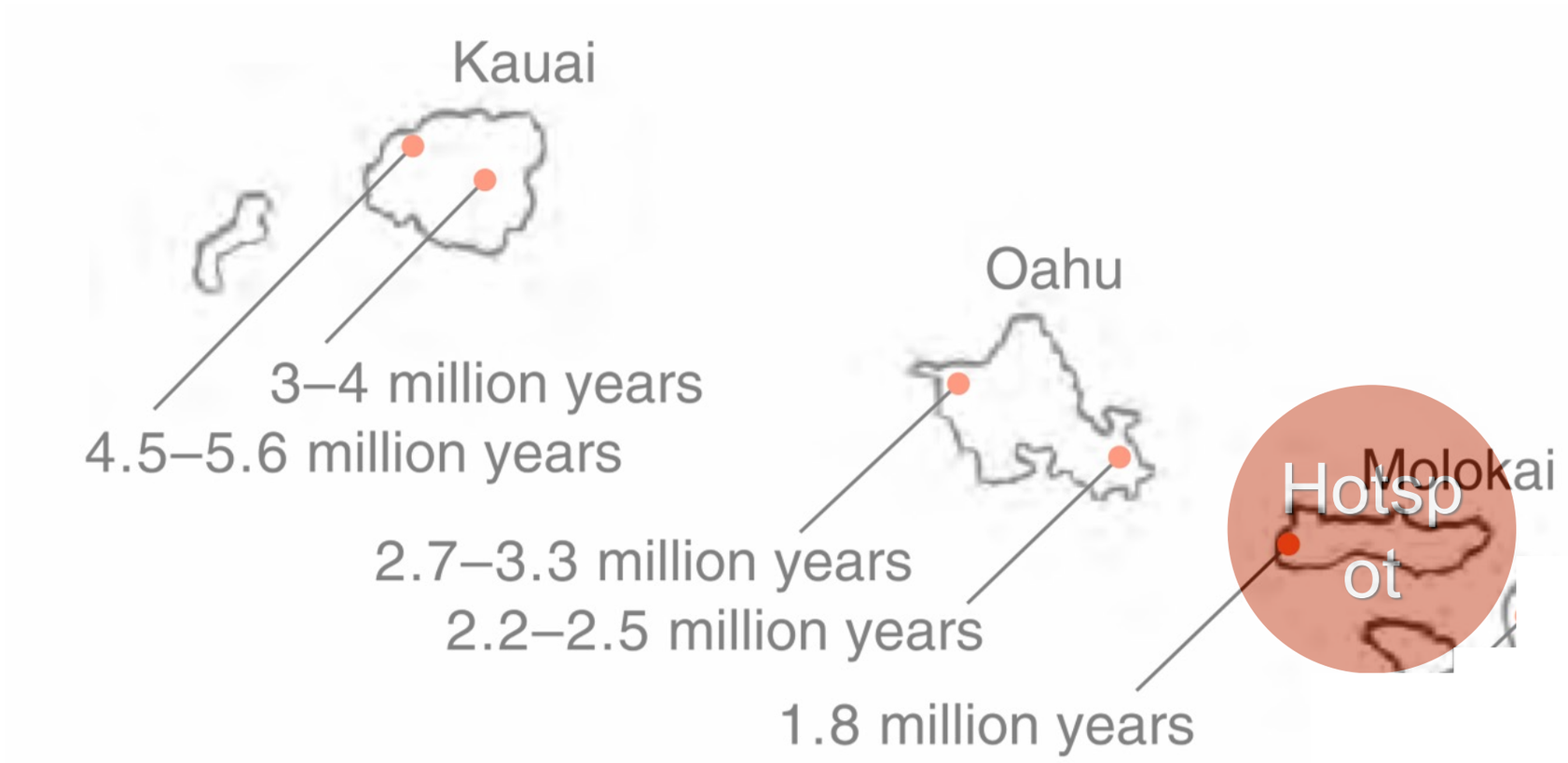

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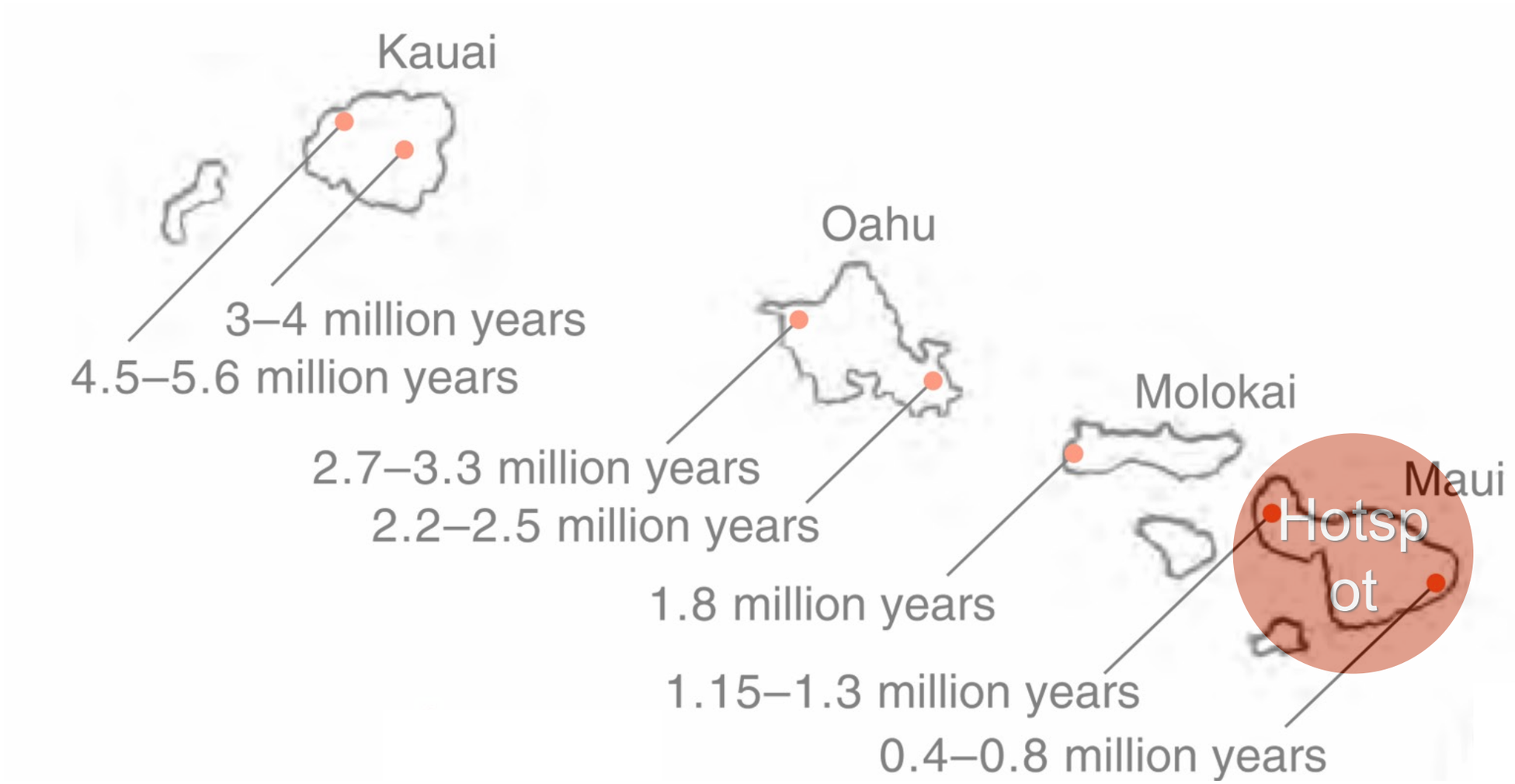

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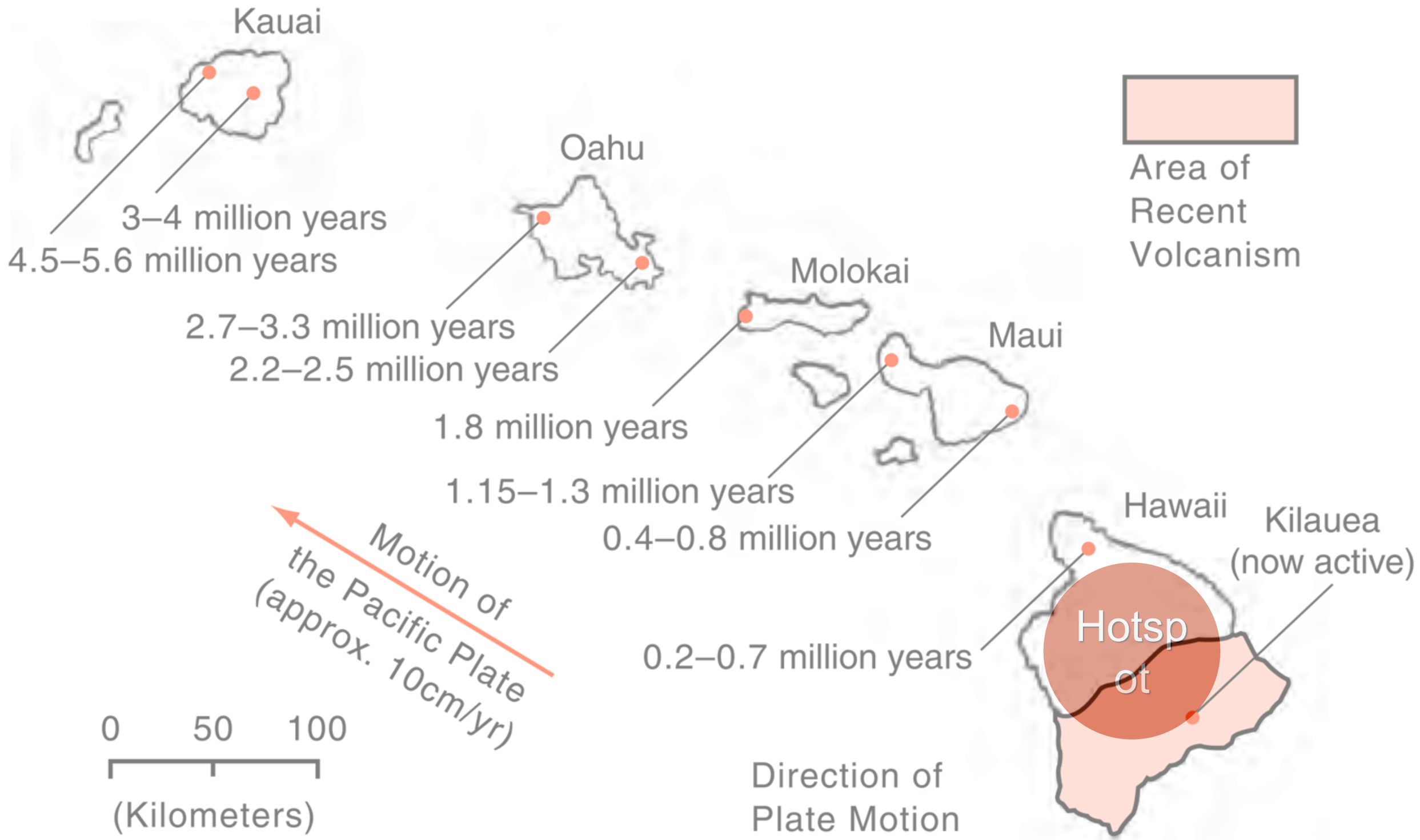

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Geologic Hazards

- Earthquake - a sudden movement of Earth's crust that releases energy.

- Volcano - an opening in Earth's surface through which molten magma erupts.

Goal: Students will be able to describe where an earthquake/volcano can occur.

Where do earthquakes and volcanoes occur?

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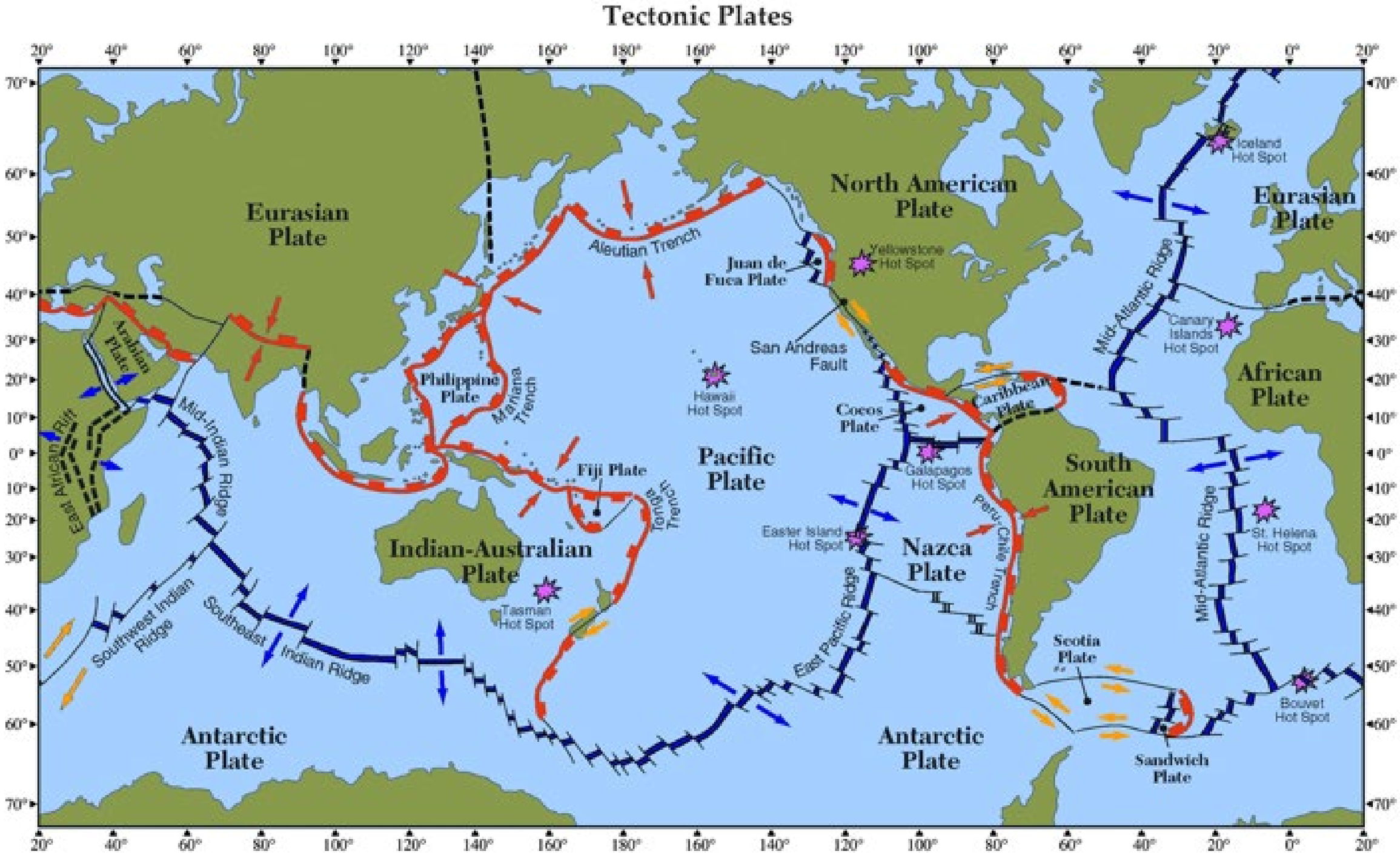


Goal: Students will be able to describe where an earthquake/volcano can occur.

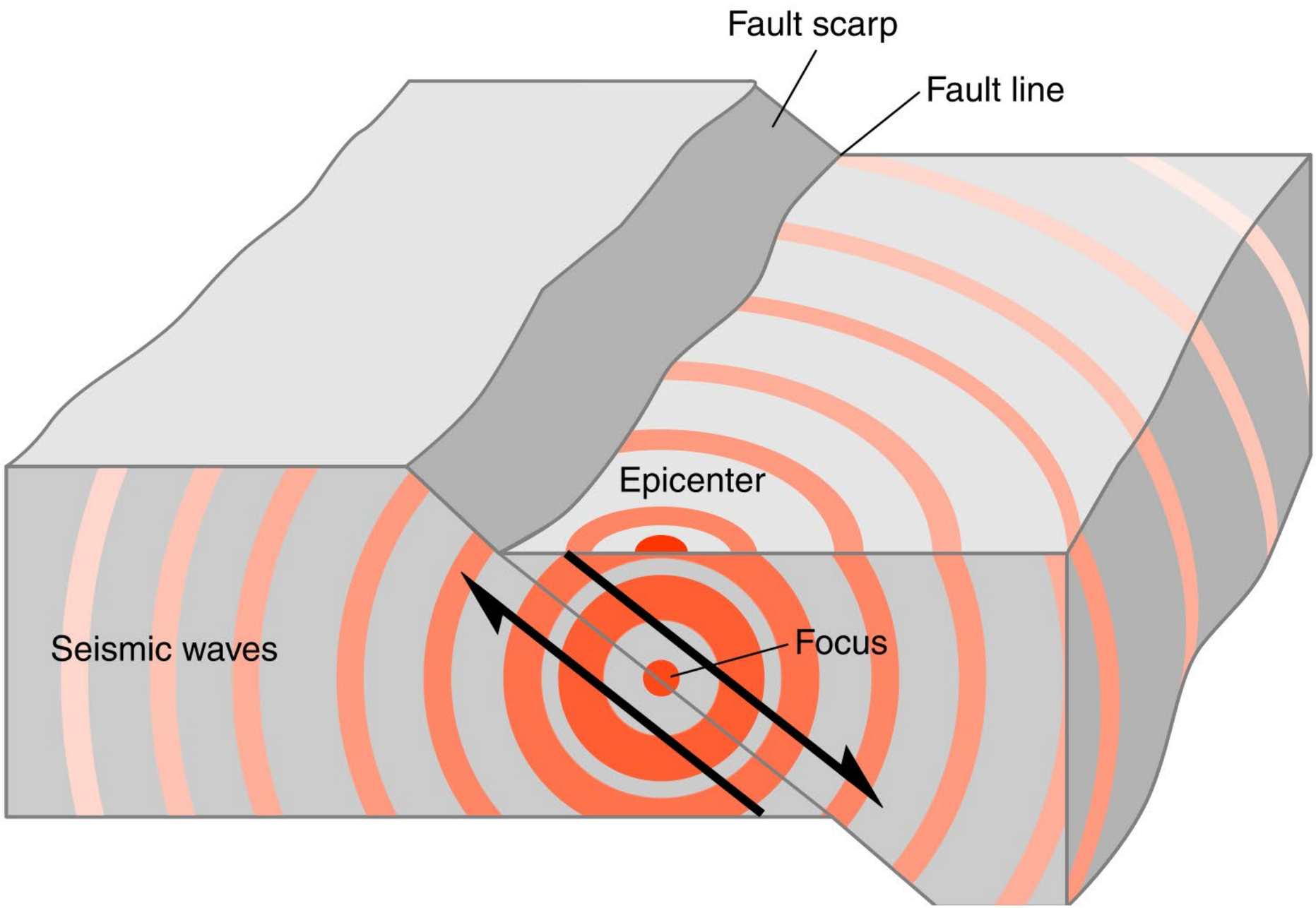
Where do earthquakes and volcanoes occur?

- Earthquakes and volcanoes occur along plate boundaries, where one plate moves along another plate.

Goal: Students will be able to describe where an earthquake occurs.

Describing Where An Earthquake Occurs

Goal: Students will be able to describe where an earthquake occurs.



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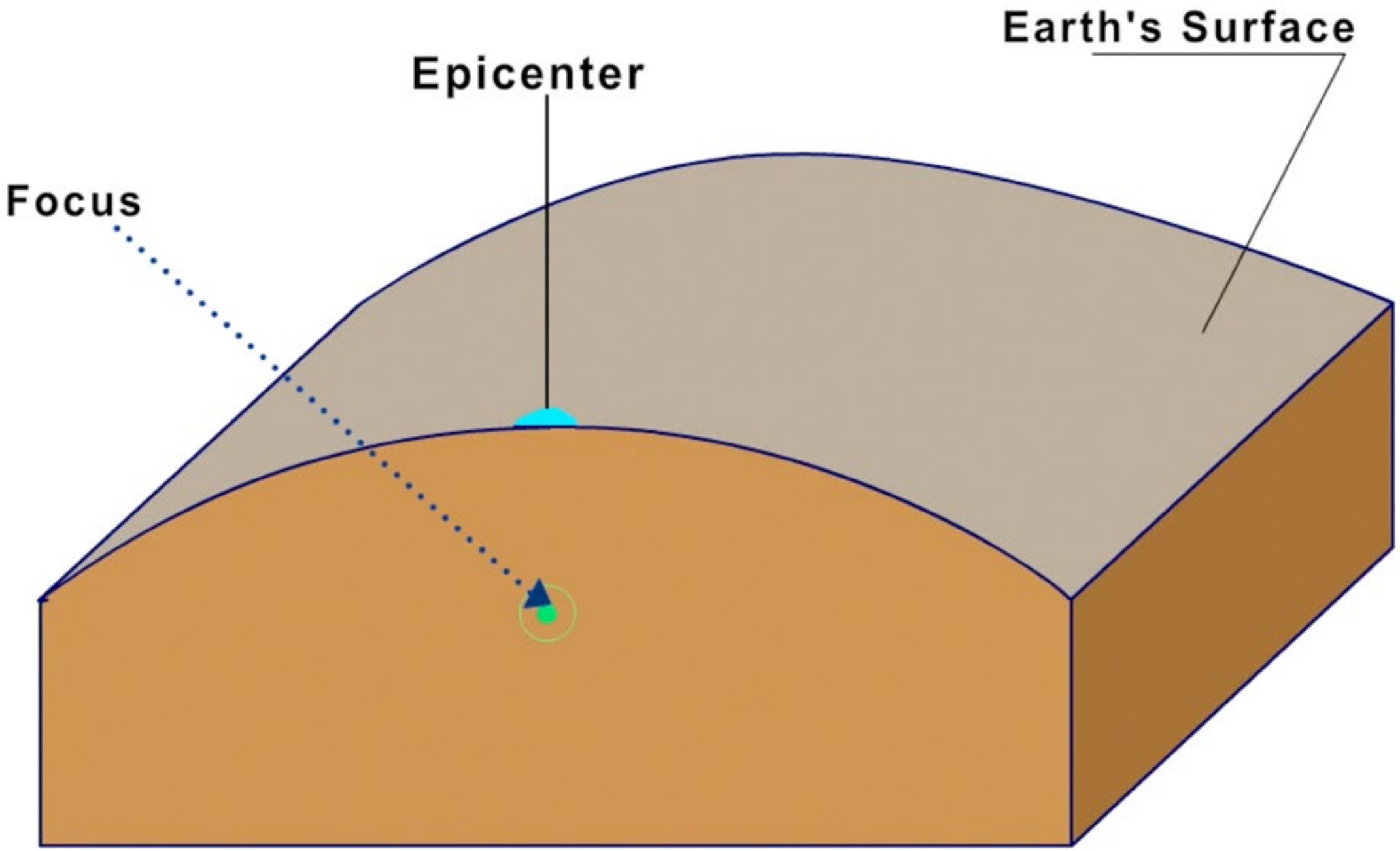


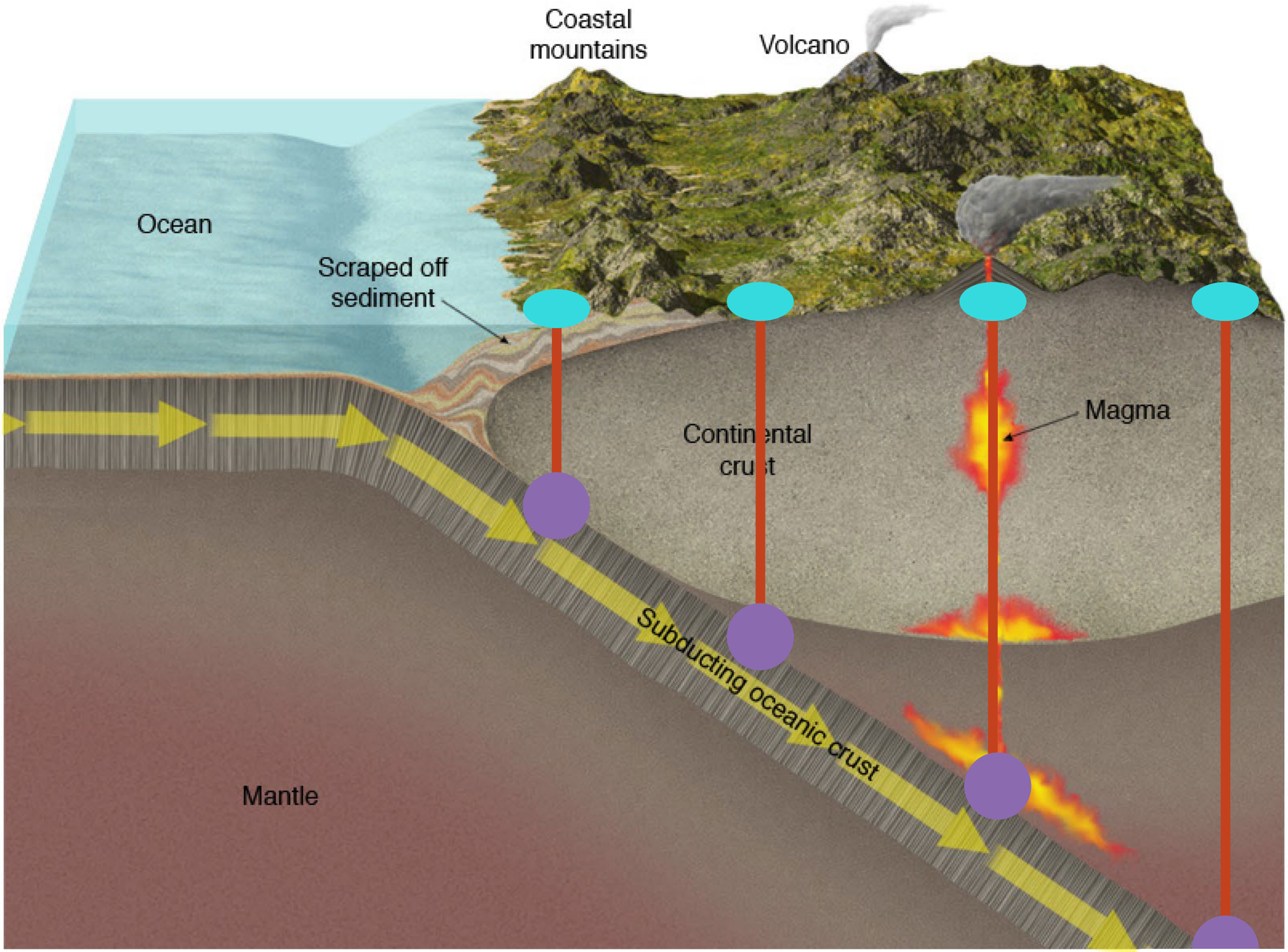
Goal: Students will be able to describe where an earthquake occurs.

Describing Where An Earthquake Occurs

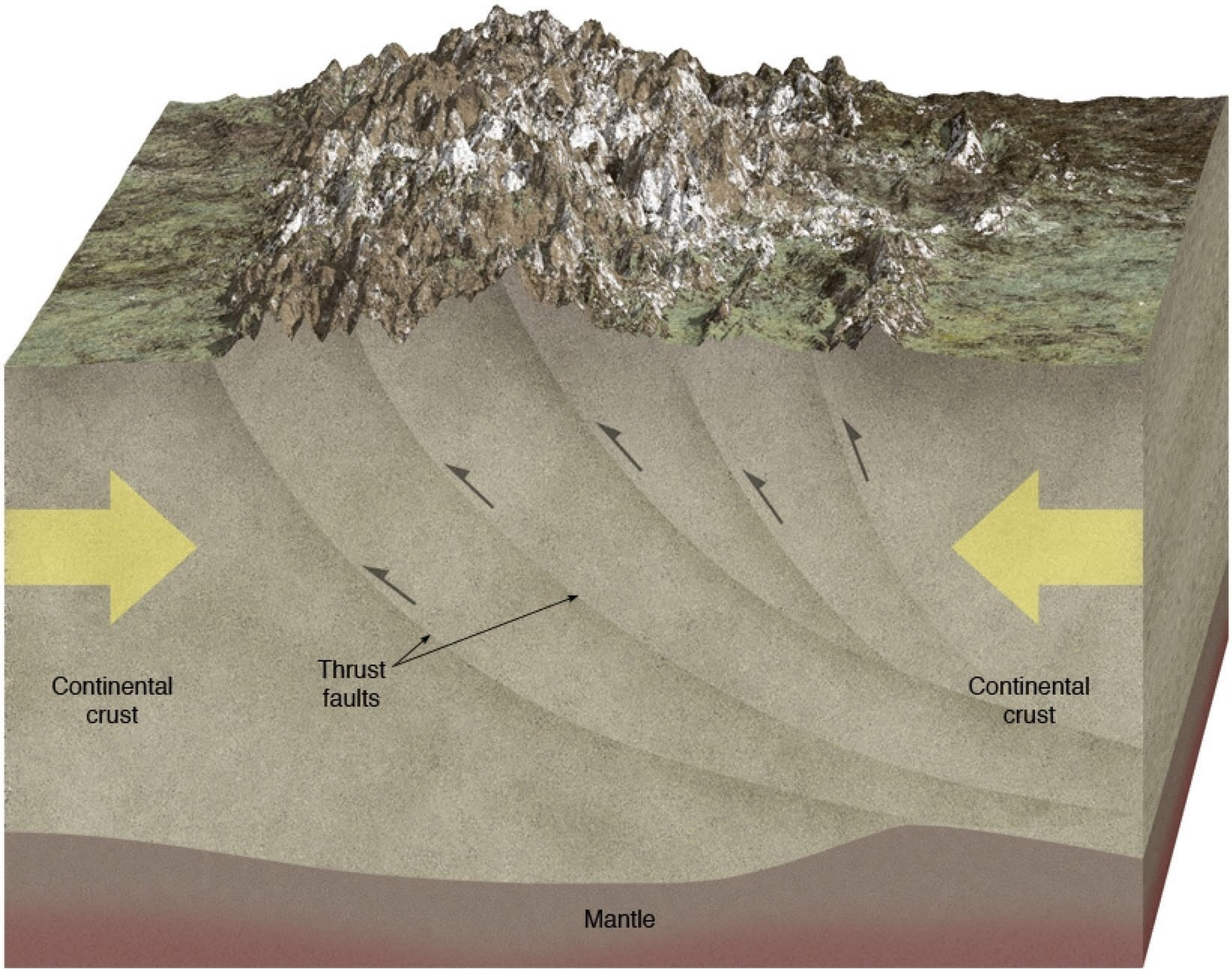
- Focus - the underground place where the rock begins to separate.

- Epicenter - the location directly above the focus of an earthquake on the surface of Earth.

Goal: Students will be able to describe where an earthquake occurs.



Goal: Students will be able to describe where an earthquake occurs.



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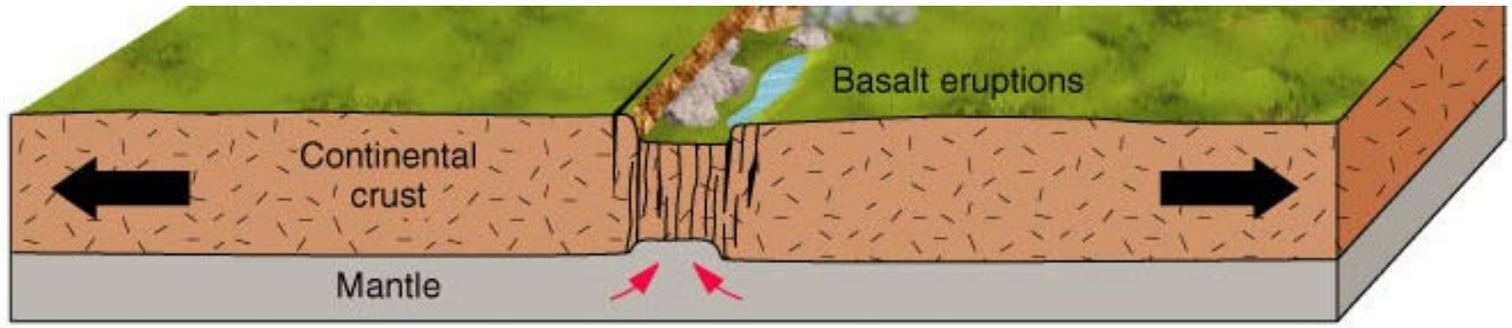

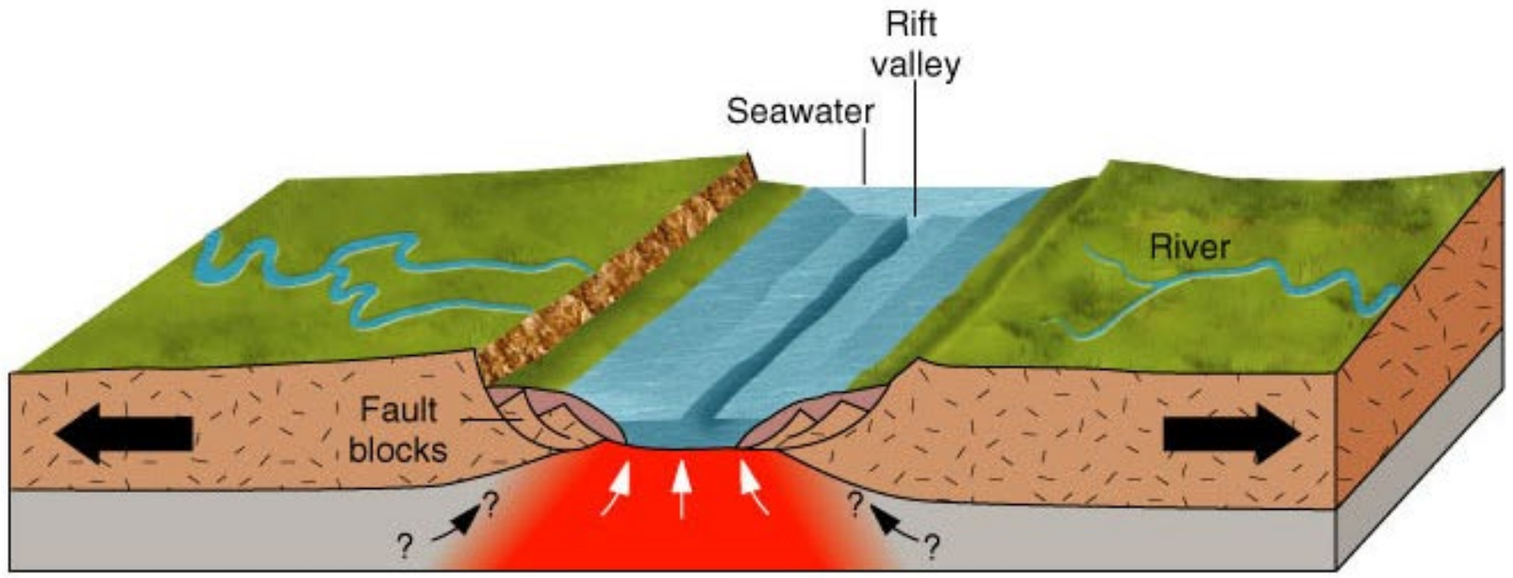

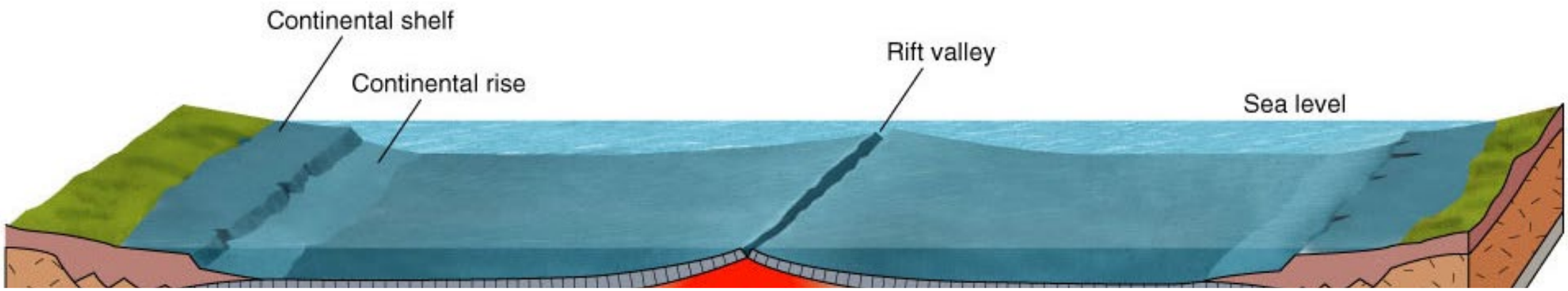

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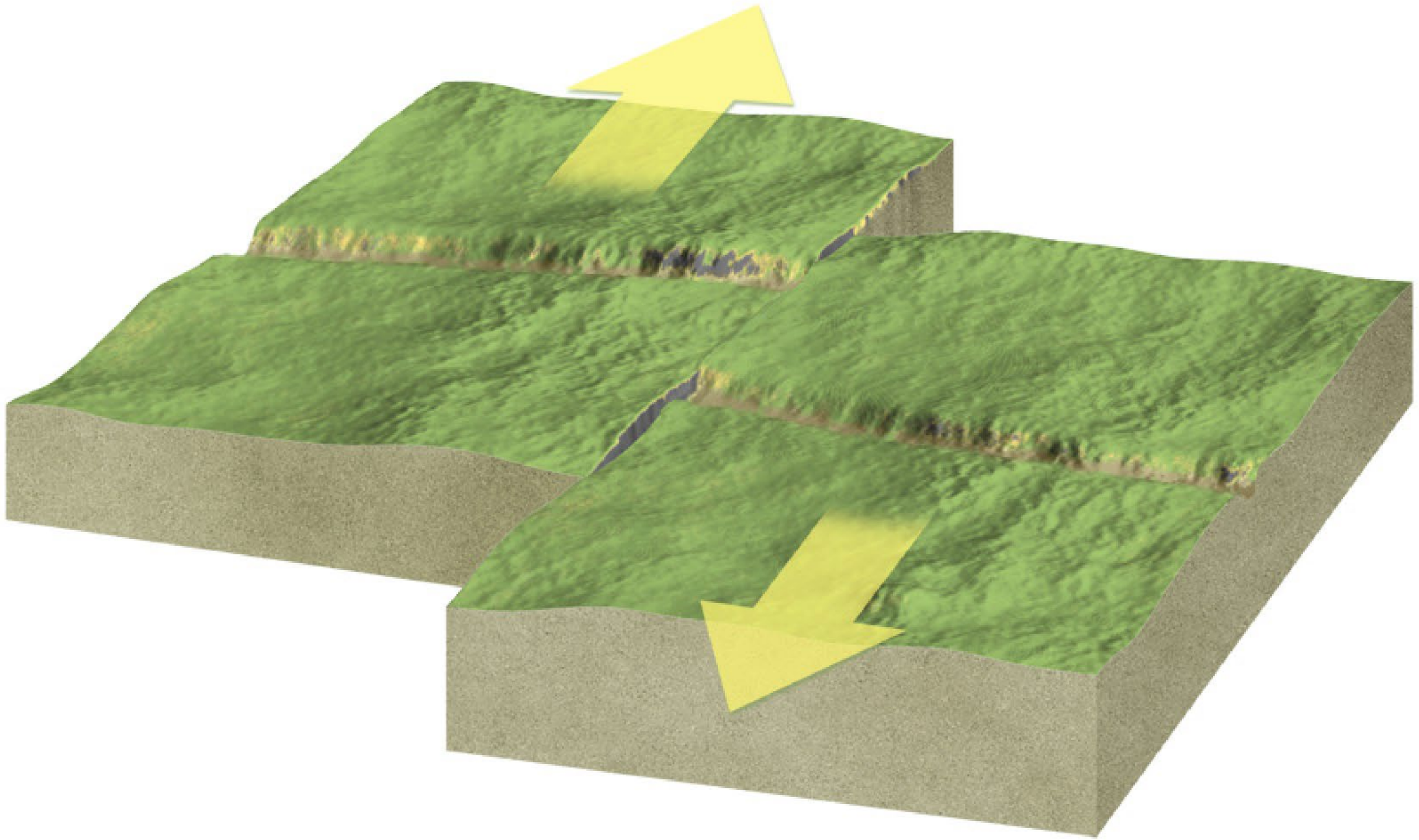

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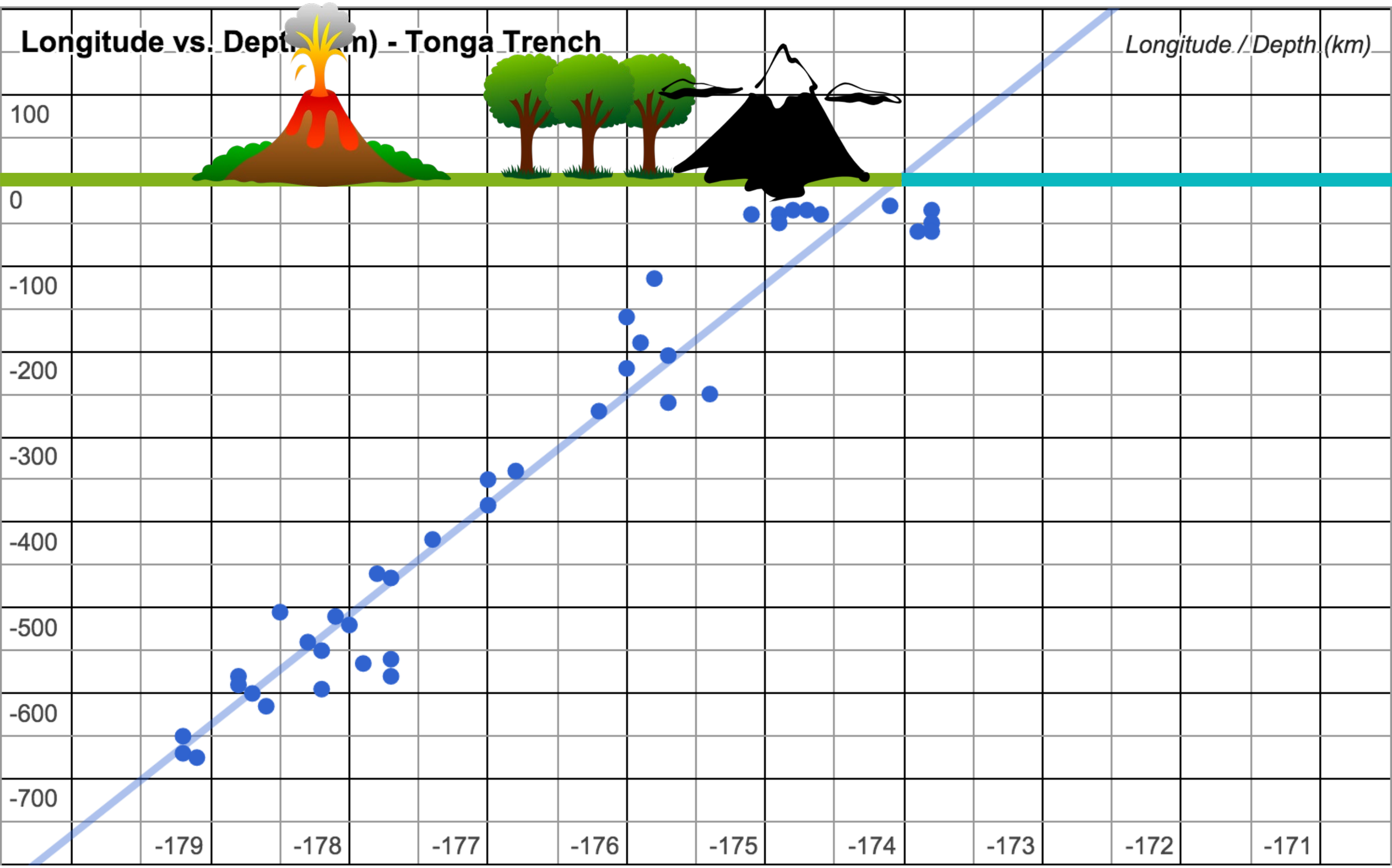

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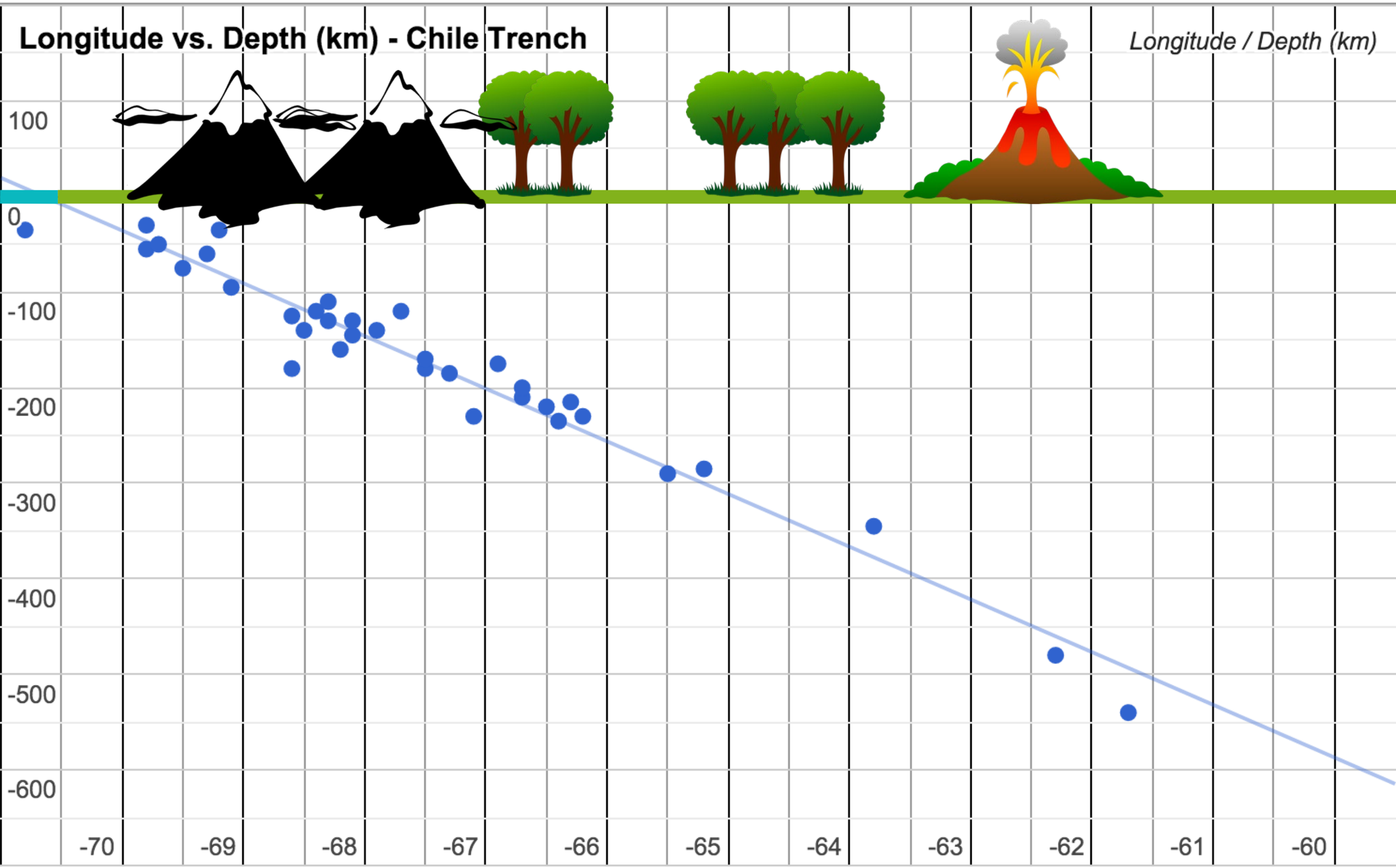
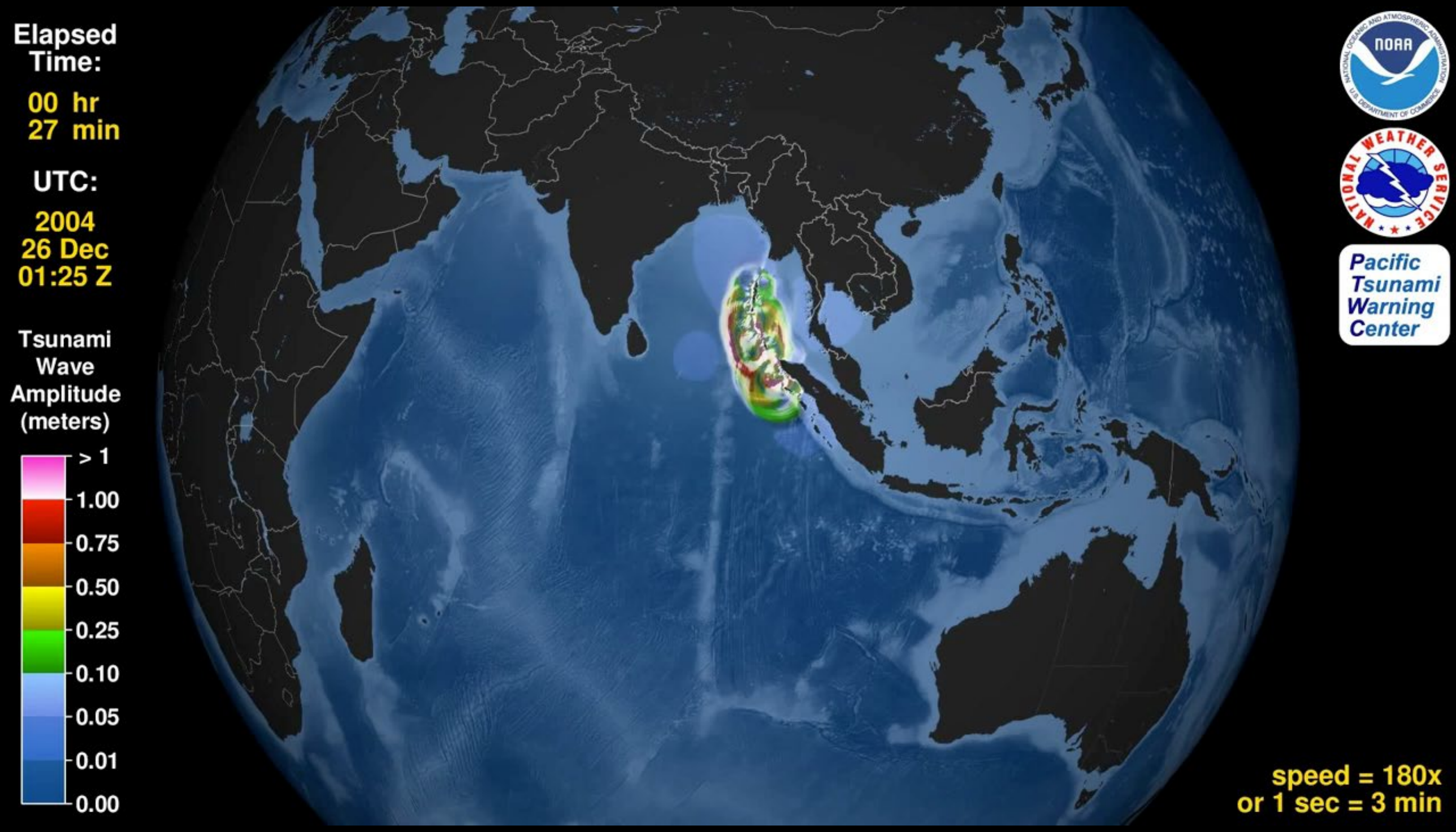


Goal: Students will be able to describe where an earthquake occurs.

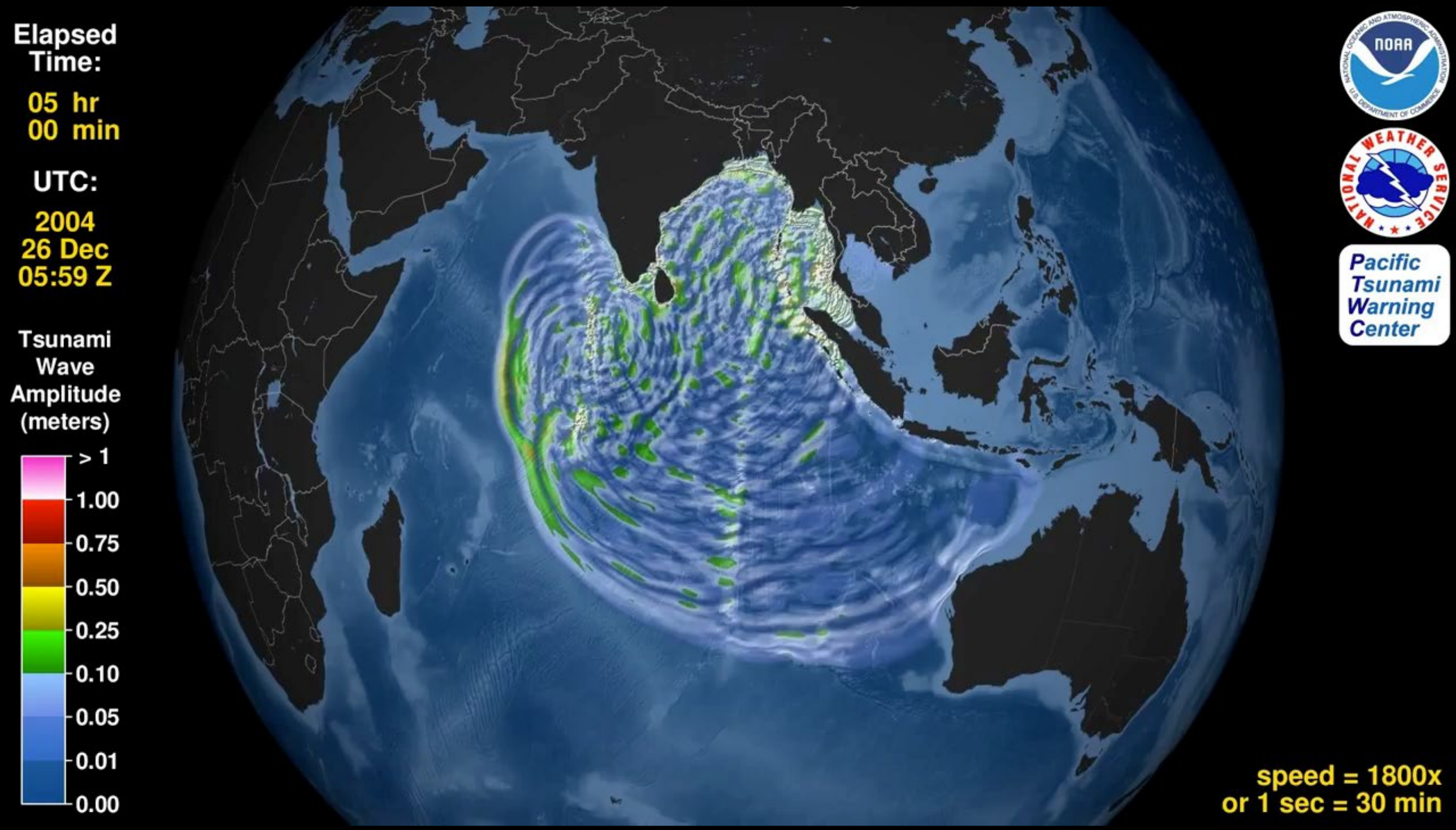
What do earthquakes cause?

- Building damage.
- Fires when gas lines and electric wires rupture or break.
- Tsunami - a giant series of waves caused by an earthquake.

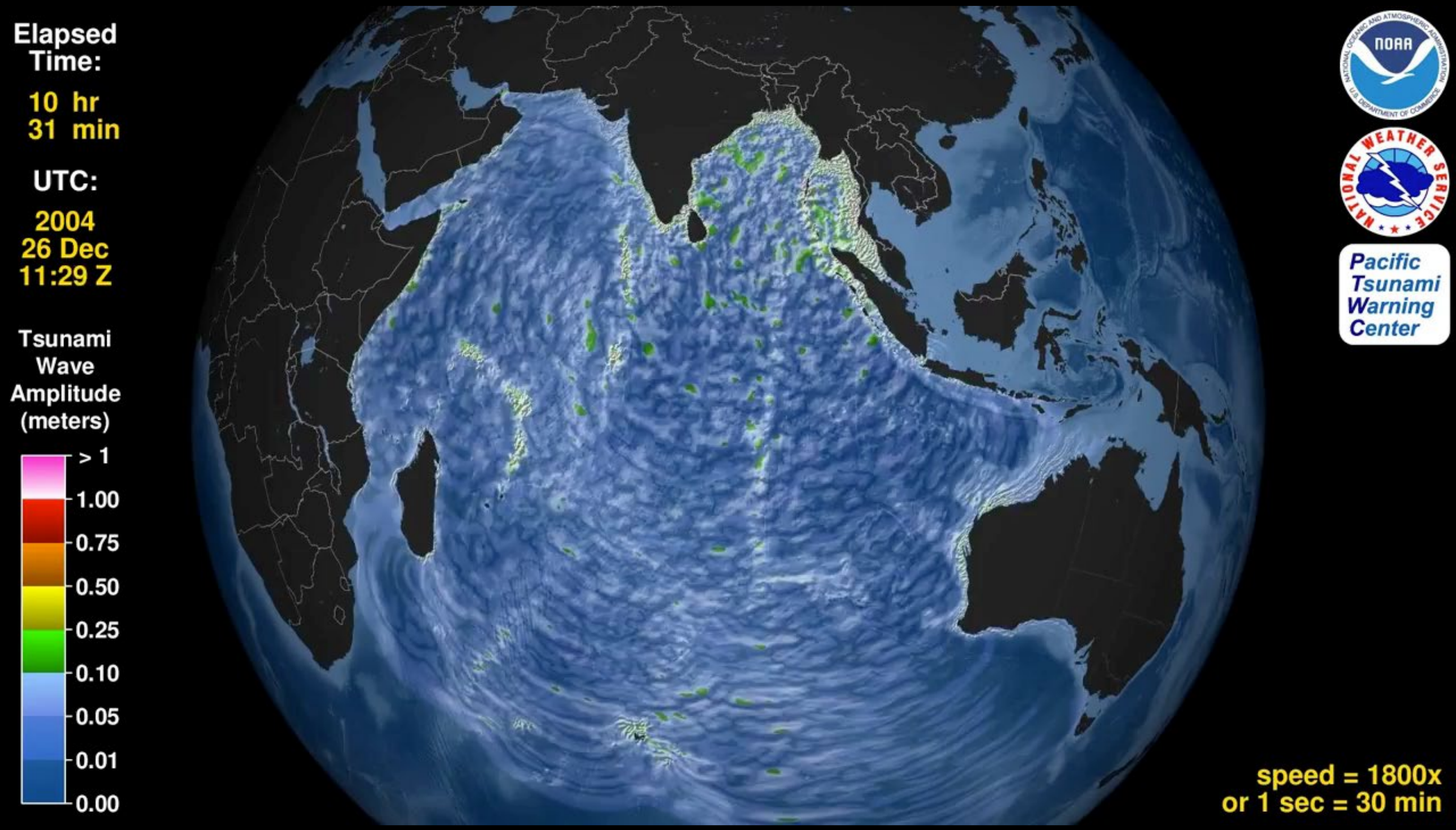
27 minutes after Earthquake…



5 hours after Earthquake…



10 hours after Earthquake…



24 hours after Earthquake…

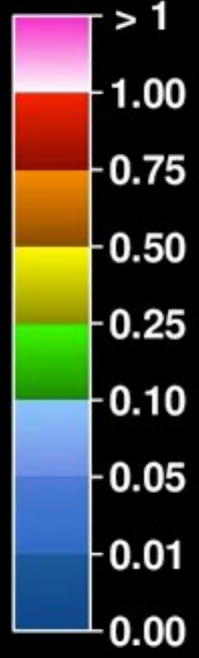
Elapsed Time:

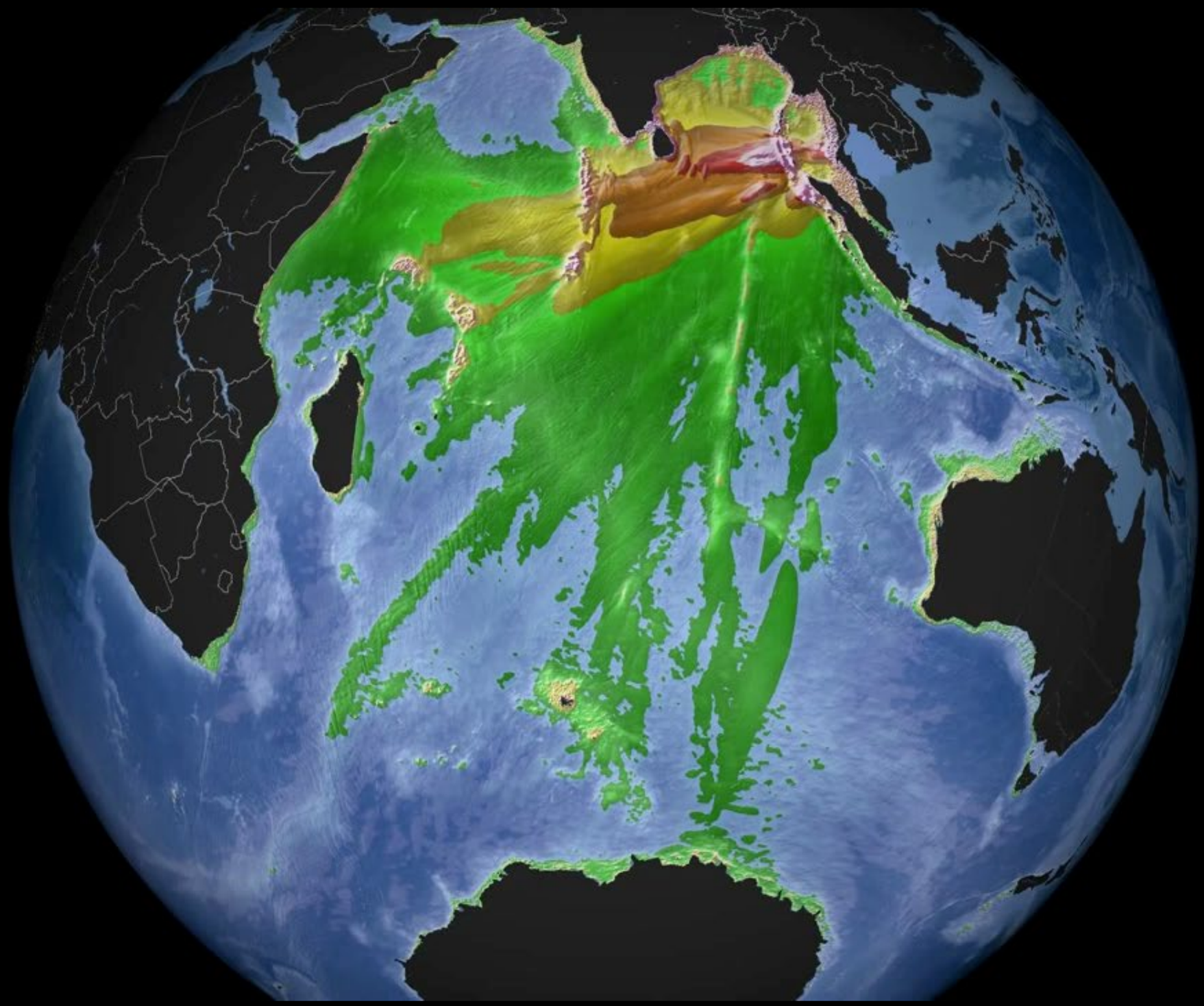
24 hr
00 min

UTC:

2004
27 Dec
00:58 Z

Tsunami Wave Amplitude (meters)





Pacific Tsunami Warning Center

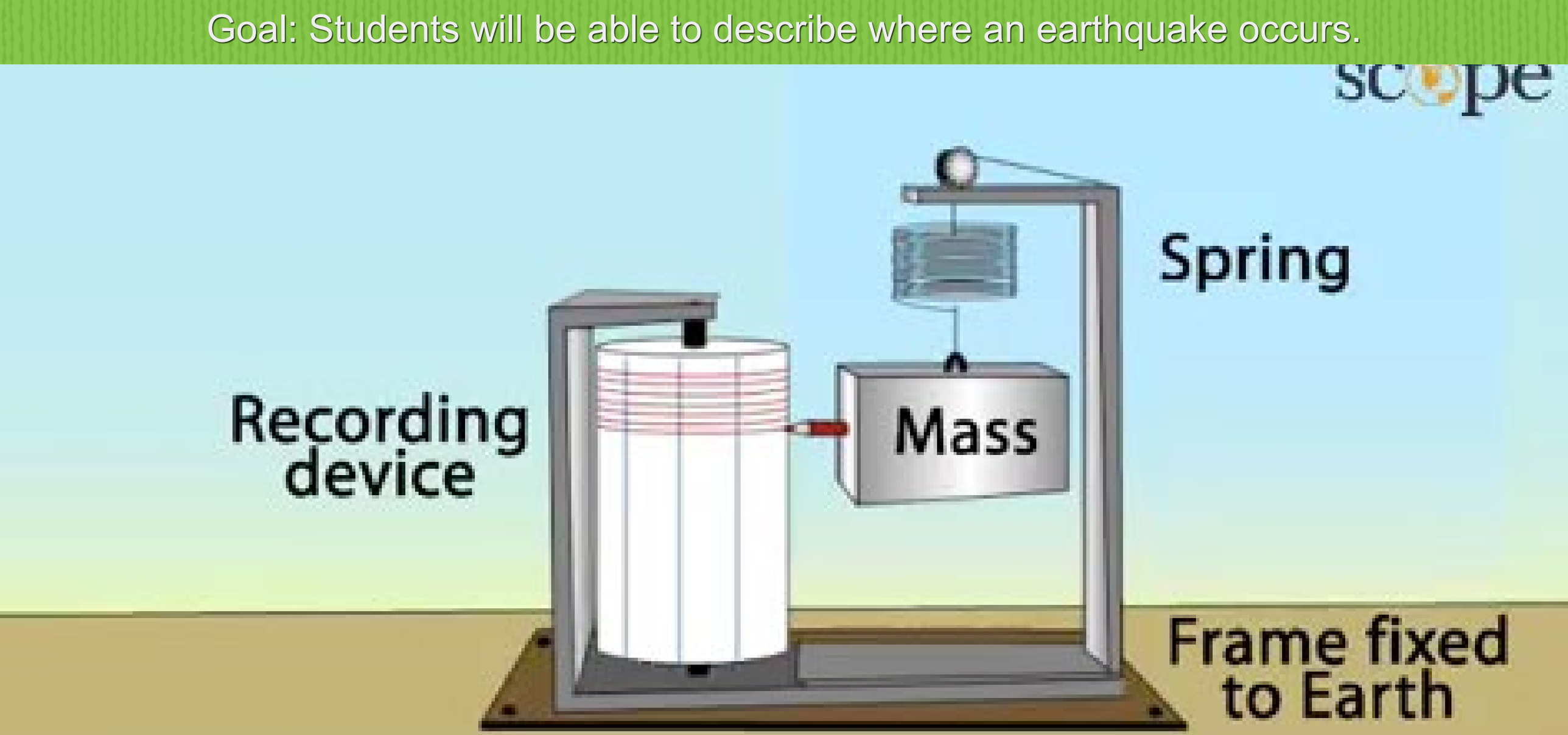
Goal: Students will be able to describe where an earthquake occurs.

How do we measure earthquakes?

- Scientists measure the magnitude of earthquakes using seismographs. The Richter Scale is the most common earthquake measurement.

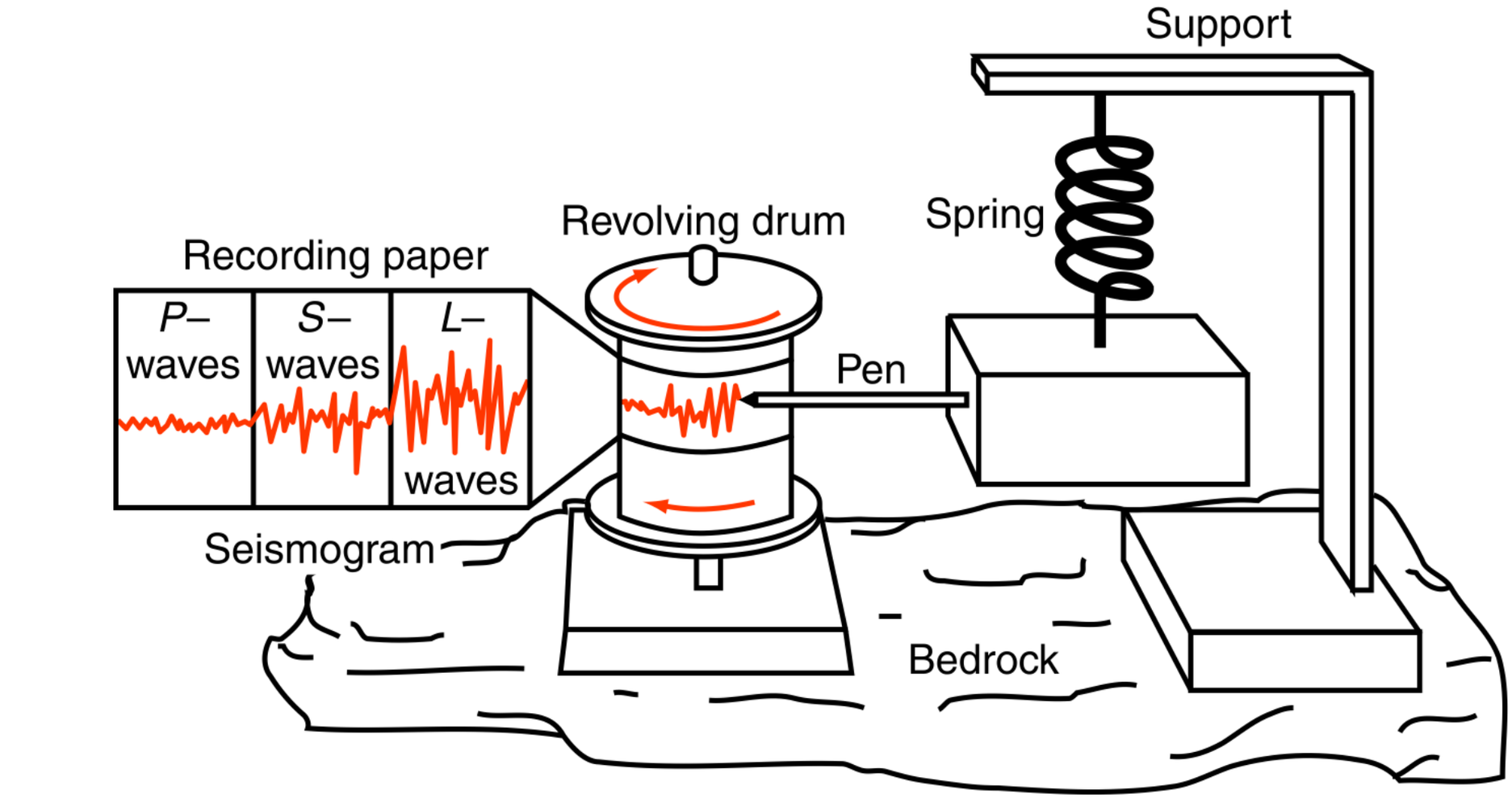
- Using this data, scientists can locate the epicenter and focus of an earthquake.

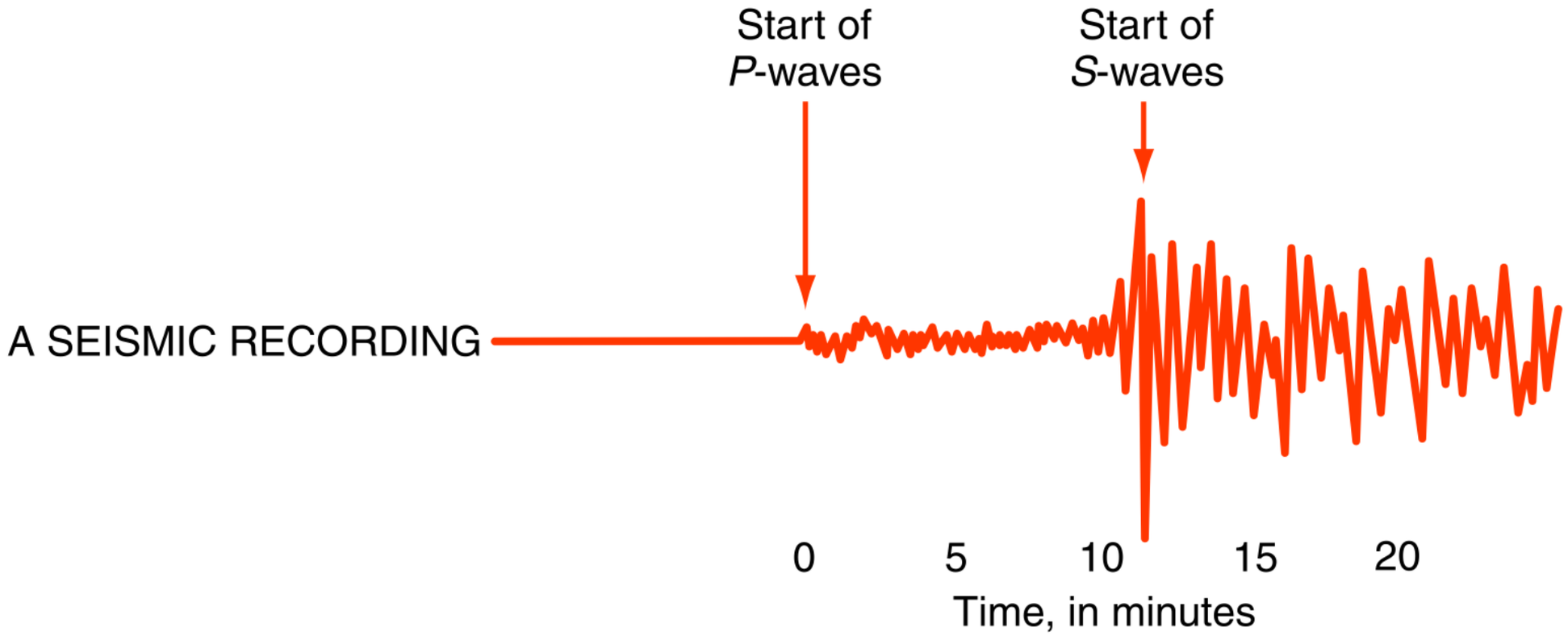
Goal: Students will be able to describe where an earthquake occurs.



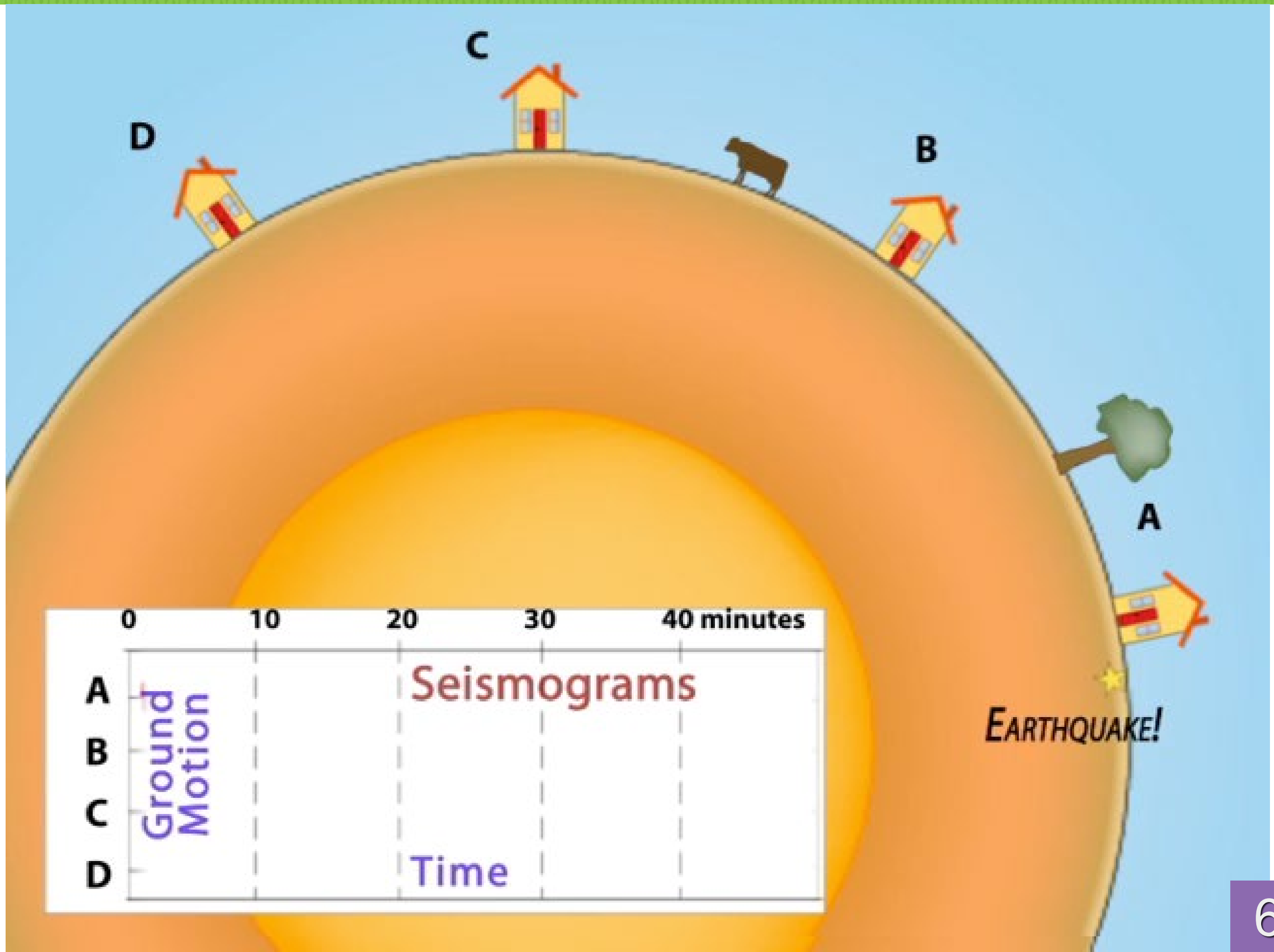
Vertical Seismograph
with generalized P- and S-wave behavior

Goal: Students will be able to describe where an earthquake occurs.





Goal: Students will be able to describe where an earthquake occurs.



Goal: Students will be able to describe where an earthquake occurs.

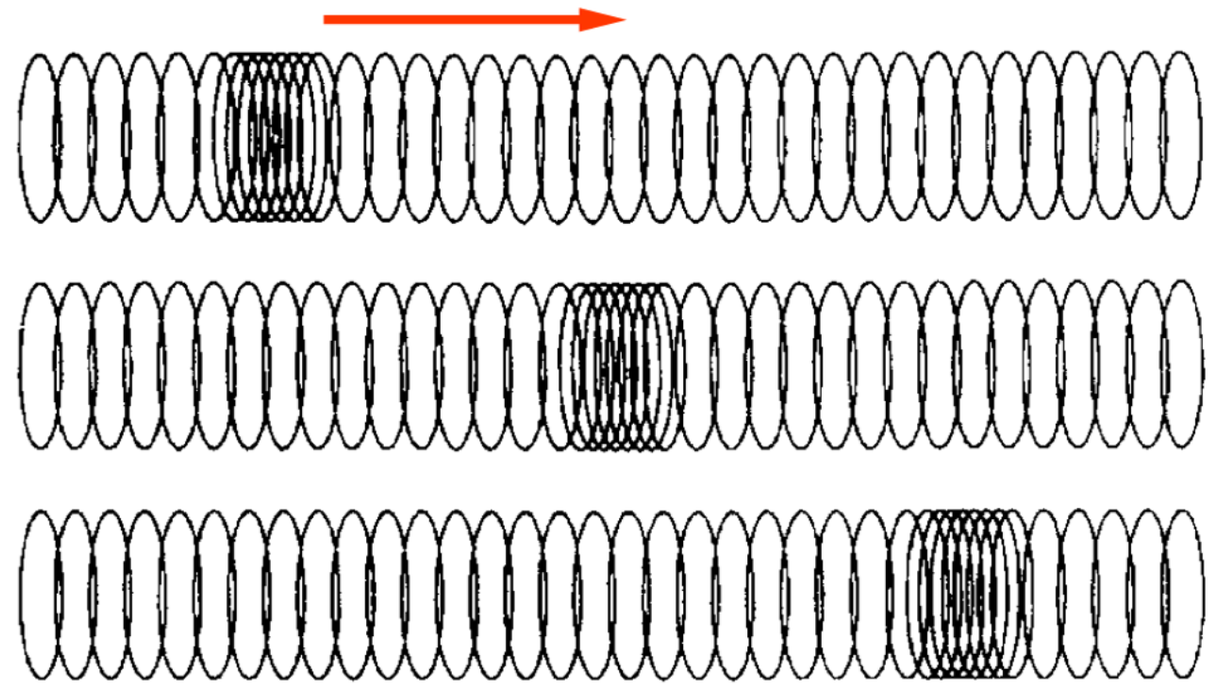
When earthquakes occur, three types of waves are released from the focus.

- P-wave (Primary wave) - travel the fastest, arrive first, and can travel through any material—solid, liquid, or gas.

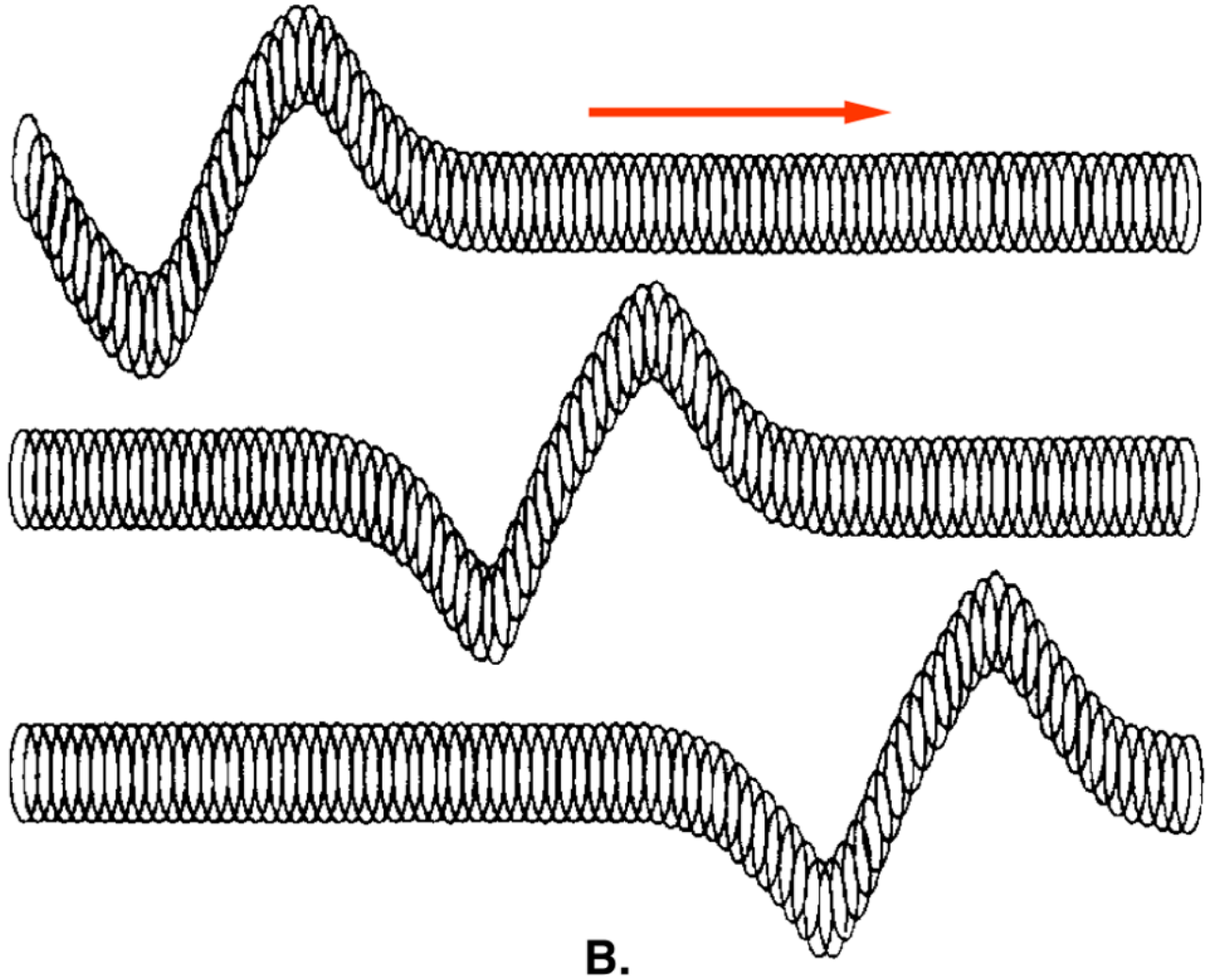
- S-wave - travel at roughly half the speed of P-waves, arrive second, and can travel through a rigid medium (solids), but cannot pass through a fluid, which includes liquids or gases.

- Surface waves - when P-waves and S-waves reach the surface, they are transformed into surface waves, which cause the most damage.

Goal: Students will be able to describe where an earthquake occurs.



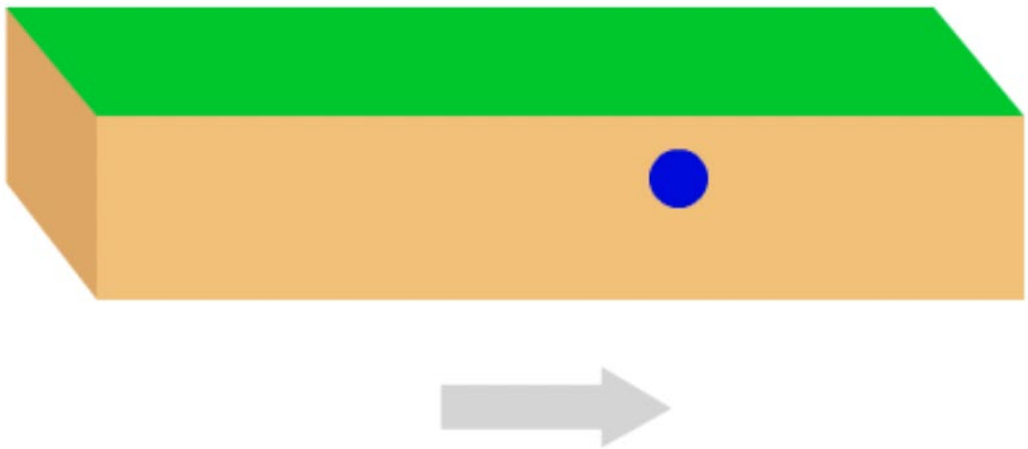
A.



B.

P waves

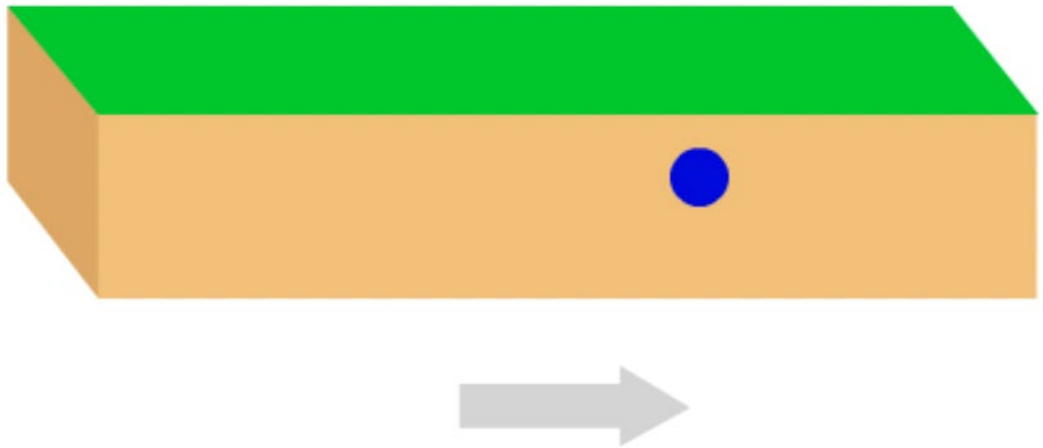
particle motion parallel
to wave motion



direction of wave motion

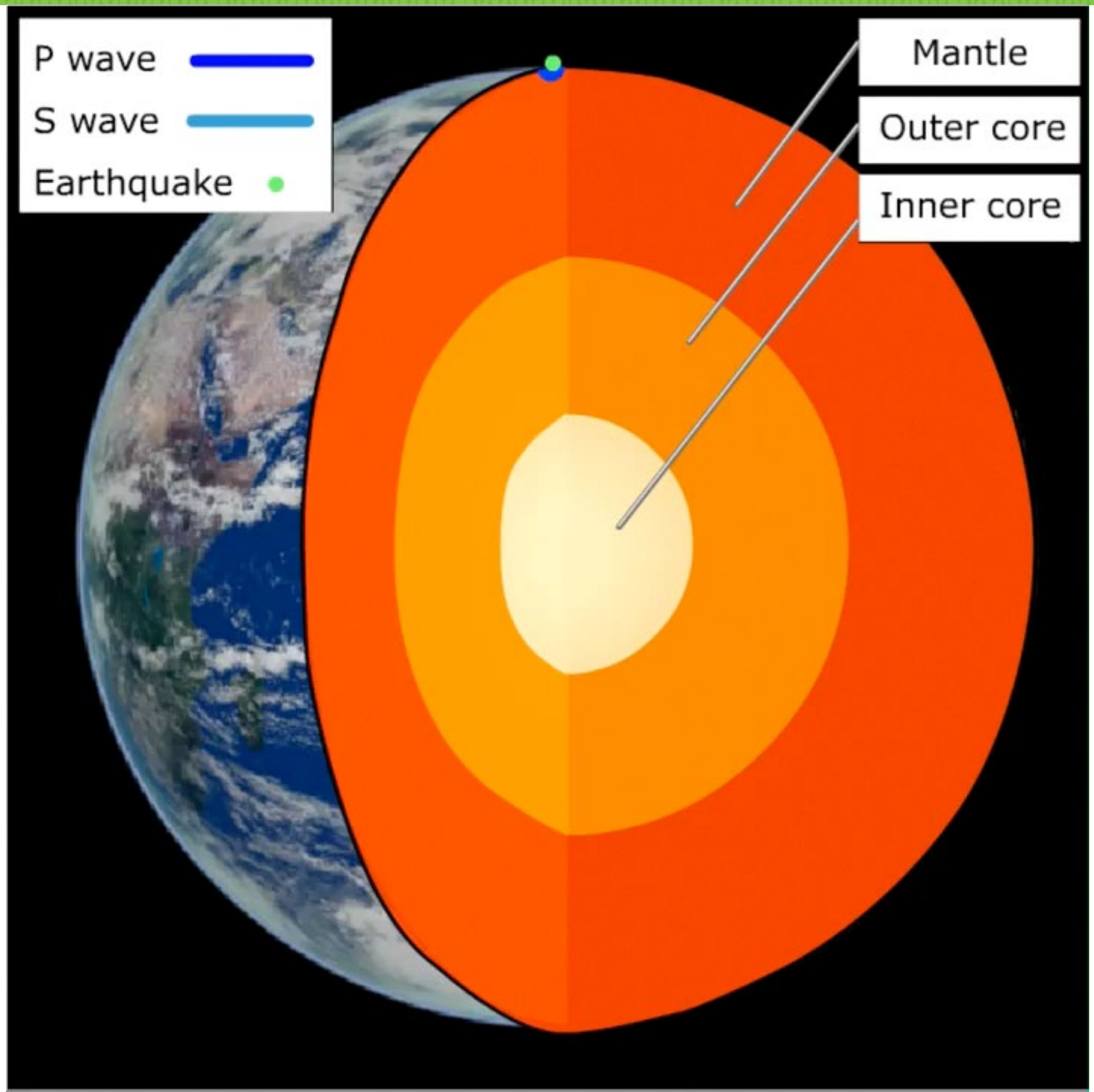
S waves

particle motion perpendicular
to wave motion



direction of wave motion

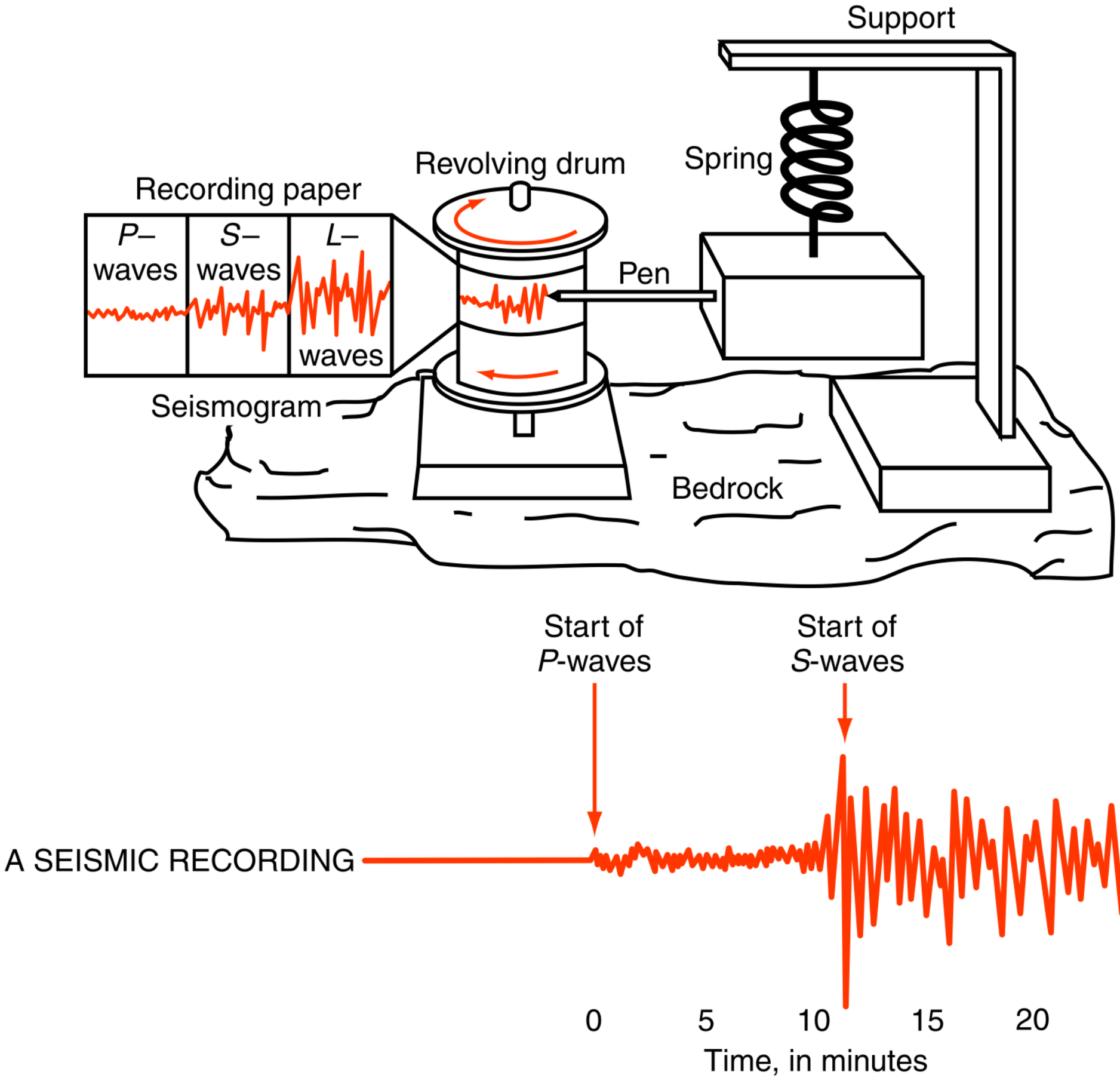
Goal: Students will be able to describe where an earthquake occurs.



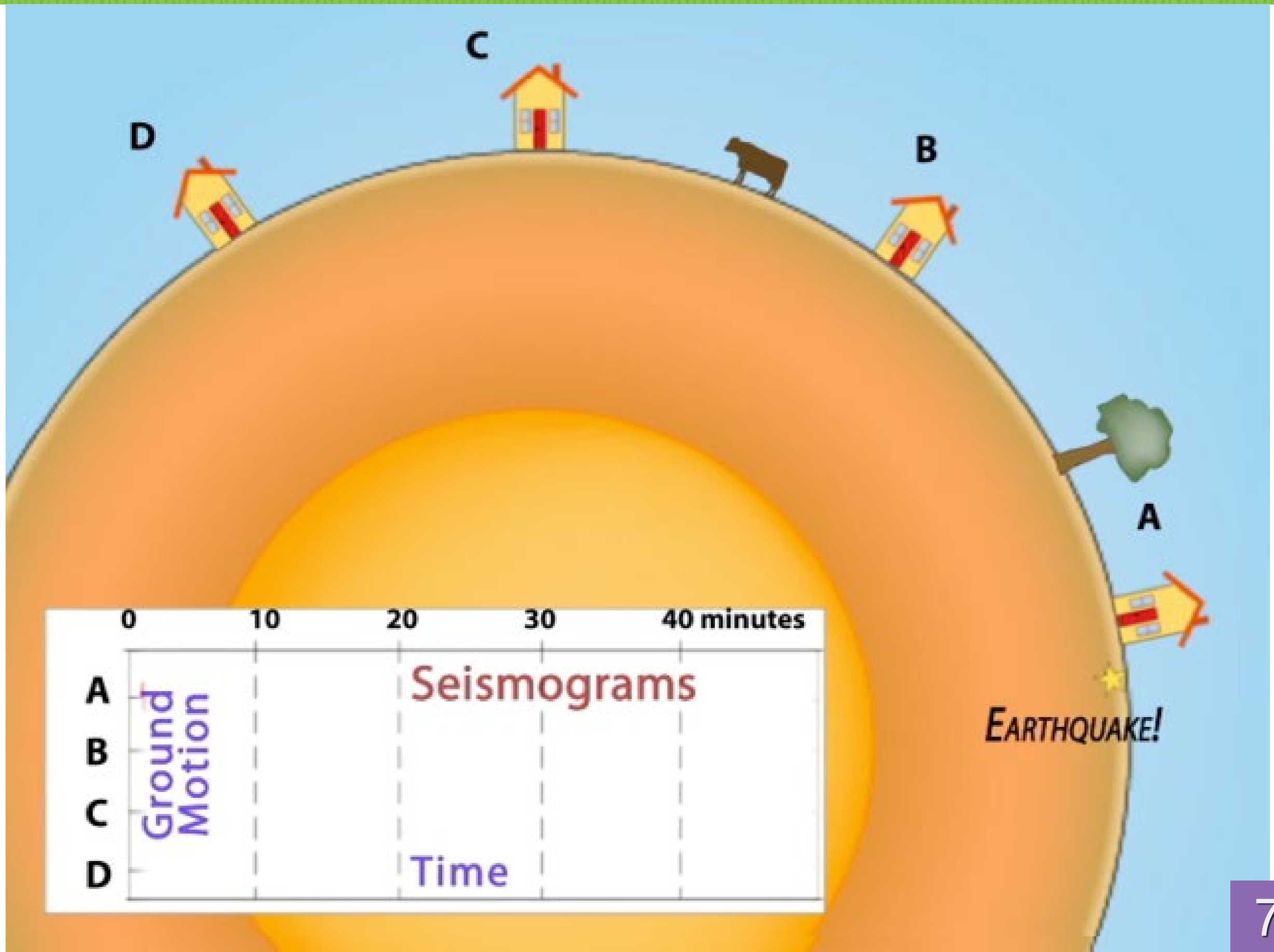
Goal: Students will be able to describe where an earthquake occurs.

How do scientists figure out where earthquakes occur?

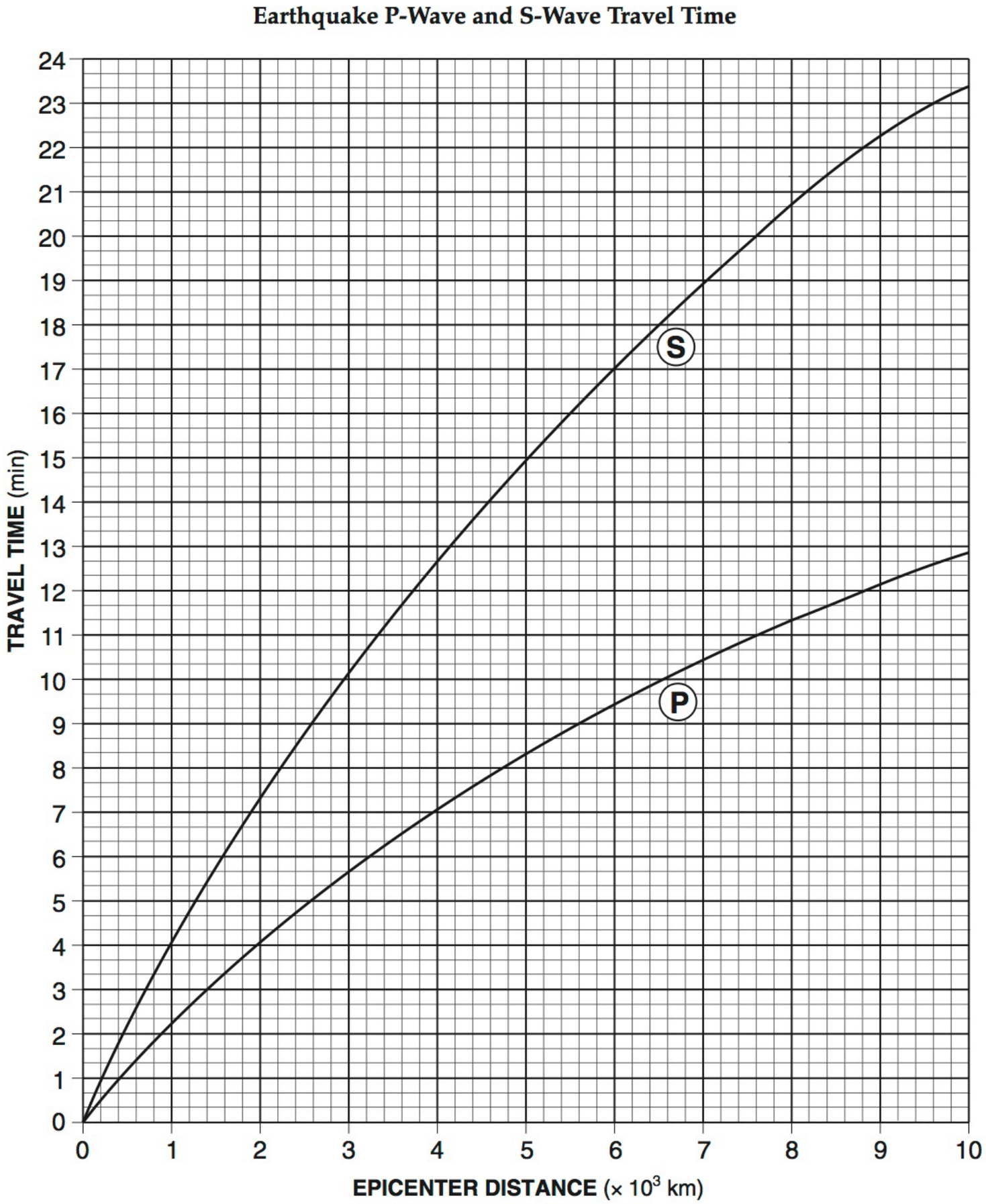
Goal: Students will be able to describe where an earthquake occurs.



Goal: Students will be able to describe where an earthquake occurs.



Goal: Students will be able to use the “Earthquake P-Wave and S-Wave Travel Time” graph to find the epicenter of an earthquake.



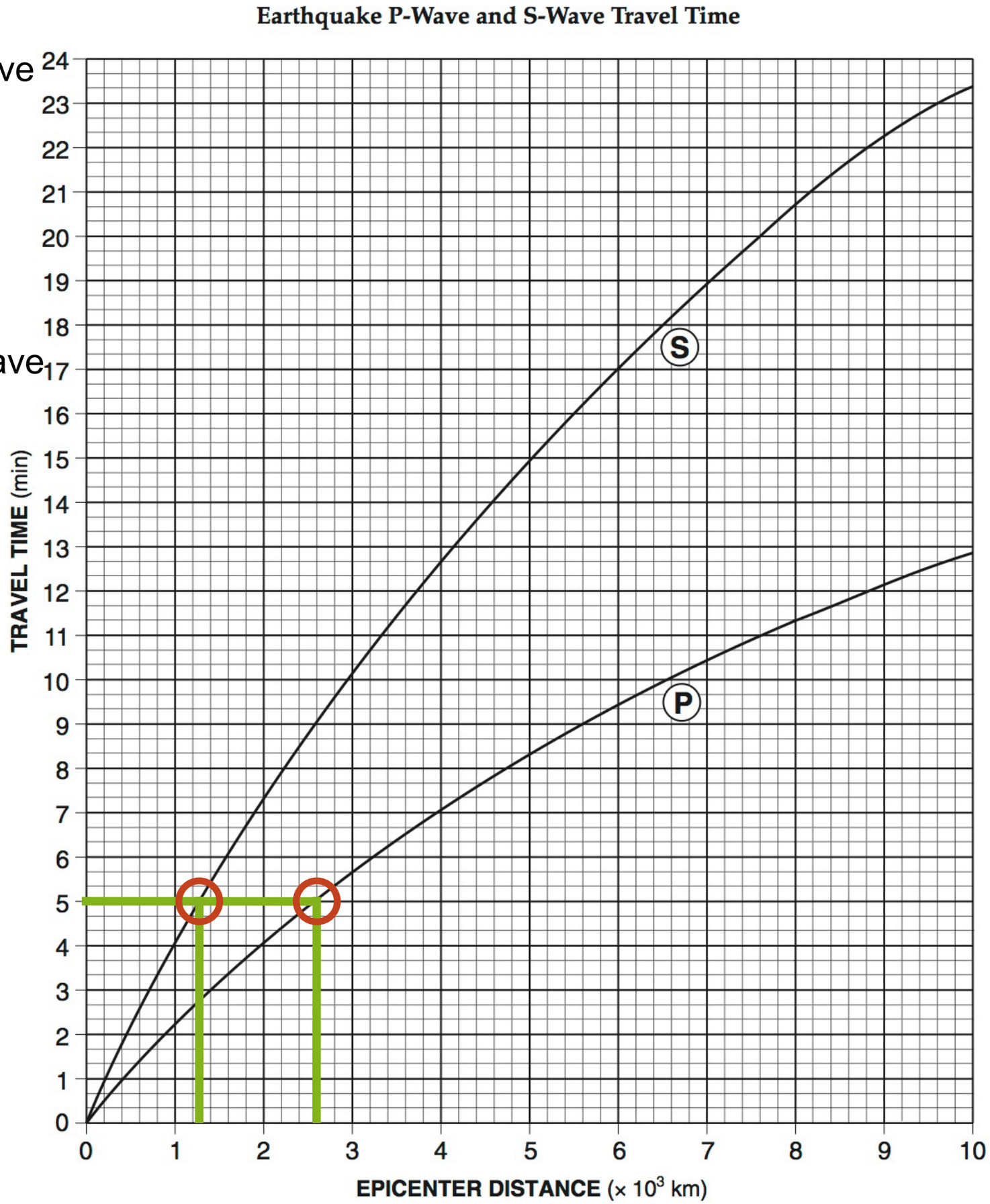
Goal: Students will be able to use the “Earthquake P-Wave and S-Wave Travel Time” graph to find the epicenter of an earthquake.

How far would a P-wave travel in 5 minutes?

2.6×10^3 km
2,600 km

How far would an S-wave travel in 5 minutes?

1.2×10^3 km
1,200 km



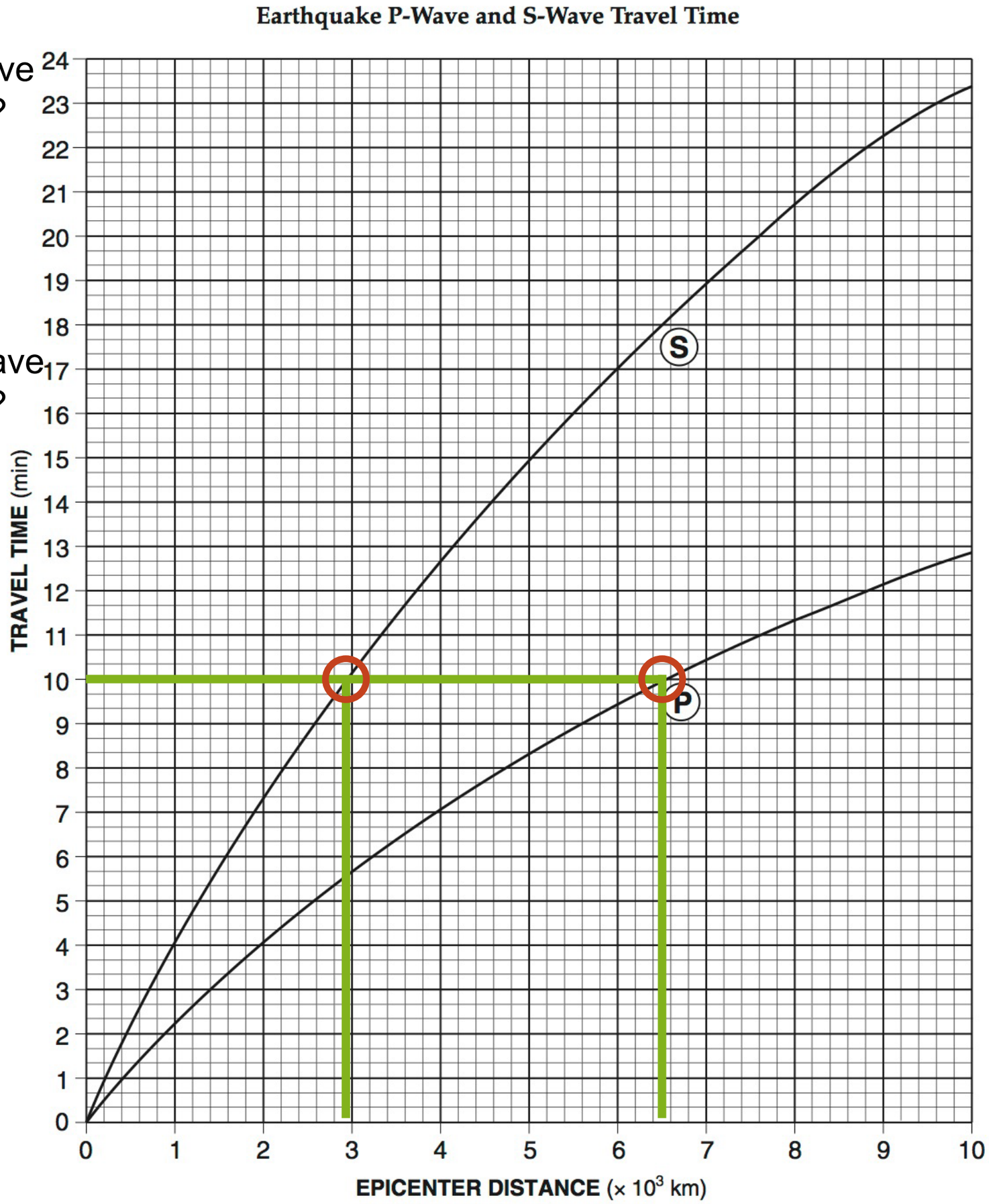
Goal: Students will be able to use the “Earthquake P-Wave and S-Wave Travel Time” graph to find the epicenter of an earthquake.

How far would a P-wave travel in 10 minutes?

6.5×10^3 km
6,500 km

How far would an S-wave travel in 10 minutes?

2.95×10^3 km
2,950 km



Goal: Students will be able to use the “Earthquake P-Wave and S-Wave Travel Time” graph to find the epicenter of an earthquake.

How long would it take a P-wave to travel 4,400 km?

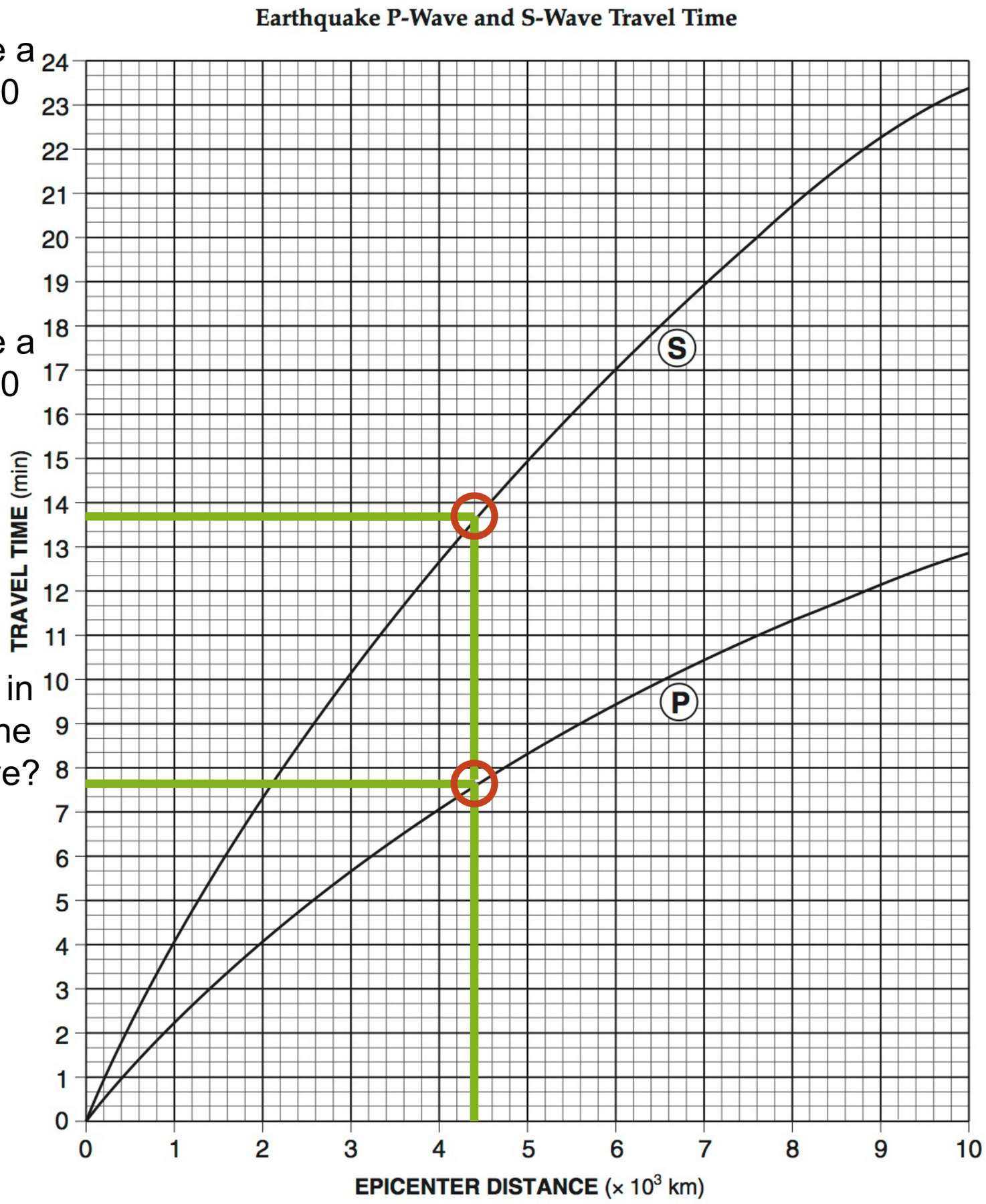
7 min. 40 sec.

How long would it take a S-wave to travel 4,400 km?

13 min. 40 sec.

What is the difference in arrival time between the P-wave and the S-wave?

6 min.



Goal: Students will be able to use the “Earthquake P-Wave and S-Wave Travel Time” graph to find the epicenter of an earthquake.

How long would it take a P-wave to travel 8,500 km?

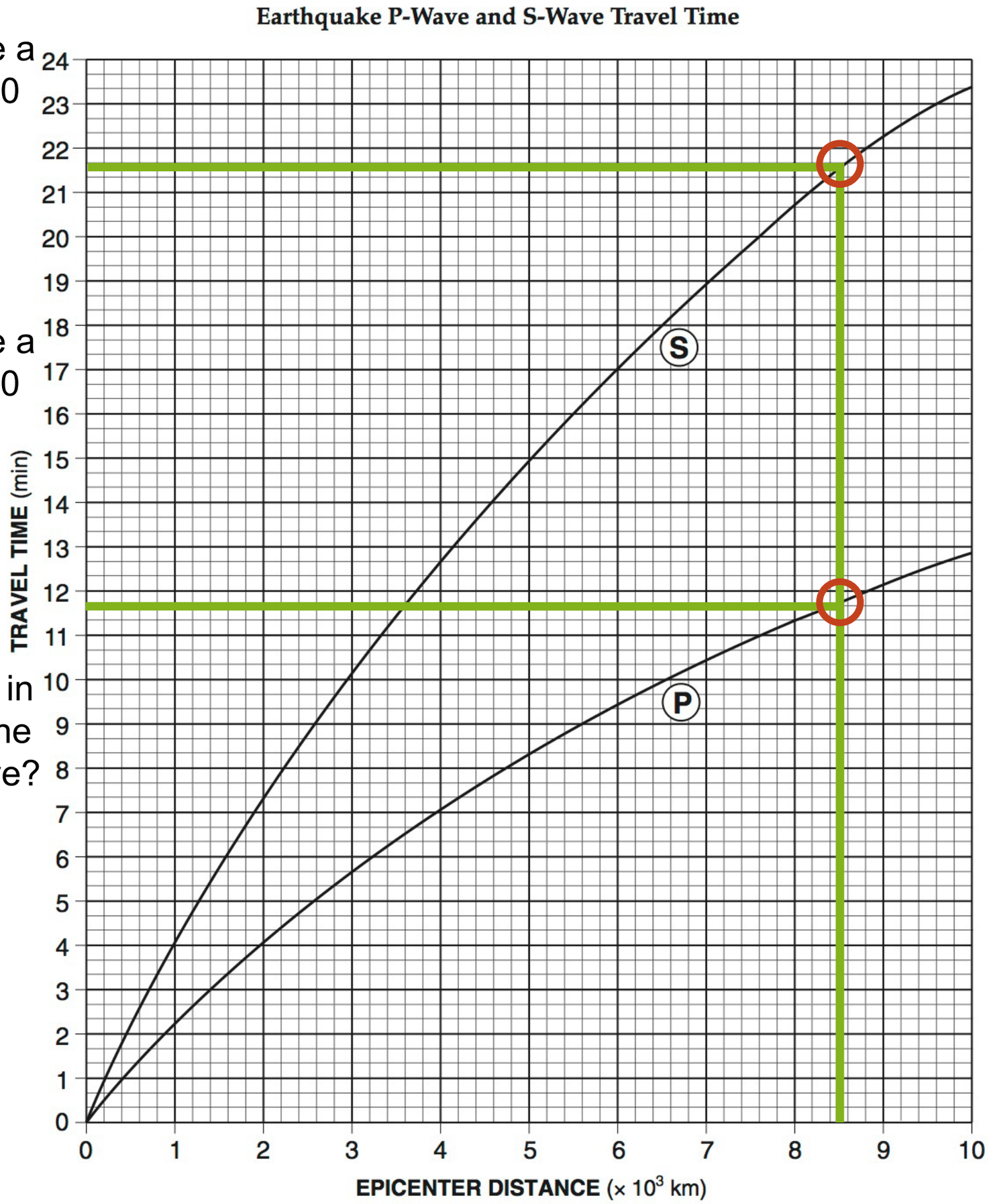
11 min. 40 sec.

How long would it take a S-wave to travel 8,500 km?

21 min. 40 sec.

What is the difference in arrival time between the P-wave and the S-wave?

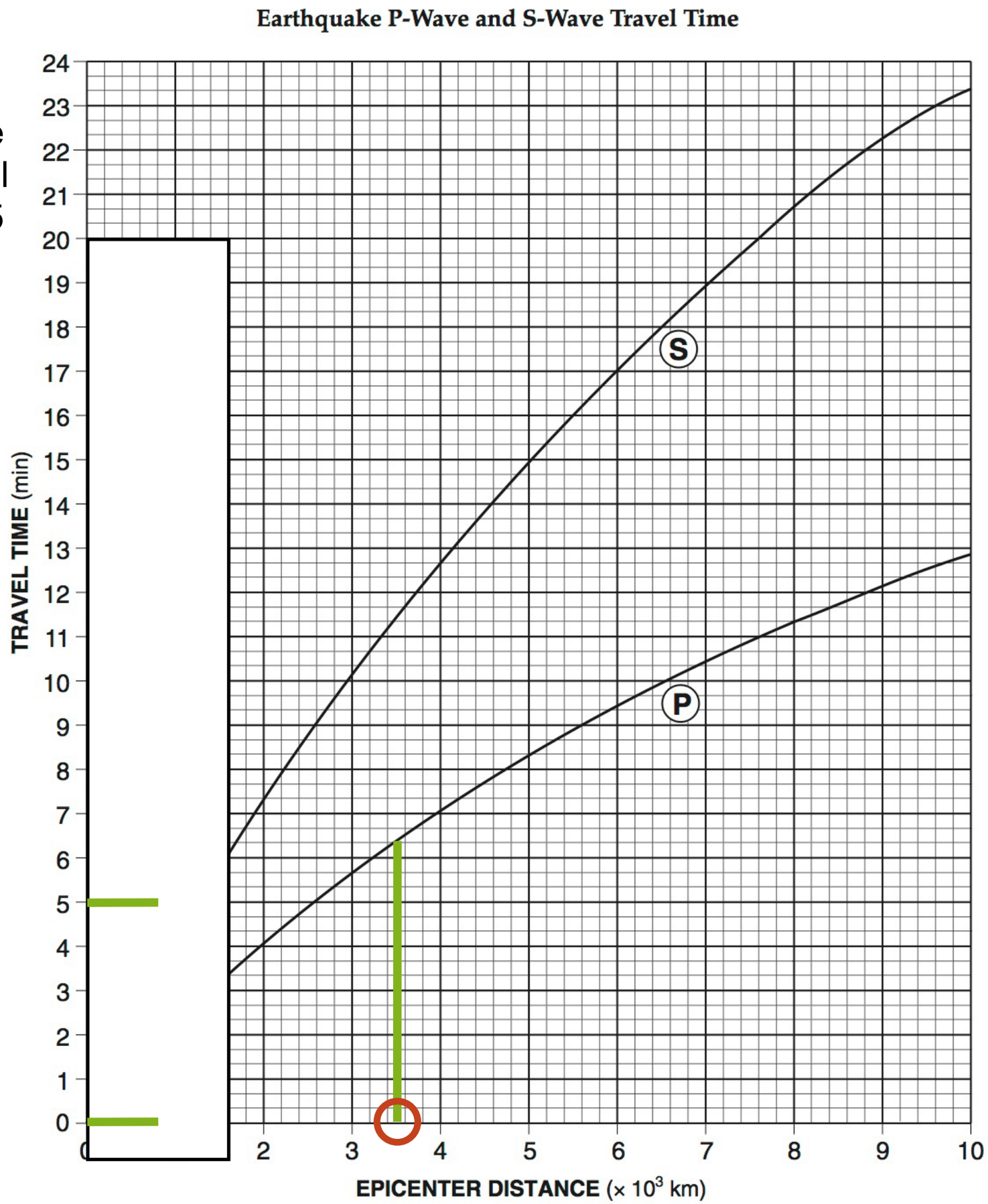
10 min.



Goal: Students will be able to use the “Earthquake P-Wave and S-Wave Travel Time” graph to find the epicenter of an earthquake.

If the difference in time between P-wave arrival and S-wave arrival is 5 minutes, what is the distance to the epicenter?

3.5 X 10^3 km
3,500 km

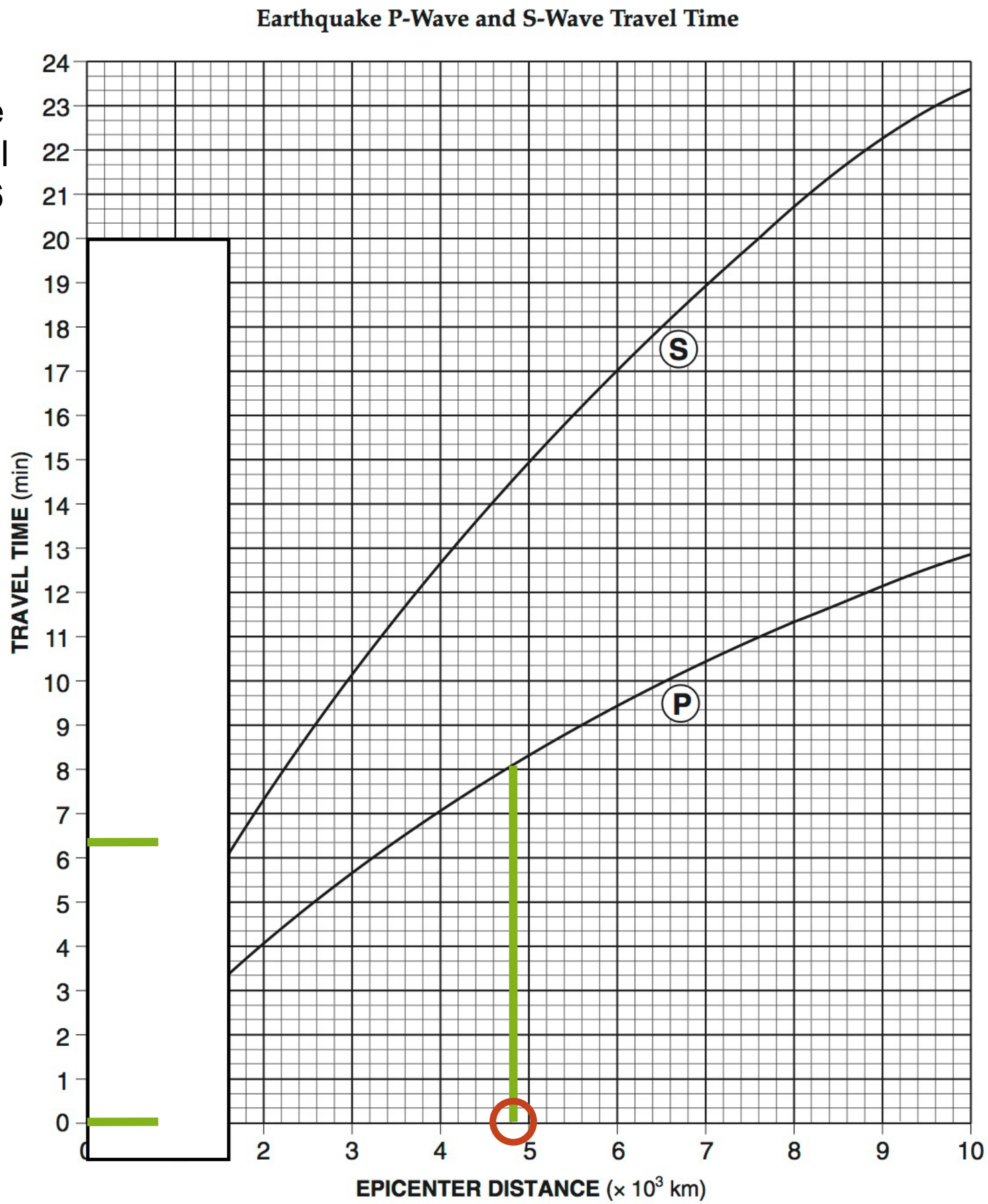


Goal: Students will be able to use the “Earthquake P-Wave and S-Wave Travel Time” graph to find the epicenter of an earthquake.

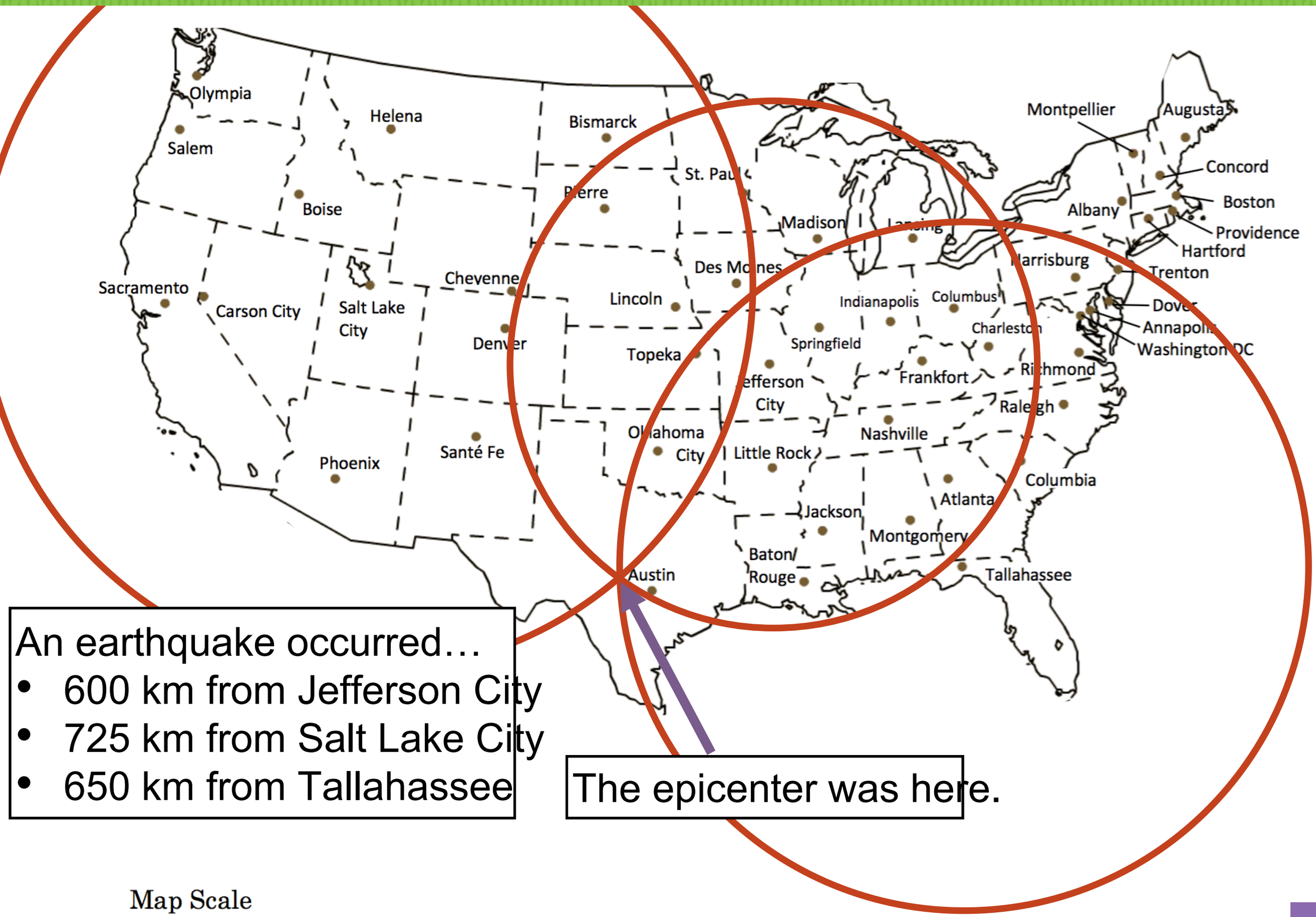
If the difference in time between P-wave arrival and S-wave arrival is 6 minutes and 20 seconds, what is the distance to the epicenter?

4.8×10^3 km

4,800 km



Goal: Students will be able to use earthquake data to find the epicenter of an earthquake.



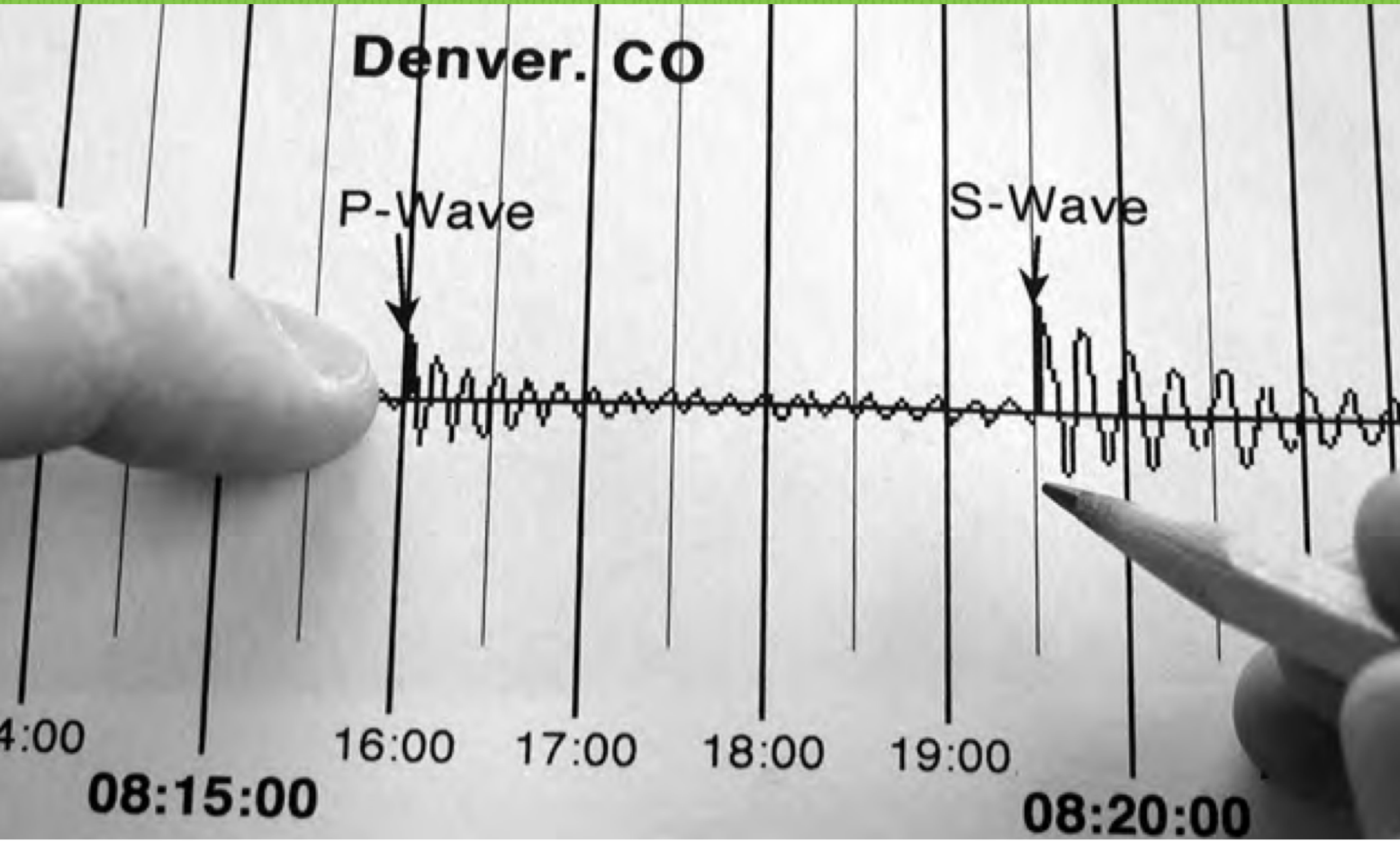
An earthquake occurred…

- 600 km from Jefferson City
- 725 km from Salt Lake City
- 650 km from Tallahassee

The epicenter was here.

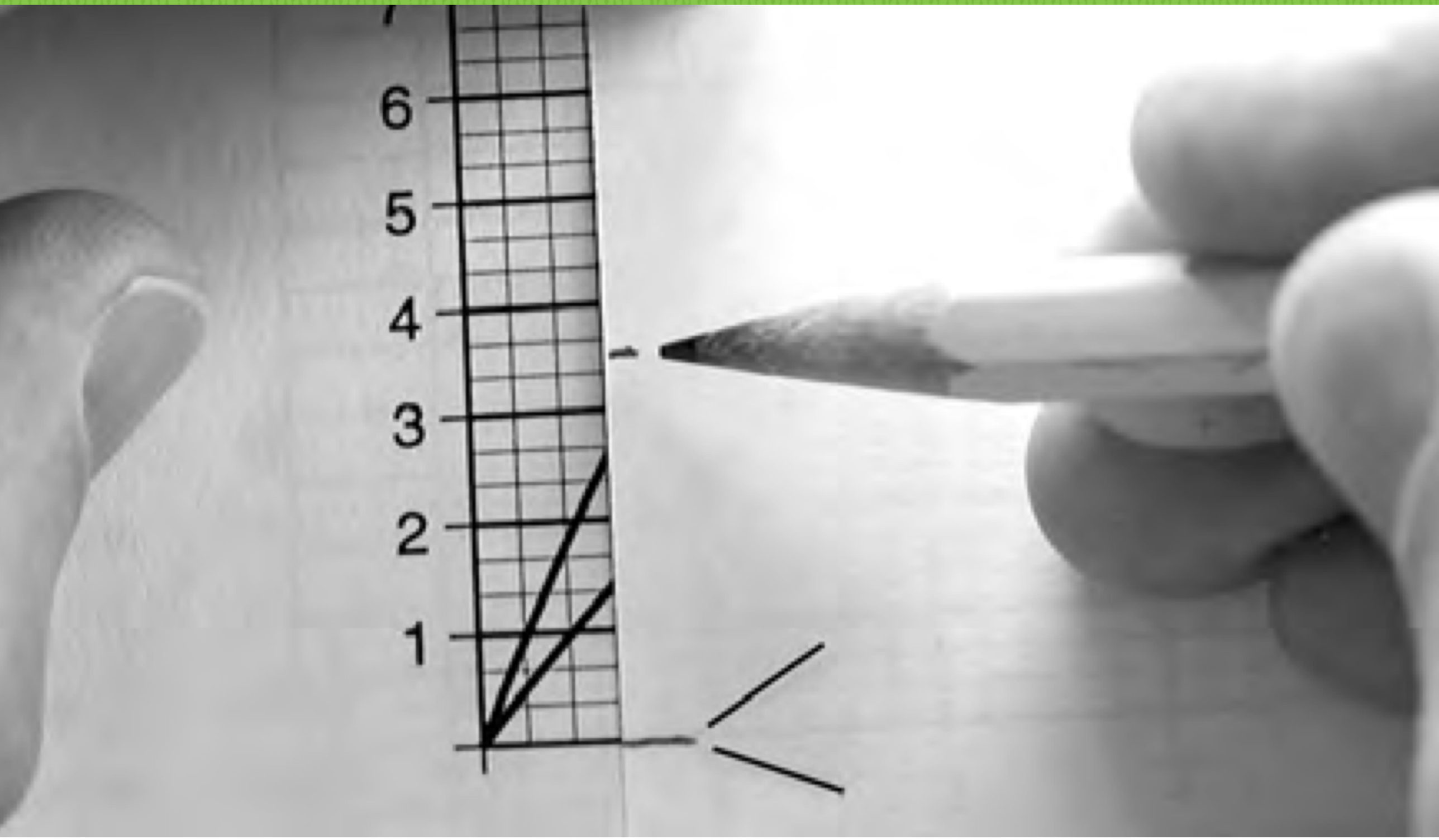
Goal: Students will be able to use earthquake data to find the epicenter of an earthquake.

Goal: Students will be able to describe where an earthquake occurs.

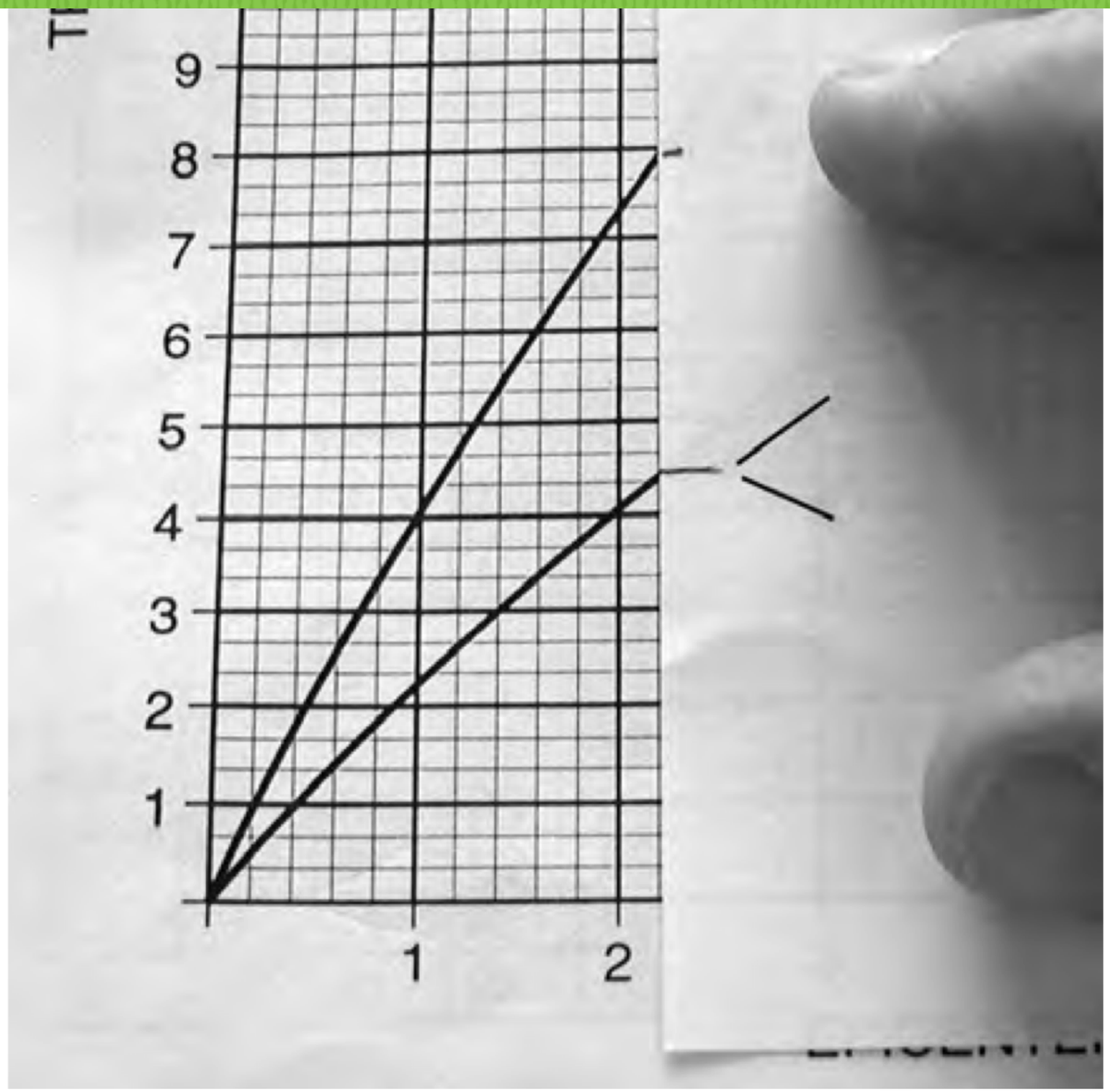


1. Find difference in time between P-wave and S-wave arrival time.

Goal: Students will be able to describe where an earthquake occurs.

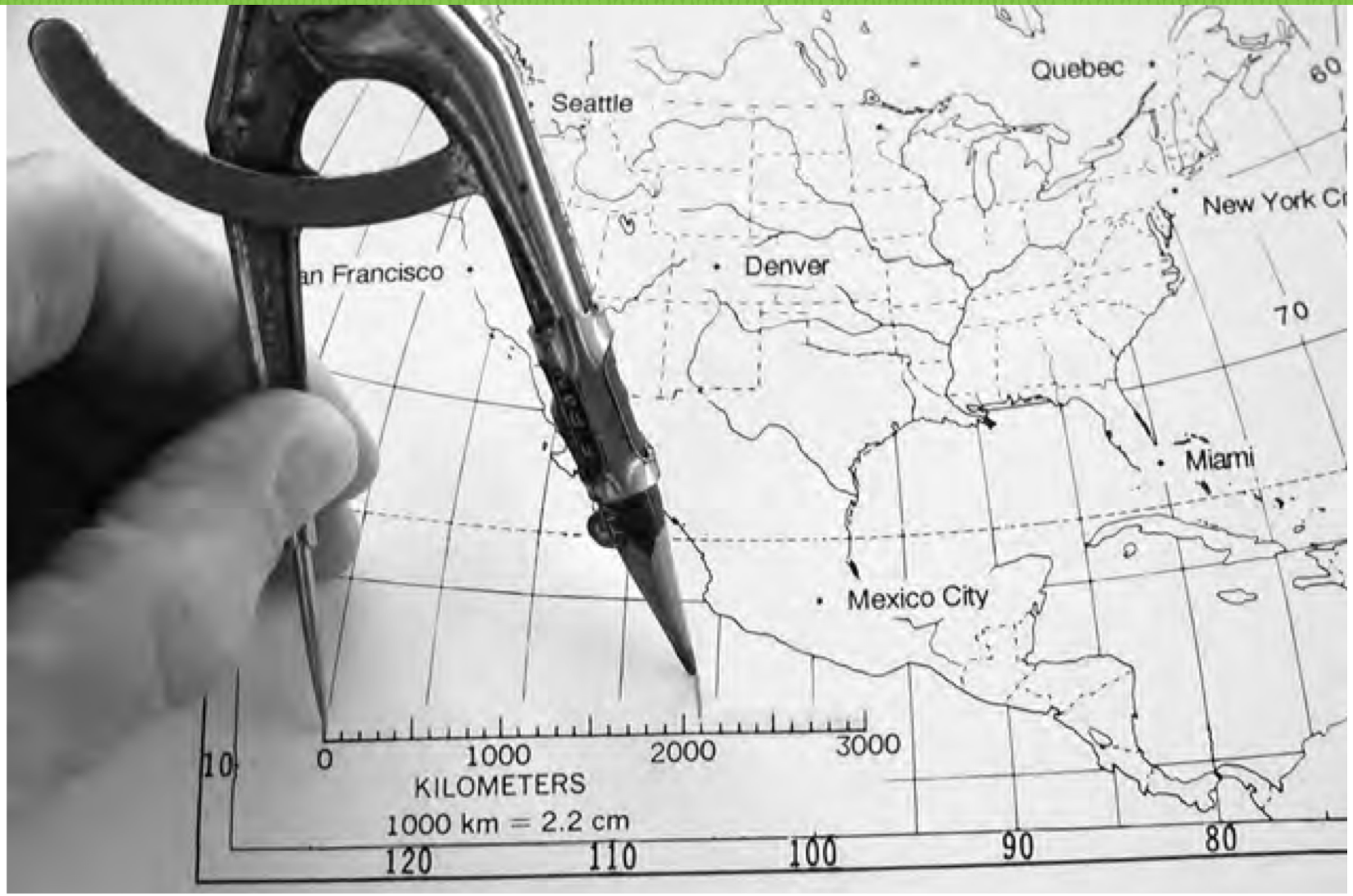


2. Measure that time difference on the Earthquake graph (Y-axis). Place one mark at 0, another at the time difference.



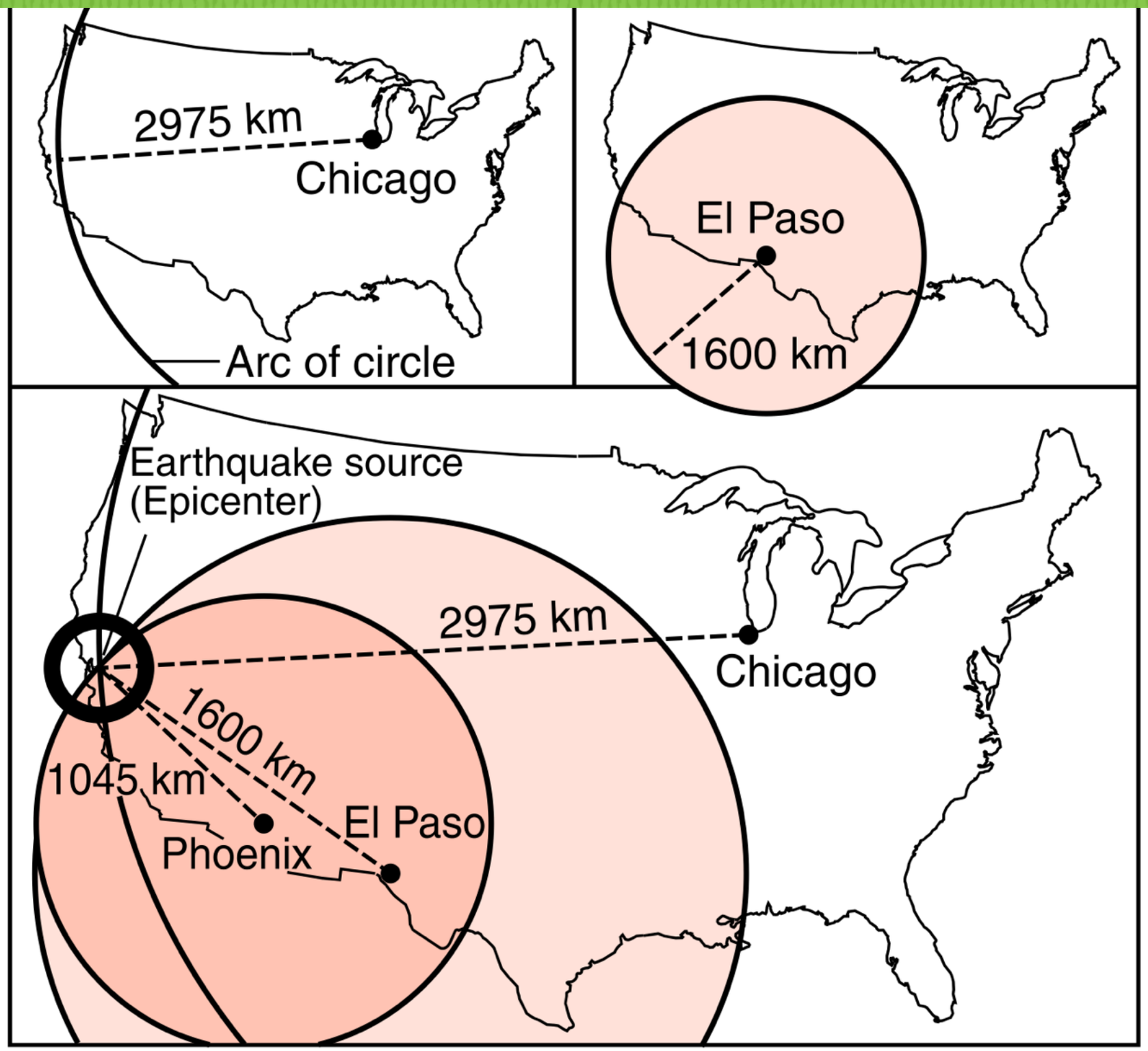
3. Move these markers to the right until they line up with both lines. Look straight down to find epicenter distance.

Goal: Students will be able to describe where an earthquake occurs.



4. Use map scale to set compass to epicenter distance.

5. Place point of compass at the station location and draw a circle around that location.



6. When this is done for three stations, the intersection of all three circles is the location of the epicenter.

Earth's Interior