

Earthquakes, Volcanoes, and Tsunamis

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Earthquakes, Volcanoes, and Tsunamis

Written by
Elizabeth Austin

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Smoke rises from what seems to be a peaceful volcano.

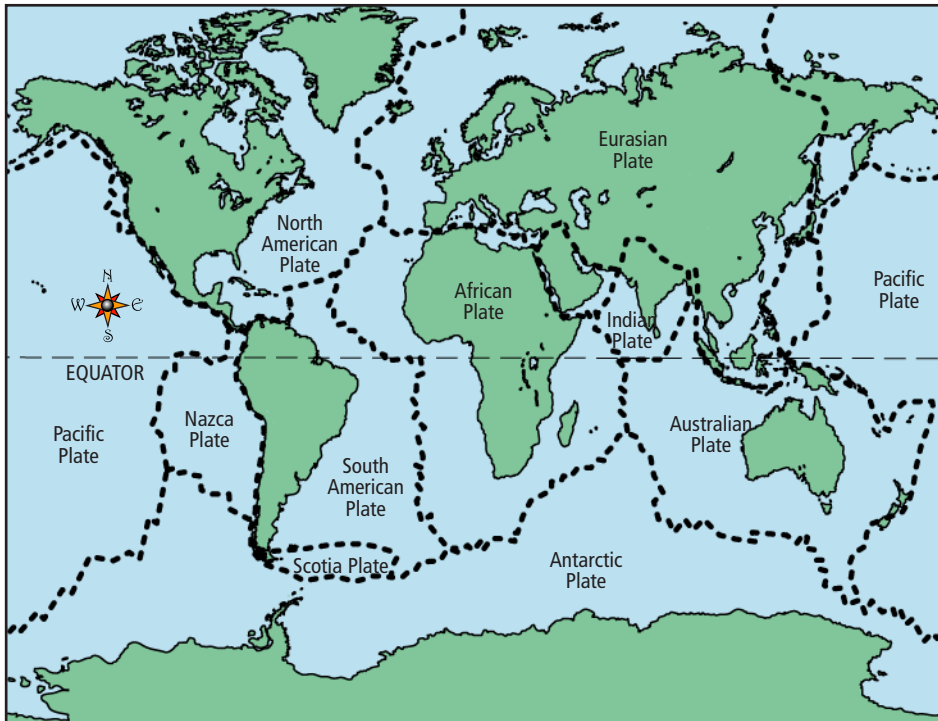
Introduction

The ground and the ocean are usually peaceful. But forces deep within the earth can suddenly cause **earthquakes**, **volcanoes**, and **tsunamis** (tsoo-NOM-ees). In this book, you will read about these events and the forces that cause them.

Deep Within the Earth

The top layer of Earth is made of giant pieces of rock, like the pieces of a puzzle. The pieces of rock, called **plates**, make up continents and ocean floors. Where the plates come together, there are often cracks and gaps, called **faults**.

Tectonic Plates



The dotted lines show the edges of the plates.

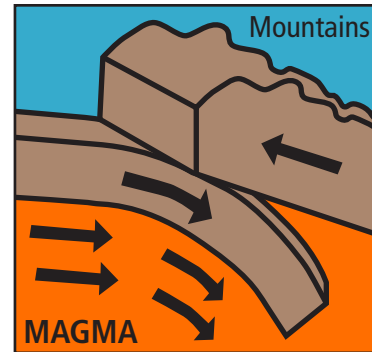


Fig. 1

Underneath the plates, the Earth is very hot. It is so hot that rock melts into a liquid called **magma**. The plates float on top of this liquid magma. The magma is always moving, dragging the plates around with it.

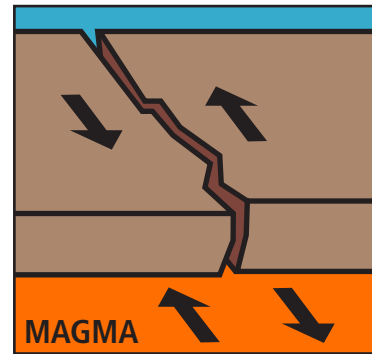


Fig. 2

At the edges of the moving plates, three different things can happen. If the plates are moving against each other, one plate slides over or under the other plate (Fig. 1). If the plates are moving past each other, the edges of the plates grind together (Fig. 2). And if the plates are moving apart, they make a gap where magma comes out (Fig. 3).

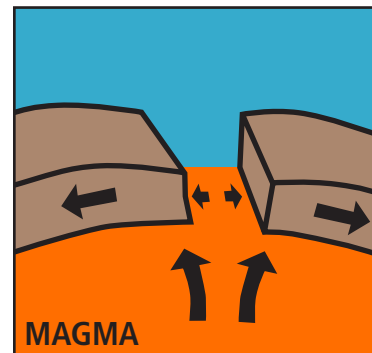


Fig. 3



Earthquakes can damage or even destroy buildings.

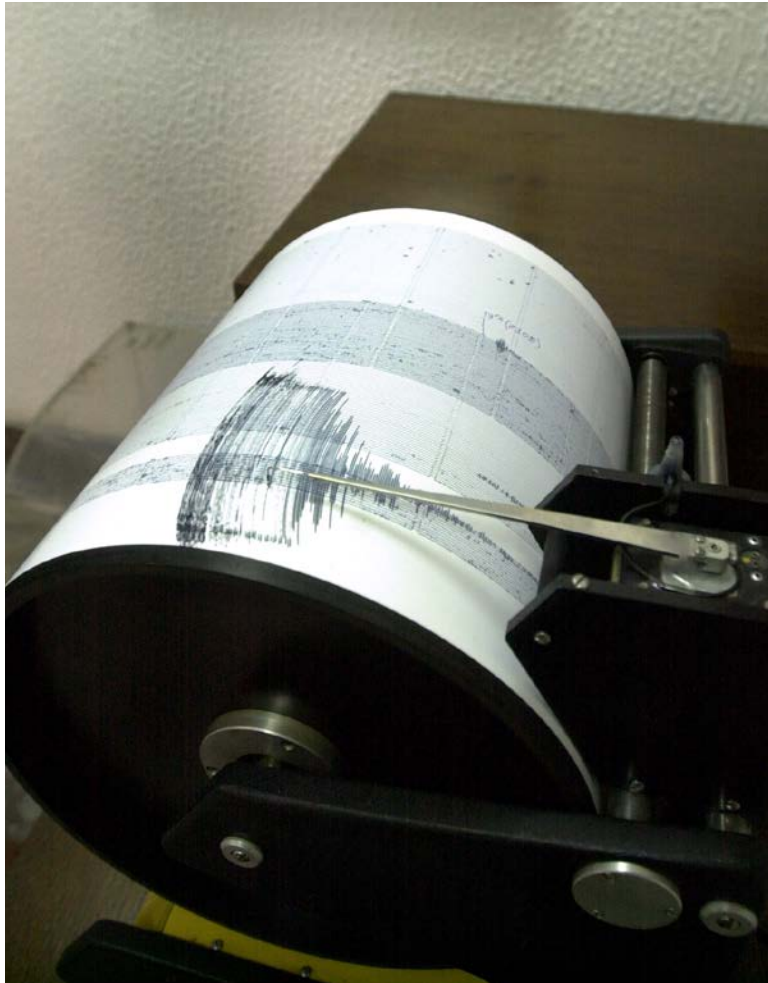
Earthquakes: Terrible Trembling

Sometimes the plates get caught on each other and cannot move. The pressure and energy build up. Then, suddenly, the rocks give way. The ground shakes. Far above, people feel an earthquake.

Some earthquakes are small and harmless. But sometimes the shaking is so strong that buildings crumble, bridges collapse, and large cracks open in the ground.



The ground here was ripped open by an earthquake.



A seismograph

We measure the strength of earthquakes on an instrument called a *seismograph* (SIZE-moh-graf). Each earthquake is given a number from the **Richter (RICK-ter) scale**, depending on its strength.

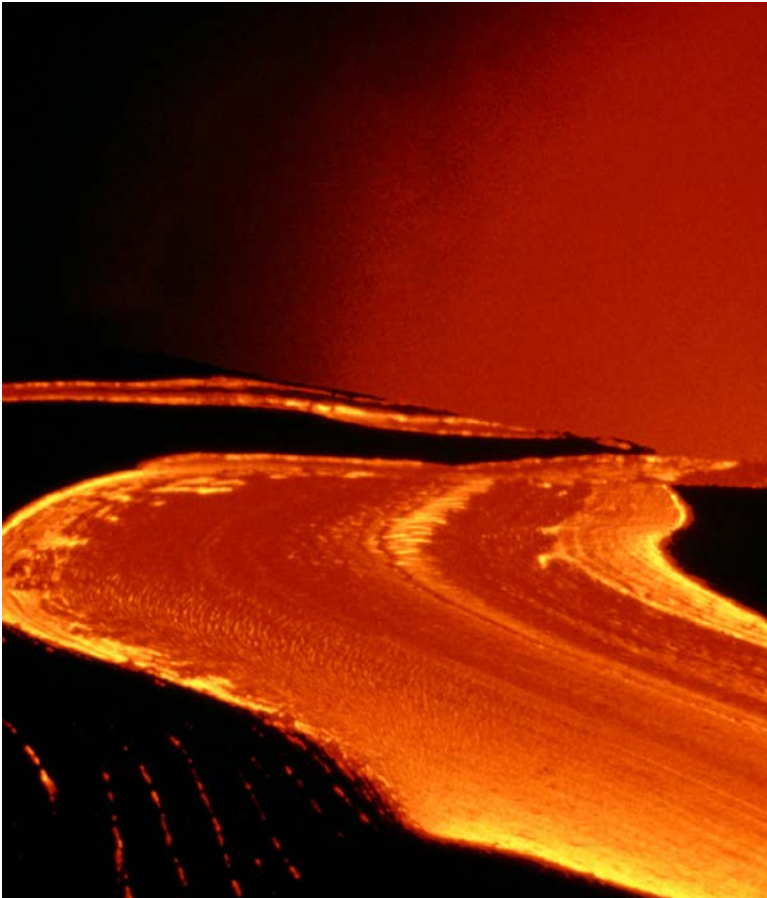
The Richter Scale

- 1 People cannot feel the earthquake—only sensitive instruments can detect it.
- 2 People usually do not feel it; some people in tall buildings may sense a slight swaying.
- 3 Many people near the origin of the earthquake notice the shaking. No damage occurs.
- 4 People at the origin of the quake definitely feel it. Hanging objects sway. Water sloshes in swimming pools. Some weak buildings may be damaged.
- 5 Felt over a wider area. Usually lots of damage to weak buildings at and around center. Some damage to strong buildings.
- 6 Lots of damage to weak buildings; some damage to strong buildings. Damage can spread over 160 kilometers (100 mi).
- 7 A very major earthquake. Most buildings at the center are destroyed. Cracks form in the Earth. Underground pipes break. Large landslides can occur.
- 8 Buildings and bridges destroyed. Large cracks appear in the ground. Large landslides.
- 9 The ground appears to move in “waves.” Entire rivers may move. Objects can be thrown into the air. Total destruction of buildings and other structures.

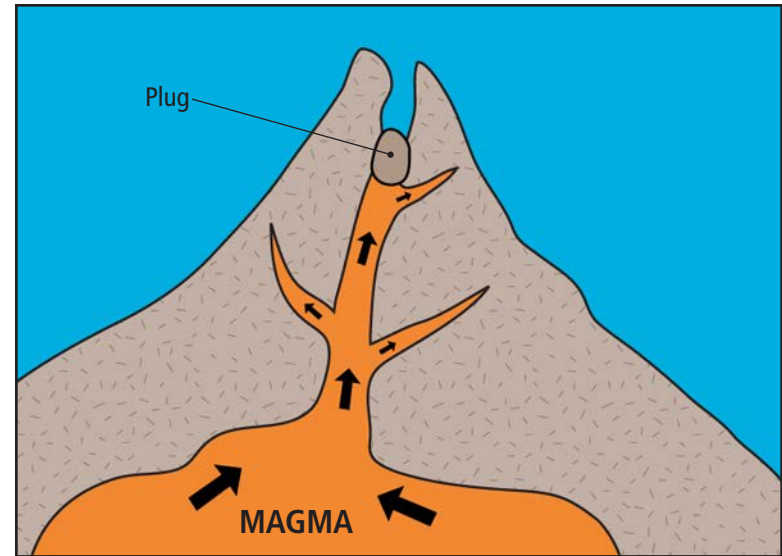
There is no top to the Richter scale, but the strongest earthquake ever recorded was a 9.5.

Volcanoes: Enormous Explosions

A volcano begins when magma from deep inside the Earth comes out through a crack in the Earth's surface. When the magma reaches the surface, it cools into solid rock, often forming a mountain or island.

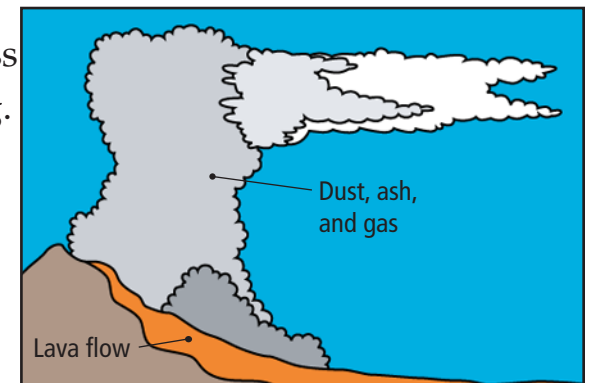


Runny liquid rock on this Hawaiian volcano flows smoothly, like a peaceful river.



Some volcanoes become plugged (above), and then they explode violently (below).

Sometimes the hot magma cools before it gets to the surface. It hardens into a solid piece of rock, plugging up the crack or hole where it had been seeping out. Hot gases in the magma continue to press against the plug. The pressure grows. Suddenly, the volcano explodes.



When mountains explode, they send tons of rock rolling down their sides. These falling rocks are called **landslides**. Clouds of ash and dust rise into the air during volcanic eruptions. The ash falls to the ground like snow. Large ash clouds can even block out sunlight.



Mount St. Helens, in Washington State, before it erupted in 1980



Mount St. Helens after it erupted



These trees were blown over by the explosion of Mount St. Helens.

Some large volcanoes have snow and ice on top. The hot gases melt all the snow and ice at once, and the water rushes down the mountain. This large, dirt-filled flood is called a **mudslide**.

Scientists are not yet able to predict when earthquakes will happen. But they have become very good at predicting volcanic eruptions. In 1991, scientists warned people in the country of the Philippines that a volcano was about to erupt. Many people left the area and found safety before the huge volcano erupted.



Scientists gather information from a volcanic fissure.



Tsunamis are the largest waves in the world.

Tsunamis: Wild Waves

Tsunamis are huge waves caused by earthquakes or volcanoes. Tsunamis can be as high as a football field is long. They are the largest waves in the world.

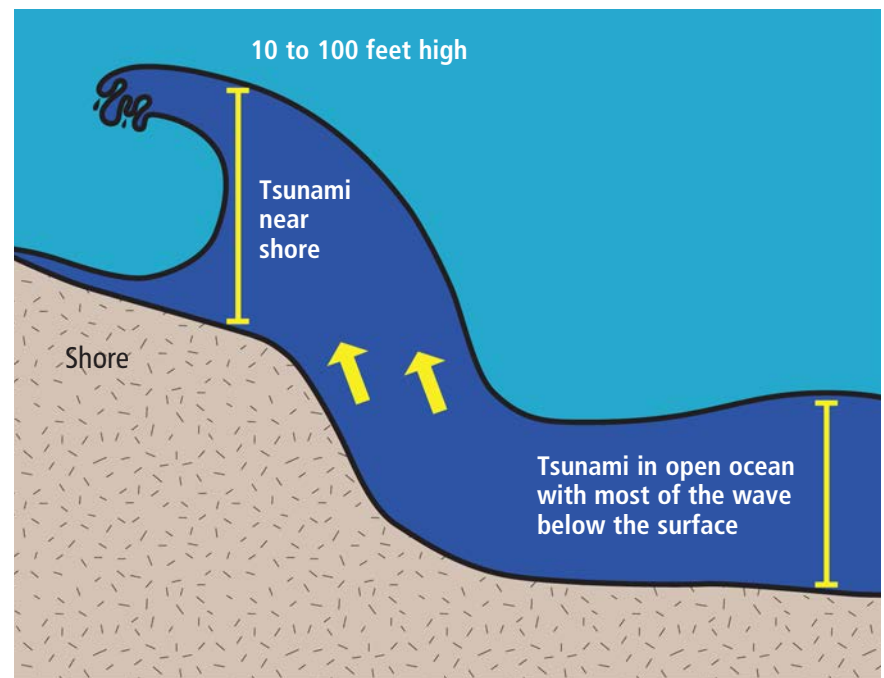
Large landslides caused by earthquakes or volcanoes sometimes fall into the sea and make huge waves. Earthquakes and volcanoes can also happen on the ocean floor. All of these events can create tsunamis.



Steam rises from a volcano near the sea.

Tsunamis speed away from where they begin in all directions. A tsunami can cross an entire ocean. Tsunamis travel very fast. In the open ocean, tsunamis may not be very high above the surface of the water, but they are very deep. As a tsunami comes close to land, the rising ocean floor pushes the wave upward. When a tsunami reaches land, it is tall enough to destroy almost anything in its path.

When a Tsunami Wave Reaches Shore



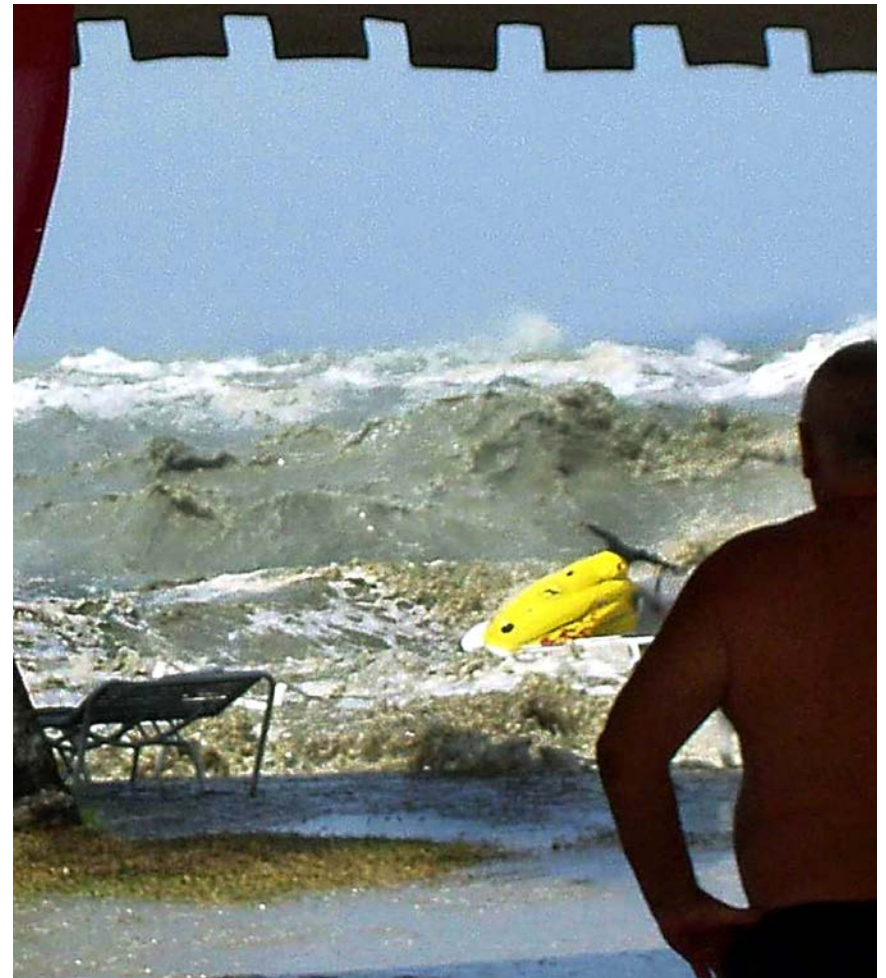
When tsunamis approach the shore, they break as giant waves.



Damage from a tsunami

Most tsunamis are between one and ten stories high. That might not sound very high, but it is hard to imagine the power of this much moving water. Even a small tsunami can destroy houses, streets, and entire towns.

Like volcanoes, tsunamis are becoming easier to predict. Scientists have instruments that detect volcanoes and earthquakes. When a large one happens, scientists often have time to warn people that a tsunami may be coming.



Many people describe tsunamis as "walls of water."



An earthquake destroyed this building.

Conclusion

During a large earthquake, the ground shakes, destroying homes and property. In an explosive volcanic eruption, liquid rock, ash, and landslides can cover whole cities. And tsunamis can cause billions of dollars in damage. Scientists are working to be able to predict volcanoes, earthquakes, and tsunamis in order to save thousands of lives.

Glossary

- earthquakes** (*n.*) the shaking of Earth's crust caused by underground vibrations (p. 4)
- faults** (*n.*) cracks in Earth's crust along which movement occurs (p. 5)
- landslides** (*n.*) moving masses of soil and rock that flow slopes (p. 13)
- magma** (*n.*) melted, liquid rock beneath Earth's surface (p. 6)
- mudslide** (*n.*) a dirt- and debris-filled flood of water (p. 14)
- plates** (*n.*) large sheets of rock that make up Earth's crust (p. 5)
- Richter scale** (*n.*) the scale that measures the strength of earthquakes (p. 9)
- tsunamis** (*n.*) enormous ocean waves caused by underwater earthquakes, landslides, or volcanoes (p. 4)
- volcanoes** (*n.*) places on Earth's surface where gases, ash, and lava spew onto the surface (p. 4)