



SCIENCE • GRADE 4

Science Content Standards

Earth Sciences: 5.A

Earth Sciences: 5.B

Earth Sciences: 5.C

Below Level

# Our Changing Earth

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LOOK  
INSIDE  
FOR:

California's  
Academic  
Content Standards  
Covered

•  
Reproducible  
Student Book

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Reproducible  
English-language  
Arts Activities

# Our Changing Earth

## California's Content Standards Met

### GRADE 4 SCIENCE

**EARTH SCIENCES: 5**—Waves, wind, water, and ice shape and reshape Earth's land surface. As a basis for understanding this concept:

- a. Students know how some changes in the earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.
- b. Students know natural processes, including freezing and thawing and the growth of roots cause rocks to break down into smaller pieces.
- c. Students know moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).

### GRADE 4 ENGLISH LANGUAGE ARTS

#### 2.0 READING COMPREHENSION

***Structural Features of Informational Materials 2.1***—Identify structural patterns found in informational text (e.g., compare and contrast, cause and effect, sequential or chronological order, proposition and support) to strengthen comprehension.

***Comprehension and Analysis of Grade-Level-Appropriate Text 2.3***—Make and confirm predictions about text by using prior knowledge and ideas presented in the text itself, including illustrations, titles, topic sentences, important words, and foreshadowing clues.

***Comprehension and Analysis of Grade-Level-Appropriate Text 2.4***—Evaluate new information and hypotheses by testing them against known information and ideas.

***Comprehension and Analysis of Grade-Level-Appropriate Text 2.5***—Compare and contrast information on the same topic after reading several passages or articles.



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# Student Book

*Our Changing Earth*

Print pages 5 – 18 of this PDF for the student book.

# How to Make the Student Book

- The student book is contained on pages 5–18 of this PDF. It begins on the next page.
- To make one student book, or a two-sided master copy that can be photocopied, you will print on both sides of seven sheets of 8.5" x 11" paper.
- Do a test printout of one book first to familiarize yourself with the procedure.
- Follow these instructions carefully.

## First—Select the Paper

Since you will be printing on both sides of the sheets of paper, select a good quality white paper. We recommend using at least a 22lb sheet.

## Second—Check Printer Settings

Be sure you have the correct page setup settings for your computer and printer. You will print these pages in landscape format.

## Third—Print EVEN Pages

Open the PDF of the book you want to print. Select print from your file menu. In your printer's dialogue box enter pages 5–18 to print. Then select EVEN pages only. It is important to print only the EVEN pages first. Click "Print" to print the even pages. (**Important note:** The first page that prints will be blank. DO NOT discard this page. It will be needed to print the cover in the next step.)

## Forth—Print ODD Pages

When the even pages have printed, flip the stack of pages over to print the odd pages. Place the stack back in your printer. Select print from the file menu again. In your printer's dialogue box, select ODD pages. Click "Print" to print the odd the pages.

## Fifth—Fold the Book

You now have a complete book. Check to be sure the pages are in the correct order with the book's cover as the top page. Then fold the stack of paper in half.

## Sixth—Staple the Book

Use an extended-length stapler to staple the pages together. Place three staples in the spine of the book.

Please note that printers vary in how they output pages. Do a test printing with one book and adjust the procedure as necessary.

If you want to make a one-sided master copy, print ALL pages 5–18 at once. Then select "one-sided to two-sided" on the copy machine.

BL

# Our Changing Earth California's Content Standards Met

## GRADE 4 SCIENCE

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Compare and contrast information on the same topic after reading several passages or articles.



SCIENCE • GRADE 4

Science Content Standards

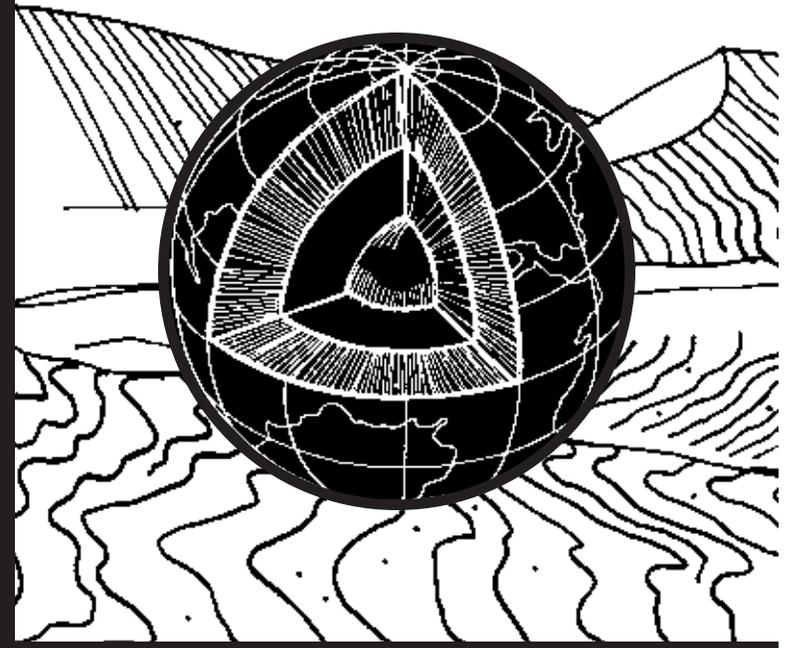
Earth Sciences: 5.A

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# Our Changing Earth

by Caitlin Scott





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# Our Changing Earth

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## INTRODUCTION

# Earth Is Changing

Earth is always changing. Most changes happen slowly. On a beach, wind can move sand into large piles. These piles are called sand dunes. In time, the beach looks different. It changes.

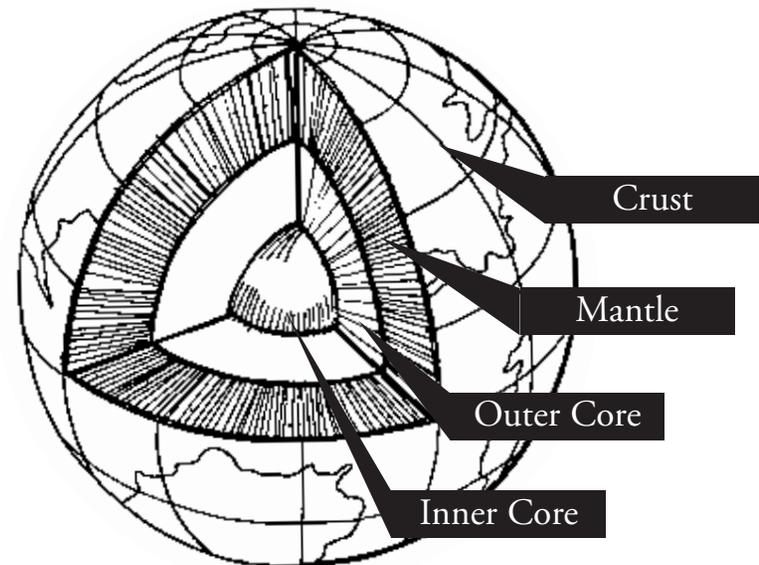
Earth changes quickly, too. These fast changes can kill plants and animals. They can bring down buildings. Sometimes they can put people in danger. Some of these fast changes are earthquakes, volcanoes, and landslides.

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## CHAPTER 1

# Slow Changes

Earth is made of four layers. The crust is the layer we walk on. Most slow changes take place on the crust. There are several **natural** ways that these slow changes happen.



**natural:** not made by man

---

## Wind

Have you seen a dust storm? The wind blows the dirt away. It changes the land.

Strong winds slowly wear away the rock on a mountain. Over time, the mountain changes shape.

## Water

Like wind, water can cause slow changes in the earth. Rain falling on a rocky cliff wears the rock away. This takes thousands of years.

A flowing river picks up dirt and small rocks. The water slowly carries the dirt and rocks from one place to another. The water changes the shape of Earth's crust.

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## Ice

Ice doesn't move the way water and wind do. But, ice still causes change.

When water freezes, it **expands**.

Have you ever left a can of soda in the freezer? If so, you know the can swells. It looks as if the soda will break out of the can.

The same thing happens when water freezes inside the ground. The ice expands. It breaks Earth's crust. Sometimes ice can even break a rock apart.

*How does wind, water, and ice change the shape of the land?*

**expands:** gets bigger

## Erosion and Deposition

### Erosion

Erosion wears away part of Earth's crust. It breaks down rocks. Erosion can be caused by natural things. Wind, water, or ice can cause erosion.

Pressure, or force, can also cause erosion. For example, plant roots can grow into cracks in rocks. As the roots grow, the cracks become bigger. After a long time, they break the rocks apart.

*Explain how a growing plant can cause erosion.*

**erosion:** the process of slowly wearing away; a type of weathering

---

Erosion is usually slow. Yet, sometimes erosion happens fast.

Flood waters carry soil and rocks away quickly. This erosion can be dangerous. Plants, animals, and houses can be swept away by the water. Sometimes people get caught in floods, too.

*What are some other ways erosion changes Earth?*

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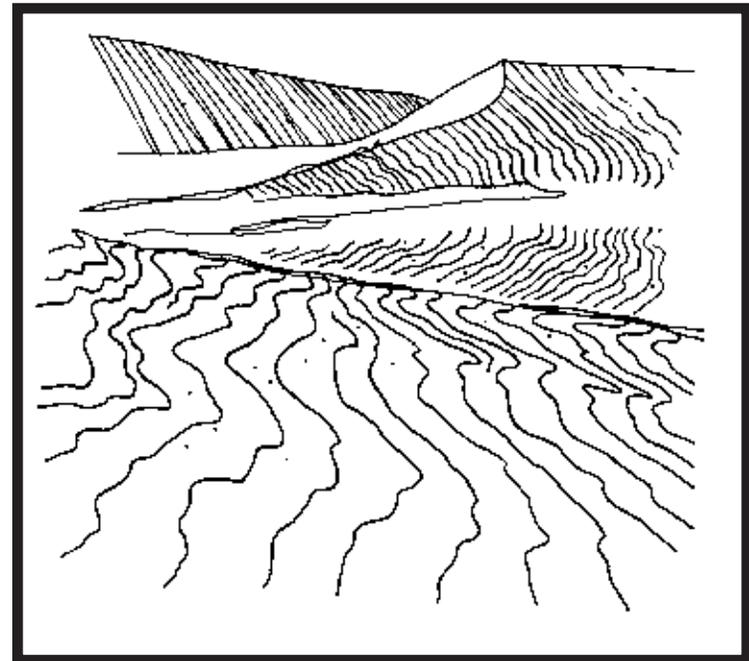
## Deposition

Erosion causes dirt and rock to slowly wear away and move. The worn away dirt and rock ends up someplace else. This is called deposition.

Deposition changes the earth. Think about a beach. Wind moves the sand. The sand piles up. The sand becomes a sand dune. The beach changes.

---

Look closely at the sand dune. You can see a pattern on the top. This shows how the wind is slowly moving the sand. The wind is causing erosion. Then the sand ends up someplace else. This is deposition.



*During a flood, do you think deposition happens slowly or quickly? Explain your answer.*

---

## CHAPTER 3

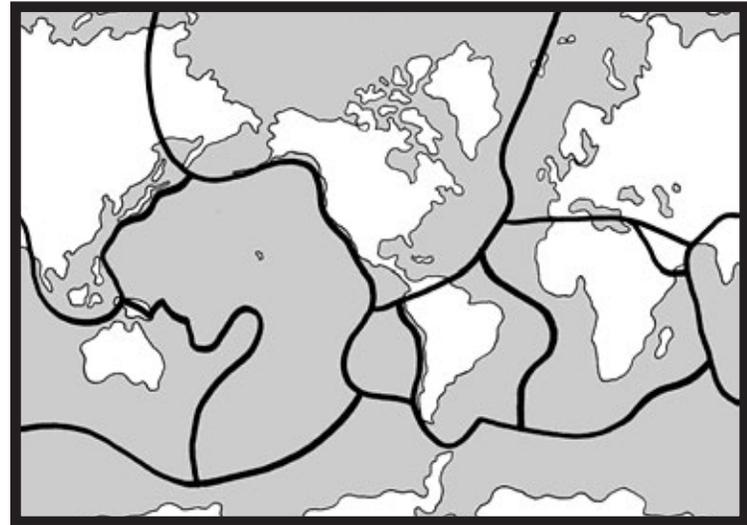
# Fast Changes

You learned that the crust of Earth is the layer we walk on. It breaks easily. The mantle is below the crust. It is softer and very hot. The crust floats on the mantle in big pieces called plates. Look at the map on page 13. You can see the plates.

About 300 million years ago, heat inside Earth began pushing the plates apart. Most of the time, this happens very slowly. But, sometimes two plates get stuck together. The pressure builds up. Then, suddenly the plates move. This causes problems.

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## Earth's Major Plates



*Look at the dark lines. The lines show the edges of Earth's plates. These plates are always moving.*

---

## Earthquakes

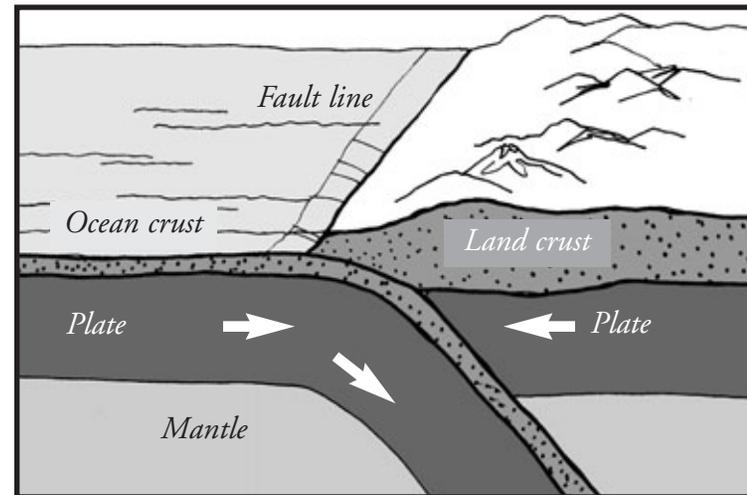
Many earthquakes happen on fault lines. Look at the map again. You can see a dark line down the west coast of the United States. This is a fault line. When two plates move suddenly along a fault line, there is an earthquake.



*A fault line is where two plates rub against each other.*

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*Along fault lines, one plate can move under another. This causes earthquakes.*



Sometimes earthquakes cause a gentle shaking. It might knock a book off a table. Other times, the shaking can bring down buildings.

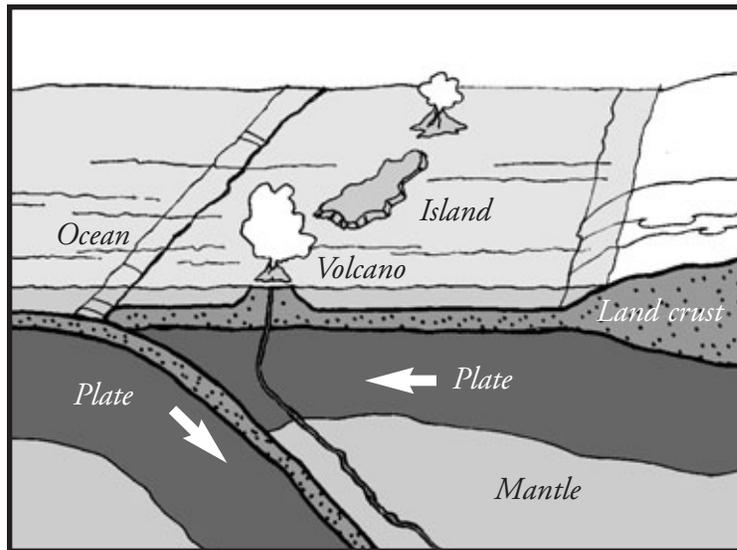
How can you stay safe in an earthquake?

- Drop to the ground.
- Get under something heavy like a desk or doorway.
- Wait for the ground to stop shaking.

---

## Volcanoes

Volcanoes also happen along fault lines. Look at the picture below. One plate is moving under another. This causes heat to build up. This heat melts some of the rock. If the melted rock is pushed toward the crust, a volcano forms.



*Lava is pushed up. This causes an undersea volcano. Undersea volcanoes can form islands.*

---

Volcanoes are dangerous. The ground shakes when they **erupt**. Hot rocks, **lava**, ash, and mud fly up in the air. The trees and buildings can be knocked down.

Most of the time, scientists can predict when a volcano will erupt. People usually have time to get away.

Some volcanoes are under the ocean. The volcanoes erupt under water. When this happens, islands form. This is how the Hawaiian Islands were formed.

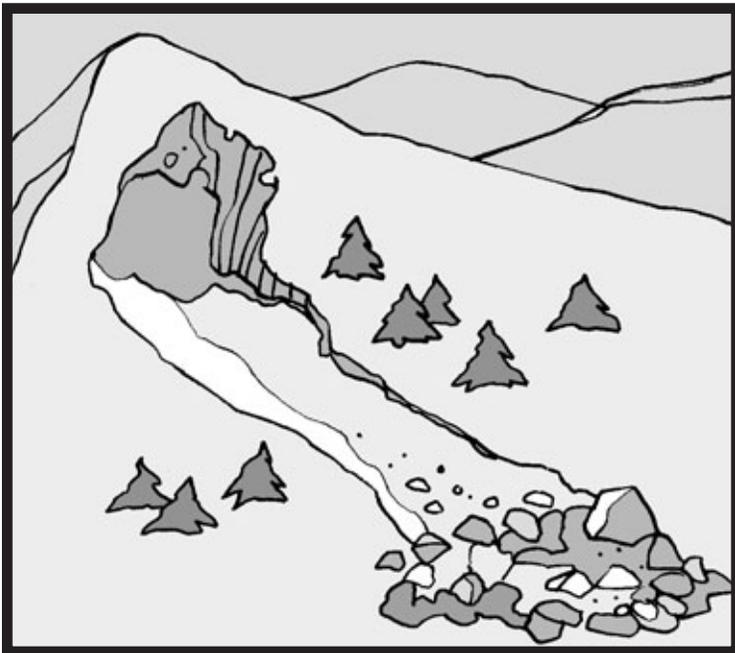
**erupt:** to explode with great force  
**lava:** molten rock that flows or bursts from a volcano

---

## Landslides

Landslides can happen in all 50 states. In a landslide, mud and rock move quickly downhill. A landslide can bury buildings and roads.

Landslides can follow an earthquake or flood. Cutting down trees on a hill can also cause a slide. The tree roots are no longer there to hold the land in place. Sometimes digging on a hill causes a landslide.



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Can you stay safe during landslides? Yes. Notice if the land is shifting. Do trees seem to be leaning over? If so, there might be a landslide. If you are in a landslide, try to get away. If you can't, get under something heavy like a table.

After the landslide, be careful. Do not go into the landslide area. The land may still be moving.

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## CHAPTER 4

# Wangari Maathai

Wangari Maathai was born in Nyeri, Kenya in 1940. She went to school to study about plants. Later, she saw that many, many trees were being cut down in Kenya. But very few trees were being planted. Without tree roots, there was erosion. The rain and wind quickly carried the good, rich soil away. Soon, people began to have trouble farming.



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Wangari wanted to help solve these problems. She formed the Green Belt Movement. She got Kenyan women to plant trees.

Through Green Belt, Kenyan women have planted more than 20 million trees. Now much of the land can be farmed again. Because of her work, Wangari won the Nobel Prize in 2004.

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## Glossary

**expands**—gets bigger

**erosion**—the process of slowly wearing away;  
a type of weathering

**erupt**—to explode with great force

**lava**—molten rock that flows or bursts from  
a volcano

**natural**—not made by man

---

## To Find Out More . . .

Want to learn more about how Earth changes?

### Try these books

*Erosion* by Joelle Riley. Lerner Publications,  
2006.

*Volcanoes and Earthquakes* by Andres Llamas  
Ruiz. Sterling Publishing Company, Inc., 1997.

### Access these Web sites

U.S. Environmental Protection Agency  
Land Revitalization Office

[http://www.epa.gov/oswer/landrevitalization/  
lrso.htm](http://www.epa.gov/oswer/landrevitalization/lrso.htm)

The Nature Conservancy  
<http://www.nature.org/>

FEMA for Kids: Federal Emergency  
Management Agency  
<http://www.fema.gov/kids/>

### Write for more information

The Nature Conservancy  
4245 North Fairfax Drive, Suite 100  
Arlington, VA 22203-1606

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Below Level

# English-language Arts Activities

*Our Changing Earth*

Print pages 20–24 of this PDF for the reading activities.

# Sequential Order

## TRY THE SKILL

Sequential order is the order in which things happen. Understanding sequential order can help you understand and remember what you read. You can retell the sequential order. To do this, use words such as, *first*, *then*, *next*, and *finally*.

Read this passage from *Our Changing Earth*.

For example, plant roots can grow into cracks in rocks. As the roots grow, the cracks get bigger. After a long time, they break the rocks apart.

How does root growth change Earth's surface? A graphic organizer can help you identify the steps.

Step 1	First, roots grow into cracks in rocks.
Step 2	Next, the cracks in the rocks get bigger.
Step 3	Finally, they break the rocks apart.

Read this passage from *Our Changing Earth*. How do sand dunes form? Retell in sequential order. Use the graphic organizer to help.

Deposition changes the earth. Think about a beach. Wind moves the sand. The sand piles up. The sand becomes a sand dune. The beach changes.

Step 1	
Step 2	
Step 3	

# Evaluate New Information

## TRY THE SKILL

Reading carefully helps you evaluate new information. Read this paragraph from *Our Changing Earth*. Then, decide whether the new information is true.

Earth is always changing. Most changes happen slowly. On a beach, wind can move sand into large piles. These piles are called sand dunes. In time, the beach looks different. It changes.

Now read these new statements. Which statement true?

- A. A volcano is an example of a slow change on Earth.
- B. Sand dunes are examples of slow changes on Earth.
- C. Earth never changes.

**Statement B agrees with the information in *Our Changing Earth*. Statement B is true.**

Read the paragraphs. Shade the circle next to the statement that is true.

1. Earth is changing quickly, too. These fast changes are very dramatic. They can kill plants and animals. They can put people in danger, too. Sometimes, they even bring down buildings.
  - Ⓐ These fast changes never hurt buildings.
  - Ⓑ Earth changes quickly too, which can be dangerous.
  - Ⓒ The fast changes never hurt people.
  
2. When two plates move suddenly, there is an earthquake. Sometimes, this brings gentle shaking. It might knock a book off a table. Other times, the shaking brings down buildings.
  - Ⓐ All earthquakes bring gentle shaking to Earth.
  - Ⓑ When there is an earthquake, buildings always fall down.
  - Ⓒ When two plates move, an earthquake shakes Earth.

# Compare and Contrast

## TRY THE SKILL

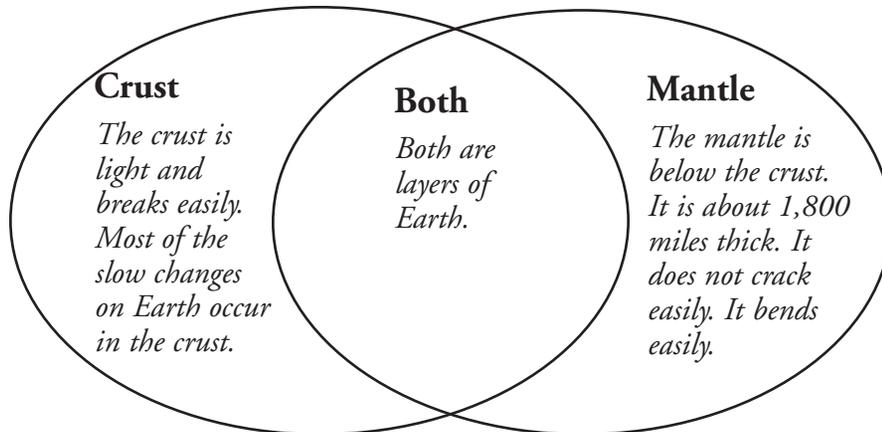
Comparing and contrasting can help you understand what you read.

- Comparing tells how things are alike.
- Contrasting tells how things are different.

Read these paragraphs. Then, read the Venn diagram that compares and contrasts.

Earth has four layers. The crust is the layer we walk on. It is light and breaks easily. Most of the slow changes on Earth occur in the crust.

The mantle is below the crust. It is about 1,800 miles thick. It does not crack easily like the crust. Instead, the mantle bends easily.



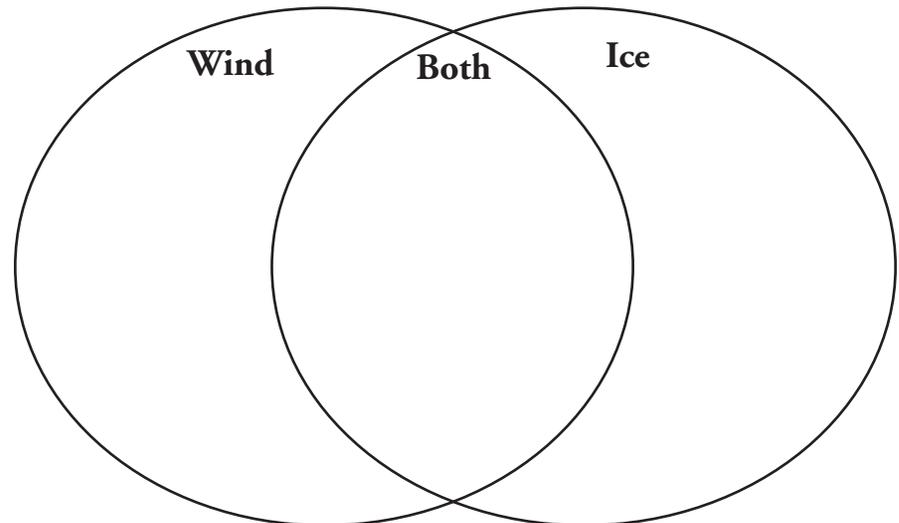
Read the paragraphs. Think about comparing and contrasting. Then complete the Venn diagram.

### Wind

Have you seen a dust storm? The wind blows the dirt away. It changes the land. Strong winds slowly wear away the rock on a mountain. Over time, the mountain changes shape.

### Ice

When water freezes in the ground, the ice expands. It breaks Earth's crust. Sometimes ice can even break a rock apart.

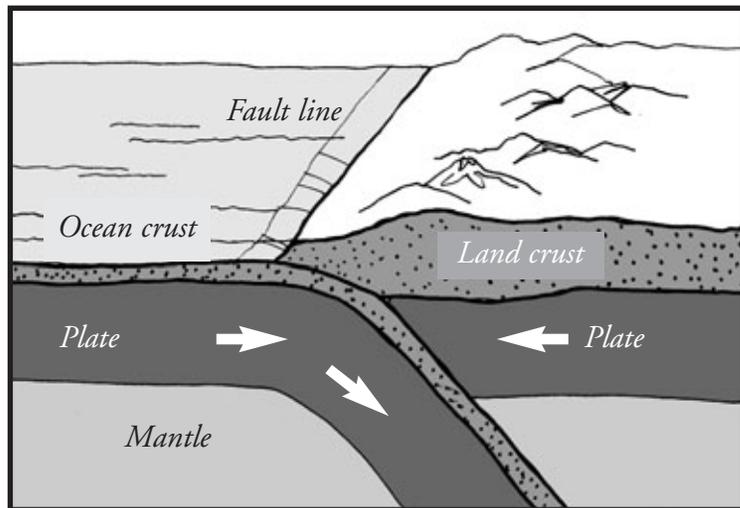


# Predicting

## TRY THE SKILL

Graphics can help you predict what will happen. Using graphics to predict can help you understand what you read.

Look at this graphic from *Our Changing Earth*.

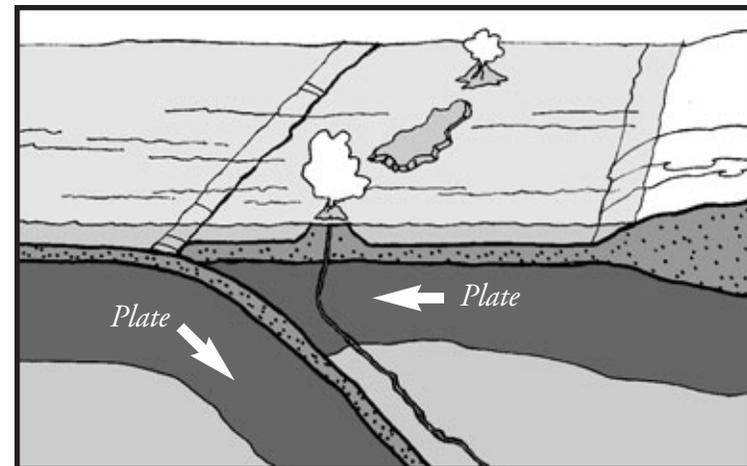


What does this graphic tell you?

A volcano forms when the ocean crust moves under the land crust.

Use the words in the box to label this graphic. Then, answer the question.

Ocean crust    Mantle    Land crust    Fault line



1. What happens when one piece of Earth's crust moves under another in the ocean?
  - Ⓐ A huge avalanche occurs in the ocean floor.
  - Ⓑ Volcanoes form and eventually make islands.
  - Ⓒ Earthquakes shake down buildings and bridges.

# Answer Key

## Sequential Order

1. First, winds erodes the sand.
2. Next, the sand piles up.
3. Finally, the sand becomes a sand dune.

## Evaluate New Information

1. B
2. C

## Compare and Contrast

**Wind:** Wind blows dirt away. It wears away rock.

**Both:** Both change Earth's crust.

**Ice:** When water freezes, it expands. Ice can break a rock apart.

## Predicting

1. B