Grade 8

2nd Term Week 7

TOPIC 8: CLIMATE

Lesson 1: Climate Factors

OBJECTIVES:

❖ Students will compare time scales of the same phenomena to
• identify weather as a description of short-term atmospheric conditions.
• recognize climate as long-term patterns in atmospheric conditions.

❖ Students will analyze and interpret data to provide evidence to support
• how latitude, altitude, distance from large bodies of water, and ocean currents affect patterns of circulation in the atmosphere and ocean.

❖ Students will construct an explanation for
• how patterns of circulation determine regional climates.

FACTORS THAT AFFECT TEMPERATURE

PGS. 385

Label the parts on the image that indicate what kind of temperature and precipitation are present in Antarctica.

Make Generalizations

From what you see in the image, how would you describe conditions in Antarctica?

1.SEP Design Solutions

How do you think humans would adapt to this climate?

Introduction to factors affecting climate
https://www.youtube.com/watch?v=I2eZR15Q4G0

Temperature and Climate Figure 1 Polar climates have certain patterns of temperature and precipitation, as shown in this image of Antarctica.

FACTORS THAT AFFECT TEMPERATURE

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- ✓ **weather** describes the **short-term** conditions in an area.
- ✓ "it's snowing" **describes** the current weather.

Climate

- is the long-term weather pattern in an area.
- refers to the average, year-after-year conditions of temperature, precipitation, wind, and clouds.
- Like: water cycles in different areas

For example,
year-round freezing temperatures in Antarctica prevent snow from melting and limit evaporation from the ocean.
Antarctica has a cold, dry climate.

For example,

- ✓ California's Mojave Desert, where the limited precipitation evaporates rapidly. The climate there is hot and dry.
- ✓ But, if you move west from the Mojave Desert toward California's coast, you would notice a cooler, more humid climate.

FACTORS THAT AFFECT TEMPERATURE PGS. 385

✓ An area's climate is affected by its :

1. **latitude**,
2. **altitude**,
3. distance from **large bodies of water**,
4. **ocean currents**, and
5. **global prevailing winds.**

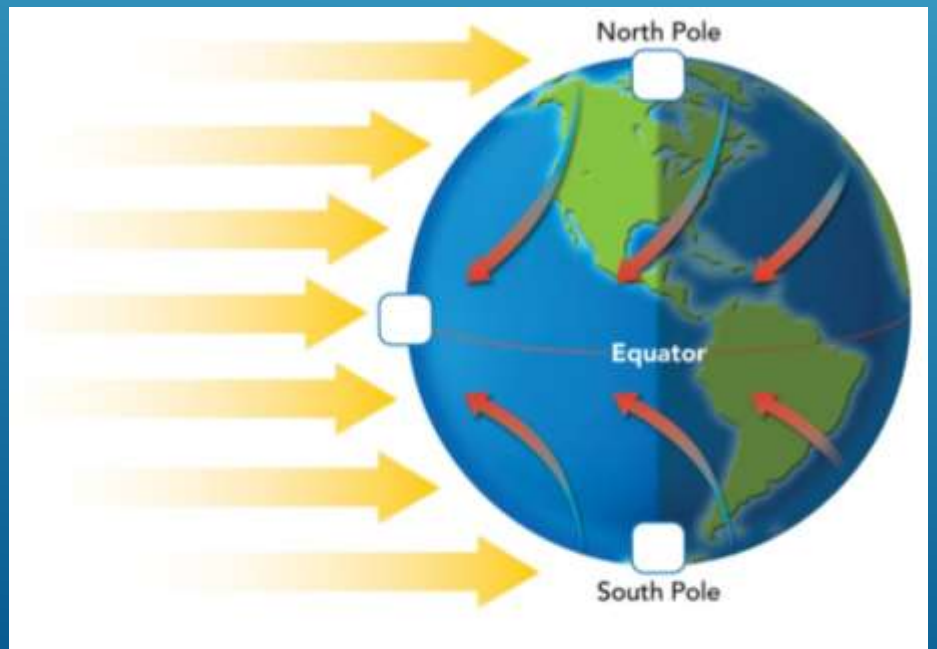
- These factors are continuously changing, but an area's climate does remain relatively stable.
- However, if these factors change too quickly or drastically, then the area's climate can change as well.

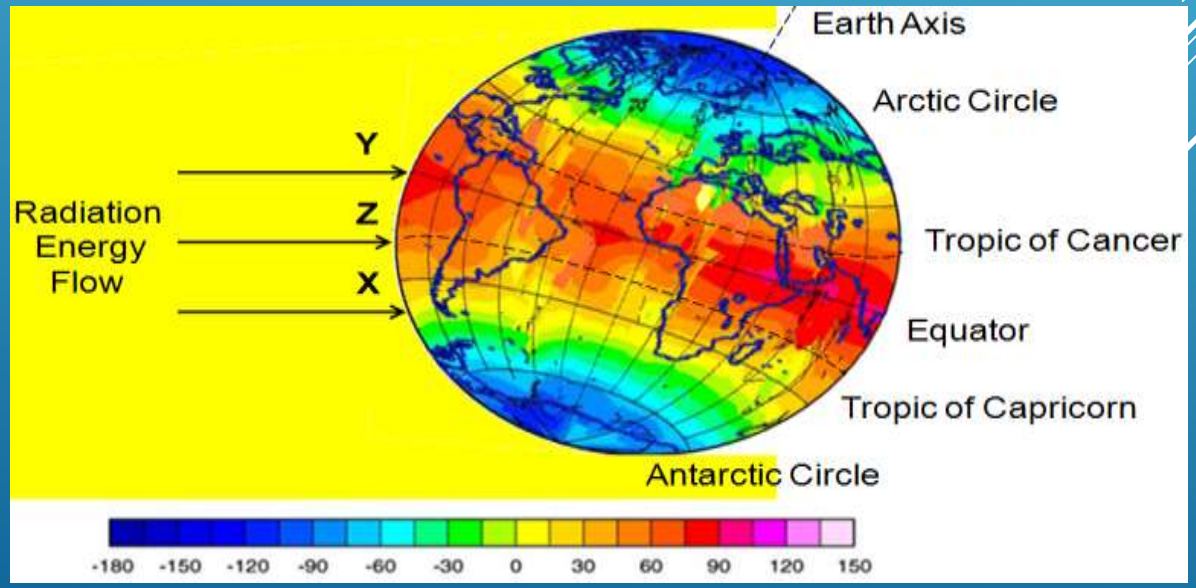
FACTORS THAT AFFECT TEMPERATURE PGS.

Towns and cities in the northern United States tend to have snowy winters, while those in the south have mild, warm winters.
Do you know why?

1- Latitude

- Areas closer to the **equator** have **warmer** climates.
- The sun's rays hit Earth's surface more directly at the equator than at the poles.
- At the poles, the same amount of solar radiation hits at a greater angle, which brings less warmth.
- Based on latitude, Earth's surface is divided into three types of temperature zones

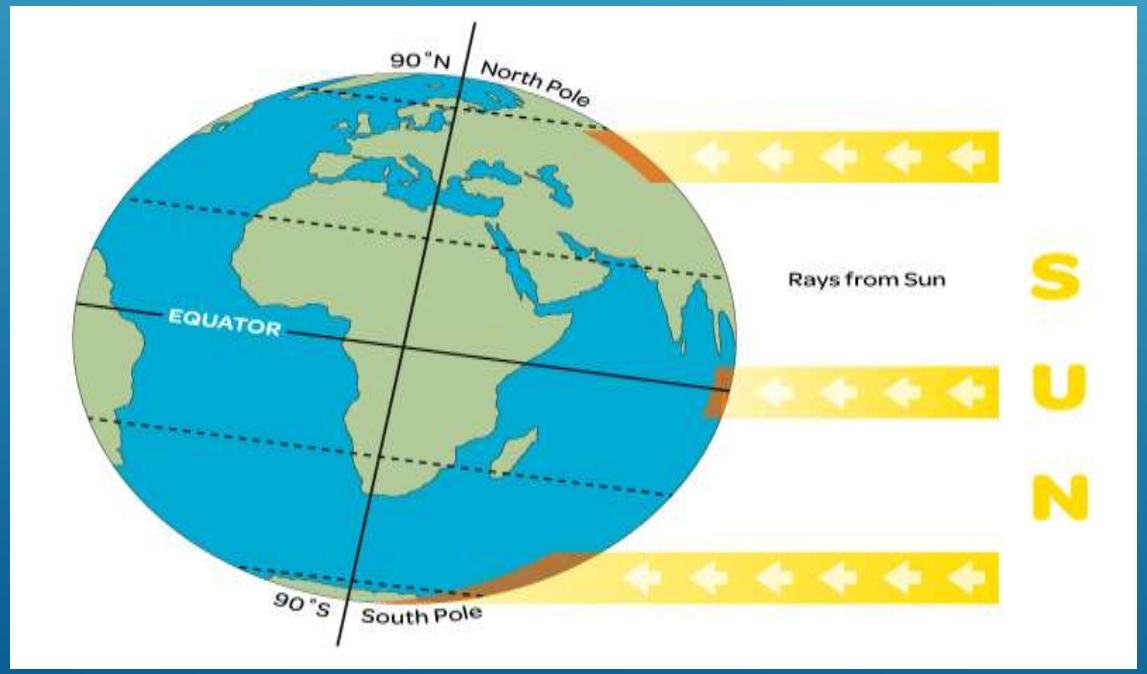




FACTORS THAT AFFECT TEMPERATURE PGS.

1- Latitude

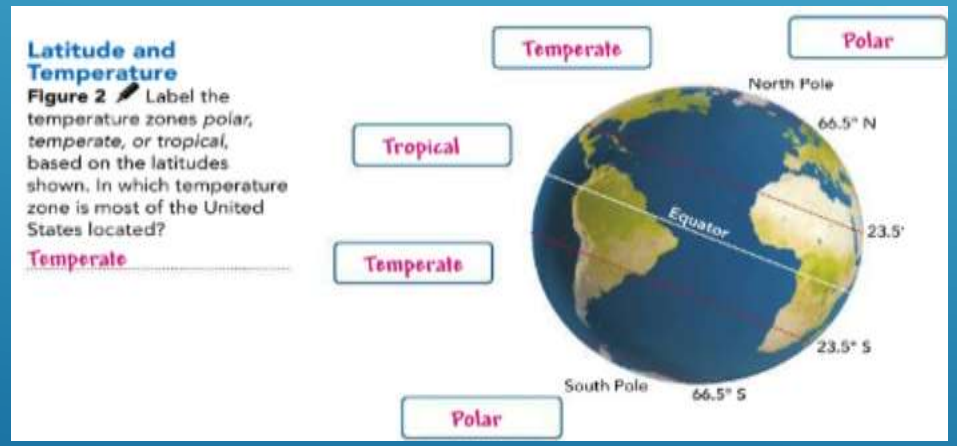
- Based on latitude, Earth's surface is divided into three types of temperature zones
- The tropical zone includes all of the locations on Earth that can possibly see the sun directly overhead.
- The polar zones extend from about 66.5° to 90°N and 66.5° to 90°S latitudes.
- Between them are the temperate zones.
- In summer, the sun's rays strike the temperate zones quite directly.
- In winter, the sun's rays strike at a lower angle.

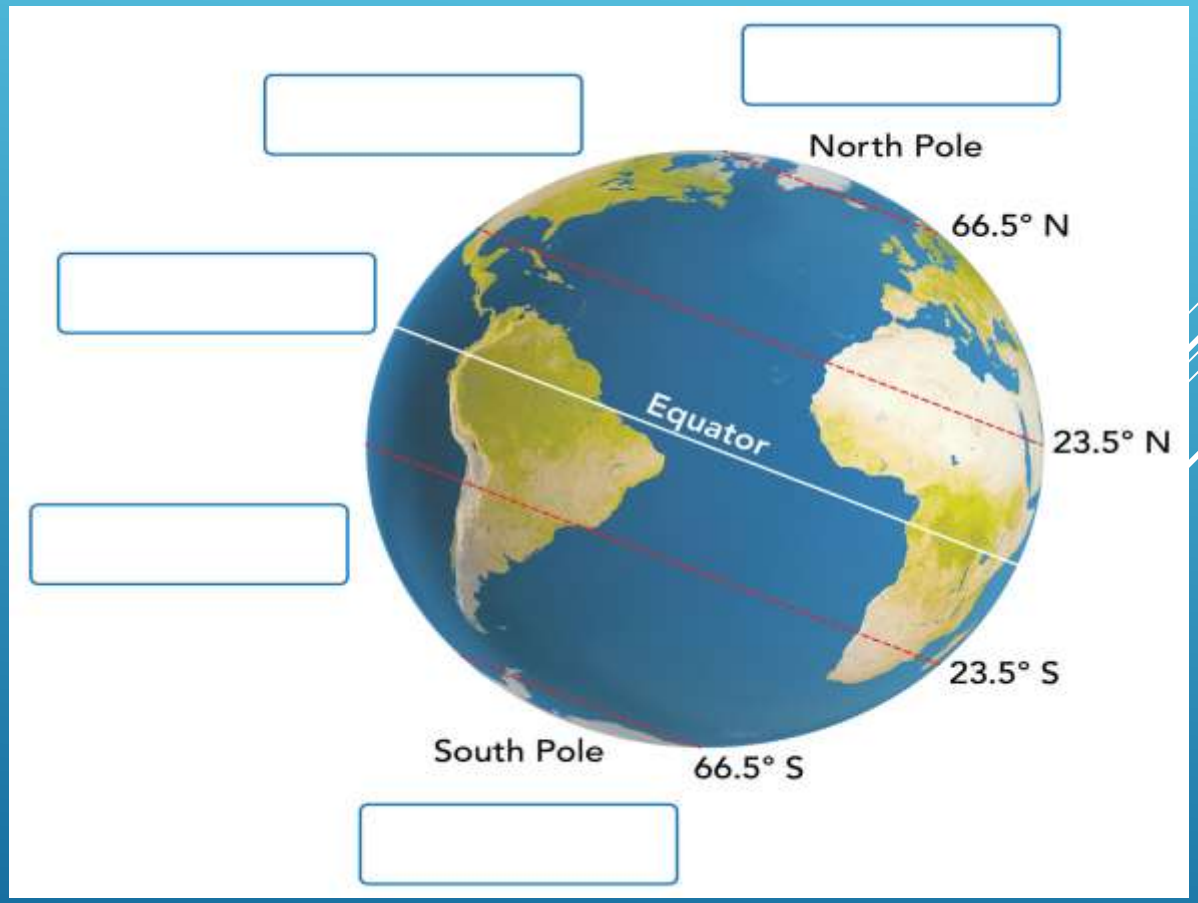


Latitude and Longitude
https://www.youtube.com/watch?v=HvCvANs7O7k

FACTORS THAT AFFECT TEMPERATURE
PGS. 386

Latitude and Temperature **Figure 2** Label the temperature zones *polar*, *temperate*, or *tropical*, based on the latitudes shown. In which temperature zone is most of the United States located?



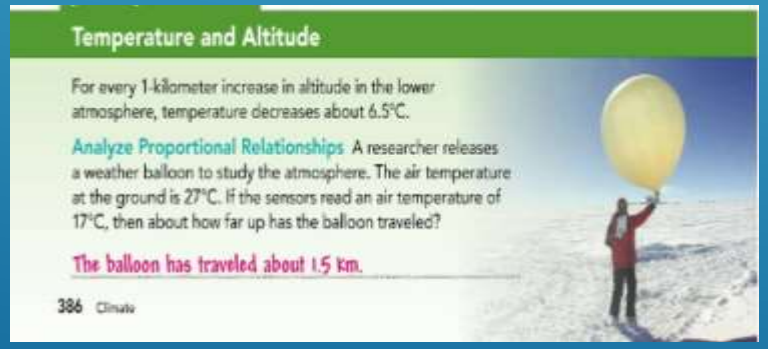


FACTORS THAT AFFECT TEMPERATURE PGS. 386

2- Altitude

- In the case of high mountains, altitude is a more important climate factor than latitude.
- Near Earth's surface, **temperature decreases** as **altitude increases**.
- Thus, many mountainous areas have cooler climates than the lower areas around them.

FACTORS THAT AFFECT TEMPERATURE PGS. 386



Math Toolbox

Temperature and Altitude

For every 1-kilometer increase in altitude in the lower atmosphere, temperature decreases about 6.5°C.

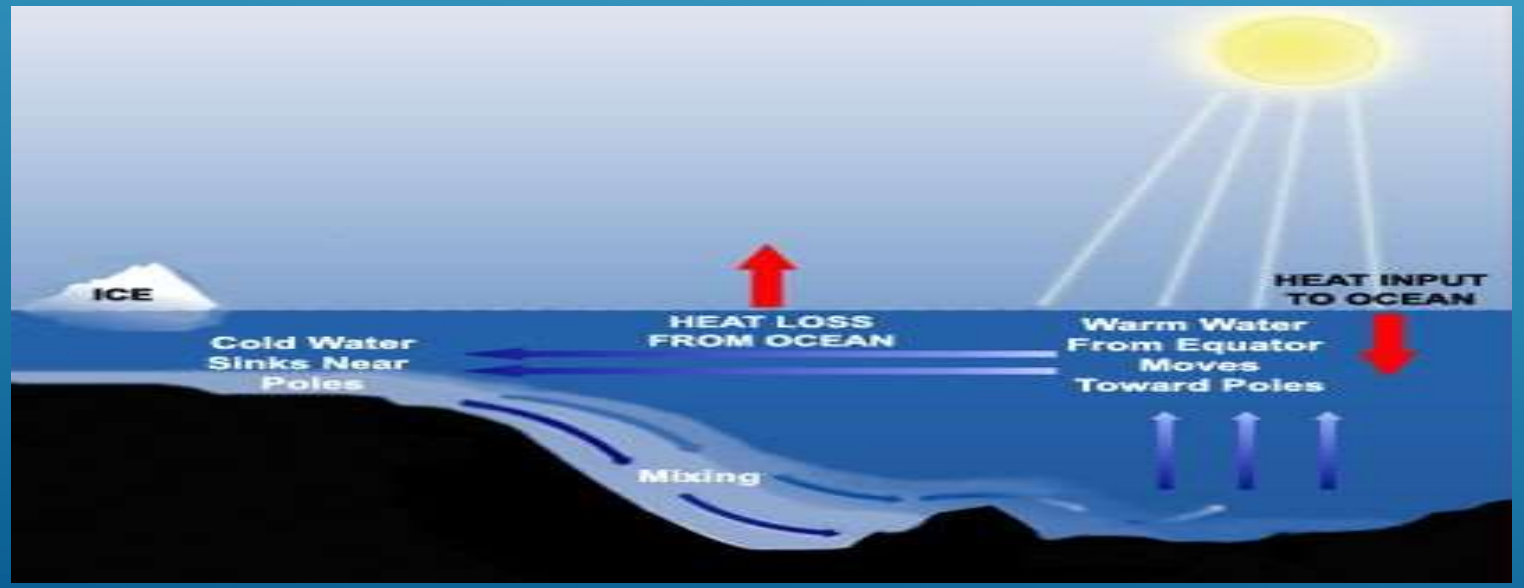
Analyze Proportional Relationships A researcher releases a weather balloon to study the atmosphere. The air temperature at the ground is 27°C. If the sensors read an air temperature of 17°C, then about how far up has the balloon traveled?

FACTORS THAT AFFECT TEMPERATURE PGS. 387

3- Distance from Large Bodies of Water

- The ocean and other large bodies of water, such as lakes, can affect the weather and climate of nearby land by moderating local air temperatures.
- Water heats up and cools down about **five times more slowly** than land.
- As a result, the air above water heats up and cools down more slowly than air over land.
- When winds blow across oceans onto land, they moderate temperatures in coastal areas, bringing **mild winters and cool summers.**

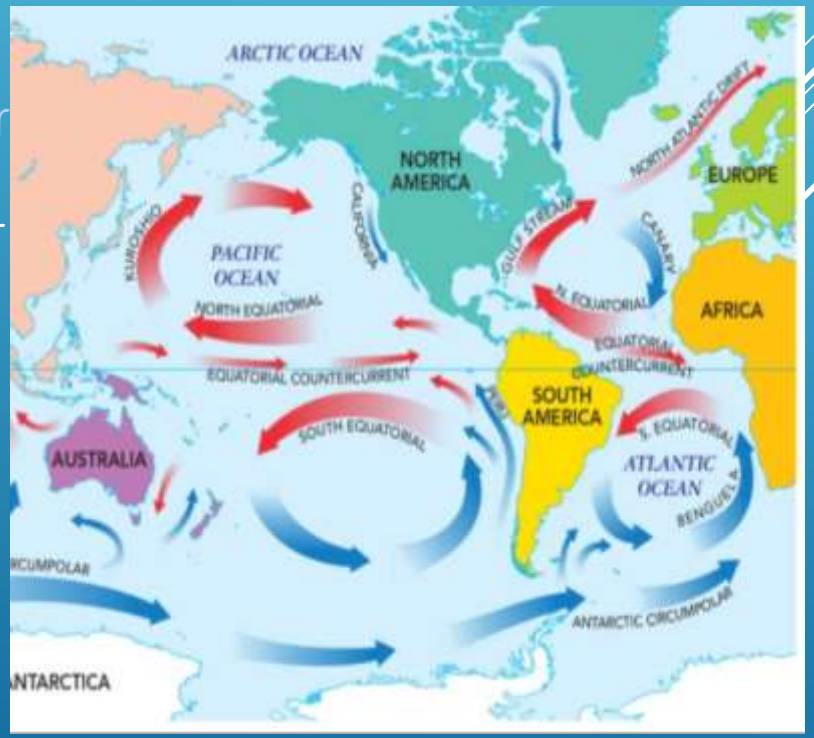
- The centers of most continents, however, are too far from the ocean to be warmed or cooled by it. These areas have **continental climates**, with colder winters and warmer summers.



FACTORS THAT AFFECT TEMPERATURE PGS. 387

4- Ocean Currents

- Marine climates are strongly influenced by the temperature of nearby ocean currents.
- Most warm ocean currents move toward the poles.
- Conversely, cold water currents tend to move toward the equator
- **Cold currents** affect climate by **carrying cold water** from the polar zones toward the equator, cooling local air masses.



FACTORS THAT AFFECT TEMPERATURE PGS. 387

Determine Conclusions

How does the North Atlantic Drift most likely affect the climate in Europe?

Major Ocean Currents
Figure 3 Major currents circulate warm and cold ocean water between the poles and the equator. Compare and contrast the major ocean currents north and south of the equator.

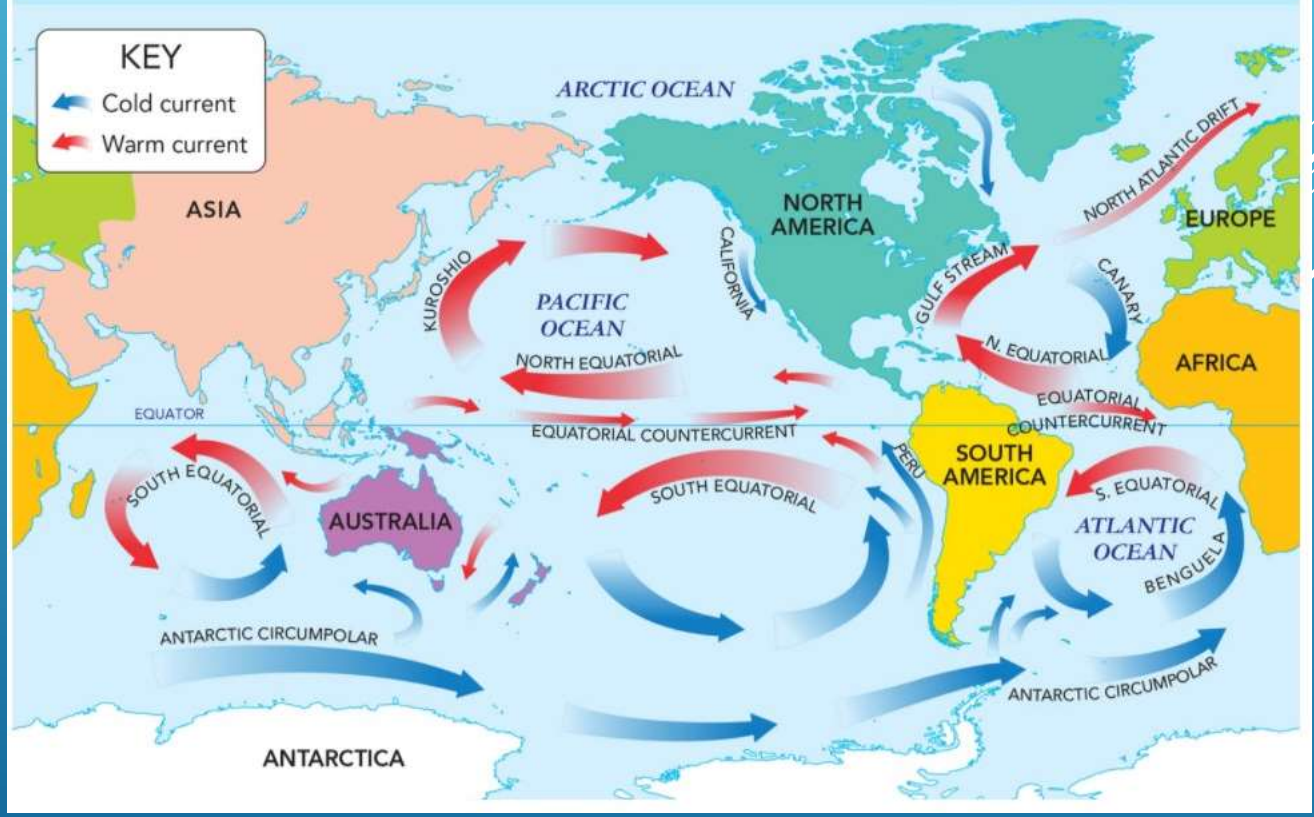
The currents circulate ocean water between the poles and the equator, but they move in opposite directions.

READING CHECK **Determine Conclusions** How does the North Atlantic Drift most likely affect the climate in Europe?

It brings mild, humid air to parts of Europe.

Major Ocean Currents **Figure 3** Major currents circulate warm and cold ocean water between the poles and the equator. Compare and contrast the major ocean currents north and south of the equator.

NOTEBOOK



FACTORS THAT AFFECT PRECIPITATION PGS.

- By analyzing the amount of precipitation an area has received over many years, meteorologists determine the average yearly precipitation for that area.

- The main factors that affect the amount of precipitation an area receives are

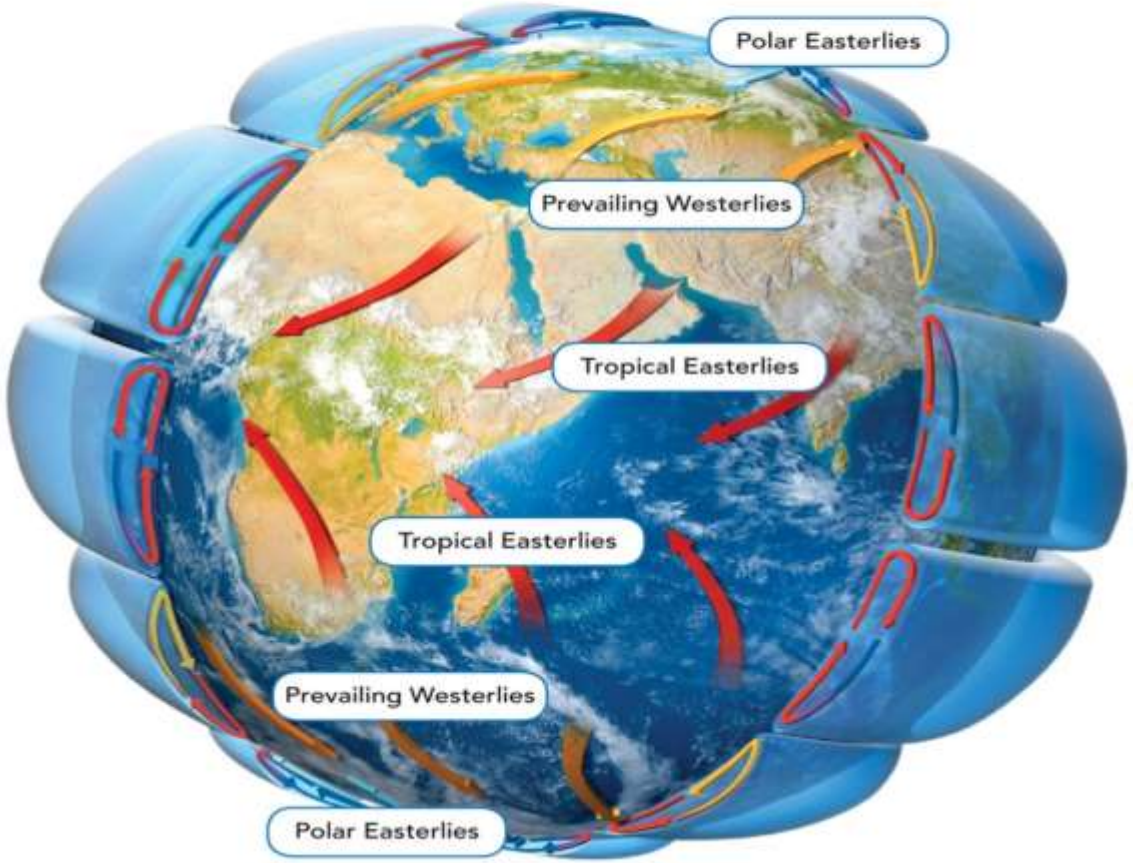
1- prevailing winds,
2- presence of mountains, and
3- seasonal winds.

- **Prevailing Winds**

- are winds that usually **blow in one direction** over large distances on Earth.
- are **organized into belts** that can move air masses with different temperatures and humidities over long distances.
- The amount of water vapor an air mass carries affects how much rain or snow it can produce.

Prevailing Winds **Figure 4** Which of the wind belts shown most affects Europe?

NOTEBOOK



FACTORS THAT AFFECT PRECIPITATION PGS.

2- Mountain Ranges

- It can affect the type and location of precipitation any air masses may produce as they pass over the area.
- Humid air masses blown in from the ocean are forced to rise as they encounter coastal mountains, producing clouds and precipitation on the side of the mountain facing the wind.
- After passing over the mountains, the air mass is dryer, having lost much of its water vapor.
- This leaves the side of the mountain facing away from the wind in a rain shadow, where little precipitation falls.

FACTORS THAT AFFECT PRECIPITATION PGS.

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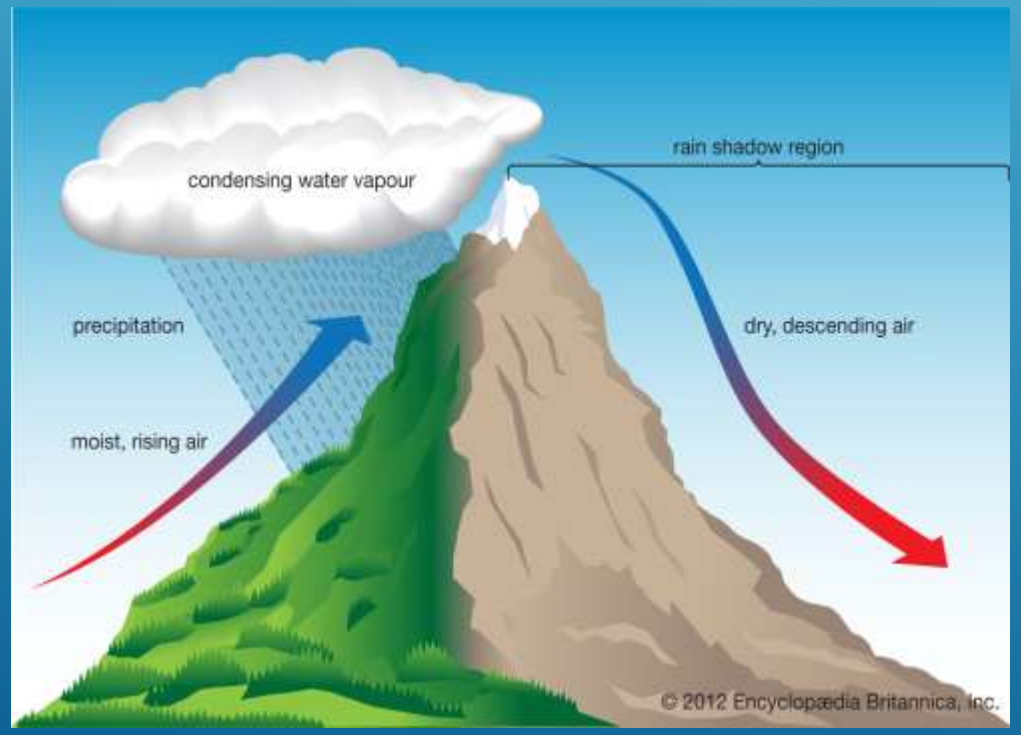

FACTORS THAT AFFECT PRECIPITATION PGS.

3- Seasonal Winds

- A seasonal change in wind patterns and precipitation, called a **monsoon**, occurs in some parts of the world.

- Monsoons are caused by different rates of heating and cooling between the ocean and nearby land.

- During the summer in southern Asia, when the land gradually gets warmer than the ocean, warm and humid winds constantly blow in from the ocean, producing heavy rains. In winter, the opposite occurs as the land becomes colder than the ocean. Cool, dry winds constantly blow out to sea from the land.

FACTORS THAT AFFECT PRECIPITATION
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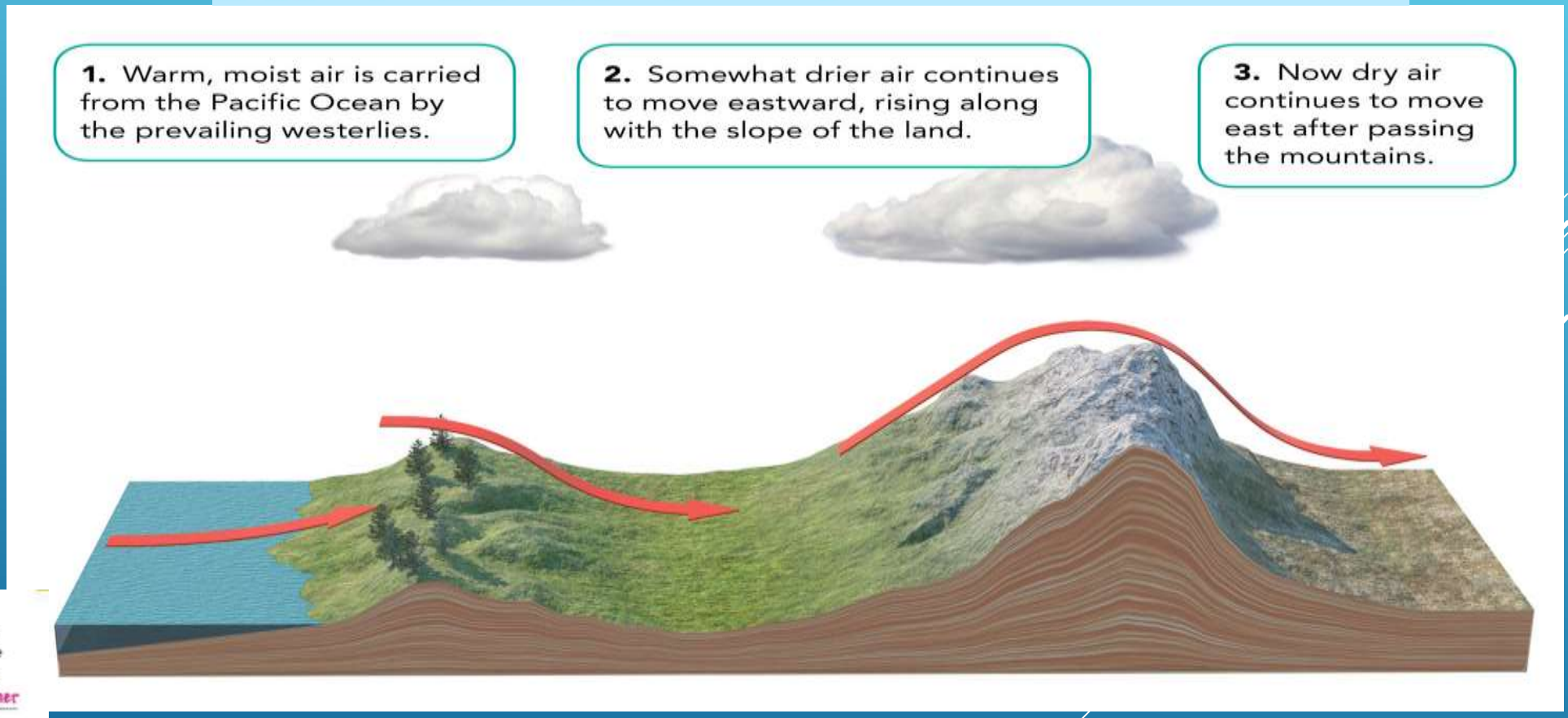
Mountains and Precipitation **Figure 5** This image shows what happens when a mountain range is in the path of a prevailing wind. Draw rain and snow where they are most likely to occur. Add a redwood tree and a cactus in the locations that you think favor the growth of these plants.



Integrate With Visuals
If the area shown were located in a region where monsoons occur, would the figure represent a summer monsoon or a winter monsoon? Explain.

READING CHECK **Integrate With Visuals** If the area shown in Figure 5 were located in a region where monsoons occur, would the figure represent a summer monsoon or a winter monsoon? Explain.

The figure would be showing the wind pattern during a summer monsoon because the winds are blowing from the ocean onto land.

WORLD CLIMATES

PGS.

Classifying Climates

- Scientists classify climates by taking into account an area's average temperature, average annual precipitation, and the vegetation found growing there.
- The major climate regions of Earth each have their own smaller subdivisions

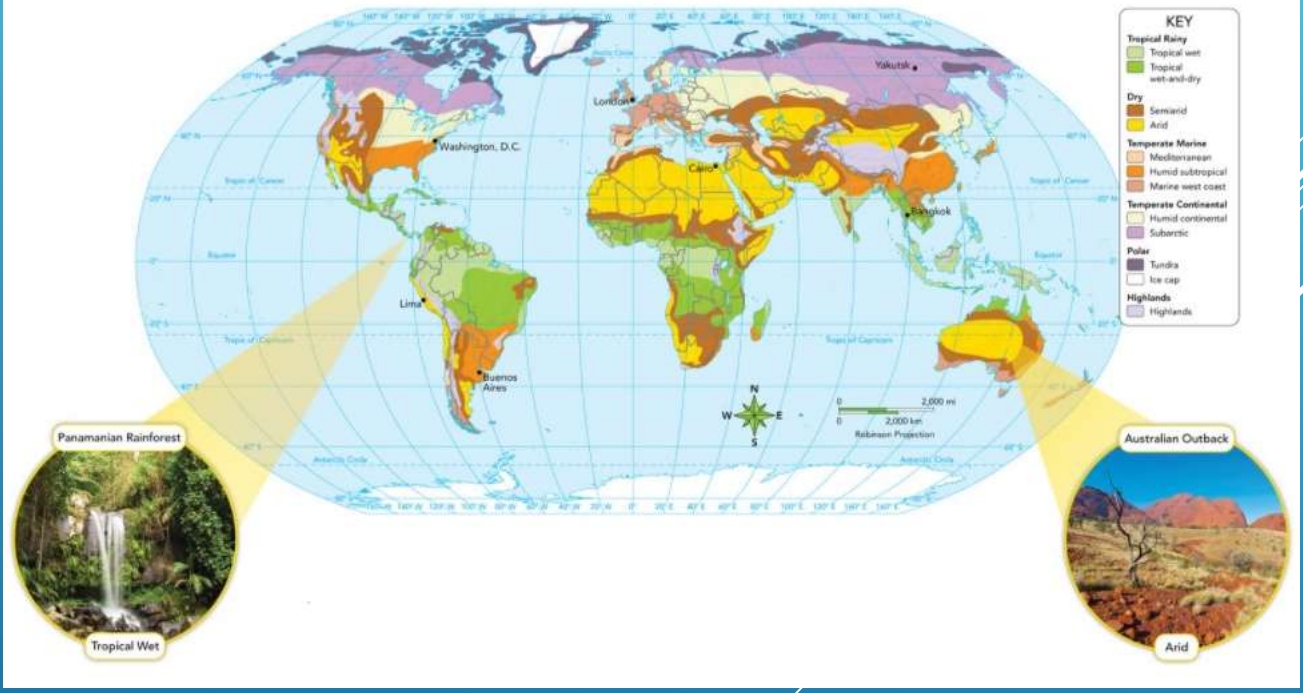
- Recall that local climates can be affected by changes in natural climate factors, such as ocean currents and winds.

- Human activities that affect the atmosphere and ocean can also impact local climates. So Earth's climate regions can change over time.

Major Climates Figure 6 The locations of major climate regions covering Earth's surface are influenced by many factors. Draw a circle around the area on the map where you live. What type of climate exists where you live?

Download to read and complete the activity.

DOWNLOAD



Major Climates

Figure 6 The locations of major climate regions covering Earth's surfac are influenced by many factors. Draw a circle around the area on the map where you live. What type of climate exists where you live?

Students should draw a small circle on the map near where they live. Students should identify their local climate using the map key.

Model It!

City Climates

SEP Use Models Choose 2 cities and explain how and why each city's climate differs.

Students should pick 2 cities and explain how and why their latitude, altitude, distance from large bodies of water, ocean currents, and global prevailing winds produce their local climates.

LESSON 1 Check

Standards

00:45

1. SEP Construct Explanations What is the difference between weather and climate?

NOTEBOOK

2. CCC Cause and Effect What are four different factors that affect the temperature of an area on Earth?

NOTEBOOK

3. CCC Patterns How do climate factors affect temperature patterns where you live?

NOTEBOOK

4. SEP Use Models How do you think the Gulf Stream influences the climate of northern Europe?

NOTEBOOK

LESSON 1 Check

MS-ESS2-6

1. **SEP Construct Explanations** What is the difference between weather and climate?

Weather is the day-to-day change in temperature and precipitation. Climate is a pattern of temperature and precipitation over time.

2. **CCC Cause and Effect** What are four different factors that affect the temperature of an area on Earth?

latitude, altitude, ocean currents, and distance from bodies of water

3. **CCC Patterns** How do climate factors affect temperature patterns where you live?

Sample: I live in coastal Florida, so I have temperate temperatures based on my latitude. I'm at sea level, so altitude does not change it. The temperatures here are warmer in the winter and cooler in the summer because I am close to large bodies of water that are affected by ocean currents.

4. **SEP Use Models** How do you think the Gulf Stream influences the climate of northern Europe?

The Gulf Stream carries warm ocean water up toward Europe. This probably helps to moderate the cold temperatures in northern Europe.

Quest CHECK-IN

In this lesson, you learned about how latitude and altitude can affect the climate of different regions on Earth. You also learned how patterns of circulation in the atmosphere and ocean affect climate.

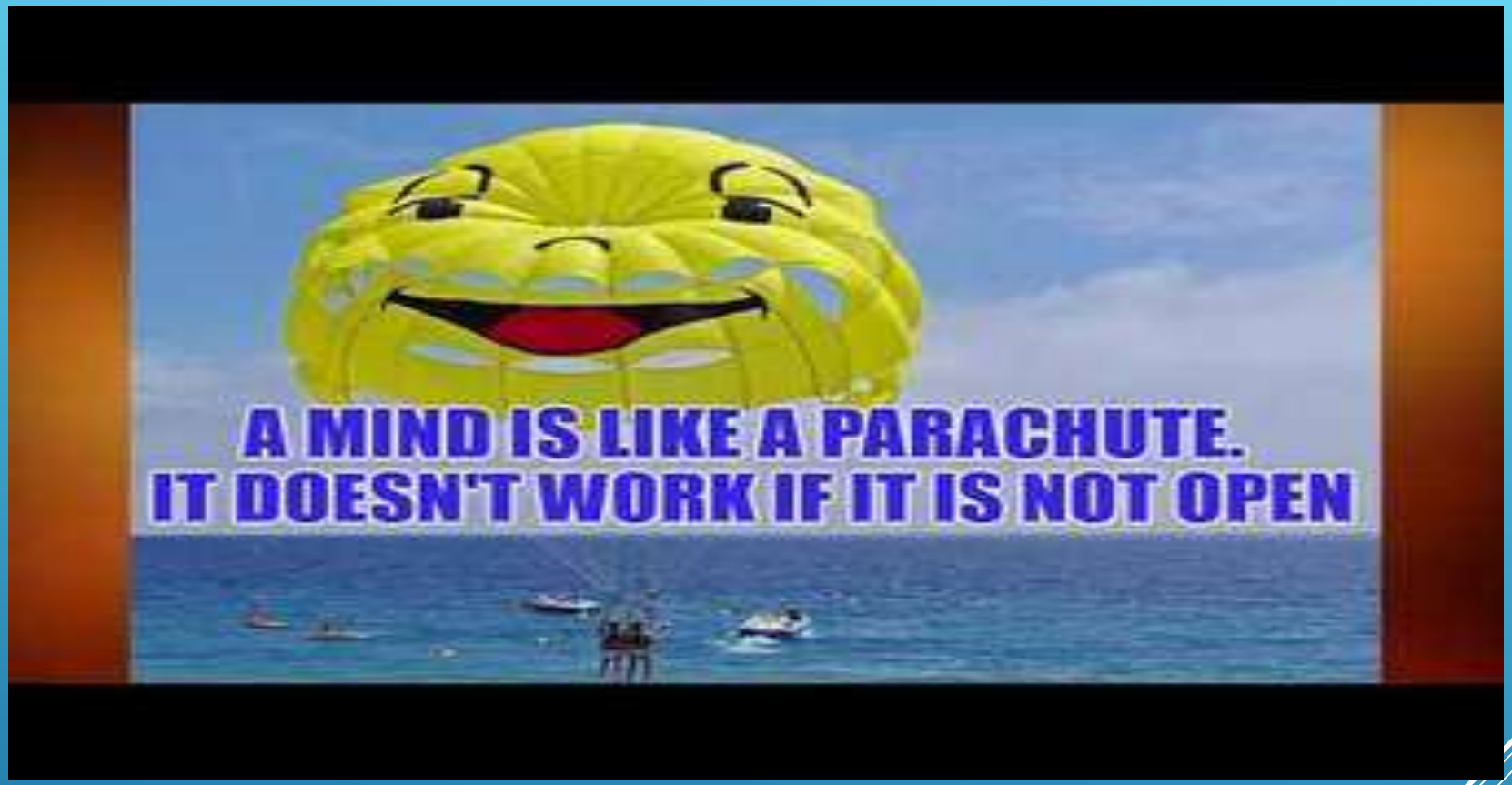
CCC Cause and Effect How might the climate of a particular region affect the carbon footprint of homes, schools, and businesses located there?

Sample: Areas in colder climates would likely use more energy during the winters to keep warm, which would increase their carbon footprints. Areas in very warm climates would also increase their footprints using energy to keep cool in the summer.

INTERACTIVITY

Footprint Steps

Go online to consider factors that affect your school's energy usage and calculate how much carbon dioxide was released by your school based on its energy usage.



THANK YOU…