

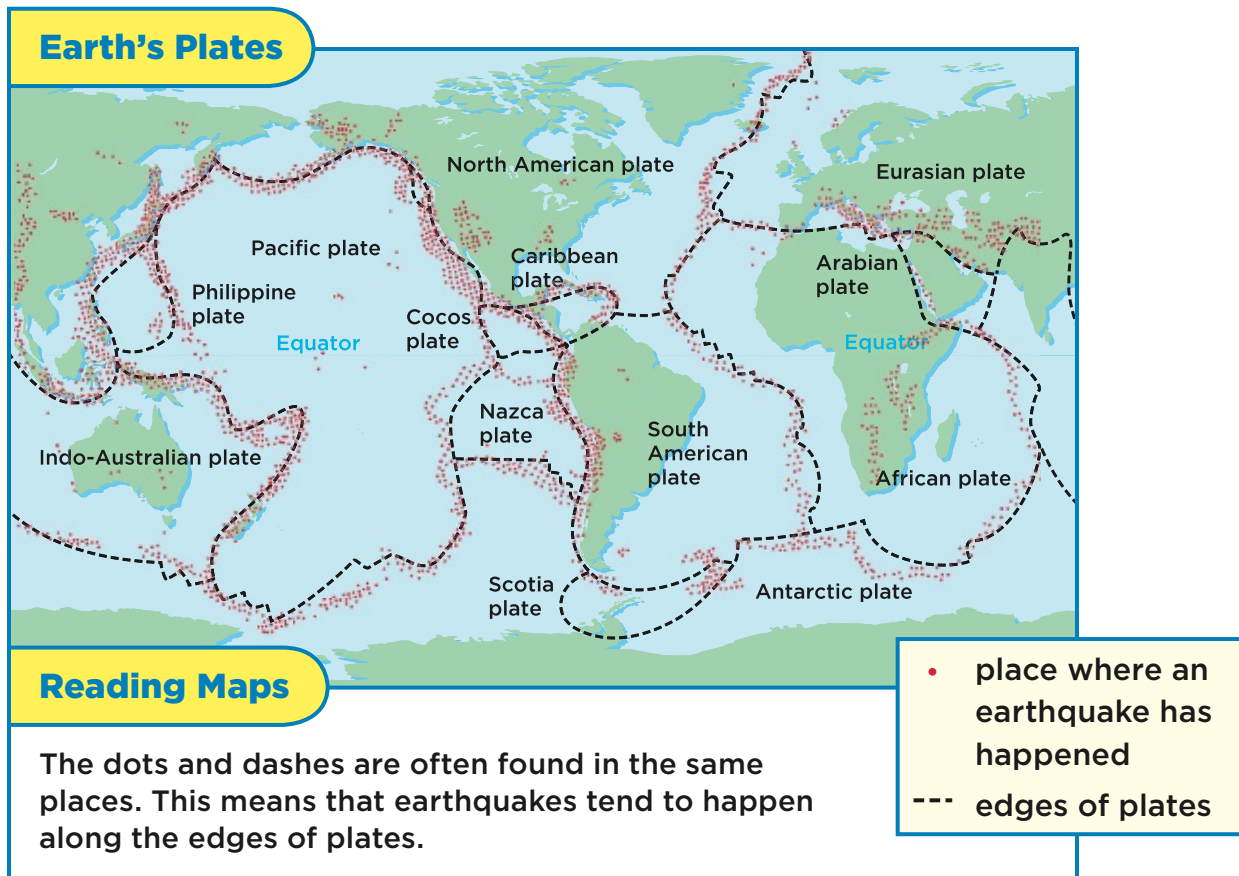
## What are earthquakes?

Earth's surface is always changing. Most changes are slow, such as weathering. Sometimes changes happen quickly. For example, Earth's surface can shake or shift suddenly.

### Earth's Moving Crust

Earth's surface is covered with its crust. The **crust** is Earth's outermost layer, much like an apple has an outer layer of skin. The crust is made up of all of Earth's land, including the ocean bottoms.

The crust is broken into huge pieces, or **plates**. The plates fit together like puzzle pieces. Unlike puzzle pieces, the plates can move.





- ▲ Route 14 near Sylmar, California, was heavily damaged as a result of an earthquake on January 17, 1994.

At the edges of the plates, there are cracks in the crust. These cracks are called **faults**. Along a fault, two plates can move by:

- sliding past each other
- pushing into each other
- pulling apart.

When plates move, earthquakes can happen. An **earthquake** is a movement in the crust caused by a sudden shift of the plates.

As the red dots in the map show, earthquakes tend to happen at the edges of the plates. Most earthquakes happen around the Pacific Ocean.

### **Quick Check**

Match the description with the word.

- |                                 |                      |
|---------------------------------|----------------------|
| 7. _____ happens at plate edges | <b>a.</b> crust      |
| 8. _____ piece of the crust     | <b>b.</b> earthquake |
| 9. _____ crack in the crust     | <b>c.</b> plate      |
| 10. _____ all of Earth's land   | <b>d.</b> fault      |

## What causes an earthquake?

Earthquakes happen along cracks, or faults, in the crust. Along a fault, parts of the crust on either side may:

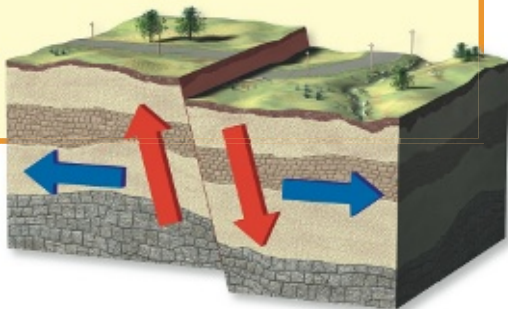
- rise up or move down
- slide past each other.

The movement may be very slow, just centimeters a year. In that case, an earthquake does not happen. Instead, when parts of the crust move up or down *slowly* over many years, mountains may be formed.

When the movement is sudden, an earthquake happens. The ground shakes, or vibrates. The ground may split open. The ground vibrates in all directions from the center of the earthquake. People far from the center of the earthquake may feel a slight shaking.

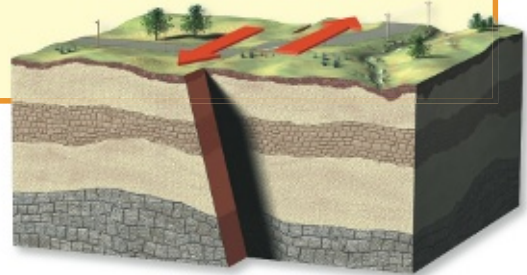
### Normal Fault

The plates pull apart. The part of the crust above the fault surface (in this case, the right side) moves down.



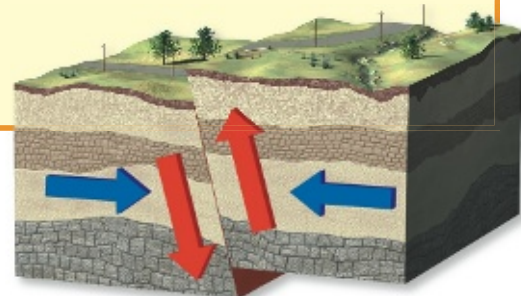
### Strike-Slip Fault

The plates slide past each other along the fault.



### Reverse Fault

The plates push into each other. The part of the crust above the fault surface (in this case, the right side) rises up.



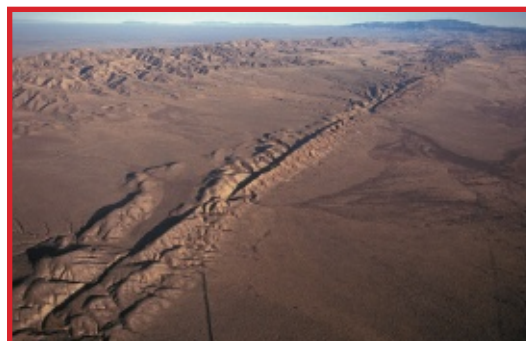
## Earthquake Safety

People who live where earthquakes happen can stay safe. Here are some safety tips:

- Place breakable or heavy objects on lower shelves. Bolt down appliances. These are two ways to keep heavy objects from falling.
- Locate *safe spots* at home and school—such as under a sturdy table.
- If outside in a quake, move to an open space away from buildings or power lines. This way you can stay safe from things falling on you.
- Have family earthquake drills. Together find a safe spot. Then drop, cover, and hold on. Arrange a meeting place outside the home.
- Drivers should stop during an earthquake. Passengers should stay inside the car.



The Sierra Nevada mountains formed over centuries where plates pull apart.



Along the San Andreas Fault, rocks slide past each other. Many earthquakes in California take place along this fault.

### Quick Check

Fill in the missing “Cause” and “Effects” in the diagram.

| Cause                          | → | Effect              |
|--------------------------------|---|---------------------|
| sudden movement along a fault  | → | 11. _____           |
| 12. _____                      | → | Mountains may form. |
| Bolt appliances down.          | → | 13. _____           |
| Move away from tall buildings. | → | 14. _____           |

## What is a tsunami?

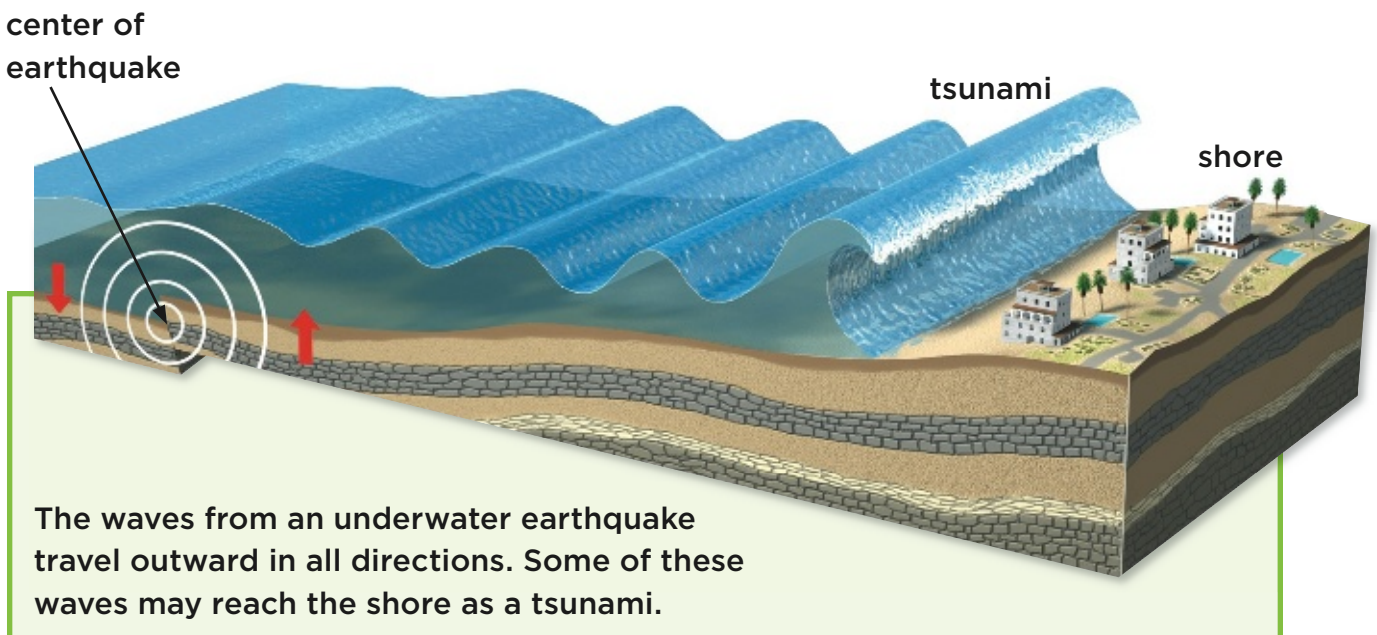
Have you ever seen small waves rise and fall as they reach a shore. However, some large ocean waves can be 30 meters (100 feet) tall and travel at a speed of 960 kilometers (600 miles) per hour. That kind of a wave is a tsunami (sew•NAH•mee).

**Tsunami** is a giant ocean wave.

Tsunamis are caused by:

- underwater landslides
- underwater erupting volcanoes
- most often, underwater earthquakes.

An earthquake may be strong enough to set a wave moving. In deep water the wave may pass by unnoticed. Closer to the shore, the wave slows down, but gets taller.



A tsunami may reach the shore as one huge wall of water or as several smaller waves. Either way, they are fast and powerful. They wash away beaches, property, and lives.

In December 2004, an earthquake in the Indian Ocean caused a tsunami to hit Sumatra. Then tsunamis reached Sri Lanka in two hours and South Africa in seven hours—800 kilometers (5,000 miles) from the earthquake.

If you are near a coast and learn of an earthquake, listen to news reports for tsunami warnings. If there is a warning, move to higher ground immediately.



Nearly 300,000 people lost their lives in the tsunami of December 2004, mostly in Sumatra.

### **Quick Check**

**15.** What are some ways a tsunami can form?

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**16.** Why are tsunamis dangerous?

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