



Earthquakes

section 5 People and Earthquakes

What You'll Learn

- how earthquakes are measured
- how to make your home or school earthquake-safe

● Before You Read

Think about pictures you have seen of a city that has been hit by a powerful earthquake. On the lines below, describe about what the city looked like.

Mark the Text

Underline Key Ideas As you read this section, underline key ideas and terms in each paragraph.

● Read to Learn

Earthquake Activity

Imagine waking in the middle of the night to find your house shaking and falling down around you. That's what happened in Northridge, California, at 4:30 A.M. on January 17, 1994. The town was struck by a huge earthquake that killed 51, injured 9,000, and left about 22,000 people homeless.

Earthquakes are natural events. They provide scientists with information about Earth. Unfortunately, they also do a great deal of damage to property and to people. On average, 10,000 people are killed in earthquakes every year. It is important for scientists to learn as much as they can about earthquakes to help reduce their impact on society.

Who studies earthquakes?

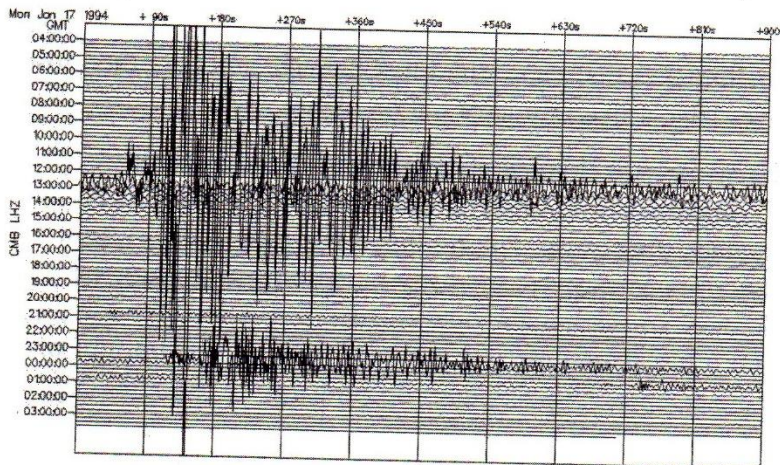
Scientists who study earthquakes and seismic waves are seismologists. As you have read, the instrument that is used to record primary, secondary, and surface waves is called a seismograph. Seismologists use records from seismographs to study earthquakes. There are seismograph stations all over the world that help determine where earthquake epicenters are located.

✓ Reading Check

1. **Define** What are seismologists?

What is an earthquake's magnitude?

A seismograph record of an earthquake is called a seismogram. A seismogram is shown in the figure below. The height of the lines on a seismogram is a measure of energy the earthquake released. The **magnitude** of an earthquake is the measure of energy released. The taller the lines on the seismogram, the greater the magnitude of the earthquake.



Picture This

- 2. Interpret** Look at the seismogram. Circle the area on the seismogram that recorded the earthquake.

What is the Richter scale?

The Richter magnitude scale is used to describe the magnitude of earthquakes. The Richter scale is based on the height of the lines on a seismogram. The Richter scale has no upper limit. However scientists think that a Richter scale value of 9.5 is the greatest magnitude an earthquake could register. ✓

For each increase of 1.0 on the Richter scale, the height of the line on a seismogram is ten times taller. For example, the line on a seismogram that shows a magnitude 7.0 earthquake is ten times taller than the line on a seismogram that shows a magnitude 6.0 earthquake.

The difference in the energy released by earthquakes of different magnitudes is even greater. About 32 times as much energy is released for every increase of 1.0 on the Richter scale. An earthquake with a Richter scale magnitude of 8.5 releases about 32 times more energy than an earthquake with a magnitude of 7.5.

✓ Reading Check

- 3. Identify** What scale is used to describe an earthquake's magnitude?

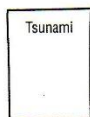
✓ Reading Check

4. Determine At about what magnitude are earthquakes first noticed?

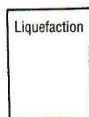
FOLDABLES™

E Describe Use two quarter-sheets of notebook paper to write down facts about liquefaction and tsunamis.

Tsunami



Liquefaction



What do we know from past earthquakes?

Thousands of earthquakes occur on Earth every day. Most are so small that no one is aware of them. Earthquakes with a magnitude of 3.0 or below are generally not noticed and cause no damage. Earthquakes with a magnitude between 3.0 and 4.9 can usually be felt by humans. There are about 55,000 earthquakes each year that are felt, but that cause little or no damage. ✓

Most of the earthquakes you hear about are large ones that cause great damage. Destructive earthquakes have a magnitude of 5.0 or more on the Richter scale. The earthquakes that cause the most damage and take the most lives have a magnitude of 6.8 or higher.

How is earthquake intensity described?

Earthquakes also can be described by the amount of damage they cause. The modified Mercalli intensity scale describes earthquake intensity based on the amount of damage an earthquake does to rock formations, buildings, and other structures at a specific location. The amount of damage an earthquake does depends on its strength, the kind of material at Earth's surface, how structures are designed, and how far a location is from the epicenter of the earthquake.

On the Mercalli scale, an intensity-I earthquake would be felt by few people and do no damage. An intensity-IV earthquake would be felt by everyone indoors, and it might do some damage to buildings. Everyone would feel an intensity-IX earthquake, which would cause serious damage to buildings and open cracks in the ground. An intensity-XII earthquake would result in total destruction of structures. The 1994 6.8-magnitude earthquake in Northridge, California, was listed at an intensity of IX because of the damage it caused.

What is liquefaction?

Have you ever tried to get thick ketchup out of a bottle? Sometimes you must shake the bottle to make the liquid ketchup flow. Something similar can happen to wet soil during earthquakes. The intense shaking from an earthquake can cause wet soil to act like a liquid. **Liquefaction** occurs when wet soil acts more like a liquid during an earthquake. When liquefaction occurs in soil under buildings, the buildings can sink into the soil and collapse.

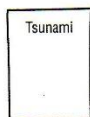
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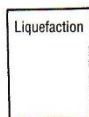
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What are tsunamis?

Some earthquakes occur under the ocean. These earthquakes cause a sudden movement of the ocean floor, which pushes against the water. The powerful wave that results can travel thousands of kilometers across the ocean in all directions, and it may finally crash into a coast. **Tsumamis** (soo NAH meeZ) are seismic sea waves caused by undersea earthquakes. On the open ocean, tsunamis may not be noticed but when they reach land, tsunamis may form a wall of water up to 30 m high. ✓

What are ways to prepare?

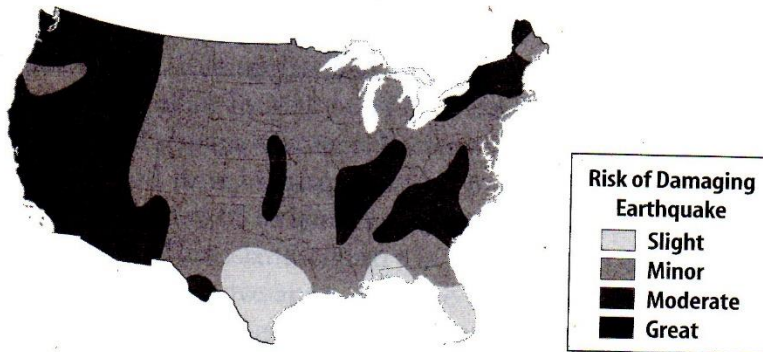
Most tsunamis occur around the *Pacific Ocean*. The Pacific Tsunami Warning Center in Hawaii monitors undersea earthquakes. People are warned if a tsunami is likely to occur so they have time to leave the danger area.

Earthquake Safety

Earthquakes may occur anywhere. The map below shows where in the United States they are most likely to occur.

Today buildings can be built to resist earthquake damage. In California, some new buildings are supported by flexible moorings made of rubber and steel. The rubber acts like a cushion to absorb the wave motion of an earthquake. In older buildings, steel rods can be installed to make the walls stronger.

There are some steps you can take before an earthquake to make your home safer. Move heavy objects from high shelves to lower shelves. Make sure water heaters and gas appliances are held securely in place. New sensors can now be installed on gas lines. These sensors automatically shut off the gas when earthquake vibrations are felt.



✓ Reading Check

5. **Identify** What are seismic sea waves caused by underground earthquakes called?
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💡 Think it Over

6. **Infer** If you live in an earthquake zone, why shouldn't you build a house on loose soil?
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-

● After You Read

Mini Glossary

liquefaction: occurs when wet soil acts more like a liquid during an earthquake

magnitude: the measure of energy released during an earthquake

tsunami (soo NAH mee): seismic sea waves caused by undersea earthquakes

1. Review the terms and their definitions in the Mini Glossary. Then write one sentence about the effects of a strong undersea earthquake.

2. Fill in the blanks with the correct scale.

Seismologists use two scales to measure earthquakes.

<hr/> <ul style="list-style-type: none">• measures intensity• scale of I to XII
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<hr/> <ul style="list-style-type: none">• measures magnitude• scale of 1.0 to about 9.5
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3. How did underlining main ideas and key terms help you understand the information in this chapter?

